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Montana First Judicial District Court
Lewis and Clark County

Rikki Held, et al., Plaintiffs, vs. State of Montana, et al., Defendants	Cause No. CDV-2020-307 **Declaration of Sonja Nowakowski in Support of Defendants' Motion for Clarification and for Stay of Judgment Pending Appeal**

1. Sonja Nowakowski declares as follows:

2. I am the Administrator of the Montana Department of Environmental Quality ("DEQ") Air, Energy, and Mining Division, and have personal knowledge of the facts herein in this Declaration. Prior to joining DEQ in 2021, I worked for the Montana Legislature for 15 years. I served in a nonpartisan capacity as a research analyst in the Legislative Environmental Policy Office and as the

Research Director for the Office of Research and Policy Analysis. My nonpartisan work for the Legislature focused on environment and energy policy.

3. As the Administrator of DEQ's Air, Energy, and Mining Division, I am familiar with DEQ permitting processes for coal mining, natural gas fueled electricity generators, coal fueled electricity generators, petroleum refineries, and oil pipelines under their respective substantive permitting statutes. I am also familiar with the requirements for energy planning and procurement in Montana, renewable energy programs in Montana, and Montana's transitioning energy marketplace. Finally, I am familiar with DEQ's separate environmental review processes for DEQ permitting decisions under Montana Environmental Policy Act ("MEPA") and understand fully how those review processes and permitting processes are distinct requirements.

4. I, additionally, was a witness for DEQ in the above captioned case and I am, therefore, familiar with this case and this Court's Findings of Fact, Conclusions of Law, and Order issued on August 14, 2023 ("Order").

5. If a stay is not granted and the Court's order not clarified in this case, DEQ and the public will be harmed in two ways. First, invalidating § 75-1-201(2)(a), MCA and expecting DEQ to immediately conduct legally defensible and scientifically appropriate greenhouse gas ("GHG") and climate analysis in all MEPA reviews will impose significant hardships on the agency. Because MEPA

judicial reviews can be, and often are, subject to requests to vacate the relevant permit, it also leaves dozens of applications at risk. Those procedural MEPA reviews are conducted for a broad spectrum of substantive permit activities, ranging from Montana Air National Guard permit modifications to provide for national security to minor coal permit revisions that allow coal mines to continue to legally operate in Montana. Second, the interpretation of this Court's Order by some, including counsel for Plaintiffs, Our Children's Trust ("OCT"), threatens Montana's energy supply. These two harms are addressed in turn.

I. Absent a stay, this Court's Order creates problems for applications currently being processed by DEQ.

6. As the Court noted in its Order, DEQ has not included analysis of GHG or climate impacts in its documents issued under MEPA since prior to 2011. Order at 13, 69, 73–74, 77. Because this review has not occurred in over a decade, DEQ cannot immediately conduct such review without adequate time to prepare scientifically and legally defendable analysis.

7. For instance, DEQ's analysis of GHG emissions in evaluating the Keystone XL Pipeline considered global economic demand of petroleum products, which was conducted with the assistance of a federal partner, the U.S. Department of State. *See* Mont. Dept't Envtl. Quality, *Supp. Information for Compliance with the Mont. Envtl. Policy Act and Supp. for Decisions under the Major Facility Citing Act*, I-6 (Aug. 26, 2011) (Ex. C). This analysis took several years to

complete (TransCanada filed its application with DEQ on December 22, 2008, and DEQ's final EIS on the project was issued on August 26, 2011) and was completed under a federal partnership. DEQ does not currently have the in-house expertise to conduct this type of economic analysis without hiring a third-party consultant. In most permitting processes, statutorily mandated timelines are also in place and do not afford DEQ with the luxury of several years to complete such an analysis.

8. A true and correct copy of DEQ's Final Environmental Impact Statement ("EIS") for TransCanada's Keystone XL Pipeline Project is attached as Exhibit C.

9. DEQ similarly engaged in climate and GHG analysis in the Highwood Generating Station Final EIS with the U.S. Department of Agriculture – Rural Utility Service. This GHG and climate discussion presented the applicant's proposed mitigation efforts to offset the plant's GHG emissions. *See* U.S. Dep't of Agric. – Rural Util. Service & Mont. Dep't of Envtl. Quality, *Final Environmental Impact Statement Highwood Generating Station*, 4-53 to 4-46 (Jan. 2007) (Ex. D). Many of these mitigation efforts appear to have taken considerable time to prepare for, like applying for federal grants. *Id.* at 4-45. If the Highwood Generating Plant is the model for conducting climate and GHG analysis under MEPA, DEQ must collect information from applicants about GHG emissions and potential mitigation efforts. The applicants will, additionally, be required to develop and describe those

efforts. Those alternatives must then be vetted by DEQ as well as stakeholders. The time necessary to collect such information, in some instances, will prevent DEQ from meeting statutory deadlines for conducting its review of projects. The Highwood Generating Station required a nearly 500-page Environmental Impact Statement, of which a draft EIS was released in June 2006 and a final EIS was released in January 2007, and included, at one time during analysis, more than 20 different alternatives.

10. A true and correct copy of the U.S. Department of Agriculture – Rural Utilities Service and DEQ's Final EIS for Southern Montana Electric Generation and Transmission Cooperative, Inc.'s Highwood Generating Station is attached as Exhibit D.

11. DEQ conducted its own GHG and climate analysis in the EIS for the Roundup Power Project without a federal partner. The Draft EIS for this project discusses the generic impacts of GHG emissions, disclosed the total GHG emissions from the proposed project, compared the proposed project's GHG emissions to nationwide GHG emissions, and concluded "[n]o basis exists for determining the severity of greenhouse gas['s] impacts on global warming; therefore, an impact level cannot be assigned." Mont. Dep't of Envtl. Quality, *Draft Envtl. Impact Statement for Roundup Power Project*, 4-20 to 4-22 (Nov. 2002) (Ex. E). In the Final EIS, DEQ determined "[f]urthermore, carbon dioxide

and other greenhouse gases are not regulated air pollutants under the federal or state regulations, so cumulative effects from carbon dioxide were not analyzed." Mont. Dep't of Envtl. Quality, *Final Envtl. Impact Statement for Roundup Power Project*, 4-12 (Jan. 2002) (Ex. F); *see also id.* at 1-1 (incorporating by reference the Draft EIS for this project into the Final EIS). It remains the case that, under Montana law, carbon dioxide and other greenhouse gases are not regulated criteria pollutants under the Montana Clean Air Act.

12. A true and correct copy of DEQ's Draft EIS of Bull Mountain Development Company, LLC's Roundup Power Project is attached as Exhibit E.

13. A true and correct copy of DEQ's Final EIS of Bull Mountain Development Company, LLC's Roundup Power Project is attached as Exhibit F.

14. In February 2002, DEQ issued its record of decision and final air quality permit for Continental Energy Service, Inc. Silver Bow Generation Plant to construct a 500 mega-watt natural gas fired power plant near Butte. The EIS disclosed that the plant would emit about 2,375,720 tons of carbon dioxide into the air each year. Montana Environmental Information Center ("MEIC") later challenged the permit because the "permit and EIS provide no analysis of the health, environmental, and economic impacts of global climate change and provide no analysis to justify the statement than an additional release of 2,375,720 tons per year of CO2 is insignificant." *In re Continental Energy Services*, Inc., Permit No.

3165-00, Aff. and Pet. for Hearing and Stay of Permit Issuance, 7 (Mont. BER Mar. 29, 2002) (Ex. G).

15. As this example demonstrates, DEQ only disclosing the amount of GHG emissions from a proposed project does not ensure that parties will be satisfied with DEQ's analysis. Without either statutory guidance on how to conduct a climate analysis in MEPA or state GHG regulations, DEQ is working to understand how a proposed project's GHG emissions interact with MEPA's command to determine "if an agency action will significantly affect the quality of the human environment." *Park Cty. Envtl. Council v. Mont. Dep't of Envtl. Quality*, 2020 MT 303, ¶ 31, 402 Mont. 168, 477 P.3d 288. This process requires time and energy that, without a stay, will be spent defending against MEPA challenges on GHG and climate grounds, rather than developing a method for addressing these issues. DEQ is committed to working through these complexities and has demonstrated so by engaging with the public in a dialogue about MEPA.

16. A true and correct copy of MEIC's Affidavit and Petition for Hearing and Stay of Permit Issuance challenging Continental Energy Services, Inc's Silver Bow Generation Plant dated March 29, 2002, is attached as Exhibit G.

17. There are additional indications that suggest that the disclosure of GHG emissions without further analysis, as provided in the Roundup Power

Project and the Silver Bow Generation Project, will be viewed as inadequate and vulnerable to challenge.

18. For instance, this Court's August 14, 2023, stated in its findings of fact that "DEQ approved revision to Spring Creek Mine, the largest coal mine in the State, allowing for recovery of [an] additional seventy-two million tons of coal," and that "DEQ refused, pursuant to the MEPA Limitation, to analyze impacts on the social cost of carbon and economic impacts from climate change in its EIS." *See* Order at 77 (finding of fact 265(f)).

19. Additionally, at a listening session hosted by DEQ in Billings on October 2, 2023, on MEPA reform, many participants indicated that they would prefer DEQ to conduct a social cost of carbon analysis for its GHG and climate review under MEPA. DEQ will be conducting additional public meetings on MEPA reform in Helena on October 18, 2023, and Missoula on October 19, 2023. *See* Mont. Dep't of Envtl. Quality, *DEQ Seeking Input on Environmental Impact Analysis Process Under the Montana Environmental Policy Act* (Sept. 27, 2023), https://deq.mt.gov/News/pressrelease-folder/news-article112. The purpose of these meetings is, in part, to determine how DEQ could conduct GHG and climate analysis. These meetings will take time to appropriately host and collect public input; this is an additional reason for granting a stay to allow DEQ to gather

information from the public and stakeholders to inform DEQ's development of how GHG and climate analysis under MEPA might be done.

20. Federal agencies have demonstrated that adopting the correct methodology for analyzing GHG and climate impacts under federal NEPA is challenging.

21. NEPA requires federal agencies to analyze the environmental effects of their proposed actions before making decisions. Climate change is one environmental effect that may be considered. The federal Council on Environmental Quality ("CEQ") oversees NEPA implementation by issuing guidance on procedural requirements. This guidance continues to evolve and change in terms of how best to evaluate greenhouse gas and climate change effects. In 2016, the CEQ issued final guidance to federal agencies regarding how they consider GHG emissions and climate change. In 2019, the CEQ rescinded the 2016 guidance and issued new draft guidance. In 2020, the CEQ adopted a comprehensive revision of NEPA and revised the definition of "effects" and removed the definition of "cumulative impacts," which the CEQ stated "does not preclude consideration" of climate change impacts, but the "analysis of the impacts on climate change will depend on the specific circumstances of the proposed action." In 2021, the CEQ was directed to rescind the previous guidance. In April 2022, "cumulative effects" was added back to the definition of "effects" and GHG

analysis was revised. In January 2023, the CEQ published interim guidance that agencies should quantify reasonably foreseeable direct and indirect gross and net GHG emissions increases or reductions, both for individual pollutants and aggregated in terms of carbon dioxide equivalence. Separate from the above-mentioned guidance, in July 2023, the CEQ released the second phase of its NEPA revisions, adding further detail to the required analysis necessary in proposed mitigation measures and alternatives under NEPA under the lens of climate.

22. While the DEQ may rely on federal guidance in its implementation of NEPA, it's not a straightforward path, and under Title 75, chapter 1, part 3 of the Montana Code Annotated, the Montana Environmental Quality Council ("EQC") is charged with analyzing and interpreting information for the purpose of determining whether actions taken by an Agency achieve the policy set forth in 75-1-103, which establishes MEPA. DEQ looks forward to engaging with the EQC in its efforts to comply with the Court order, however, this will require thoughtful and time-intensive discussions and coordination.

23. Most state actions—including DEQ permits and certificates for coal mining, natural gas fueled electricity generators, coal fueled electricity generators, petroleum refineries, and oil pipelines—are the subject of an environmental assessment ("EA"), as opposed to an EIS. State agencies undergo a review of proposed state actions to determine whether an EA or an EIS is needed. See ARM

17.4.608. In accordance with § 75-1-208, MCA, statutory timelines, however, apply to both EA and EIS procedures. While the Court's order points to "fossil-fuel activities[,]" Order at 69, 79, 88–90, 101, and "greenhouse gas-emitting projects[,]" *id.* 75, those terms are undefined in Montana statute. Potential projects that allow the burning of coal or natural gas are obviously "fossil-fuel activities." However, an approved opencut application permits an operator to mine gravel and is not obviously a fossil-fuel or greenhouse gas emitting project. Nevertheless, these opencut projects require heavy equipment that may emit GHGs. Determining what GHG and climate impacts (if any) might result from an opencut project, which is already subject to strict statutory timelines, *see* § 82-4-432, MCA, will be less straight forward than projects that emit GHG at a point-source, like a proposed power plant. Without legislative direction, DEQ needs time to work with stakeholders and properly weigh its limited discretion to find the proper path forward to ensure DEQ complies with its statutory timelines for issuing permits, follows the Court's order, and does not unnecessarily jeopardize permits.

24. Absent this Court's order, DEQ would have conducted statutory interpretation to determine if it could have examined climate and GHG impacts under House Bill 971 from the 2023 Montana Legislature. Under § 75-1-201(2)(b), MCA, as amended by House Bill 971, "[a]n environmental review conducted pursuant to [MEPA] may include an evaluation if . . . the United States congress

amends the federal Clean Air Act to include carbon dioxide emissions as a regulated pollutant." 2023 Mont. Laws ch. 450, § 1(2)(b). MEIC filed comments asserting DEQ's Environmental Assessment ("EA") of NorthWestern's Natural Gas Plant near Laurel, Montana may include a discussion of GHG and climate impacts because the Inflation Reduction Act of 2022 passed by the U.S. Congress designates carbon dioxide as a pollutant, satisfying the requirements of § 75-1-201(2)(b), MCA. *See* MEIC's Comments on DEQ's Draft EA, 4–10 (Jun. 30, 2023) (Ex. H). Because of this Court's invalidation of § 75-1-201(2)(a), MCA as amended by House Bill 971 and the stay granted by the district court, DEQ has paused its MEPA analysis on the Laurel Gas Plant and DEQ is, therefore, not addressing MEIC's proposed statutory interpretation of § 75-1-201(2)(b), MCA.[1]

25. A true and correct copy of MEIC's comments on DEQ's draft EA of NorthWestern Energy's Laurel Gas Plant is attached as Exhibit H.

26. Each year, DEQ processes roughly 30 to 50 coal applications, ranging from requests for minor revisions to existing permits to amendments that allow for new areas to be mined. These actions, if they impact the human environment, all trigger a MEPA review. In addition, each year, the Mining Bureau analyzes upward

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[1] The district court stayed its vacatur of NorthWestern Energy's permit pending appeal before the Montana Supreme Court, which has allowed DEQ to pause its MEPA review being conducted on remand. *See Mont. Envtl. Information Center v. Mont. DEQ*, Cause No. DV 21-1307, Order Granting Defs' Mot. to Stay Pending Appeal (Mont. 13th Jud. Dist. Ct. Jun. 8, 2023).

of 120 new opencut mining applications and 40 to 60 hard rock mining applications, permit amendments, and modifications. These actions are also all subject to MEPA. Air quality permit modifications and applications number close to 70 annually. These numbers do not include the numerous actions taken by the other Divisions across DEQ which also trigger a MEPA analysis.

27. In 2022, the Air, Energy, and Mining Division staff, one of only three Divisions at DEQ, issued 525 permits or licenses and conducted 194 environmental assessments.

28. In the month of September, 2023, DEQ's Air, Energy, and Mining programs have done the following: the Coal Mining Section received one new permit application and reported 18 additional permits or amendments in process; the Opencut Mining Section received 9 new applications and reported 72 permits and amendments in process; and the Air Quality program reported 19 permits, renewals, and modifications in process.

29. Because DEQ may not make a permitting decision until the MEPA analysis is complete, DEQ will have to delay issuing decisions on many of these projects or decline to conduct climate and GHG analysis during the MEPA review, which will make these projects vulnerable to challenge on appeal. In either event, this Court denying DEQ's motion for stay has the potential to harm entities and individuals beyond the parties included in this litigation.

II. This Court's Order has led Plaintiffs' counsel to argue that it prevents the permitting of any project that adds GHG emissions to the atmosphere.

30. On September 9, 2023, DEQ received two letters from Plaintiffs' Counsel, OCT, regarding permits currently being addressed by DEQ.

31. The first of these letters concerns an air quality permit for the applicant Montana Renewables, LLC for a new renewable biodiesel facility.

32. A true and correct copy of OCT's letter dated September 29, 2023, titled "RE: Montana Youth's Demand Letter and Comments on DEQ's Preliminary Determination on Permit Application MAQP #5263-02, Montana Renewables LLC" is attached as Exhibit A ("Montana Renewables Letter").

33. The second letter concerns an air quality permit for the Montana Air National Guard. The intent of this permit action is to update assumptions, equipment, processes, emission factors, and permit language that was specific to the previous F-15 mission. The benefits of the proposed action, if approved, include allowing the facility to continue operating within the 100 tons/year threshold for all criteria pollutants and updating equipment identifiers to reflect more accurately what is on-site. There are no proposed increases in total site potential to emit ("PTE"), with every pollutant decreasing.

34. A true and correct copy of OCT's letter dated September 29, 2023, titled "Montana Youth's Demand Letter and Comments on DEQ's Preliminary

Determination on Permit Application MAQP #2930-07, Montana Air National Guard" is attached as Exhibit B ("MANG Letter").

35. Both letters state:

> Every additional fossil fuel permit approved by DEQ that causes an increase in GHG emissions is a violation of the constitutional rights of the youth Plaintiffs in Held. Every ton of GHG emissions exacerbates the injuries and constitutional violations the Plaintiffs are already suffering. Fortunately, as the undisputed facts in Held established, Montana can transition to 100% clean renewable energy—thereby mitigating the enormous harms caused to Montana's youth and saving Montanans billions of dollars in avoidable costs caused by reliance on fossil fuels. *Held* Order at 80-84.

Montana Renewables Letter at 1; MANG Letter at 1.

36. Both letters provided by OCT also assert:

> [T]he MEPA Limitation has been declared unconstitutional, and therefore, DEQ must now calculate the GHG emissions that will result from proposed projects …. Importantly, because the Court held that Plaintiffs' constitutional rights are already being violated due to the current atmospheric concentration of GHG emissions and resulting climate harms, it is incumbent upon DEQ, before issuing permits that will result in additional GHG emissions, to establish that the proposed project will not further violate Plaintiffs' constitutional rights.

Montana Renewables Letter at 6; MANG Letter at 6.

37. In other words, OCT has interpreted this Court's Order to require additional analysis by DEQ in permitting any projects that would emit GHG. OCT also distorts and disregards the differences between DEQ's obligations under MEPA and DEQ's authority under the various permitting statutes,

38. Absent clarification and correction from this Court, OCT's interpretation of this Court's order will potentially disrupt and endanger the energy supply of Montana.

39. For instance, OCT's interpretation of this Court's Order would prevent DEQ from issuing new coal mining permits, minor revisions, or modifications. Those permits, revisions, and modifications affect existing coal provisions under contract and are necessary to fuel existing power plants like Colstrip Units 3 and 4, which currently provide power to Montana and the Northwestern United States.

40. OCT's interpretation of this Court's Order would also prevent DEQ from granting air quality permits to natural gas electricity generating plants, which are necessary to provide the dispatchable and flexible electricity generation needed to integrate variable wind and solar facilities into the electric grid and meet the dynamic demand of Montana ratepayers.

41. OCT's interpretation of this Court's Order explicitly claims that DEQ cannot permit renewable biodiesel facilities, which use alternative fuels to create products that have lower carbon intensities than traditional petroleum products. OCT's interpretation of this Court's Order would undoubtedly extend to traditional refineries that produce the petroleum products that, among other things, power our cars.

42. DEQ has a particular interest in avoiding OCT's disruptive reading of this Court's Order. DEQ houses the state energy bureau, *see* ARM 17.1.101(3)(c)(iii), which means DEQ has administrative and information sharing obligations concerning Montana's energy supply emergency powers, *see* §§ 90-4-301 to -319, MCA; ARM 14.8.401–412; Mont. Dep't of Envtl. Quality, *Montana Energy Assurance Plan*, 22 (Jan. 2016), https://deq.mt.gov/files/Energy/EnergizeMT/Energy%20Assurance/MTENERGYASSURANCEPLAN-final.pdf ("DEQ has been designated the primary agency in the State's response to energy emergencies."). DEQ is also required to provide comment on Montana public utilities' long term electricity supply planning before the Montana Public Service Commission, § 69-3-1205(3), MCA, which entails an evaluation "of cost-effective means for the public utility to meet the service requirements of its Montana customers[,]" § 69-3-1204(2)(a)(i), MCA.

43. OCT's letters suggest that this Court's Order states that 100% renewable energy supply is possible today. Montana Renewables at 1; MANG at 1. This Court found that 100% renewable energy is possible by 2050. Order at 80–84. This Court's Order seems to understand that an immediate change prohibiting GHG emissions is impractical. This interpretation also ignores that the rapid siting, development, and construction of renewable energy cannot be completed absent other environmental (wildlife, water) protections afforded to the state and its

citizens, as well as other contractual obligations (interconnection agreements, Federal Energy Regulatory Commission approval).

44. This Court's findings regarding the transition to 100% renewable energy supply still lack important findings on issues like reliability. The energy consulting group Energy + Environmental Economics ("E3") found in 2019 for Montana and other states in the Northwestern United States "absent technological breakthroughs, achieving 100% GHG reductions using only wind, solar, hydro, and energy storage is both impractical and prohibitively expensive." E3, *Resource Adequacy in the Pacific Northwest*, i (March 2019) (Ex. I). E3 noted that land use implications and reliability standards would be impediments to complete decarbonization in places like Montana. *Id.* at 67–74. While this Court's Order discusses land use concerns, it did not address the reliability of Montana's electric grid if 100% transition to renewables were to occur. Order at 80–84. Without a discussion of this important subject of reliability, this Court cannot really address the subject of whether a 100% transition to renewables would be possible while maintaining other legal requirements like North American Electric Reliability Corporation ("NERC") Standards. See NERC, *Reliability Standards* (last visited Oct. 9, 2023), https://www.nerc.com/pa/Stand/Pages/ReliabilityStandards.aspx.

45. A true and correct copy of E3's study titled Resource Adequacy in the Pacific Northwest from March 2019 is attached as Exhibit I.

46. The Montana legislature has passed statutes guiding Montana utilities' acquisition of electricity supply resources. *See* § 69-3-1201 to -1209, MCA; *see also* § 38.5.38.5.2016–2025 (the Montana Public Service Commission's administrative rules on the subject). Included within these requirements is "an evaluation of the full range of cost-effective means for the public utility to meet the service requirements of its Montana customers[.]" Section 69-3-1204, MCA; *see also* § 69-3-201, MCA("Every public utility is required to furnish reasonably adequate service and facilities."). Thus, Montana law requires utilities to acquire resources with reliability as a priority, which is not addressed by this Court's Order regarding the transition to 100% renewable energy.

I hereby declare that under the penalty of perjury that the foregoing is true and correct to the best of my knowledge.

DATED this 16th day of October, 2023.

/s/ Sonja Nowakowski
SONJA NOWAKOWSKI

EXHIBITS

EXHIBIT A OCT's letter dated September 29, 2023, titled "RE: Montana Youth's Demand Letter and Comments on DEQ's Preliminary Determination on Permit Application MAQP #5263-02, Montana Renewables LLC"

EXHIBIT B OCT's letter dated September 29, 2023, titled "Montana Youth's Demand Letter and Comments on DEQ's Preliminary Determination on Permit Application MAQP #2930-07, Montana Air National Guard"

EXHIBIT C DEQ's Final Environmental Impact Statement ("EIS") for TransCanada's Keystone XL Pipeline Project (Aug. 26, 2011)

EXHIBIT D Montana Department of Environmental Quality's Final Environmental Impact Statement for Southern Montana Electric Generation and Transmission Cooperative, Inc.'s Highwood Generating Station (Jan. 2007)

EXHIBIT E DEQ's Draft EIS of Bull Mountain Development Company, LLC's Roundup Power Project (Nov. 2002)

EXHIBIT F DEQ's Final EIS of Bull Mountain Development Company, LLC's Roundup Power Project (Jan. 2002)

EXHIBIT G MEIC's Affidavit and Petition for Hearing and Stay of Permit Issuance challenging Continental Energy Services, Inc's Silver Bow Generation Plant (March 29, 2002)

EXHIBIT H MEIC's comments on DEQ's draft Environmental Assessment for Laurel Generating Station (MAQP: #5261-00) (June 30, 2023)

EXHIBIT I Energy + Environmental Economics, *Resource Adequacy in the Pacific Northwest* (March 2019)

Exhibit A

Our Children's Trust's Demand Letter and Comments on DEQ's Preliminary Determination on Permit Application MAQP #5263-02, Montana Renewables LLC (Sept. 29, 2023)

September 29, 2023

Submitted via email only

DEQ-ARMB-Admin@mt.gov
Montana Department of Environmental Quality
1520 E 6th Avenue
Helena, MT 59601

RE: Montana Youth's Demand Letter and Comments on DEQ's Preliminary Determination on Permit Application MAQP #5263-02, Montana Renewables LLC

To Montana Department of Environmental Quality:

On behalf of the 16 youth Plaintiffs in the constitutional climate case *Held v. State of Montana* (CDV-2020-307), Our Children's Trust respectfully submits this demand letter and comments on DEQ's preliminary determination on Permit Application MAQP #5263-02 for applicant Montana Renewables LLC.[1] As you are presumably aware, DEQ cannot simply defy the Montana Constitution and the August 14, 2023 Order in *Held v. State of Montana* declaring the Montana Environmental Policy Act Limitation (MEPA Limitation), § 75-1-201(2)(a), MCA, unconstitutional and permanently enjoining DEQ from implementing it. *Held*, CDV-2020-307, *102 (1st Jud. Dist., Aug. 14, 2023). The August 14 Order in *Held* is in full force and effect and is binding on DEQ—one of the Defendants in the case. As a result, DEQ cannot continue to rely on § 75-1-201(2)(a), MCA, as a basis for failing to analyze the greenhouse gas (GHG) emissions from the proposed project, and the impacts of the proposed project on climate change, Montana's environment and natural resources, and Montana's youth. As DEQ staff admitted during their depositions, the agency must comply with Montana's Constitution and court orders interpreting the Constitution. Defying a Court Order constitutes contempt of court and is sanctionable conduct. § 3-1-501(1)(e), MCA.

Every additional fossil fuel permit approved by DEQ that causes an increase in GHG emissions is a violation of the constitutional rights of the youth Plaintiffs in *Held*. Every ton of GHG emissions exacerbates the injuries and constitutional violations the Plaintiffs are already suffering. Fortunately, as the undisputed facts in *Held* established, Montana can transition to 100% clean renewable energy—thereby mitigating the enormous harms caused to Montana's youth and saving Montanans billions of dollars in avoidable costs caused by reliance on fossil fuels. *Held* Order at 80-84.

For the reasons outlined herein, DEQ must substantially revise its Environmental Assessment and preliminary determination on Permit Application MAQP #5263-02 to comply with the August 14, 2023 Order in *Held v. State of Montana.* Absent such corrections, DEQ must explain why they should not be held in contempt of court for defying a court order.

[1] These comments should be included in the administrative record for MAQP #5263-02.

I. The Proposed Project Will Burn Fossil Fuels and Release GHG Emissions.

DEQ's Environmental Assessment and preliminary determination on Permit Application MAQP #5263-02 admit that if approved, the permitted activities will burn fossil fuels, including natural gas, distillate fuel oil, and diesel. *See* MAQP Analysis, Montana Renewables LLC, MAQP #5263-02, 11, 37, 38 (Sept. 14, 2023). Burning fossil fuels, of course, results in the release of GHG emissions, as DEQ admits. DEQ, Environmental Assessment for MAQP #5263-02, 9. While the Environmental Assessment and MAQP Analysis includes an emissions inventory for many pollutants, it explicitly excludes GHGs on the emissions inventory table, instead listing GHGs as "N/A". *Id*. Contrary to the *Held* Order, there is no analysis about how the proposed project will contribute to climate change, harm Montana's youth, or comply with Montana's Constitution. *Held* Order at 102 ("By prohibiting analysis of GHG emissions and corresponding impacts to the climate, as well as how additional GHG emissions will contribute to climate change or be consistent with the Montana Constitution, the MEPA Limitation violates Youth Plaintiffs' right to a clean and healthful environment and is unconstitutional on its face."). DEQ is unconstitutionally failing to quantify and disclose the GHG emissions associated with the proposed permit and the resulting harm to the climate system, Montana's environment and natural resources, and Montana's children.

II. The MEPA Limitation, § 75-1-201(2)(a), MCA, Has Been Declared Unconstitutional and DEQ Is Permanently Enjoined from Enforcing It.

DEQ admits that it is aware of the August 14, 2023 Order in *Held v. State of Montana*, yet ignores the detailed findings of fact, conclusions of law, and injunctive relief, in the Order. DEQ, Environmental Assessment for MAQP #5263-02, 17 ("DEQ is aware of the recent opinion in *Held v. State.*"). The Court unequivocally declared § 75-1-201(2)(a), MCA, unconstitutional and enjoined Defendants, including DEQ, from implementing or relying on the MEPA Limitation. The Court held the MEPA Limitation, § 75-1-201(2)(a), MCA, "unconstitutional and is permanently enjoined." *Held* Order at 102. The Court further enjoined DEQ, "prohibiting Defendants from acting in accordance with the statutes declared unconstitutional." *Id.*

While Defendants have filed their notice of appeal to the Montana Supreme Court, the District Court's judgment has not been stayed. Montana Rule of Civil Procedure 62 clearly states that a court-ordered injunction is not stayed, even if an appeal is taken. M. R. Civ. P. 62(a)(1). In the meantime, the Court's Order is valid and enforceable, if necessary, through enforcement and contempt proceedings in the District Court. *See, e.g., State ex rel. Kaasa v. Dist. Ct. of Seventeenth Jud. Dist., In & For Phillips Cnty.*, 177 Mont. 547, 550, 582 P.2d 772, 774 (1978) (District Court "has the power to enforce the judgment already entered by contempt proceedings" even if an appeal is pending); *Valley Unit Corp. v. City of Bozeman*, 232 Mont. 52, 54–55, 754 P.2d 822 (1988) (affirming District Court's contempt order after a motion to show cause was filed).

DEQ cites two cases in support of its position that it can ignore the District Court's August 14 Order. DEQ, Environmental Assessment for MAQP #5263-02, 17. But both cases are easily distinguishable. *Whitehall Wind, LLC v. Montana Pub. Serv. Comm'n*, 2010 MT 2, ¶1, 355 Mont. 15, 223 P.3d 907, concerned judicial review of a Public Service Commission (PSC) order in a rate-setting case. There the Supreme Court held that the PSC did not need to recalculate the appropriate rate while the appeal was pending because § 2-4-711, MCA, provided for an automatic stay of the order pending final determination of the appeal. *Id.* Importantly, § 2-4-711, MCA, **only applies to cases where a party is seeking judicial review of a specific agency action pursuant to the Administrative Procedure Act**. DEQ and its counsel are well aware *Held v. State of Montana* is not a case challenging an individual agency decision pursuant to the Administrative Procedure Act.[2] Therefore, § 2-4-711, MCA, which provided for the automatic stay in *Whitehall Wind* pending appeal, is inapplicable to the *Held* judgment. Similarly, *Grenz v. Montana Dep't of Nat. Res. & Conservation*, 2011 MT 17, ¶ 20, 359 Mont. 154, 248 P.3d 785, involved judicial review of a specific agency action and is inapplicable here for the same reason.

Defendants cite no authority to support their untenable position that they can continue to implement a statute that has been declared unconstitutional. DEQ's blatant disregard for the August 14, 2023 Order in *Held v. State of Montana* is contempt of court. § 3-1-501(1)(e), MCA (contempt of the court includes "disobedience of any lawful judgment, order, or process of the court"). Indeed, just three months ago, the State of Montana, Governor Gianforte, and the Montana Department of Public Health and Human Services, were found to be in contempt of Court for failing to comply with a District Court order declaring a statute unconstitutional and enjoining it from being implemented. *Marquez v. State of Montana*, DV 21-873 (13th Jud. Dist., June 26, 2023). According to the District Court, Defendants "repeatedly disobeyed a lawful order from this Court, showing their contempt for this judicial body and the judicial system as a whole. . . . Defendants acted in total disregard for this Court and the established procedures of the judicial branch of government." *Id.* at *8, 9. The *Held* plaintiffs are experiencing grave constitutional injuries, harms that are compounded daily by DEQs failure to comply with the August 14, 2023 Order in *Held v. State of Montana*.

III. The Youth Plaintiffs in *Held*, and Other Montana Children, Are Being Gravely Injured by DEQ's Fossil Fuel Permitting Activities and DEQ Cannot Act so as to Further Violate Their Constitutional Rights.

The August 14 Order in *Held v. State of Montana* set forth detailed findings of fact and conclusions of law relating to Montanans' fundamental rights, including their right to a clean and healthful environment. The Order also made detailed factual findings related to the basic science of climate change; the irrefutable connection between fossil fuel extraction, transportation, and combustion and the observed planetary warming and attendant consequences; and the array of serious harm that climate change has already caused and will increasingly cause to Montana's environment and citizens. Importantly, based on the testimony of the youth Plaintiffs and their experts at trial, the Court also detailed how the 16 youth Plaintiffs are already suffering grave injuries as a result of Defendants' (including DEQ's) historic and ongoing approval of fossil fuel

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> 138. The unrefuted testimony at trial established that climate change is a critical threat to public health.
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> 140. Anthropogenic climate change is impacting, degrading, and depleting Montana's environment and natural resources, including through increasing temperatures, changing precipitation patterns, increasing droughts and

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141. Climate change impacts result in hardship to every sector of Montana's economy, including recreation, agriculture, and tourism.

193. The science is clear that there are catastrophic harms to the natural environment of Montana and Plaintiffs and future generations of the State due to anthropogenic climate change. . . . The degradation to Montana's environment, and the resulting harm to Plaintiffs, will worsen if the State continues ignoring GHG emissions and climate change.

Based on the compelling factual record presented by Plaintiffs and their experts, the Court held, as a conclusion of law, that:

50. Montana's climate, environment, and natural resources are unconstitutionally degraded and depleted due to the current atmospheric concentration of GHGs and climate change.

The Defendants, including DEQ, were provided the opportunity to present evidence refuting these factual findings, but they did not. The Court made clear that the MEPA Limitation, § 75- 1-201(2)(a), MCA, (and § 75-1-201(6)(a)(ii), MCA) infringe Plaintiffs' fundamental right to a clean and healthful environment (as well as their fundamental rights to equal protection, dignity, liberty, health and safety, and public trust resource rights stemming from harm to Montana's environment). The Court declared § 75-1-201(2)(a), MCA, and § 75-1-201(6)(a)(ii), MCA, facially unconstitutional and permanently enjoined their enforcement.

The Court also made important findings of fact both detailing how the MEPA Limitation, § 75- 1-201(2)(a), MCA, is harming Plaintiffs; and once declared unconstitutional, Defendants, including DEQ, can calculate GHG emissions from proposed projects, as they did before the MEPA Limitation was first passed into law in 2011. As determined by the Court:

194. The unrefuted testimony established that Plaintiffs have been and will continue to be harmed by the State's disregard of GHG pollution and climate change pursuant to the MEPA Limitation.

214. It is possible to calculate the amount of CO_2 and GHG emissions that results from fossil fuel extraction, processing and transportation, and consumption activities that are authorized by Defendants.

257. If the MEPA Limitation is declared unconstitutional, state agencies will be capable of considering GHG emissions and the impacts of projects on climate change.

259. Defendants' application of the MEPA Limitation during environmental review of fossil fuel and GHG-emitting projects, prevents the availability of vital

> information that would allow Defendants to comply with the Montana Constitution and prevent the infringement of Plaintiffs' rights.

In sum, the MEPA Limitation has been declared unconstitutional, and therefore, DEQ must now calculate the GHG emissions that will result from proposed projects, including the project proposed by Montana Renewables LLC, just as DEQ calculates the emissions for other pollutants that will result from the proposed project. **Importantly, because the Court held that Plaintiffs' constitutional rights are already being violated due to the current atmospheric concentration of GHG emissions and resulting climate harms, it is incumbent upon DEQ, before issuing permits that will result in additional GHG emissions, to establish that the proposed project will not further violate Plaintiffs' constitutional rights.**

Should DEQ need a reminder that it has the authority to deny permits, the Court in *Held v. State of Montana* made this clear, holding as conclusions of law that:

> 18. Defendants can alleviate the harmful environmental effects of Montana's fossil fuel activities through the lawful exercise of their authority if they are allowed to consider GHG emissions and climate change during MEPA review, which would provide the clear information needed to conform their decision-making to the best science and their constitutional duties and constraints, and give them the necessary information to deny permits for fossil fuel activities when inconsistent with protecting Plaintiffs' constitutional rights.
>
> 22. Permitting statutes give the State and its agents discretion to deny permits for fossil fuel activities.
>
> 24. [T]his Court clarifies that Defendants do have discretion to deny permits for fossil fuel activities that would result in unconstitutional levels of GHG emissions, unconstitutional degradation and depletion of Montana's environment and natural resources, or infringement of the constitutional rights of Montanans and Youth Plaintiffs.

The constitutional rights of Montana's youth, including the *Held* Plaintiffs, are currently being violated, in part, due to DEQ's historic and ongoing permitting of fossil fuels activities. To address these constitutional violations, sixteen brave Montanans' took their state to Court and on August 14, 2023 won an historic victory. Now, instead of working to alleviate the ongoing harms to Montana's children, DEQ is choosing to deliberately ignore a binding order from Montana's judiciary. Such deliberate disregard for the rule of law not only risks having DEQ continue to approve dangerous fossil fuels projects exacerbating the youth Plaintiffs' constitutional injuries, but is an affront to our constitutional democracy. DEQ must amend its Environmental Assessment and preliminary determination on Permit Application MAQP #5263-02 to comply with the legally binding August 14, 2023, Order in *Held v. State of Montana*, as outlined herein, or explain why it should not be held in contempt of court.

We would be pleased to meet with you and your counsel to discuss the ruling in *Held v. State of Montana,* and the requisite steps DEQ must take to comply with the Court's order by exercising its statutory and constitutional authority and duty to redress the climate crisis and protect Montana's children. Please send us a response to this demand letter and comments no later than October 13, 2023

Sincerely,

Nathan Bellinger
Counsel for Plaintiffs in *Held v. State of Montana*
Our Children's Trust
P.O. Box 5181
Eugene, OR 97405
nate@ourchildrenstrust.org

Exhibit B

Our Children's Trust's Demand Letter and Comments on DEQ's Preliminary Determination on Permit Application MAQP #2930-07, Montana Air National Guard (Sept. 29, 2023)

Our Children's Trust Youth v. Gov

September 29, 2023

Submitted via email only

DEQ-ARMB-Admin@mt.gov
Montana Department of Environmental Quality
1520 E 6th Avenue
Helena, MT 59601

RE: Montana Youth's Demand Letter and Comments on DEQ's Preliminary Determination on Permit Application MAQP #2930-07, Montana Air National Guard

To Montana Department of Environmental Quality:

On behalf of the 16 youth Plaintiffs in the constitutional climate case *Held v. State of Montana* (CDV-2020-307), Our Children's Trust respectfully submits this demand letter and comments on DEQ's preliminary determination on Permit Application MAQP #2930-07 for applicant Montana Air National Guard.[1] As you are presumably aware, DEQ cannot simply defy the Montana Constitution and the August 14, 2023 Order in *Held v. State of Montana* declaring the Montana Environmental Policy Act Limitation (MEPA Limitation), § 75-1-201(2)(a), MCA, unconstitutional and permanently enjoining DEQ from implementing it. *Held*, CDV-2020-307, *102 (1st Jud. Dist., Aug. 14, 2023). The August 14 Order in *Held* is in full force and effect and is binding on DEQ—one of the Defendants in the case. As a result, DEQ cannot continue to rely on § 75-1-201(2)(a), MCA, as a basis for failing to analyze the greenhouse gas (GHG) emissions from the proposed project, and the impacts of the proposed project on climate change, Montana's environment and natural resources, and Montana's youth. As DEQ staff admitted during their depositions, the agency must comply with Montana's Constitution and court orders interpreting the Constitution. Defying a Court Order constitutes contempt of court and is sanctionable conduct. § 3-1-501(1)(e), MCA.

Every additional fossil fuel permit approved by DEQ that causes an increase in GHG emissions is a violation of the constitutional rights of the youth Plaintiffs in *Held*. Every ton of GHG emissions exacerbates the injuries and constitutional violations the Plaintiffs are already suffering. Fortunately, as the undisputed facts in *Held* established, Montana can transition to 100% clean renewable energy—thereby mitigating the enormous harms caused to Montana's youth and saving Montanans billions of dollars in avoidable costs caused by reliance on fossil fuels. *Held* Order at 80-84.

For the reasons outlined herein, DEQ must substantially revise its Environmental Assessment and preliminary determination on Permit Application MAQP #2930-07 to comply with the August 14, 2023 Order in *Held v. State of Montana.* Absent such corrections, DEQ must explain why they should not be held in contempt of court for defying a court order.

[1] These comments should be included in the administrative record for MAQP #2930-07.

I. The Proposed Project Will Burn Fossil Fuels and Release GHG Emissions.

DEQ's Environmental Assessment and preliminary determination on Permit Application MAQP #2930-07 admit that if approved, the permitted activities will burn fossil fuels, including natural gas and diesel. *See* MAQP Analysis, Montana Air National Guard, MAQP #2930-07, 2 (Sept. 15, 2023). Burning fossil fuels, of course, results in the release of GHG emissions. While the Environmental Assessment includes an emissions inventory for many pollutants, it explicitly excludes GHGs on the emissions inventory table, instead listing GHGs as "N/A". DEQ, Draft Environmental Assessment for MAQP #2930-07, 24. Contrary to the *Held* Order, there is no analysis about how the proposed project will contribute to climate change, harm Montana's youth, or comply with Montana's Constitution. *Held* Order at 102 ("By prohibiting analysis of GHG emissions and corresponding impacts to the climate, as well as how additional GHG emissions will contribute to climate change or be consistent with the Montana Constitution, the MEPA Limitation violates Youth Plaintiffs' right to a clean and healthful environment and is unconstitutional on its face."). DEQ is unconstitutionally failing to quantify and disclose the GHG emissions associated with the proposed permit and the resulting harm to the climate system, Montana's environment and natural resources, and Montana's children.

II. The MEPA Limitation, § 75-1-201(2)(a), MCA, Has Been Declared Unconstitutional and DEQ Is Permanently Enjoined from Enforcing It.

In a different Environmental Assessment, DEQ has admitted that it is aware of the August 14, 2023 Order in *Held v. State of Montana*, yet ignores the detailed findings of fact, conclusions of law, and injunctive relief, in the Order. *See* DEQ, Environmental Assessment for MAQP #5263-02, 17 ("DEQ is aware of the recent opinion in *Held v. State.*"). The Court unequivocally declared § 75-1-201(2)(a), MCA, unconstitutional and enjoined Defendants, including DEQ, from implementing or relying on the MEPA Limitation. The Court held the MEPA Limitation, § 75-1-201(2)(a), MCA, "unconstitutional and is permanently enjoined." *Held* Order at 102. The Court further enjoined DEQ, "prohibiting Defendants from acting in accordance with the statutes declared unconstitutional." *Id.*

While Defendants have filed their notice of appeal to the Montana Supreme Court, the District Court's judgment has not been stayed. Montana Rule of Civil Procedure 62 clearly states that a court-ordered injunction is not stayed, even if an appeal is taken. M. R. Civ. P. 62(a)(1). In the meantime, the Court's Order is valid and enforceable, if necessary, through enforcement and contempt proceedings in the District Court. *See, e.g., State ex rel. Kaasa v. Dist. Ct. of Seventeenth Jud. Dist., In & For Phillips Cnty.*, 177 Mont. 547, 550, 582 P.2d 772, 774 (1978) (District Court "has the power to enforce the judgment already entered by contempt proceedings" even if an appeal is pending); *Valley Unit Corp. v. City of Bozeman*, 232 Mont. 52, 54–55, 754 P.2d 822 (1988) (affirming District Court's contempt order after a motion to show cause was filed).

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Sincerely,

Nathan Bellinger
Counsel for Plaintiffs in *Held v. State of Montana*
Our Children's Trust
P.O. Box 5181
Eugene, OR 97405
nate@ourchildrenstrust.org

Exhibit C

Montana Department of Environmental Quality's Final Environmental Impact Statement for TransCanada's Keystone XL Pipeline Project (Aug. 26, 2011)

Appendix I

SUPPLEMENTAL INFORMATION FOR COMPLIANCE WITH THE
MONTANA ENVIRONMENTAL POLICY ACT AND SUPPORT FOR DECISIONS
UNDER THE MAJOR FACILITY SITING ACT

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LIST OF ATTACHMENTS

Attachment 1 Montana Department of Environmental Quality Environmental Specifications for the Keystone XL Project

Attachment 2 Montana Department of Environmental Quality Requirements of the Short-term Narrative Water Quality Standard for Turbidity (318 Authorization) Related to Construction Activity in State Waters Pursuant to 75-5-318, MCA

Attachment 3 Keystone XL Pipeline Rate Impact Study and Responses to Public Comments

I-1.0 INTRODUCTION

As described in Section 1.0 of this U.S. Department of State (DOS) environmental impact statement (EIS), TransCanada Keystone Pipeline, L.P. (Keystone) has applied to the Montana Department of Environmental Quality (MDEQ) for a Certificate of Compliance under the Major Facility Siting Act (MFSA) for the proposed construction, operation, and maintenance of the Montana portion of the Keystone XL Project (proposed Project), a 36-inch-diameter crude oil pipeline and associated facilities. Pursuant to 75-20-301 Montana Code Annotated (MCA), before MDEQ can approve the proposed Project as proposed or an alternative, MDEQ must find and determine:

"(1)(a) the basis of the need for the facility;

(b) the nature of the probable environmental impact;

(c) that the facility minimizes adverse environmental impact, considering the state of available technology and the nature and economics of the various alternatives;

(d) in the case of an electric, gas, or liquid transmission line or aqueduct:

(i) what part, if any, of the line or aqueduct will be located underground;

(ii) that the facility is consistent with regional plans for expansion of the appropriate grid of the utility systems serving the state and interconnected utility systems; and

(iii) that the facility will serve the interests of utility system economy and reliability;

(e) that the location of the facility as proposed conforms to applicable state and local laws and regulations, except that the department may refuse to apply any local law or regulation if it finds that, as applied to the proposed facility, the law or regulation is unreasonably restrictive in view of the existing technology, of factors of cost or economics, or of the needs of consumers, whether located inside or outside the directly affected government subdivisions;

(f) that the facility will serve the public interest, convenience, and necessity;

(g) that the department or board has issued any necessary air or water quality decision, opinion, order, certification, or permit as required by 75-20-216(3); and

(h) that the use of public lands for location of the facility was evaluated and public lands were selected whenever their use is as economically practicable as the use of private lands.

(2) In determining that the facility will serve the public interest, convenience, and necessity under subsection (1)(f), the department shall consider:

(a) the items listed in subsections (1)(a) and (1)(b);

(b) the benefits to the applicant and the state resulting from the proposed facility;

(c) the effects of the economic activity resulting from the proposed facility;

(d) the effects of the proposed facility on the public health, welfare, and safety;

(e) any other factors that it considers relevant."

This appendix[1] provides supplemental information needed to support the findings that must be made by MDEQ before the proposed Project could be approved in Montana under MFSA. Without this approval, Keystone would not be able to construct the pipeline in Montana. Further, without the approval of MDEQ, Keystone would not be able to exercise the right of eminent domain in Montana, and there is no federal eminent domain authority for crude oil pipelines.

MDEQ has determined that issuance of a Certificate of Compliance under MFSA may result in a significant adverse impact to the environment as defined by the Montana Environmental Policy Act (MEPA). This appendix provides the environmental analyses required by MEPA to supplement the environmental assessments presented in the main body of the EIS, which was prepared in accordance with the requirements of the National Environmental Policy Act (NEPA). The analyses in this appendix focus upon environmental concerns in the vicinity of the proposed Project route, alternative routes, Montana route variations, and Keystone route realignments in Montana.

MEPA requires that MDEQ provide a detailed statement about the following:

- The environmental impact of the proposed Project in Montana;
- Any adverse environmental effects that could not be avoided if the proposal was implemented;
- Alternatives to the proposed Project, including a meaningful analysis of the No Action Alternative;
- Any regulatory impacts on the private property rights of the applicant;
- The relationship between local short-term uses of the human environment and the maintenance and enhancement of long-term productivity;
- Any irreversible and irretrievable commitments of resources that would be involved in the proposed Project if it was implemented; and
- The details of the beneficial aspects of the proposed Project, both short term and long term, and the economic advantages and disadvantages of the proposal.

The proposed Project would transport Western Canadian Sedimentary Basin (WCSB) crude oil from an oil supply hub near Hardisty, Alberta, Canada to destinations in the south central U.S., including an existing oil terminal in Cushing, Oklahoma and existing delivery points in the Port Arthur and east Houston areas of Texas. In total, the proposed Project would consist of approximately 1,711 miles of new 36-inch-diameter pipeline, with approximately 327 miles in Canada and 1,384 miles in the U.S. In Canada, the proposed pipeline would be adjacent to an existing pipeline along much of the route, including at the proposed border crossing near the Port of Morgan, Montana.[2] Most of the alternative routes analyzed in the EIS begin at that border crossing.

The proposed Project would initially have a nominal transport capacity of 700,000 barrels per day (bpd) of crude oil. By increasing the pumping capacity in the future, the proposed Project could ultimately transport up to 830,000 bpd of crude oil through the proposed pipeline. Additional information about the proposed Project is presented in Sections 1.1 and 2.0 of the main body of the EIS.

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[1] References to other appendices are to appendices in the main EIS. References to attachments are to the attachments to this Appendix I.

[2] On March 11, 2010, the National Energy Board (NEB) of Canada announced that it had issued a Certificate of Public Convenience and Necessity for the Project in Canada. The NEB Reasons for Decision, including Certificate Conditions and the Environmental Screening Report are presented in Appendix R.

As defined in the EIS, the proposed Project would consist of three new pipeline segments plus additional pumping capacity on the previously constructed Cushing Extension Segment of the existing Keystone Oil Pipeline project (Cushing Extension; see Section 1.1 of the EIS, Figure 1.1-1). The three proposed new pipeline segments in the U.S. would consist of the following:

- Steele City Segment − from the U.S./Canada border, crossing between Saskatchewan and Montana near the Port of Morgan, Montana (where the pipeline of the Canadian portion of the proposed Project terminates), to the northern end of the existing Cushing Extension at Steele City, Nebraska;
- Gulf Coast Segment − from the southern end of the Cushing Extension in Cushing, Oklahoma, to the existing crude oil delivery point in the Petroleum Administration for Defense District (PADD) III at Nederland, Texas; and
- Houston Lateral − from the Gulf Coast Segment in Liberty County, Texas, to a new delivery point near Moore Junction (Harris County), Texas.

As proposed, the new pipeline would extend through five states: Montana, South Dakota, Nebraska, Oklahoma, and Texas. The existing Cushing Extension traverses southern Nebraska, Kansas, and northern Oklahoma.

MDEQ assisted DOS as a cooperating agency during preparation of the EIS for the proposed Project. As a result of its involvement in the EIS process, MDEQ will use the DOS EIS, including the Montana-specific information presented in this appendix, to comply with MEPA and MFSA.

Information presented in the main body of the EIS addresses the topics listed below that are also required under MEPA and MFSA. The sections of the EIS where the major topics are addressed are noted in parentheses:

- Executive Summary (Executive Summary);
- Purpose and Need (Section 1.2);
- Alternatives to the Proposed Action (Section 4.0, including the No Action Alternative);
- Description of the proposed Project (including construction methods − Section 2.0);
- Potential Environmental Impacts (including direct, indirect [secondary], cumulative impacts, and mitigation measures − Section 3.0);
- Permitting Requirements (Section 1.8);
- Public and Agency Coordination (Sections 1.3 through 1.7);
- Potential Releases during Construction and Operation and Environmental Consequence Analysis (Section 3.13);
- List of Preparers (Appendix X);
- List of Abbreviations and Acronyms (Table of Contents); and
- References Cited (presented at the end of each section of the EIS).

This appendix provides the supplemental information required to fully comply with MEPA and MFSA in the following sections:

- Analysis of Alternatives in Montana (Section I-2.0);
- Environmental Analysis of the Proposed Keystone XL Project in Montana (supplemental to information in the EIS regarding the nature of environmental impacts, as required by MFSA, and residual impacts remaining after the application of mitigating measures; Section I-3.0);
- Unavoidable Adverse Impacts (Section I-4.0);
- Irreversible and Irretrievable Commitments of Resources (Section I-5.0);
- Relationship Between Local Short-Term Uses of the Human Environment and the Maintenance and Enhancement of Long-Term Productivity (Section I-6.0); and
- Regulatory Restrictions (Section I-7.0).

Information regarding the proposed Project and potential alternatives (i.e., design, location, schedule, workforce, and other details needed to conduct an environmental assessment of the proposed Project and alternatives) was obtained from Keystone's application for a Presidential Permit and associated submittals to DOS, Keystone's application for a MFSA Certificate of Compliance and subsequent field studies and submittals associated with the application, Keystone's proposed Plan of Development for a right-of-way (ROW) grant from the U.S. Bureau of Land Management (BLM), and limited field work undertaken by MDEQ staff. Information about the existing environment in Montana that was included in the documents submitted by Keystone was partially reviewed for accuracy by MDEQ, and the documents were reviewed for accuracy by the third-party environmental contractor to DOS and MDEQ. Where appropriate, information from those documents was used in this appendix. Information about existing conditions and potential environmental impacts associated with implementation of the proposed Project was also obtained from literature searches and field studies conducted by the third-party environmental contractor, sources of information publicly available in Montana, and knowledge of the area in the vicinity of the routes of the proposed Project and the alternatives and variations to and the realignments of the proposed route.

I-2.0 ANALYSIS OF ALTERNATIVES

This section describes the development and analysis of proposed Project alternatives, and proposed route variations and potential realignments to Keystone's proposed route (Alternative SCS-B) in Montana in the following subsections:

- Background (Section I-2.1);
- No Action Alternative (Section I-2.2);
- Major Alternative Routes in Montana (Section I-2.3)
- Route Variations and Keystone Realignments (Section I-2.4);
- Preferred Route in Montana (Section I-2.5); and
- References Cited (Section I-2.6).

I-2.1 BACKGROUND

Section 4.0 of the EIS presents an analysis of alternatives to the proposed Project. The analysis was conducted in accordance with the requirements of NEPA, which has requirements that are essentially the same as those of MEPA. The alternatives analysis presented in the EIS was revised based upon comments on the draft and supplemental draft EIS and updated information or information unavailable at the times the draft and supplemental draft EIS were issued. This information included the recent EnSys Energy and Systems, Inc. report (EnSys 2010) about the need for the proposed Project and the relationship of the proposed Project to production of crude oil from the Canadian oil sands. The U.S. Department of Energy (DOE) Office of Policy & International Affairs contracted with EnSys to evaluate WSCB crude oil transportation scenarios through 2030. DOE conducted the study to assist DOS in better understanding the potential impacts of the presence or absence of the proposed Project on U.S. refining and petroleum imports, international markets, and production of crude oil from the WCSB. The EnSys (2010) report is presented Appendix V.

The conclusions reached in the revised assessment of alternatives remain the same as those presented in the EIS.

The alternatives analysis included a screening process that first considered a range of categories of potential alternatives. The categories of alternatives considered included:

- No Action Alternative (Section 4.1) − addresses projected beneficial and adverse environmental, social, and economic impacts that would result if the proposed Project were not implemented;
- System Alternatives (Section 4.2) − the use of other pipeline systems or other methods of providing heavy crude oil to the Cushing tank farm (PADD II) and the U.S. Gulf Coast market (PADD III);
- Major Route Alternatives and Route Variations (Section 4.3) − other potential pipeline routes for transporting heavy crude oil from the U.S./Canada border to the Cushing tank farm (PADD II) and the U.S. Gulf Coast Market (PADD III), and minor route adjustments along the proposed Project route;
- Alternative Pipeline Designs (Section 4.4) − aboveground installation of the pipeline and alternate pipeline diameters; and

- Alternative Sites for Aboveground Facilities (Section 4.5) − alternative sites for pump stations, mainline valves (MLVs), and the tank farm.

The No Action Alternative considered a variety of potential scenarios that would occur if the proposed Project was not implemented. The screening process for all other categories identified potential alternatives based upon the following evaluation criteria:

- The alternative must be technically and economically practicable;
- The alternative must meet the purpose of and need for the proposed Project; and
- The alternative must offer a substantial environmental advantage over the comparable proposed Project element.

As described in Section 4.1 of the EIS, DOS eliminated the No Action Alternative from further consideration for the following primary reasons:

- Implementation of the No Action Alternative would not meet the purpose of and need for the proposed Project;
- Implementation of the No Action Alternative would not meet the demand for heavy crude oil in PADD III, even with implementation of the "low demand" scenario for transportation identified by EPA and the use of alternative energy sources and energy conservation, because those scenarios would have only a minor effect on the heavy crude oil needs of PADD III[3] refineries;
- Implementation of the No Action Alternative would likely result in impacts that would be similar to those of the proposed Project due to the construction and operation of other projects to meet the heavy crude oil needs of PADD III refineries;
- Implementation of the No Action Alternative would not affect future production in the Canadian oil sands unless no other pipelines were constructed, west through Canada or south through Canada and the U.S., to transport WCSB crude oil to markets in the U.S. or other countries;
- Implementation of the No Action Alternative would not affect total life-cycle greenhouse gas (GHG) emissions of crude oil production and use because the oil would continue to be produced and shipped elsewhere; and
- Implementation of the No Action Alternative would not provide a relatively stable and secure source of North American crude oil and reduce U.S. dependence on less reliable foreign oil supplies.

MEPA requires that MDEQ analyze the No Action Alternative. That analysis is provided in Section I-2.2 of this appendix.

In Section 4.2 of the EIS, the system alternatives considered were eliminated from further consideration because the alternative modes considered would be less safe, would require construction of infrastructure that would be similar to that of the proposed Project, have greater atmospheric emissions (including GHG), and/or pose greater safety hazards than the proposed Project.

Major alternative routes and route variations were considered in Section 4.3 of the EIS using the screening process described in Section 4.3.2. The screening process was designed to determine whether

[3] PADD III (Gulf Coast) consists of the states of Alabama, Mississippi, Louisiana, Arkansas, Texas, and New Mexico.

the alternatives identified should be eliminated from further consideration or should be evaluated in greater detail. Most alternative routes were required to connect to several fixed locations (control points) to meet the proposed Project's purpose and need. The control points placed constraints on potential geographic alternatives to achieve the proposed Project's purpose and need. The Steele City Segment, which would extend through Montana, had the following two control points:

- Control Point 1: the U.S./Canada border crossing between Saskatchewan and Montana near the town of Morgan, Montana, where the pipeline of the Canadian portion of the proposed Project would terminate – that control point would be the northern end of the Steele City Segment; and
- Control Point 2: the northern end of the existing Cushing Extension of the existing Keystone Oil Pipeline project near Steele City, Nebraska – that control point would be the southern end of the Steele City Segment).

In Section 4.3 of the EIS, seven alternative routes were identified and compared to the proposed Project route for the Steele City Segment and one additional alternative that would extend from the U.S./Canada border to the Cushing tank farm and that would not include Control Point 2 at the northern end of the Cushing Extension (i.e., would not be a Steele City Segment alternative). Two of the Steele City Segment alternative routes identified were not considered reasonable alternatives and were eliminated from further consideration and none of the remaining five Steele City Segment alternatives assessed in Section 4.3 of the EIS offered a significant environmental advantage or a safety advantage over the proposed route, and were therefore eliminated from further consideration.

The following information is summarized for Montana from the complete analysis of alternatives presented in Section 4 of the EIS. See Section 4 of the EIS for the complete analysis.

I-2.2 NO ACTION ALTERNATIVE

MDEQ would select the No Action Alternative if it could not make the findings required for issuance of a Certificate of Compliance under MFSA. Under the No Action Alternative, MDEQ would not issue a Certificate of Compliance to Keystone, and the proposed Project would not be constructed and operated in Montana.

With selection of the No Action Alternative, the beneficial and adverse environmental, social, and economic impacts associated with the proposed Project in Montana (discussed in Section 3.0 of the EIS and in Section I-3.0 of this appendix) would not occur. While this alternative would eliminate the environmental impacts specific to the proposed Project, it would not meet Keystone's objectives. As stated in Section 1.2.1 of the EIS, the primary purpose of the proposed Project is to transport crude oil from the WCSB to delivery points in PADD III to meet the growing demand by refineries and markets in PADD III. It could also offset the decreasing domestic crude oil supply and reduce U.S. dependence on less reliable foreign oil sources.

U.S. demand for petroleum products would likely continue to increase for the foreseeable future. The Energy Information Administration (EIA) estimated that the total U.S. consumption of liquid fuels, including fossil liquids and biofuels, would increase from the 19.5 million bpd consumed in 2008 to 22.1 million bpd in 2035 in the AEO2010 reference case (EIA 2010). For the total U.S. demand, biofuels consumption would account for most of the growth, because consumption of petroleum-based liquids is projected to be essentially flat across the country. However, in PADD III, consumption of heavy crude is expected to increase as production of lighter crude from current sources decreases (EnSys 2010). The increase in heavy crude consumption coupled with continued expected declines from Mexican and Venezuelan sources of heavy crude make increased access to Canadian crude desirable from both an economic and national security standpoint. Further, limited pipeline capacity constrains the supply of WCSB crude oil reaching PADD III (Canadian Association of Petroleum Producers 2009, Purvin & Gertz 2009, EnSys 2010), which represents the largest refining capacity in the U.S. The proposed Project would have a nominal initial capacity to deliver up to 700,000 bpd of crude oil to delivery points in PADD III near the Gulf Coast refineries. If market demand were to increase in the future, the maximum capacity of the proposed Project could be increased to approximately 830,000 bpd by increasing pumping capacity along the route.

The No Action Alternative would not provide the U.S. with a relatively stable and secure source of North American crude oil for the PADD III market via a new pipeline through Montana. In addition, the U.S. dependence on less reliable foreign oil supplies from the Mideast, Africa, Mexico, and South America would remain at its current level or increase further unless alternative methods of delivery or alternative pipeline routes were developed to transport crude oil to PADD III. Alternative transportation methods and pipeline routes are discussed in Sections 4.2 and 4.3 of the EIS.

The forecasted demand for crude oil in the U.S., including in PADD III, is expected to continue, even with concentrated efforts to develop renewable energy resources and promote energy conservation (EIA 2010, EnSys 2010). As a result, other oil transportation projects could be developed if the proposed Project were not constructed and operated. Over the long term, despite current economic concerns, worldwide demand for crude oil from the WCSB oil sands would continue to increase. Alternative transportation systems to move this oil to markets in the U.S. or elsewhere, such as China or Japan, could emerge if the proposed Project were not constructed (EnSys 2010). Although it would be speculative to predict the environmental impacts of those actions, selection of the No Action Alternative would not necessarily result in less impact.

In addition, the No Action Alternative could result in more expensive and less reliable crude oil supplies for the Gulf Coast refineries, particularly heavy crude oil supplies. This would increase the costs of delivered heavy crude oil and could decrease the availability of the refined products for end-users.

I-2.3 MAJOR ALTERNATIVE ROUTES IN MONTANA

The following sections describe the methods that were used to develop major pipeline route alternatives, including analyses of the alternatives that were carried forward for evaluation, as well as those that were considered and eliminated from further evaluation.

I-2.3.1 DEVELOPMENT OF ALTERNATIVE ROUTES IN MONTANA

MFSA regulations require MDEQ to identify the alternative that minimizes adverse environmental impacts and uses public land whenever the use of public lands is as economically practicable as the use of private land. In addition to the route alternatives assessed in Section 4.3 of the EIS and in the initial Keystone MFSA application (see Section I-2.3.4), MDEQ required that Keystone provide assessments of two additional routes using a route development model based upon geographic information system (GIS) databases (i.e., ground surveys were not conducted) that incorporated a set of weighted environmental factors, including both preferred attributes and less desirable attributes (described below). With that approach, the model-generated routes could be further evaluated and compared to the proposed Project route relative to environmental impacts, the use of public lands, and costs.

The model-generated routes used the following control points:

- U.S./Canada Border near the Port of Morgan, Montana to an interconnection with Alternative SCS-A in Williams County, North Dakota;

- U.S./Canada Border near the Port of Morgan to the Missouri River; and
- Missouri River to an interconnection with an alternative in South Dakota.

The model-generated route segments between the control points had to meet both the key criteria used to develop alternatives for the DOS EIS, including avoiding or minimizing use of, to the extent practical, key areas of concern, and any additional avoidance factors identified by MDEQ. For the alternative development process for the main body of the EIS, the following were the primary areas to be avoided or used minimally:

- Crossings of large waterbodies and water control structures;
- Rugged terrain that could impact constructability;
- Crossings of large wetland complexes;
- Highly developed urban areas and urban infrastructure;
- Properties listed on the National Register of Historic Places;
- Wildlife refuges and management areas;
- Key waterfowl use or nesting areas;
- Irrigated croplands;
- Forested areas, including commercial forest lands; and
- Close approaches to residences and outbuildings.

In developing the GIS model alternatives, Keystone, after consultation with MDEQ, used a “fatal flaw” approach that included the criteria listed in MFSA and in MFSA Circular 2. These criteria included use of preferred, excluded, and avoidance areas that were weighted in the GIS model.

The following were in the “preferred areas” category of the GIS model:

- Public lands;
- Existing utility and/or transportation corridors (use of or parallel to);
- Logged areas rather than undisturbed forest, in timbered areas;
- Geologically stable areas;
- Non-erosive soils in flat or gently rolling terrain;
- Roaded areas where existing roads could be used for access to the facility during construction and operations and maintenance;
- Areas where the facility would create the least visual impact;
- Alignments that were a safe distance from residences and other areas of human concentration;
- Lands which could be returned to their original condition through re-contouring; and
- Areas that enhanced conservation of topsoil and reclamation.

The following were in the “excluded areas” category in the GIS model:

- National wilderness areas;

- National primitive areas;
- National wildlife refuges and ranges;
- State wildlife management areas;
- Wildlife habitat protection areas;
- National parks and monuments;
- State parks;
- National recreation areas;
- Corridors of rivers in the national wild and scenic rivers system and rivers eligible for inclusion in the system;
- Roadless areas of 5,000 acres or greater in size and managed by federal or state agencies to retain the roadless character;
- Rugged topography (defined as areas with slopes greater than 30 percent);
- Specially managed buffer areas surrounding national wilderness areas and national primitive areas;
- Active faults;
- Large waterbodies;
- Residences;
- Domestic wells; and
- Oil and gas wells.

The following were in the “areas to be avoided” category of the GIS model:

- Wetlands and streams;
- Habitat of listed threatened or endangered species or that of species that are candidates for listing; and
- Irrigated farmland.

The model also included other sensitive areas typically avoided during route refinement, including the following:

- Known paleontological sites;
- Wellhead protection areas and aquifers;
- Known locations of cultural resources; and
- High Consequence Areas, as designated by the Pipeline and Hazardous Materials Safety Administration (PHMSA), Office of Pipeline Safety (OPS).

The overall constructability of the pipeline and associated facilities was also considered, as was the desire to minimize impacts of the proposed Project while considering costs and optimizing the use of public land. A more detailed description of the methods used in developing the GIS alternatives is included in Keystone’s alternatives assessment report submitted to MDEQ; that document (*Keystone XL Steele City*

U.S. Segment, Montana Route Alternatives Analysis Report; August 2009) is incorporated into this EIS by reference.

The extent, shape, and prevalence of many resources (e.g., rivers, historic trails, wetlands, and farmlands) preclude completely avoiding impacts to them for any route within the Steele City Segment. In developing the GIS route alternatives, consideration was given to routes that would have all or part of their lengths parallel to existing linear facility ROWs (i.e., routes that overlap, are directly adjacent to, or are within 150 feet of an existing ROW). Siting a new pipeline parallel to an existing ROW is often considered because concentrating linear developments in or near other existing linear corridors could reduce the impacts to certain resources, such as sage-grouse habitat, that already had been disturbed by major linear projects. However, such paralleling also could concentrate impacts on a few private landowners.

Installing the pipeline within existing ROWs could reduce the amount of new disturbance. However, the owner of an existing ROW may not allow the proposed construction ROW to overlap with an existing pipeline ROW. This could result in two separate but parallel disturbances. In other cases it could be advantageous to select a new pathway that made better use of public land, if the number of miles of new construction that could be required was economically practicable and impacts to environmental and cultural resources were not substantially greater than those of the proposed route.

The GIS modeling identified the following two alternatives:

- Canada to South Dakota Alternative (CSD), which initially consisted of two route segments − the Canada to Missouri River (CMR) segment and the Missouri River to South Dakota (MRSD) segment − based upon the control points identified above; and
- Canada to North Dakota Alternative (CND).

Figure I-2.3-1 depicts these two alternatives along with the other alternatives assessed in Montana. The two segments of Alternative CSD would cross the Missouri River at the same locations. As a result, Keystone combined the two segments in its MFSA application to compare the alternative with the proposed route. In the analyses presented below, the two segments are addressed separately, where appropriate, and are also considered as a single alternative, Alternative CSD, for the purposes of comparing the alternative to the proposed route in Montana and in the Steele City Segment of the proposed Project.

The Alternative CSD route would cross the Missouri River at about the same location as the proposed route and would extend along the same route as the proposed Project for approximately 22.9 miles. The southern end of Alternative CSD would connect to the proposed route in southern Harding County, South Dakota.

Alternative CND would end in western Williams County, North Dakota, where it would join the route of Alternative SCS-A, which would extend to the Cushing Extension. Starting in Roosevelt County, Montana, the Alternative CND route would be in close proximity and essentially parallel to Alternative SCS-A. Because of that close proximity and the scale of Figure I-2.3-1, the Alternative CND route would appear to connect to the route of Alternative SCS-A in Roosevelt County. However, Alternative CND would extend across the Montana/North Dakota border and join the Alternative SCS-A route in western Williams County, North Dakota.

I-2.3.2 ANALYSIS OF MONTANA ROUTE ALTERNATIVES

As discussed in Section I-2.1, an initial screening process was used to identify potential major route alternatives for transporting heavy crude oil from two U.S./Canada border crossings in Montana to the Cushing tank farm (PADD II) and the U.S. Gulf Coast Market (PADD III). This process resulted in development of the 10 alternatives listed below and depicted in Figure I-2.3-1 for consideration in Montana:

- Express-Platte Alternative 1 and Express-Platte Alternative 2 would parallel the existing Express-Platte Pipeline System through central Montana, Wyoming, and Nebraska;
- Alternatives SCS-A1A, SCS-A, and CND would extend through northeastern Montana, North Dakota, South Dakota, and Nebraska;
- Keystone Corridor Alternative 1 would extend to the east from Morgan to the existing Keystone Pipeline and parallel to that ROW to the Cushing Extension;
- The proposed route (Alternative SCS-B) would traverse eastern Montana, South Dakota, and Nebraska;
- The Baker Alternative would traverse southeast Montana, southwest North Dakota, and northwest South Dakota;
- The Western Alternative would parallel the Express-Platte Pipeline System into Wyoming, divert from the Express-Platte route, and then extend to the Gulf Coast Segment without using the existing Cushing Extension; and
- The CSD Alternative that is generally parallel to the proposed route (Alternative SCS-B).

The analysis of alternative routes was conducted in several phases, as described in Section 4.3.2. After identifying potential route alternatives that were economically and technically practicable, the assessment considered overall feasibility in relation to the purpose of and need for the proposed Project (as described in Section 1.2 of the EIS) and major environmental issues. This initial review resulted in the elimination of some alternatives, as described in Section I-2.3.3 (Alternatives Initially Considered and Eliminated). Alternatives selected for further analysis were reviewed, as described in Section I-2.3.4(Comparison of Retained Alternatives).

I-2.3.3 ALTERNATIVES INITIALLY CONSIDERED AND ELIMINATED

After reviewing the 10 alternatives listed above, seven of those alternatives were eliminated from further evaluation as summarized below. Sections 4.3.3 and 4.3.4 of the EIS present additional information about those alternatives.

I-2.3.3.1 Express-Platte Alternatives

The Express-Platte Pipeline System is a 1,700-mile-long oil transportation network that connects Canadian and U.S. producers to refineries in the Rocky Mountain and Midwest regions of the United States. The system consists of two crude oil pipelines – the Express Pipeline and the Platte Pipeline. The Express Pipeline extends from Hardisty to markets in Montana, Wyoming, Utah, and Colorado. It crosses the U.S./Canada border near the Port of Wild Horse, Montana, and connects to the Platte Pipeline system at Casper, Wyoming. The Platte system extends from Casper to Wood River, Illinois.

Express-Platte Alternative 1

The border crossing of the Express-Platte Pipeline System is substantially west of the proposed Project's border crossing near the Port of Morgan. As described in Section 4.3.3.1 of the EIS, the Express-Platte Alternative 1 for the Steele City Segment would be approximately 234 miles longer than the proposed route, have a greater area of impact, affect more areas of key resources, and would have almost three times as much federal land as the proposed route. It also would extend over more land underlain by the Northern Plains High Aquifer (NHPAQ) system in Nebraska.

Keystone has obtained the necessary permits to construct the proposed Project in Canada, which terminates north of the U.S./Canada border near Morgan. Implementation of Express-Platte Alternative 1 would require submitting a new permit application to the NEB for a revised route in Canada, and the approval process would not be completed in a time frame that would meet the proposed Project objectives. For these reasons, Express-Platte Alternative 1 was not considered reasonable and it was therefore eliminated from further consideration.

Express-Platte Alternative 2

Express-Platte Alternative 2 was developed to provide an alternative route that would start at the control point near Morgan while still paralleling the existing pipeline system over much of its length. It would not require a new route in Canada. This alternative would be approximately 198 miles longer than the proposed Project route, and would affect about 2,700 more acres when considering the 110-foot-wide construction ROW, extra work spaces, additional contractor and pipe yards, and additional access roads over that distance. In addition, it would cross the Antelope Creek Wilderness Study Area from mileposts 112.7 to 114.9. It would also affect almost four times as much federal land as the proposed route, including a crossing of the Antelope Creek Wilderness Study Area, and would extend over more of the NHPAQ system than the proposed Project route. For those and other reasons described in Section 4.3.3.1, Express-Platte Alternative 2 would not offer a significant environmental advantage over the proposed route and was therefore eliminated from further consideration.

I-2.3.3.2 Alternatives SCS-A and SCS-A1A

In its initial application to MDEQ, Keystone identified two alternatives that would connect with the existing Keystone Pipeline in North Dakota; from there the alternatives would parallel the Keystone Pipeline to Steele City. Alternative SCS-A would parallel the Northern Border Pipeline and would cross through the Fort Peck Indian Reservation. Keystone developed a second alternative (Alternative SCS-A1A) that would extend north of the reservation in Montana. Although the alternate routes would parallel the Northern Border Pipeline, they would not meet the preferred location criteria listed in Circular MFSA-2, particularly the use of public lands, including state lands. Alternative SCS-A would be 69.0 miles longer than the proposed route for the Steele City Segment, and Alternative SCS-A1A would be about 100.6 miles longer than the proposed route along the Steele City Segment. These alternatives would be considerably longer and the overall impacts of each route for the entire Steele City Segment were considered to be greater than those of Keystone's proposed route. For these and other reasons presented in Sections 4.3.3.2 and 4.3.3.3 of the EIS, neither Alternative SCS-A or Alternative SCS-A1A would offer a significant environmental advantage over the proposed Project route and both alternatives were eliminated from further consideration.

I-2.3.3.3 Keystone Corridor Alternative 1

Keystone Corridor Alternative 1 would begin at the Morgan control point, extend approximately 442 miles eastward into eastern North Dakota, and then extend southward about 640 miles paralleling the existing Keystone Pipeline ROW to the control point at the northern end of the Cushing Extension. This alternative route was developed to avoid major national wildlife refuges and several smaller refuges that are present near the northern border of North Dakota. The route would also avoid crossing the Turtle Mountain Indian Reservation.

This alternative would be approximately 230 miles longer than the proposed route and would affect at least 3,200 more acres during construction when including the 110-foot-wide construction ROW, extra work space areas, additional pipe and construction yards, and additional access roads. It would affect less rangeland and grassland than the proposed route and would cross nearly 60 percent less federal land than the proposed route. However, it would affect substantially more streams and rivers, more agricultural land, developed land, forested land, and wetlands, and would cross more National Park Service land than the proposed Project route.

In addition, groundwater information reflected by well depth data, well density data, and hydraulic conductivity data (where available) suggest that there is no overall environmental advantage to Keystone Corridor Alternative 1 in terms of cumulative risk to groundwater resources.

For these and other reasons described in Section 4.3.3.4 of the EIS, Keystone Corridor Alternative 1 would not offer a significant environmental advantage over the proposed Project route and was eliminated from further consideration.

I-2.3.3.4 Baker Alternative

The Baker Alternative was developed at MDEQ's request to parallel an existing pipeline, use a greater proportion of public land, and be shorter than the proposed Project route. The Baker Alternative would deviate from the proposed Project route in Fallon County and would extend for approximately 62.1 miles parallel to an existing pipeline ROW into Bowman County in southwest North Dakota. The alternative would return to the ROW of the proposed Project in Harding County, South Dakota. The Baker Alternative would be approximately 2.4 miles shorter than the segment of the proposed Project route that it would replace.

This alternative would cross an active oil and gas field along the Cedar Creek Anticline. While the alternative would avoid the wells themselves, the route would cross many gathering pipelines. Construction through that area would increase the risk of accidental damage and a resultant gas leak or oil spill. Keystone estimated that the cost to construct this alternative would be approximately $3.25 million greater than that of the proposed route because of the additional time needed to construct through the existing gathering pipelines. Further, if a leak or spill were to occur due to damage to one of these gathering lines, Keystone would incur additional environmental and cleanup costs.

The initial segment of the Baker Alternative would extend below Lake Baker or would be in its watershed. There is a popular, developed recreation site at the edge of Baker that is one of only a few such sites in the region. Construction could disrupt access to recreation in the short term in this area. Over the long term, the risk associated with an oil spill was considered to be unacceptably high, despite a very low statistical probability of a leak.

This alternative would cross substantially less agricultural land and less forested land and wetlands than the comparable segment of the proposed route. However, it would also cross more developed areas, rangeland and grassland, and streams and rivers than the proposed route; would affect a substantially larger area of BLM land; and would also cross approximately 22 more miles of core sage-grouse habitat than the proposed Project route.

For these and other reasons described in Section 4.3.3.6 of the EIS, the Baker Alternative would not offer a significant environmental advantage over the segment of the proposed route it would replace and was eliminated from further consideration.

I-2.3.3.5 Western Alternative (Alternative to both the Steele City Segment and the Cushing Extension)

The Western Alternative would be a substitute for both the Steele City Segment and the Cushing Extension. This approximately 1,277-mile-long alternative would enter the U.S. at Morgan and extend through Montana, Wyoming, Colorado, Kansas, and Oklahoma to the control point at the southern end of the Cushing Extension.

Although the Western Alternative would parallel the existing Express-Platte System corridor for approximately 350 miles, the existing easements along that corridor are in the control of a different company and it may not be possible to construct the alternative pipeline within the existing ROW. Therefore, construction of the alternative may result in the same impacts as construction of a pipeline of similar length that is not parallel and adjacent to an existing ROW.

The Western Alternative would be approximately 426 miles longer than the proposed route and would affect about 6,000 more acres (more than 9 square miles) than the proposed route, including the 110-foot-wide construction ROW, extra work space areas, additional pipe and construction yards, and additional access roads. The Western Alternative would affect substantially more agricultural land, developed land, forested land, rangeland and grassland, and wetlands than the proposed route. It would also cross substantially more streams, rivers, and federal land than the proposed route. The Western Alternative would avoid crossing the NHPAQ system and the Sand Hills topographic region of Nebraska. The route would also avoid crossing the Charles M. Russell National Wildlife Refuge, the Medicine Bow National Forest, and the Pawnee National Grassland.

The Western Alternative is not considered a reasonable alternative to the proposed Project due to the financial impracticability of constructing a pipeline that would be substantially longer than the proposed route. In addition, the Western Alternative would not offer an overall environmental advantage over the proposed route. Therefore, this alternative was eliminated from further consideration.

I-2.3.4 COMPARISONS OF RETAINED ALTERNATIVES

The remaining three alternatives (Alternative CND, Alternative CSD, and the proposed Project route [Alternative SCS-B]) were analyzed further, as described in this section. The comparisons include length of the alternatives (Section I-2.3.4.1), potential impacts to key resources (Section I-2.3.4.2), and estimated construction costs (Section I-2.3.4.3).

Keystone did not include consideration of the preferred Montana routing criteria and preference for the use of public land in selecting Alternative SCS-B as its proposed route. The MFSA application noted that state school trust lands and other public lands had specifically been avoided, which was not in compliance with MFSA and MEPA requirements. Thus, MDEQ worked with Keystone and the third-party EIS contractor to develop two new alternatives (Alternatives CND and CSD) in a manner that provided clear documentation of the steps taken and factors considered, as indicated in Sections I-2.1 and I-2.3.

MFSA, in part, requires that MDEQ find and determine that a proposed facility minimizes adverse environmental impacts, considering the state of available technology and the nature and economics of the various alternatives, before the facility is approved. This finding does not prohibit MDEQ from considering costs and impacts outside of Montana. Thus, in the following sections, Alternatives CND and CSD are compared to the proposed Project route in Montana and also for the entire Steele City Segment (i.e., from the Montana-Saskatchewan border to Steele City, Nebraska), where appropriate. For this phase of the analysis of alternatives, overall length of the pipeline was considered (Section I-2.4.2.1), as were potential impacts to key environmental resources (Section I-2.3.4.2) and construction costs (Section I-2.3.4.3). Section I-2.3.4.4 presents conclusions to the analysis of the retained alternatives.

I-2.3.4.1 Lengths of the Alternatives

In general, longer alternative routes affect a greater area of land than shorter routes. However, if the 110-foot-wide construction ROW were to overlap an existing pipeline's operating ROW, the amount of new disturbance might be reduced. Without overlap, each mile of an alternative route would typically impact approximately 13.3 acres during construction and 6.0 acres during operation without including the area required for extra work space areas, additional pipe and construction yards, and access roads. As a result, there usually are environmental advantages to keeping the length of pipe required to reach the control point as short as possible while considering impacts to natural, cultural, and other environmental resources. However, a shorter route may not optimize the use of public lands as required by MFSA.

Table I-2.3-1 lists the distances of each of the Montana alternatives assessed from the Montana-Saskatchewan border near the Port of Morgan to Steele City, along with the distance in Montana.

TABLE I-2.3-1
Lengths and Construction Areas of Alternatives

Alternative	Length In Montana (miles)	Estimated Construction Area In Montana (Acres)	Length of Steele City Segment (miles)[1]	Estimated Construction Area of Steele City Segment (Acres)[1]
Canada to North Dakota (CND)	185.4	2,472.0	924.7	12,329.3
Proposed Route (SCS-B)	282.7	3,769.3	851.6	11,354.7
Canada to South Dakota (CSD)[2]	290.5	3,873.3	859.2	11,456.0

[1] The Steele City Segment extends from the Montana-Saskatchewan border near the Port of Morgan, Montana to Steele City, Nebraska.

[2] Consists of the Canada to Missouri River (CMR) segment and the Missouri River to South Dakota (MRSD) segment.

As noted in Table I-2.3-1, implementation of the proposed route for the Steele City Segment would result in the shortest pipeline distance of the three alternatives and would therefore result in less total construction impacts than the other alternatives; however, it would not optimize the use of public lands. Alternative CND would be the shortest route through Montana, but it would be the longest Steele City Segment route of the three alternatives.

I-2.3.4.2 Potential Impacts

For the second phase of analysis of the alternatives, the potential impacts to three key resources were considered:

- Major Stream Crossings;
- Land Uses; and
- Use of Publicly Owned Lands.

Major Stream Crossings

Table I-2.3-2 lists the number of perennial and intermittent streams crossed in Montana by each alternative. Alternative CND would cross 50 fewer major streams than the proposed Project route and 44 fewer major streams than Alternative CSD in Montana. However, the route of the entire Steele City Segment, from the Port of Morgan, Montana to Cushing, Oklahoma, with Alternative CND has 118 more major stream crossings than Keystone's proposed Steele City segment. Alternative CSD would cross 11 fewer intermittent streams than the proposed Project route in Montana, but 5 more perennial streams. Based upon this level of analysis, Alternative CND would offer an environmental advantage for stream crossings over both Alternative CSD and the proposed route in Montana. Alternative CSD and the proposed route are expected to have similar overall impacts to stream crossings in Montana.

TABLE I-2.3-2
Major Stream Crossings by Alternatives in Montana[1]

Alternative	Segment	Number and Type of Crossings		
		Intermittent Streams	Perennial Streams	Total Major Streams
Proposed Route (SCS-B)	Canada to Missouri River	34	7	41
Canada to South Dakota (CSD)	Canada to Missouri River (CMR)	32	7	39
Proposed Route (SCS-B)	Missouri River to South Dakota Border Segment	83	8	91
CSD	Missouri River to South Dakota (MRSD) Border	74	13	87
Canada to North Dakota (CND)	Entire Route	72	10	82
CSD	Entire Route	106	20	126
Proposed Route (SCS-B)	Entire Route	117	15	132

[1] Perennial and intermittent streams from ESRI 2004.

Land Use

No cities or towns would be directly crossed by the alternatives because all alternatives would extend through sparsely populated areas. The counties that would be crossed by the alternatives had population densities that ranged from about 0.5 to 4.4 people per square mile. Although Alternative CSD would cross approximately 0.8 mile on the west side of the St. Marie Census Designated Place[4], that area is also sparsely populated (about 8 people per square mile). Therefore, the impact to populated areas is not a discriminator in the assessment of alternatives.

Table I-2.3-3 lists the major types of land uses crossed by each alternative. Most of the land crossed by the three alternatives considered would be range land or fallow land. The proposed route would cross about 274.6 miles of those lands, compared to 282.2 miles for Alternative CSD and 182.4 miles for Alternative CND. Because these types of land use could generally continue as currently practiced after

[4] A Census Designated Place is an unincorporated area without a separate municipal government that has been established exclusively for census purposes.

reclamation and revegetation was implemented, there would not be a substantial difference in impacts to those land uses among the alternatives considered.

In Montana, Alternative CSD would affect about 0.2 mile more developed land and 2.5 miles more forest/woodlands than the proposed Project route. However, Alternative CSD would extend through about 1.4 fewer miles of wetlands than the proposed route. Alternative CND would not cross forest/woodlands, whereas the proposed route would cross about 0.7 mile of forest/woodlands. Alternative CND would cross about 0.4 mile less wetlands than the proposed route, but 3.5 miles more developed land. Overall, Alternatives CSD and CND would not appear to offer an environmental advantage for land use over the proposed route.

TABLE I-2.3-3
Land Uses Crossed by Alternatives in Montana

Land Use Type[1]	Land Use Crossed (Miles)						
	Proposed Route − Canada to Missouri River Segment	Canada to South Dakota (CSD) − Canada to Missouri River (CMR) Segment	Proposed Route − Missouri River to South Dakota Segment	CSD − Missouri River to South Dakota (MRSD) Segment	Canada to North Dakota (CND)	CSD (Entire Route)	Proposed Route
Land Cover[1]							
Wetlands	1.0	0.6	1.7	0.7	2.3	1.3	2.7
Forest/Woodlands	0.1	0.0	0.6	3.2	0.0	3.2	0.7
Developed	0.9	2.0	2.5	1.6	6.9	3.6	3.4
Combined Land Unit Classification[2]							
Fallow Land	22.6	20.3	57.2	26.6	96.5	46.9	79.8
Range Land	64.2	70.9	130.6	164.4	85.9	235.3	194.8
Hay Land	0.1	0.0	4.6	5.8	2.9	5.8	4.7
Irrigated Land	2.1	2.2	1.0	0.0	0.1	2.2	3.1
Non-Commercial Forest Land	0.1	0.1	0.2	0.2	0.0	0.3	0.3
Total	89.1	93.5	193.6	197.0	185.4	290.5	282.7

1 Based on United States Geological Survey (USGS) 2001.
2 Based on Montana Department of Revenue and Montana Department of Administration 2010.

Public Lands

Table I-2.3-4 summarizes the ownership of public land for the alternatives considered in Montana. As noted in Section I-2.3.1, MDEQ included state and federal lands in the "preferred area" category. This preference was due to the requirement to conform to criteria listed in Section 75-20-301, MCA. However, in developing Alternative SCS-B (the proposed route), Keystone elected to avoid public land to the extent feasible. Most federal lands in Montana are managed by BLM, and the majority of federal lands crossed by each alternative are managed by BLM. BLM typically would prefer an alternative that used less BLM land, if all other environmental factors were roughly equivalent and the proposed Project purpose and need were met.

TABLE I-2.3-4 Public Land Crossed by the Alternatives in Montana							
	Miles of Public Land Crossed						
Agency with Jurisdiction[1]	Proposed Route − Canada to Missouri River Segment	Canada to South Dakota (CSD) − Canada to Missouri River (CMR) Segment	Proposed Route − Missouri River to South Dakota Segment	CSD − Missouri River to South Dakota (MRSD) Segment	Canada to North Dakota (CND)	CSD − Entire Route	Proposed Route in Montana
U.S. Bureau of Land Management	22.2	34.6	21.6	77.7	70.1	112.3	43.8
State of Montana	13.1	21.9	6.3	35.3	38.5	57.2	19.4

[1] Data are for public lands listed in Montana Department of Revenue and Montana Department of Administration, 2010.

Alternatives CND and CSD would cross more state land and more BLM land than the proposed route. Although Alternative CND would cross more state land in Montana, it would follow the route of Alternative SCS-A outside of Montana. This would result in impacts to sensitive public lands not affected by either Alternative CSD or the proposed Project route. Alternative CND would affect public land such as the Little Missouri National Grassland in North Dakota and the Missouri River National Recreational Area in South Dakota and Nebraska. Therefore, Alternative CND is not considered environmentally preferable with regard to the use of public land.

I-2.3.4.3 Estimated Construction Costs

Table I-2.3-5 lists the estimated construction costs for the alternatives in Montana and for the Steele City Segment. The estimated construction cost per mile includes the pipeline, pump stations, and the electrical power supply for the pump stations. Keystone has stated that the cost of the pipeline alone would be approximately 30 percent of the total cost per mile.

TABLE I-2.3-5 Estimated Construction Cost of Alternatives			
	Estimated Construction Cost[1]		
Alternative/Segment	Per Mile of Alternative/Segment	Total Cost in Montana	Total Cost for Steele City Segment[2]
Proposed Route − Canada to Missouri River Segment	$2,630,731	$234,135,059	-
Canada to South Dakota (CSD) − Canada to Missouri River (CMR) Segment	$2,860,000	$267,410,000	-
Proposed Route − Missouri River to South Dakota Segment	$2,630,731	$509,046,449	-
CSD − Missouri River to South Dakota (MRSD) Segment	$2,860,000	$563,420,000	-
Canada to North Dakota (CND)	$2,730,000	$506,142,000	$2,524,431,000
CSD − Entire Route	$2,860,000	$830,830,000	$2,457,312,000
Proposed Route − Entire Route	$2,630,731	$743,707,654	$2,240,330,520

[1] Estimated construction costs includes estimated cost of pipeline construction plus 30 percent for the estimated cost of the pump stations and electrical power supply for the pump stations.

[2] The Steele City Segment extends from the Montana-Saskatchewan border near the Port of Morgan, Montana to Steele City, Nebraska.

The routes for Alternatives CSD and CND were not surveyed, and therefore the estimated construction costs for those alternatives were based on elevation maps, GIS data, aerial photographs, and other information that is not as precise as on-the-ground evaluations. In addition, none of the alternatives include the estimated costs of procuring the ROW. For the portions of the alternatives that cross private land, the total cost of ROW acquisition (e.g., the costs of attorneys, filings, payments to landowners for easements, surveys, and land agents) would be from about $30,000 to $40,000 per mile. The basic costs to acquire ROWs across public land would be similar, but there would be additional costs for complying with the specific requirements imposed upon Keystone by each land management agency for use of the ROW. Because those requirements are not known at this time, the cost of ROW acquisition across public lands could not be estimated.

The estimated total construction cost of Alternative CND would be less than that for Alternatives CSD or SCS-B in Montana but would be the greatest for the Steele City Segment. The estimated construction cost of the proposed Project route would be about $237.6 million more than Alternative CND in Montana but $284.1 million less for the Steele City Segment. The estimated construction cost of Alternative CSD would be greater than for the proposed route in Montana and for the entire Steele City Segment. The proposed route would cost about $87.1 million less to construct in Montana than Alternative CSD and about $217.0 million less for the entire Steele City Segment.

I-2.3.4.4 Conclusions

CND Alternative

As described in Section I-2.3.2, Alternative CND would connect to Alternative SCS-A in Williams County, North Dakota; from there, Alternative SCS-A would continue to the Cushing Extension. This Steele City alternative would be 65.5 miles longer than Alternative CSD and 73.1 miles longer than the proposed route, and the area of construction impacts would also be greater as compared to those of Alternative CSD and the proposed route. The estimated construction cost of Alternative CND for the Steele City Segment is about $67.1 million more than that of Alternative CSD and about $284.1 million more than that of the proposed route. Although Alternative CND would cross more state lands than the proposed route, it would cross substantially less state land than Alternative CSD. In addition, Alternative CND and the connected Alternative SCS-A outside of Montana would cross more federal land than the proposed route. Therefore, Alternative CND was eliminated from further consideration.

Alternative CSD Compared to the Proposed Route

After removing Alternative CND from further consideration, MDEQ conducted a more detailed review of Alternative CSD and found many unusual angles along the alignment that appeared to be artifacts of the modeling effort. To develop a more realistic alternative pipeline route, MDEQ straightened the Alternative CSD alignment where appropriate and also adjusted it to avoid the steepest terrain, multiple crossings of the same stream, residences, and irrigated lands. These adjustments resulted in slightly more private land being crossed, as compared to the originally modeled Alternative CSD. This MDEQ-revised Alternative CSD is termed the “modified Alternative CSD” (or “modified segment”) in the remainder of this section to differentiate it from the original model-produced Alternative CSD (or segments of that alternative) presented in Keystone’s MFSA application.

The potential impacts to key resources of the modified Alternative CSD north of the Missouri River (modified CMR segment) were then compared to those of the proposed route north of the river, and the potential key impacts of the modified Alternative CSD from the Missouri River to the Montana-South Dakota border (modified MRSD segment) were compared to those of the proposed route south of the river to the state border. Table I-2.3-6 presents the comparisons.

TABLE I-2.3-6 Comparison of the Canada to South Dakota (CSD) Alternative with the Proposed Route		
	Approximate Miles of Land Crossed Except where Noted[1]	
Location and Item	Segment of Canada to South Dakota (CSD) Alternative	Segment of Proposed Route
Canada to Missouri River Segment		
Total Length	93.5	89.1
Montana Dept. of Fish, Wildlife & Parks (MFWP) Designated Core Habitat of Sage-Grouse	22.5	20.2
Number of Sage-Grouse Leks within 4 miles of Centerline	5	4
Number of Wells within 0.25 mile of Centerline	11	26
Number of Parcels Crossed with Dwelling Indicated	8	14
Slopes from 0% to ≤ 5%	71.6	57.6
Slopes > 5% and ≤ 15%	18.9	26.7
Slopes > 15% and ≤ 30%	2.5	4.3
Slopes > 30%	0.3	0.5
Conservation Reserve Program (CRP) or Fallow	20.3	22.6
Range Land	70.9	64.2
Hay Land	0	0.1
Irrigated Land	2.2	2.1
Non-Commercial Forested Land	0.1	0.1
BLM Land	34.6	22.2
State Land	21.9	13.1
Private Land	36.8	53.0
Missouri River to Montana/South Dakota Border		
Total Length	197.0	193.6
MFWP Designated Core Habitat of Sage-Grouse	0.0	0.0
Number of Sage-Grouse Leks within 4 miles of Centerline	25	31
Number of Wells within 0.25 mile of Centerline	50	100
Number of Parcels Crossed with Dwelling Indicated	15	33
Slopes from 0% to ≤ 5%	77.2	62.7
Slopes > 5% and ≤ 15%	102.8	114.1
Slopes > 15% and ≤ 30%	15.7	15.8
Slopes > 30%	1.4	1.0
CRP or Fallow	26.6	57.2
Range Land	164.4	130.6
Hay Land	5.8	4.6
Irrigated Land	0.0	1.0
Non-Commercial Forested Land	0.2	0.2
U.S. Army Corps of Engineers Land	1.0	1.0
National Wildlife Refuge Land	0.2	0.2
BLM Land	77.7	21.6
State Land	35.3	6.3
Private Land	82.6	164.3

Sources: sources used for data in the table are listed in Section I-2.4.1.
[1] Mileage rounded to nearest tenth.

Summary of Comparisons

From the Canadian border to the Missouri River, the proposed route would be about 4.4 miles shorter than the modified CMR segment and would cross 2.3 fewer miles of sage-grouse habitat, about 6.7 fewer miles of range land, about 0.1 mile less irrigated land, about 8.8 fewer miles of state land, and about 12.4 fewer miles of BLM land. The proposed route segment also would have one less known sage-grouse lek within 4 miles than the modified CMR segment. The modified CMR segment would have 15 fewer wells within 0.25 mile, six fewer parcels with a dwelling indicated, more gradual slopes, about 2.3 fewer miles of CRP or fallow land, about 0.1 fewer miles of hay land, and about 16.2 fewer miles of private land.

From the Missouri River to the state border, the proposed route would be about 3.4 miles shorter than the modified MRSD segment and would cross more gradual slopes, about 33.8 fewer miles of range land, about 1.2 fewer miles of hay land, about 29.0 fewer miles of state land, and about 56.1 fewer miles of BLM land. The modified MRSD segment would have six fewer known sage-grouse leks within 4 miles, 50 fewer wells within 0.25 mile, cross 18 fewer parcels with a dwelling indicated, cross 30.6 fewer miles of CRP or fallow land, cross about 1.0 fewer miles of irrigated land, and would cross 81.7 fewer miles of private land.

Although the modified Alternative CSD would cross substantially more public land in Montana, its implementation would result in a longer construction ROW and a greater total area of construction impacts in Montana and along the Steele City Segment as compared to the proposed route. In addition, the greater length of the modified Alternative CSD would result in about a nine percent increase in construction cost for the Steele City Segment of the proposed Project.

Conclusions

MFSA regulations require that MDEQ identify the alternative that minimizes adverse environmental impacts and uses public land whenever the use of public lands is as economically practicable as the use of private land. The modified Alternative CSD would cross approximately three times as much state land in Montana as the proposed route (57.2 miles versus 19.4 miles) and nearly three times as much federal land as the proposed route (112.3 miles versus 43.8 miles).

As a result of this comparison, MDEQ determined that it was not reasonable to carry forward the entire modified Alternative CSD because of its additional impacts and costs compared to Keystone's proposed route. However, portions of the modified Alternative CSD would cross more public land as compared to the proposed route segments in those areas. As a result, MDEQ considered those portions of the modified Alternative CSD as variations to the proposed route. Section I-2.4.3 presents descriptions of those variations along with comparisons of key environmental concerns along the variations and the segments of the proposed route that they would replace.

I-2.4 MONTANA ROUTE VARIATIONS AND KEYSTONE REALIGNMENTS

Variations and realignments are relatively short deviations from the proposed Project route, that were developed to resolve or reduce construction impacts to localized, specific resources such as land ownership, terrain, residences and other structures, cultural resources, wetlands and streams, and wildlife conditions. They are different from major proposed Project route alternatives in that alternatives, such as those identified in Section 4.3 of the EIS and in Section I-2.3 of this appendix, are typically substantial distances from the proposed pipeline route, are generally much longer than variations and realignments, and were developed to reduce overall environmental impacts while meeting the purpose and need of the proposed Project. Although route variations and realignments also may be many miles in length, they are typically shorter and nearer to the proposed Project route than a major route alternative. Many requests for variations and realignments were submitted by concerned landowners.

Section I-2.4.1 describes the methods used to develop and evaluate route variations and realignments for the proposed Project. Section I-2.4.2 presents a comparison of the Montana proposed route variations with the segments of the proposed Project route that would be replaced by those variations. Section I-2.4.3 presents similar comparisons between the Keystone proposed realignments and the associated segments of the proposed Project route. For the purposes of the determinations under MFSA, the 2010 and 2011 route variations (MTVs) and 2010 realignments (KEYs) described below are considered to be modifications to Keystone's proposed Project, as defined in the December 2008 MFSA application (and referred to as the 2009 alignment in this appendix). This section compares the Montana proposed route variations developed throughout 2010 and 2011to the Keystone proposed 2010 realignments (which comprise the revised proposed Keystone route).

I-2.4.1 DATA SOURCES AND METHODS

The following sections describe the variables, data sources, and methods used to compare the Montana proposed route variations and the Keystone proposed realignments against each other, or the proposed Project route, as appropriate.

I-2.4.1.1 DEVELOPMENT OF ROUTE VARIATIONS AND REALIGNMENTS

During its environmental review process, MDEQ developed route variations to avoid or minimize impacts to specific resources, to increase the use of public lands, or to avoid or minimize conflicts with existing or proposed residential and agricultural land uses. Other variations were developed in response to requests submitted by concerned landowners.

To receive MDEQ approval, the proposed Project must conform to the criteria in Section 75-20-301, MCA, (see Section I-1.0) and the decision standards in Administrative Rules of Montana (ARM) 17.20.1604 and ARM 17.20.1607. Several variations were developed to conform to Section 75-20-301(1)(h), MCA, which requires that the use of public land be given a preference where its use is as economically practicable as the use of private land.

For route variation development, the following were the primary areas to be avoided to the extent practical, or used minimally:

- Residences;
- Wells;
- Irrigated land;
- Cultural resources;
- Stream crossings;
- Transmission line structures;
- Major elevation changes; and
- Steep slopes.

In addition, forested areas were generally avoided to the extent practical and, where possible, variations were developed to be parallel to existing linear facility ROWs (i.e., routes that overlap, are directly adjacent to, or are within 150 feet of an existing ROW).

Initially, 19 variations to the 2009 proposed Project route were identified in Montana and described in the draft EIS. Each variation was given the designation of MTV (i.e., Montana Variation) and a number (e.g., MTV-11). These 19 variations were evaluated in the draft EIS, and MDEQ identified nine tentatively preferred variations to the proposed Project, including MTV-1, -2, -5, -6, -9, -11, -15, -17, and -19.

However, during 2010 and 2011, landowners submitted requests to consider additional variations in the EIS, and landowner field visits were conducted from June 29, 2010 through June 2011. MDEQ studied these additional variations to the 2009 proposed Project. As a result of those requests, a total of 50 variations were identified in Montana, ranging in length from about 0.2 mile to about 42.0 miles.

Simultaneously, Keystone also conducted their own additional studies of potential reroutes to the 2009 proposed Project route, as well as those suggested by landowners and MDEQ. This resulted in the creation of 48 Keystone realignments (identified as KEY-1, for example), ranging in length from about 0.2 mile to about 4.1 miles. An overview of all 50 MDEQ variations is depicted in Figure I-2.4.2-1, and additional details are provided in Figures I-2.4.2-2 through I-2.4.2-24. Similarly, an overview of all 48 Keystone realignments is depicted in Figure I-2.4.3-1, and additional details are provided in Figures I-2.4.3-2 through I-2.4.3-24. The location of the variations and realignments can also be viewed from MDEQ's web mapping application at http://svc.mt.gov/deq/wmaKeystoneXL.

I-2.4.1.2 Comparison of Route Variations and Realignments with the Proposed Route

The following sections first provide an overview of the variables used to compare the variations and the realignments to the proposed Project route. This overview is then followed by a more detailed discussion about the methods and data sources used for stream crossings, cultural resources, paleontological resources, biological resources (e.g., wetlands and noxious weed areas), greater sage-grouse and sharp-tailed grouse leks, and construction and environmental mitigation costs.

I-2.4.1.3 Variables and Methods Used for Route Comparisons

Sections I-2.4.2 and I-2.4.3 provide the primary reasons for developing the variations and realignments, as well as tabular comparisons of the key environmental characteristics and other data associated with each segment (presented in Tables I-2.4.2-1 through I-2.4.2-30 and Tables I-2.4.3-2 through I-2.4.3-33, respectively). In each table, 17 variables were used to compare each MDEQ variation or Keystone realignment to the corresponding proposed route segment.

For each variable in the tables, the appropriate route segment was used as the reference point for calculating the difference between the value listed for the route segment and the value listed for the variation or realignment (i.e., the value listed for each item of the variation or realignment was subtracted from the value listed for the route segment). The following are two examples of how those differences were calculated:

- If the route segment was 4 miles long and the variation was 1 mile long, the difference listed would be +3 (i.e., the route segment is 3 miles longer than the variation).
- If there were two perennial streams crossed by the route segment and four perennial streams crossed by the variation, the difference listed would be -2 (i.e., the route segment would cross two fewer perennial streams than the variation).

Each of the MTV variations developed throughout 2010 and 2011were generally compared to the Keystone realignments that together now comprise the 2010 proposed Project route (in very selected cases the comparison was made to portions of the original 2009 alignment), as defined in each table. These comparisons were made using the 15 criteria or variables, as outlined below:

- Length: the length in miles of the variation or realignment, and the route segment that would be replaced;
- Land Cover: the distance in miles across developed, forested/woodlands, and wetlands (from the United States Geological Survey [USGS], 2001);
- Revenue Final Land Unit Classification: the distance in miles across range land, irrigated land, and hay land, which includes non-irrigated farmland, noncommercial forest land, and summer fallow farmland (from Montana Center Department of Revenue, 2010);
- Land ownership: the distance in miles across state, private, BLM, and local government lands as well as across existing ROWs (from Montana Department of Revenue and Montana Department of Administration, 2010);
- Road Crossings: the number of major roads (e.g., U.S., state, and secondary highways), and other minor roads crossed (from ESRI, 2003);
- Railroad Crossings: the number of railroads crossed (from ESRI, 2002);
- Stream Crossings: the number of perennial and intermittent streams crossed (from ESRI, 2004), as well as the number of streams crossed that were not identified as a perennial or intermittent stream from the ESRI (2004) data (i.e., listed as USGS streams and obtained from USGS maps, dated 1966 to 1984);
- Slope: the length in miles of slopes crossed using four categories (from USGS, 2002):
    - slopes less than 5 percent,
    - slopes equal to or greater than 5 percent but equal to or less than 15 percent,
    - slopes greater than 15 percent but equal to or less than 30 percent, and
    - slopes greater than 30 percent;
- Water Wells: the number of water wells located within 100 feet of the centerline of the pipeline (from the Montana Bureau of Mines and Geology, 2010);
- Residences: the number of residences located within 25 feet and within 500 feet of the edge of the construction ROW (from the Montana Basemap Service Center, 2010 and MDEQ field surveys);
- Structures: the number of other types of structures located within 25 feet and within 500 feet of the edge of the construction ROW (from Montana Basemap Service Center, 2010 and MDEQ field surveys). Structures included only commercial and industrial buildings and outbuildings; residences and water wells were separated out, as described above;
- Cultural and Paleontological Resources:
    - the number of cultural resources located within a 300-foot-wide Area of Potential Effect (APE), based upon Class I research in historic Government Land Office maps, Cultural Resource Annotated Bibliography System (CRABS) and the Cultural Resource Information System (CRIS); and the number of previously recorded cultural resources by township, range, and section (TRS) (provided by the Montana SHPO, January 2011), or

- the number of eligible, potentially eligible, or non-eligible cultural resources located within a 300-foot-wide Area of Potential Effect (APE), based upon the results of Class III field surveys conducted in 2010 and 2011;
- the number of significant and non-significant paleontological resources located within a 300-foot-wide Area of Potential Effect (APE), based upon the results of field surveys conducted in 2010;

- Biological Resources: the number and type of wetlands, and the number of noxious weed areas crossed by a route centerline, as identified by field surveys conducted in 2010 (from the Keystone September 2010 Montana Summary Report, and also subsequent additional information provided by Keystone);
- Greater Sage-grouse and Sharp-tailed Grouse Leks:
  - as presented in the comparison tables and text, the length in miles across greater sage-grouse core areas; and the number of greater sage-grouse and the number of sharp-tailed grouse leks within 1, 2, 3, and 4 miles of the routes (from the Montana Department of Fish, Wildlife and Parks [MFWP, February 2011]), or
  - as also described in the text only, the number of greater sage-grouse leks located within 3 miles of the centerline, as identified by field surveys conducted in 2010, and the degree to which terrain would obscure the visibility of the pipeline from these greater sage-grouse leks.
- Construction and Environmental Mitigation Costs:
  - the estimated cost per mile of pipeline construction,
  - the estimated total pipeline construction cost (either provided by Keystone or estimated using $2.1 million per mile), and
  - the environmental mitigation costs for impacts to core areas and important greater sage-grouse habitat (estimated using $600 per acre of ROW).

Because route variations and realignments were identified in response to the preference to site the proposed Project on public land, to avoid or minimize specific environmental impacts, to avoid land use conflicts, or in response to landowner comments, they may not clearly display an environmental advantage other than reducing or avoiding impacts to specific features or resources. Conversely, the proposed alignment may not conform to regulatory requirements under MFSA. Further, the variations and realignments are generally close to the route segments that they would replace and extend across similar terrain, the construction methods for the variations and realignments would be essentially the same as those of the route segments, and the appearance of the proposed Project along the routes of the variations and realignments after construction and reclamation are completed could be similar to the appearance along the segments. As a result, for many resources the impacts associated with implementation of the variations and realignments could be essentially the same as the impacts that would result from construction and operation of the route segments, except where noted below.

The following sections provide some additional details about the data sources and methods that were used to conduct the comparative analysis of the variations and the realignments.

I-2.4.1.4 Description of Studies and Methods

Stream Crossings

The number of stream crossings was evaluated using the ESRI 2004 detailed streams database for Montana and electronic copies of USGS 7 ½ minute topographic quadrangles (a total of 58 quadrangles dated 1966 to 1984). The ESRI database was used to identify perennial and intermittent streams. The USGS 7 ½ minute topographic quadrangles were used to identify other types of streams the proposed Project would cross, that were not identified in the ESRI database. Each MTV, KEY, and proposed route comparison was overlain on scanned versions of USGS 7 ½ minute topographic quadrangles. Then, streams mapped by the USGS, excluding those already identified in the ESRI database, were identified and provided in variation and realignment comparison tables.

Cultural Resources

The cultural resources record search (provided by the Montana State Historic Preservation Office in January 2011) includes the Cultural Resource Annotated Bibliography System (CRABS), the Cultural Resource Information System (CRIS), and sites identified on state lands. Site specific information about cultural resources was not available at the time this EIS was prepared, and it is not known if any of the site surveys conducted for the proposed route are included in the dataset.

Stone features and areas with the potential for stone features to occur were identified along the proposed route. However, no known stone features were identified along any of the variations. As required by the Programmatic Agreement (PA; described in Section 3.11.3.2 of the EIS and presented in Appendix S and Attachment 1 of Appendix I), Keystone would conduct cultural resource surveys along the selected route variations to determine whether such resources were present. DOS would work with the tribes, the SHPO, and Keystone, in coordination with the other consulting parties in the PA, to develop the appropriate mitigation measures if these resources would be impacted by the proposed Project.

To assess the MDEQ route variations, Keystone realignments, and the proposed route, SWCA conducted Class I inventories and Class III field surveys in 2010. Class I inventories were completed using existing data from the cultural resource inventory files maintained by the Montana State Historic Preservation Office (SHPO) and included the Cultural Resource Annotated Bibliography System (CRABS), the Cultural Resource Information System (CRIS), and sites identified on state lands. Class I inventories served to identify known properties and were used to determine whether a more intensive inventory of specific areas was appropriate.

Class III intensive field surveys were conducted by professional archaeologists in a pedestrian survey of the 300-foot APE. The intent of the Class III inventory was to locate and record all cultural resources and was consistent with standards in the Secretary of the Interior’s Standards and Guidelines for Archaeology and Historic Preservation (48 FR 44716). The Class III surveys were designed to produce a total inventory of the cultural properties observable within the APE.

Pedestrian surveys of the MDEQ route variations and Keystone realignments were conducted between May 17 and August 27, 2010 and covered 101.4 miles. The report of findings was sent to DOS on September 23, 2010 (Crossland et al. 2010). In cases where SWCA could not access properties, typically due to lack of landowner approval, Class III surveys were not conducted. Because these areas were not known until the end of the fieldwork season, a Class I inventory was carried out by SHPO staff and provided in January 2011. In these cases, the number of previously recorded cultural resources, identified by township, range, and section (TRS) that the variation passed through, were counted rather than those within the defined APE.

Cultural resources that were previously identified and those located during the Class III surveys were assessed for NRHP eligibility. In some instances, archeological sites were identified as potentially eligible or unevaluated when there were not sufficient data to assess the site. In these instances, testing and/or additional consultation with Tribes will be carried out. Known historic properties or those that are identified through testing and consultation will require mitigation through avoidance, professional monitoring, and/or data recovery excavations. Areas that require additional work will be included in a Historic Properties Treatment Plans developed under the PA.

Paleontological Resources

To assess the MDEQ route variations, Keystone realignments, and the proposed route, SWCA conducted background research and analysis to identify known fossil resources and geologic formations. In conjunction with this background research, evaluation of the 300-foot APE was conducted to identify paleontological sensitivity of geological formations using the Potential Fossil Yield Classification System (PFCS). Field surveys were then conducted for all paleontologically sensitive areas with exposed fossiliferous rock in the 300-foot APE.

Biological Resources

A 300-foot-wide survey corridor, 150 feet on each side of a proposed variation, realignment, or proposed Project route, was utilized to conduct all biological surveys. Biological surveys were conducted by trained professional biologists to identify wetlands and noxious weed areas. Biological resources are presented for the proposed route, variations, and realignments as the number and type of wetlands and the number of noxious weed areas crossed by a route centerline. Biological resources were obtained from the Keystone September 2010 Montana Summary Report.

Greater Sage-grouse and Sharp-tailed Grouse Leks

Aerial greater sage-grouse surveys were conducted via helicopter in the spring of 2010, searching a corridor that was 4 miles on either side of a route segment centerline. The identified leks are noted within the text for variations and realignments that were surveyed. The core greater sage-grouse areas were identified using MFWP data, obtained in February 2011. MFWP defines core areas as habitats associated with the highest density of greater sage-grouse and lek complexes and associated habitat important to distribution.

For each route, the miles of greater sage-grouse core areas crossed and the number of greater sage-grouse and sharp-tailed grouse leks were identified using MFWP data (February 2011). These greater sage-grouse and sharp-tailed grouse leks are presented in the tables as being within 1, 2, 3, or 4-miles of a route centerline. The counts for each concentric circle are cumulative, meaning that they include the counts of the smaller circle (e.g., if one lek is identified within 2 miles and three leks are identified within 3 miles, it means that there are two leks located beyond the 2-mile circle but within 3 miles).

Construction and Environmental Mitigation Costs

The routes of all of the variations and realignments have not been surveyed, and therefore the estimated construction costs for them were based on elevation maps, GIS data, aerial photographs, and other information that was not as precise as on-the-ground evaluations. Where specific engineering was not completed and a cost estimate was not provided by the Applicant, it was assumed that the costs of construction for a variation or realignment would be $2.1 million per mile. These estimated costs are only for the cost of the pipe and for construction; they do not include the cost of constructing pump stations and electrical distribution lines and connections. In addition, the estimated costs do not include the cost of procuring the ROW. For portions of the routes across private land, the total cost of ROW acquisition (e.g., the costs of attorneys, filings, easement remunerations, surveys, and land agents) would be from about $30,000 to $40,000 per mile. The costs to acquire ROWs across public land would include many of the same expenditures, but would also include the additional costs of complying with the specific requirements imposed on Keystone by the land management agency for use of the ROW. Because those requirements are not known at this time, the cost of ROW acquisition across public lands could not be estimated.

The MFWP suggested a $600 per acre compensatory environmental mitigation package for loss of the use of sagebrush habitat as a result of pipeline construction. The mitigation costs were based upon the average per acre cost of unimproved rangeland in the proposed Project area. Greater sage-grouse habitat was identified as either greater sage-grouse core areas or as distribution areas defined by the MFWP. Greater sage-grouse core areas were located along the proposed pipeline from approximately mileposts 44 to 64, and greater sage-grouse distribution areas that the MFWP identified were located from mileposts 96.5 to 131.0. These greater sage-grouse distribution areas were defined by the MFWP as nesting/early brood rearing and year round/overall distribution and were not included if they occurred on fallow farmland, which was defined from the Revenue Final Land Unit Classification listed above.

I-2.4.2 MONTANA ROUTE VARIATIONS

I-2.4.2.1 Route Variation MTV-1 (Phillips/Valley County Variation)

MTV-1 (see Figure I-2.4.2-2 and Table I-2.4.2-1) was developed primarily to increase the amount of public land crossed, in comparison to the proposed Project route. In addition, it would be downstream rather than upstream of the Frenchman Reservoir, which would serve as a precaution against a possible spill affecting this locally important body of water. MTV-1 would be approximately 2 miles longer than the 2010 proposed route segment, which would include KEY-2, KEY-3, and KEY-4 (see Section I-2.4.3).

Implementation of MTV-1 would use more public land, including 6.7 miles of BLM land and 1.2 miles more of state land. It would cross 0.5 mile more developed land and more range and hay land. MTV-1 would be closer to one residence but farther from one structure, and would cross the same number of minor roads as the 2010 proposed route segment. Field surveys found that MTV-1 would cross seven more potentially eligible cultural resources and three more non-eligible cultural resources. A survey of paleontological sites found that MTV-1 would affect three fewer non-significant sites.

MTV-1 would cross 0.1 mile each less of wetlands and forested/woodland areas, two fewer intermittent streams, and 12 fewer USGS streams than the route segment it would replace, and would extend across a shorter distance of moderate slope. Desktop data indicated that MTV-1 also would be farther from greater sage-grouse habitat and one greater sage-grouse lek than the route segment, and field surveys confirmed that the route segment would be within 3 miles of one lek. As a result, the estimated cost per mile of pipeline construction would be greater for Keystone's proposed route segment than for MTV-1. However, due to the greater length of MTV-1, its total estimated construction cost would be greater than that of the proposed route segment.

MDEQ tentatively identified MTV-1 as its preferred alternative in the draft EIS in place of the 2009 proposed route segment. However, since publication of the draft EIS, additional information became available to compare the 2010 proposed route (including KEY-2, KEY-3, and KEY-4) with MTV-1 and a landowner's request, which is presented below as MTV-1a. A hydraulic design review of the potential impacts of the additional 2.0 miles of centerline that would be required for MTV-1 indicated that pump station 10 in Valley County would have to be relocated a minimum of 1.25 miles upstream to maintain a nominal capacity of 830,000 barrels per day (bpd). To maintain this nominal capacity, the route variation in this segment (between pump stations 9 and 10) could not exceed 1.12 miles (1.8 km). With the additional 2.0 miles to incorporate MTV-1 into this pipeline segment, the nominal capacity would be reduced to about 800,000 bpd. Depending upon the final revised location of pump station 10, a relocation of pump station 11 in McCone County approximately 0.75 mile upstream also could be required.

Most of the land within several miles upstream of the proposed pump station 10 is either a Nature Conservancy easement or owned by the BLM. If a suitable site for pump station 10 could be acquired, the potential impacts of relocating each pump station would include additional costs of $850,000 related to land acquisition, civil survey, pipeline engineering, environmental survey, geotechnical investigation, power line routings, station design, and hydraulic reviews. In addition, the power provider would have to conduct a new power line routing study and lose the right-of-way they have already acquired.

After consideration of the potential engineering concerns and greater impacts to cultural resources, MDEQ did not select MTV-1.

I-2.4.2.1a Route Variation MTV-1 with Segment MTV-1a (Phillips/Valley County Variation A)

MTV-1a (see Figure I-2.4.2-2 and Table I-2.4.2-1a) was developed primarily to avoid wells, a private landing strip, and a saline seep control project. In doing so it increased the amount of public land crossed in comparison to the proposed route. This variation would include a landowner's request to avoid a saline seep project from about milepost 15 to milepost 20. Use of MTV-1 with segment MTV-1a would be 2.57 miles longer than the proposed route. The variation would cross 1.13 miles more state land and 6.95 miles more BLM land.

MTV-1a would cross 0.92 mile more developed land, three fewer minor roads, and would not be near any residences or structures. For cultural findings, the variation would cross seven more potentially eligible cultural resources and three more non-eligible cultural resources. About 93 percent of cultural surveys were completed for MTV-1a. MTV-1a also would cross three fewer non-significant paleontological sites.

MTV-1a would cross no forested/woodlands, 0.12 mile less wetlands, two fewer intermittent streams, and 12 fewer USGS streams. For biological resources, the 2010 proposed route would cross two wetlands (PEM and PSS) and four noxious weed areas, compared to none for MTV-1a. Desktop data indicated that MTV-1a would be farther from one greater sage-grouse lek, and field surveys confirmed that the route segment would be within 3 miles of one lek. Because of the proximity to greater sage-grouse leks, timing restrictions would be required along about 6.2 miles of the 2010 proposed Project route during mating and rearing periods. No such timing restrictions would be necessary along MTV-1 with MTV-1a.

In November 2010, Keystone advised MDEQ that due to route adjustments further south in Montana and other states, the design of pump stations 9 and 10 and the intervening segment had become a limiting factor. A hydraulic design review of the impacts of the additional 2.57 miles of centerline that would be required by MTV-1 indicated that pump station 10 in Valley County would have to be relocated a minimum of 1.25 miles upstream to maintain the nominal capacity of 830,000 bpd. To maintain this nominal capacity, the route variation in this segment (between pump stations 9 and 10) could not exceed 1.12 miles (1.8 km). With the additional 2.57 miles to incorporate MTV-1 into this pipeline segment, the nominal capacity would be reduced to about 800,000 bpd. Depending upon the final revised location of pump station 10, a relocation of pump station 11 in McCone County could be required approximately 0.75 miles upstream.

Keystone opposes MTV-1a and states the MFSA findings required for certification under 75-20-301 MCA or the preferred location criteria of Circular MFSA-2 are not satisfied, but MDEQ notes that

Keystone's proposed route does not maximize the use of public land as required by 75-20-301(1)(h), MCA. BLM indicates that the variation does not avoid and minimize impacts (Circular MFSA-2 75-20-301(1) (c) MCA) due to the cultural resources impacts. Topography would prevent redirecting MTV-1a away from six cultural sites, except on private land. After consideration of the potential engineering concerns and greater impacts to cultural resources, MDEQ did not select MTV-1a.

I-2.4.2.2 Route Variation MTV-2 (Rock Creek Variation) Compared to Keystone's 2009 Proposed Route

MTV-2 (see Figure I-2.4.2-3 and Table I-2.4.2-2) was developed to avoid constructing the pipeline diagonally across the face of a steep valley wall. The variation would be approximately 0.03 mile shorter than the 2009 route segment and would extend more directly through the valley. MTV-2 would not connect to KEY-6 on the 2010 proposed route, which is discussed in comparison to MTV-2a.

Other than the slopes, there is very little difference between MTV-2 and the 2009 proposed route and neither one would affect many resources. MTV-2 would cross one more minor road than the 2009 route segment, and the cost of that bore is included in the cost per mile listed in Table I-2.4.2-2. Both routes would affect one potentially eligible cultural resource and one significant paleontological site.

MTV-2 would extend up a steep slope, whereas the 2009 proposed segment would angle across greater distances of moderate and steep slopes. Construction of this variation would result in less ground disturbance than construction of the 2009 proposed route segment, the potential impacts due to erosion would be less, and revegetation of the ROW would be less difficult. Implementation of the appropriate reclamation and erosion control measures would be important to minimizing impacts with this variation. Although the estimated cost per mile of pipeline construction would be greater for the variation than for the 2009 proposed route segment, with costs for the latter partially offset by extending along a greater distance of low slopes, the total estimated construction cost of the adjusted 2009 proposed route segment would be greater than that of MTV-2 because of its greater length.

Based upon these considerations, MDEQ selected MTV-2 as part of the tentatively preferred route in place of the 2009 proposed route segment in the draft EIS. Since publication of the draft EIS, additional information has become available and is presented as MTV-2a and KEY-6. As a result, MTV-2 was not selected because KEY-6 was identified as the more appropriate and environmentally protective route.

TABLE I-2.4.2-1
Comparison of Montana Route Variation 1 (MTV-1) with the Proposed Segment of the 2010 Route it Would Replace

Item	2010 Proposed Route Segment	MTV-1	Difference
	Miles of Land Crossed (except where noted)		
Length	25.9	27.9	-2.0
Land Cover			
Developed	0.1	0.6	-0.5
Forested/ Woodlands	0.1	0.0	+0.1
Wetlands	0.3	0.2	+0.1
Total	0.5	0.8	-0.3
Revenue Final Land Unit Classification			
Range Land	22.9	24.3	-1.4
Irrigated Land	0.0	0.0	0.0
Hay Land	3.0	3.6	-0.6
Total	25.9	27.9	-2.0
Land Ownership			
State of Montana	4.0*	5.2	-1.2
Private Land	17.1	11.5	+5.6
U.S. Bureau of Land Management	4.5	11.2	-6.7
Local Government	0.3	0.0	+0.3
ROW	0.0	0.0	0.0
Total	25.9	27.9	-2.0
Number of Road Crossings			
Major Roads	0	0	0
Minor Roads	24	24	0
Total	24	24	0
Number of Railroad Crossings	0	0	0
Number of Stream Crossings			
Perennial Streams	1	1	0
Intermittent Streams	9	7	+2
Additional USGS Streams	37	25	+12
Total	47	33	+14

Item	2010 Proposed Route Segment	MTV-1	Difference
	Miles of Land Crossed (except where noted)		
Slope			
< 5%	15.1	18.6	-3.5
≥ 5% and ≤ 15%	9.2	8.3	+0.9
> 15% and ≤ 30%	1.3	0.9	+0.4
> 30%	0.3	0.1	+0.2
Water Wells within 100 ft	0	0	0
Residences			
Residences within 25 ft	0	0	0
Residences within 500 ft	0	1	-1
Structures			
Structures within 25 ft	0	0	0
Structures within 500 ft	1	0	+1
Cultural Resources (Class III)			
Cultural Findings (% Surveyed)	9 Pot. Elg. (100%)	16 Pot. Elg., 3 Not Elg., (100%)	-7 Pot. Elg., -3 Not Elg.,
Paleo Findings (% Surveyed)	5 Not Sig. (100%)	2 Not Sig. (100%)	+3 Not Sig.
Grouse (desktop data)			
Sage-grouse Core Area crossed	0	0	0
Sage-grouse Leks within 1 mile	0	0	0
Sage-grouse Leks within 2 miles	1	0	+1
Sage-grouse Leks within 3 miles	1	0	+1
Sage-grouse Leks within 4 miles	1	1	0
Sharp-tailed Leks within 1 mile	0	0	0
Sharp-tailed Leks within 2 miles	0	0	0
Sharp-tailed Leks within 3 miles	0	0	0
Sharp-tailed Leks within 4 miles	0	0	0

TABLE I-2.4.2-1
Comparison of Montana Route Variation 1 (MTV-1) with the Proposed Segment of the 2010 Route it Would Replace

Item	2010 Proposed Route Segment (Miles of Land Crossed, except where noted)	MTV-1 (Miles of Land Crossed, except where noted)	Difference	Item	2010 Proposed Route Segment (Miles of Land Crossed, except where noted)	MTV-1 (Miles of Land Crossed, except where noted)	Difference
				Biology (survey data)			
				Biological Resources (% Surveyed)	2 Wetlands (PSS, PEM), 4 Noxious Weeds (100%)	0 (93%)	+2 Wetlands (PSS, PEM), +4 Noxious Weeds
				Construction Costs			
				Cost per mile	$1,900,000	$1,880,000	
				Total Construction Cost	$49,210,000	$52,452,000	-$3,242,000

*Includes 0.26 mile of State Water Conservation Board Land.

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.2-1a
Comparison of Montana Route Variation 1a (MTV-1a) with the Proposed Segment of the 2010 Route it Would Replace

Item	2010 Proposed Route Segment (Miles of Land Crossed, except where noted)	MTV-1a (Miles of Land Crossed, except where noted)	Difference	Item	2010 Proposed Route Segment (Miles of Land Crossed, except where noted)	MTV-1a (Miles of Land Crossed, except where noted)	Difference
Length	25.9	28.46	-2.57	**Slope**			
Land Cover				< 5%	15.15	18.26	-3.11
Developed	0.06	0.98	-0.92	≥ 5% and ≤ 15%	9.16	9.12	+0.04
Forested/ Woodlands	0.06	0.00	+0.06	> 15% and ≤ 30%	1.29	1.00	+0.29
Wetlands	0.34	0.22	+0.12	> 30%	0.29	0.08	+0.21
Total	0.46	1.20	-0.74	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	22.92	25.58	-2.66	Residences within 25 ft	0	0	0
Irrigated Land	0.00	0.10	-0.10	Residences within 500 ft	0	0	0

TABLE I-2.4.2-1a
Comparison of Montana Route Variation 1a (MTV-1a) with the Proposed Segment of the 2010 Route it Would Replace

Item	2010 Proposed Route Segment	MTV-1a	Difference
	Miles of Land Crossed (except where noted)		
Hay Land	2.97	2.78	-0.19
Total	25.89	28.46	-2.57
Land Ownership			
State of Montana*	4.02	5.15	-1.13
Private Land	17.08	11.82	+5.26
U.S. Bureau of Land Management	4.54	11.49	-6.95
Local Government	0.25	0.00	+0.25
ROW	0.00	0.00	0.00
Total	25.89	28.46	-2.57
Number of Road Crossings			
Major Roads	0	0	0
Minor Roads	24	21	+3
Total	24	21	+3
Number of Railroad Crossings	0	0	0
Number of Stream Crossings			
Perennial Streams	1	1	0
Intermittent Streams	9	7	+2
Additional USGS Streams	37	25	+12
Total	47	33	+14

Item	2010 Proposed Route Segment	MTV-1a	Difference
	Miles of Land Crossed (except where noted)		
Structures			
Structures within 25 ft	0	0	0
Structures within 500 ft	0	0	0
Cultural Resources (Class III)			
Cultural Findings (% Surveyed)	9 Pot. Elg. (100%)	16 Pot. Elg., 4 Not Elg. (100%)	+7 Pot. Elg., -4 Not Elg.,
Paleo Findings (% Surveyed)	5 Not Sig. (100%)	2 Not Sig. (100%)	+3 Not Sig.
Grouse (desktop data)			
Sage-grouse Core Area crossed	0	0	0
Sage-grouse Leks within 1 mile	0	0	0
Sage-grouse Leks within 2 miles	1	0	+1
Sage-grouse Leks within 3 miles	1	0	+1
Sage-grouse Leks within 4 miles	1	1	0
Sharp-tailed Leks within 1 mile	0	0	0
Sharp-tailed Leks within 2 miles	0	0	0
Sharp-tailed Leks within 3 miles	0	0	0
Sharp-tailed Leks within 4 miles	0	0	0
Biology (survey data)			
Biological Resources (% Surveyed)	2 Wetlands (PSS, PEM), 4 Noxious Weeds (100%)	0 (93%)	+2 Wetlands, +4 Noxious Weeds
Construction Costs			
Cost per mile	$2,100,000	$2,100,000	
Total Construction Cost	$54,369,000	$59,766,000	-$5,397,000

*Includes 0.26 mile of State Water Conservation Board Land.

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.2-2
Comparison of Montana Route Variation 2 (MTV-2) with the Proposed Segment of the 2009 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	MTV-2	Difference	Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	MTV-2	Difference
Length	0.67	0.64	+0.03	**Slope**			
Land Cover				< 5%	0.39	0.36	+0.03
Developed	0.00	0.00	0.00	≥ 5% and ≤ 15%	0.10	0.16	-0.06
Forested/ Woodlands	0.00	0.00	0.00	> 15% and ≤ 30%	0.10	0.06	+0.04
Wetlands	0.00	0.00	0.00	> 30%	0.08	0.06	+0.02
Total	0.00	0.00	0.00	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	0.67	0.64	+0.03	Residences within 25 ft	0	0	0
Irrigated Land	0.00	0.00	0.00	Residences within 500 ft	0	0	0
Hay Land	0.00	0.00	0.00	**Structures**			
Total	0.67	0.64	+0.03	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.52	0.48	+0.04	**Cultural Resources (Class III)**			
Private Land	0.15	0.16	-0.01	Cultural Findings (% Surveyed)	1 Pot. Elg. (100%)	1 Pot. Elg. (100%)	0
U.S. Bureau of Land Management	0.00	0.00	0.00	Paleo Findings (% Surveyed)	1 Sig. (100%)	1 Sig. (100%)	0
Local Government	0.00	0.00	0.00	**Grouse (desktop data)**			
ROW	0.00	0.00	0.00	Sage-grouse Core Area crossed	0	0	0
Total	0.67	0.64	+0.03	Sage-grouse Leks within 1 mile	0	0	0
Number of Road Crossings				Sage-grouse Leks within 2 miles	0	0	0
Major Roads	0	0	0	Sage-grouse Leks within 3 miles	0	0	0
Minor Roads	1	2	-1	Sage-grouse Leks within 4 miles	0	0	0
Total	1	2	-1	Sharp-tailed Leks within 1 mile	0	0	0
Number of Railroad Crossings	0	0	0	Sharp-tailed Leks within 2 miles	0	0	0
Number of Stream Crossings				Sharp-tailed Leks within 3 miles	0	0	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 4 miles	0	0	0
Intermittent Streams	0	0	0	**Construction Costs**			
Additional USGS Streams	0	0	0	Cost per mile	$1,900,000	$1,960,000	
Total	0	0	0	Total Construction Cost	$1,273,000	$1,254,400	+$18,600

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

I-2.4.2.2a Route Variation MTV-2a (Rock Creek Variation A) Compared to KEY-6

MTV-2a (see Figure I-2.4.2-3 and Table I-2.4.2-2a) was originally developed to avoid constructing the pipeline diagonally across the face of a steep valley wall. Since its development, Keystone revised its proposed route in 2010, which is described as KEY-6. This section compares MTV-2a, which is connected to the 2009 proposed route segment and MTV-2, to the corresponding segment of Key-6 (the 2010 proposed route segment).

The variation would extend from milepost 38.7 to milepost 40 and be about 0.2 mile shorter than KEY-6. MTV-2a would cross about 0.2 mile less state land and 0.03 mile less BLM land, but one more minor road. Both routes would cross one potentially eligible cultural resource and the variation would have one significant and one non-significant paleontological site. The variation would not cross any surveyed wetlands and one less noxious weed area, but would cross one additional USGS stream. As a result, MTV-2a was not selected because KEY-6 was identified as the more appropriate and environmentally protective route.

I-2.4.2.3 Route Variation MTV-3 (Willow to East Fork Cherry Creek Variation)

MTV-3 (see Figure I-2.4.2-4 and Table I-2.4.2-3) was developed to increase the amount of public land crossed in comparison to the proposed route. MTV-3 would extend across 11.7 fewer miles of private land but would be 2.4 miles longer than the 2010 proposed route segment, which includes KEY-7 through KEY-15. It would cross more public land than the proposed segment, including nearly 8 more miles of state land and 5 more miles of BLM land than the 2010 route segment.

MTV-3 would cross three more minor roads than the 2010 route segment. The variation would not be near residences or structures, whereas the 2010 route segment would be within 500 feet of two residences and seven structures. MTV-3 would also cross about 1,300 feet of the Cornwell Ranch Conservation Easement, which would be avoided by the proposed route. The conservation easement is located on glaciated grasslands and is part of the FWP's Greater Sage-Grouse Core Area. In addition, according to Class I research the variation would cross 66 fewer cultural resources from TRS than the 2010 route segment. A Class III survey was not conducted for this variation.

MTV-3 would extend across less steeply sloped areas, which would offset the increased cost of construction across streams and roads. As a result, the estimated cost per mile of pipeline construction would be about the same for MTV-3 as for the 2010 route segment. However, due to its greater length, the total estimated construction cost of MTV-3 would be greater than that of the 2010 route segment.

The variation would cross one fewer USGS stream, would be farther from one sharp-tailed grouse lek, and would affect one additional greater sage-grouse lek. It also would extend through 2.4 miles more greater sage-grouse core habitat than the route segment and could require a pump station near a greater sage-grouse lek. Because the potential impact to greater sage-grouse habitat was considered more important than the use of more public land, MDEQ did not select MTV-3.

TABLE I-2.4.2-2a
Comparison of Montana Route Variation 2a (MTV-2a) with KEY-6 of the Proposed Segment of the 2010 Route it Would Replace

Item	Miles of Land Crossed (except where noted)		
	KEY-6	MTV-2a	Difference
Length	1.78	1.59	+0.19
Land Cover			
Developed	0.00	0.00	0.00
Forested/ Woodlands	0.00	0.00	0.00
Wetlands	0.06	0.00	+0.06
Total	0.06	0.00	+0.06
Revenue Final Land Unit Classification			
Range Land	1.78	1.59	+0.19
Irrigated Land	0.00	0.00	0.00
Hay Land	0.00	0.00	0.00
Total	1.78	1.59	+0.19
Land Ownership			
State of Montana	1.08	0.89	+0.19
Private Land	0.15	0.17	-0.02
U.S. Bureau of Land Management	0.56	0.53	+0.03
ROW	0.00	0.00	0.00
Total	1.78	1.59	+0.19
Number of Road Crossings			
Major Roads	0	0	0
Minor Roads	2	3	-1
Total	2	3	-1
Number of Railroad Crossings	0	0	0
Number of Stream Crossings			
Perennial Streams	1	1	0
Intermittent Streams	0	0	0
Additional USGS Streams	1	2	-1
Total	2	3	-1

Item	Miles of Land Crossed (except where noted)		
	KEY-6	MTV-2a	Difference
Slope			
< 5%	0.76	0.55	+0.21
≥ 5% and ≤ 15%	0.54	0.70	-0.16
> 15% and ≤ 30%	0.38	0.17	+0.21
> 30%	0.10	0.17	-0.07
Water Wells within 100 ft	0	0	0
Residences			
Residences within 25 ft	0	0	0
Residences within 500 ft	0	0	0
Structures			
Structures within 25 ft	0	0	0
Structures within 500 ft	0	0	0
Cultural Resources (Class III)			
Cultural Findings (% Surveyed)	1 Pot. Elg. (100%)	1 Pot. Elg. (100%)	0
Paleo Findings (% Surveyed)	0 (100%)	1 Sig., 1 Not Sig. (100%)	+1 Sig., +1 Not Sig.
Grouse (desktop data)			
Sage-grouse Core Area crossed	0	0	0
Sage-grouse Leks within 1 mile	0	0	0
Sage-grouse Leks within 2 miles	0	0	0
Sage-grouse Leks within 3 miles	0	0	0
Sage-grouse Leks within 4 miles	0	0	0
Sharp-tailed Leks within 1 mile	0	0	0
Sharp-tailed Leks within 2 miles	0	0	0
Sharp-tailed Leks within 3 miles	0	0	0
Sharp-tailed Leks within 4 miles	0	0	0
Biology (survey data)			
Biological Resources (% Surveyed)	3 Noxious Weeds (100%)	2 Noxious Weeds (100%)	+1 Noxious Weed
Construction Costs			
Cost per mile	$2,100,000	$2,100,000	
Total Construction Cost	$3,087,000	$2,688,000	+$399,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.2-3
Comparison of Montana Route Variation 3 (MTV-3) with the Proposed Segment of the 2010 Route it Would Replace

	Miles of Land Crossed (except where noted)				Miles of Land Crossed (except where noted)		
Item	**2010 Proposed Route Segment**	**MTV-3**	**Difference**	**Item**	**2010 Proposed Route Segment**	**MTV-3**	**Difference**
Length	39.6	42.0	-2.4	**Slope**			
Land Cover				< 5%	24.9	29.9	-5.0
Developed	0.4	0.3	+0.1	≥ 5% and ≤ 15%	12.7	10.9	+1.9
Forested/ Woodlands	0.0	0.0	0.0	> 15% and ≤ 30%	1.9	1.1	+0.8
Wetlands	0.4	0.3	+0.1	> 30%	0.1	0.1	0.0
Total	0.8	0.6	+0.2	**Water Wells within 100 ft**	1	0	+1
Revenue Final Land Unit Classification				**Residences**			
Range Land	27.9	33.0	-5.1	Residences within 25 ft	0	0	0
Irrigated Land	0.0	0.0	0.0	Residences within 500 ft	2	0	+2
Hay Land	11.7	9.0	+2.7	**Structures**			
Total	39.6	42.0	-2.4	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	7	0	+7
State of Montana	3.7	11.6	-7.9	**Cultural Resources (Class I)**			
Private Land	22.5	10.8	+11.7	Cultural Resources in 300-ft APE	2	2	0
U.S. Bureau of Land Management	13.4	18.4	-5.0	Cultural Resources in TRS	126	60	+66
Local Government	0.0	1.2	-1.2	**Grouse (desktop data)**			
ROW	0.0	0.0	0.0	Sage-grouse Core Area crossed	20.2	22.6	-2.4
Total	39.6	42.0	-2.4	Sage-grouse Leks within 1 mile	0	1	-1
Number of Road Crossings				Sage-grouse Leks within 2 miles	0	1	-1
Major Roads	0	0	0	Sage-grouse Leks within 3 miles	3	4	-1
Minor Roads	45	48	-3	Sage-grouse Leks within 4 miles	3	4	-1
Total	45	48	-3	Sharp-tailed Leks within 1 mile	4	4	0
Number of Railroad Crossings	1	1	0	Sharp-tailed Leks within 2 miles	9	6	+3
Number of Stream Crossings				Sharp-tailed Leks within 3 miles	13	13	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 4 miles	18	17	+1
Intermittent Streams	20	20	0	**Construction Costs**			
Additional USGS Streams	36	35	+1	Cost per mile	$1,965,000	$1,965,000	
Total	56	55	+1	Total Construction Cost	$77,814,000	$82,530,000	-$4,716,000
				Environmental Mitigation Cost	$161,600	$180,800	-$19,200

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

I-2.4.2-4 Route Variation MTV-4 (South Fork Shade Creek Variation)

MTV-4 (see Figure I-2.4.2-5 and Table I-2.4.2-4) was developed to address potential terrain alteration and erosion impacts from mileposts 114.5 to 115.3, where the 2009 route segment would cross between two badlands bluffs. The picture inset in Figure I-2.4.2-5 depicts the terrain that the 2009 proposed route would cross. Although the badlands are on BLM land, routing in this area could also affect adjacent private land.

The ESRI database for roads indicated that MTV-4 and the 2009 proposed segment would each cross one minor road (Table I-2.4.2-4). However, an additional review of aerial photographs indicated that each route had one additional minor road crossing (see Figure I-2.4.2-5). Cultural resources surveys did not find any resources on either route.

Although the ESRI database indicated that the routes would not cross any streams, additional review of the USGS maps showed that MTV-4 would cross four streams while the 2009 proposed route segment would cross two streams (Table I-2.4.2-4). Again, an additional review of aerial photographs indicated that the 2009 proposed route segment would cross three drainages, whereas MTV-4 would cross two drainages (see Figure I-2.4.2-5).

As an alternative to the mitigation provided by MTV-4, pipeline construction through the areas of concern could be accomplished using either the horizontal directional drilling (HDD) or horizontal boring method along the proposed route, or a smaller variation of the proposed route if geotechnical studies indicated that subsoil conditions were appropriate for use of either of those methods. Keystone would conduct further subsurface investigations to determine the feasibility of boring under this feature instead of trenching through it.

Although MTV-4 would be approximately 0.01 mile longer than the 2009 proposed route, it could result in less engineering and constructability concerns than along the more rugged terrain of the proposed route segment. However, it would not eliminate the potential to substantially alter terrain due to construction and erosion on the steep, sparsely vegetated, erodible soils of the area. Thus, the estimated cost of constructing MTV-4 would be less than the 2009 route segment because of the potential reduction in engineering costs, ease of constructability, the fewer number of streams, and the shorter distance along steeply sloped areas, as described above. Environmental mitigation cost would also be $320 less for the variation.

MTV-4 would cross slightly more BLM land than the 2009 route segment. With either MTV-4 or the 2009 proposed route segment, Keystone could use the HDD method for construction, but this would still result in traffic being routed around the badland terrain. Keystone proposed a revised realignment in this area that avoids the badlands, which is discussed as KEY-48 (see Section I-2.4.3.2.32). KEY-48 avoids the badlands bluffs and, therefore, MDEQ did not select MTV-4.

TABLE I-2.4.2-4
Comparison of Montana Route Variation 4 (MTV-4) with the Proposed Segment of the 2009 Route it Would Replace

	Miles of Land Crossed (except where noted)				Miles of Land Crossed (except where noted)		
Item	**2009 Proposed Route Segment**	**MTV-4**	**Difference**	**Item**	**2009 Proposed Route Segment**	**MTV-4**	**Difference**
Length	0.75	0.76	-0.01	**Slope**			
Land Cover				< 5%	0.31	0.20	+0.11
Developed	0.0	0.0	0.0	≥ 5% and ≤ 15%	0.24	0.40	-0.16
Forested/ Woodlands	0.0	0.0	0.0	> 15% and ≤ 30%	0.16	0.16	0.00
Wetlands	0.0	0.0	0.0	> 30%	0.03	0.00	+0.03
Total	0.0	0.0	0.0	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	0.52	0.50	+0.02	Residences within 25 ft	0	0	0
Irrigated Land	0.0	0.0	0.0	Residences within 500 ft	0	0	0
Hay Land	0.23	0.26	-0.03	**Structures**			
Total	0.75	0.76	-0.01	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.0	0.0	0.0	**Cultural Resources (Class III)**			
Private Land	0.44	0.40	+0.04	Cultural Findings (% Surveyed)	0 (100%)	0 (100%)	0
U.S. Bureau of Land Management	0.31	0.36	-0.05	Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
Local Government	0.0	0.0	0.0	**Grouse (desktop data)**			
ROW	0.0	0.0	0.0	Sage-grouse Core Area crossed	0	0	0
Total	0.75	0.76	-0.01	Sage-grouse Leks within 1 mile	0	0	0
Number of Road Crossings				Sage-grouse Leks within 2 miles	1	1	0
Major Roads	0	0	0	Sage-grouse Leks within 3 miles	2	2	0
Minor Roads	1	1	0	Sage-grouse Leks within 4 miles	3	3	0
Total	1	1	0	Sharp-tailed Leks within 1 mile	0	0	0
Number of Railroad Crossings	0	0	0	Sharp-tailed Leks within 2 miles	0	0	0
Number of Stream Crossings				Sharp-tailed Leks within 3 miles	0	0	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 4 miles	0	0	0
Intermittent Streams	0	0	0	**Construction Costs**			
Additional USGS Streams	2	4	-2	Cost per mile	$2,100,000	$2,040,000	
Total	2	4	-2	Total Construction Cost	$1,575,000	$1,550,400	+$24,600
				Environmental Mitigation Cost	$4,240	$3,920	+$320

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

I-2.4.2-5 Route Variation MTV-5 (East Fork Prairie Elk Creek Variation)

MTV-5 (see Figure I-2.4.2-6 and Table I-2.4.2-5) was developed to reduce the distance of construction through a channel migration zone of East Fork Prairie Elk Creek, which is a perennial stream. This variation would connect back into the 2009 proposed route segment at milepost 127.65. MTV-5 would cross the creek approximately 300 feet north (downstream) of the proposed crossing site but would be approximately the same length as the 2009 route segment it would replace. The East Fork Prairie Elk Creek crossing is discussed in the Stream Crossing Inspections Report for the proposed Project that is on file with MDEQ (see Section I-3.1 for a summary of key information from the report). MTV-5 would not connect to KEY-25 on the 2010 proposed route segment, which is the comparison for MTV-5a.

The 2009 proposed route segment would be located within 25 feet of one structure whereas MTV-5 would be located within 500 feet of one structure. Because MTV-5 would extend through less of the channel than the 2009 route segment it would replace, the estimated construction cost per mile of the variation would be less than that of the 2009 route segment. Environmental mitigation cost would be $3,200 for both the proposed route and the variation.

Construction of MTV-5 would result in fewer potential impacts associated with crossing East Fork Prairie Elk Creek. Since publication of the draft EIS, additional information has become available and is presented as MTV-5a and the 2010 proposed route segment identified as KEY-25. As a result of the analysis of MTV-5a and KEY-25, MDEQ did not select MTV-5.

I-2.4.2-5a Route Variation MTV-5a (East Fork Prairie Elk Creek Variation A) Compared to KEY-25

MTV-5a (see Figure I-2.4.2-6 and Table I-2.4.2-5a) was developed to reduce the distance of construction through a channel migration zone of the East Fork Prairie Elk Creek. However, it would place the crossing in a deep pool and an ephemeral channel east of the creek crossing. MTV-5a would be 0.1 mile longer than the 2010 proposed route segment it would replace (KEY-25) and would extend from approximately mileposts 127.2 to 128.

Both routes would cross mostly privately-owned range land, one minor road, and would be within 500 feet of one structure. Neither the 2010 proposed route segment nor MTV-5a would cross cultural resource or paleontological sites. Both routes would cross the East Fork Prairie Elk Creek, and the 2010 proposed route would also cross three USGS streams. Neither the 2010 proposed route segment nor MTV-5a would cross any other biological features.

More recently, Keystone proposed a realignment (KEY-25) that has some of the same advantages of MTV-5a but also avoids being located in an intermittent stream channel about 0.2 mile east of the East Fork of Prairie Elk Creek. Therefore, in a compromise to achieve the least amount of environmental impact and to avoid a stream pool and intermittent stream channel, MDEQ selected a combined route that includes a portion of both MTV-5a and KEY-25. The selected route consists of the western most portion of KEY-25, to the point where MTV-5a and KEY-25 diverge; then from the divergence point it consists of the eastern portion of MTV-5a.

TABLE I-2.4.2-5
Comparison of Montana Route Variation 5 (MTV-5) with the Proposed Segment of the 2009 Route it Would Replace

	Miles of Land Crossed (except where noted)				Miles of Land Crossed (except where noted)		
Item	2009 Proposed Route Segment	MTV-5	Difference	Item	2009 Proposed Route Segment	MTV-5	Difference
Length	0.4	0.4	0.0	**Slope**			
Land Cover				< 5%	0.03	0.04	-0.01
Developed	0.0	0.0	0.0	≥ 5% and ≤ 15%	0.28	0.25	+0.03
Forested/ Woodlands	0.0	0.0	0.0	> 15% and ≤ 30%	0.12	0.15	-0.03
Wetlands	0.0	0.0	0.0	> 30%	0.00	0.00	0.00
Total	0.0	0.0	0.0	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	0.4	0.4	0.0	Residences within 25 ft	0	0	0
Irrigated Land	0.0	0.0	0.0	Residences within 500 ft	0	0	0
Hay Land	0.0	0.0	0.0	**Structures**			
Total	0.4	0.4	0.0	Structures within 25 ft	1	0	+1
Land Ownership				Structures within 500 ft	0	1	-1
State of Montana	0.0	0.0	0.0	**Cultural Resources (Class III)**			
Private Land	0.4	0.4	0.0	Cultural Findings (% Surveyed)	0 (100%)	0 (100%)	0
U.S. Bureau of Land Management	0.0	0.0	0.0	Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
Local Government	0.0	0.0	0.0	**Grouse (desktop data)**			
ROW	0.0	0.0	0.0	Sage-grouse Core Area crossed	0	0	0
Total	0.4	0.4	0.0	Sage-grouse Leks within 1 mile	0	0	0
Number of Road Crossings				Sage-grouse Leks within 2 miles	0	0	0
Major Roads	0	0	0	Sage-grouse Leks within 3 miles	0	0	0
Minor Roads	0	0	0	Sage-grouse Leks within 4 miles	0	0	0
Total	0	0	0	Sharp-tailed Leks within 1 mile	0	0	0
Number of Railroad Crossing	0	0	0	Sharp-tailed Leks within 2 miles	0	0	0
Number of Stream Crossings				Sharp-tailed Leks within 3 miles	0	0	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 4 miles	0	0	0
Intermittent Streams	1	1	0	**Construction Costs**			
Additional USGS Streams	0	0	0	Cost per mile	$2,100,000	$2,080,000	
Total	1	1	0	Total Construction Cost	$840,000	$832,000	+$8,000
				Environmental Mitigation Cost	$3,200	$3,200	$0

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.2-5a
Comparison of Montana Route Variation 5a (MTV-5a) with Key-25 of the 2010 Proposed Segment of the Route it Would Replace

Item	Miles of Land Crossed (except where noted)			Item	Miles of Land Crossed (except where noted)		
	KEY-25	MTV-5a	Difference		KEY-25	MTV-5a	Difference
Length	0.77	0.78	-0.1	**Slope**			
Land Cover				< 5%	0.12	0.09	+0.03
Developed	0.00	0.00	0.00	≥ 5% and ≤ 15%	0.49	0.54	-0.05
Forested/ Woodlands	0.00	0.00	0.00	> 15% and ≤ 30%	0.16	0.15	+0.01
Wetlands	0.00	0.00	0.00	> 30%	0.00	0.00	0.00
Total	0.00	0.00	0.00	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	0.77	0.78	-0.1	Residences within 25 ft	0	0	0
Irrigated Land	0.00	0.00	0.00	Residences within 500 ft	0	0	0
Hay Land	0.00	0.00	0.00	**Structures**			
Total	0.77	0.78	-0.1	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	1	1	0
State of Montana	0.00	0.00	0.00	**Cultural Resources (Class III)**			
Private Land	0.77	0.78	-0.1	Cultural Findings (% Surveyed)	0 (100%)	0 (100%)	0
U.S. Bureau of Land Management	0.00	0.00	0.00	Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
Local Government	0.00	0.00	0.00	**Grouse (desktop data)**			
ROW	0.00	0.00	0.00	Sage-grouse Core Area crossed	0	0	0
Total	0.77	0.78	-0.1	Sage-grouse Leks within 1 mile	0	0	0
Number of Road Crossings				Sage-grouse Leks within 2 miles	0	0	0
Major Roads	0	0	0	Sage-grouse Leks within 3 miles	0	0	0
Minor Roads	1	1	0	Sage-grouse Leks within 4 miles	0	0	0
Total	1	1	0	Sharp-tailed Leks within 1 mile	0	0	0
Number of Railroad Crossings	0	0	0	Sharp-tailed Leks within 2 miles	0	0	0
Number of Stream Crossings				Sharp-tailed Leks within 3 miles	0	0	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 4 miles	0	0	0
Intermittent Streams	1	1	0	**Biology (survey data)**			
Additional USGS Streams	3	0	+3	Biological Resources (% Surveyed)	0 (100%)	0 (100%)	0
Total	4	1	+3	**Construction Costs**			
				Cost per mile	$2,100,000	$2,100,000	
				Total Construction Cost	$1,617,000	$1,638,000	-$21,000
				Environmental Mitigation Cost	$6,240	$6,160	+$80

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

I-2.4.2-6 Route Variation MTV-6 (McCone/Dawson County Variation)

MTV-6 (see Figure I-2.4.2-7 and Table I-2.4.2-6) was developed to increase the amount of public land crossed in comparison to the 2010 proposed route. MTV-6 would address a landowner request to site the pipeline farther from a residence (see Section I-2.4.2-7, Route Variation MTV-7, for additional details). MTV-6 would be 0.33 mile longer than the 2010 proposed route segment it would replace, but by using almost 7.94 miles more of state land it would reduce the amount of private land crossed by 6.91 miles. Pump station 12 would be moved along the route variation to about 2.7 miles south of the Redwater River crossing.

MTV-6 would avoid being within 500 feet of three more structures, within 100 feet of a water well, and crossing two railroads. Although MTV-6 would cross 22 more minor roads than the 2010 route segment, many of those roads would be crossed using open-cut construction methods, with costs similar to those of typical overland pipeline construction. As a result, the estimated cost per mile of pipeline construction would be greater for the 2010 route segment than for MTV-6. It also could cross five fewer eligible cultural resources.

MTV-6 would avoid crossing Buffalo Springs Creek. The 2010 proposed route segment would cross 0.34 mile more NLCD wetland areas, seven more intermittent streams, 10 more USGS streams, and also would extend across a greater distance of moderate to steeply sloped areas than MTV-6. Both routes would be within 2 miles of two sharp-tailed grouse leks.

MTV-6 would cross about 7.95 more miles of state land than the 2010 route segment and would not cross BLM land. It also would extend across less hay land than the 2010 route segment. Thus, MDEQ selected MTV-6 as part of the tentatively preferred route in place of the 2009 proposed route segment in the draft EIS. Since publication of the draft EIS, additional information has become available with the 2010 proposed route segment, MTV-6a, MTV-6b, and MTV-6c which are presented in Figure I-2.4.2-7 and Table I-2.4.2-6. As a result of the additional analysis, it was determined that MTV-6, with the incorporation of the MTV-6a, MTV-6b, and MTV-6c variations, would cross substantially more public lands without a substantial increase in construction costs from the 2010 proposed route segment. In addition, it avoids more structures and stream crossings, while providing easier constructability. Therefore, MDEQ has selected MTV-6, with the incorporation of MTV-6a, MTV-6b, and MTV-6c, which are detailed further below.

TABLE I-2.4.2-6
Comparison of Montana Route Variations 6a-c (MTV-6a-c) with the Proposed Segment of the 2010 Route it Would Replace

	Miles of Land Crossed (except where noted)				
Item	**2010 Proposed Route Segment***	**MTV-6**	**MTV-6a**	**MTV-6b**	**MTV-6c**
Length	30.67	31.00	31.10	31.03	31.04
Land Cover					
Developed	0.56	1.10	1.11	1.10	1.11
Forested/ Woodlands	0.00	0.00	0.00	0.00	0.00
Wetlands	0.34	0.00	0.00	0.01	0.00
Total	0.90	1.10	1.11	1.11	1.11
Revenue Final Land Unit Classification					
Range Land	13.38	17.30	17.32	17.45	17.31
Irrigated Land	0.00	0.00	0.00	0.00	0.00
Hay Land	17.29	13.70	13.78	13.58	13.73
Total	30.67	31.00	31.10	31.03	31.04
Land Ownership					
State of Montana	0.16	8.10	8.11	8.06	7.96

TABLE I-2.4.2-6
Comparison of Montana Route Variations 6a-c (MTV-6a-c) with the Proposed Segment of the 2010 Route it Would Replace

	Miles of Land Crossed (except where noted)				
Item	**2010 Proposed Route Segment***	**MTV-6**	**MTV-6a**	**MTV-6b**	**MTV-6c**
Private Land	29.90	22.90	22.99	22.97	23.08
U.S. Bureau of Land Management	0.00	0.00	0.00	0.00	0.00
Local Government	0.61	0.00	0.00	0.00	0.00
ROW	0.00	0.00	0.00	0.00	0.00
Total	30.67	31.00	31.10	31.03	31.04
Number of Road Crossings					
Major Roads	3	3	3	3	3
Minor Roads	20	42	28	28	28
Total	23	45	31	31	31
Number of Railroad Crossings	2	0	0	0	0
Number of Stream Crossings					
Perennial Streams	0	0	0	0	0
Intermittent Streams	15	8	8	8	8
Additional USGS Streams	45	35	34	34	34
Total	60	43	42	42	42
Slope					
< 5%	6.53	7.20	7.53	7.28	7.10
≥ 5% and ≤ 15%	22.08	22.00	21.85	22.02	22.17
> 15% and ≤ 30%	1.90	1.70	1.63	1.64	1.67
> 30%	0.16	0.10	0.09	0.09	0.10
Water Wells within 100 ft	1	0	0	0	0
Residences					
Residences within 25 ft	0	0	0	0	0
Residences within 500 ft	0	0	0	0	0
Structures					
Structures within 25 ft	0	0	0	0	0
Structures within 500 ft	4	1	1	1	1
Cultural Resources (Class III)					
Cultural Findings (% Surveyed)	6 Elg., 1 Not Elg. (100%)	1 Elg., 3 Not Elg. (100%)	1 Elg., 3 Not Elg. (100%)	1 Elg., 3 Not Elg. (97%)	1 Elg., 3 Not Elg. (100%)
Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0 (100%)	0 (97%)	0 (100%)
Grouse (desktop data)					
Sage-grouse Core Area crossed	0	0	0	0	0
Sage-grouse Leks within 1 mile	0	0	0	0	0
Sage-grouse Leks within 2 miles	0	0	0	0	0
Sage-grouse Leks within 3 miles	0	0	0	0	0
Sage-grouse Leks within 4 miles	0	0	0	0	0
Sharp-tailed Leks within 1 mile	0	0	0	0	0
Sharp-tailed Leks within 2 miles	2	2	2	2	2
Sharp-tailed Leks within 3 miles	2	2	2	2	2
Sharp-tailed Leks within 4 miles	2	2	2	2	2
Biology (survey data)					
Biological Resources (%Surveyed)	5 Wetlands (PEM), 9 Noxious Weeds (100%)	3 Wetlands (PEM), 4 Noxious Weeds (90.1%)	3 Wetlands (PEM), 4 Noxious Weeds (90.1%)	3 Wetlands (PEM), 4 Noxious Weeds (90.1%)	3 Wetlands (PEM), 4 Noxious Weeds (90.1%)
Construction Costs					
Cost per mile	$2,100,000	$2,050,000	$2,100,000	$2,100,000	$2,100,000
Total Construction Cost	$64,407,000	$63,550,000	$65,310,000	$65,163,000	$65,184,000
Environmental Mitigation Cost	$2,960	$2,880	$2,880	$2,880	$2,880

* The 2010 proposed route includes KEY-26, KEY-27, and KEY-28.
Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

I-2.4.2-6a Route Variation MTV-6a (McCone/Dawson County Variation A)

MTV-6a (see Figure I-2.4.2-7 and Table I-2.4.2-6) would differ from MTV-6 between approximately milepost 144 to milepost 145 on private land, to move farther from a residence. Variation 6a would be about 0.1 mile longer than MTV-6 in this area.

MTV-6a would cross 0.55 mile more developed land, eight more minor roads, no railroads, would not be within 100 feet of water wells, and would be within 500 feet of three fewer structures than the equivalent parallel portion of the 2010 proposed route. MTV-6a would cross about 7.95 miles more of state land while being about 0.43 mile longer than the equivalent portion of the 2010 proposed route. Surveys found that the variation would cross five fewer eligible cultural resources. MTV-6a would cross seven fewer intermittent streams and 11 fewer USGS streams. Biological surveys found that the variation would cross two fewer PEM wetlands and five fewer noxious weed areas. MTV-6a was selected by MDEQ in conjunction with MTV-6 to avoid excessive stream crossings, to increase the distance between the pipeline and a house, and to avoid cultural impacts.

I-2.4.2-6b Route Variation MTV-6b (McCone/Dawson County Variation B)

MTV-6b (see Figure I-2.4.2-7 and Table I-2.4.2-6) would divert from MTV-6 at a MDEQ proposed crossing at Redwater River at milepost 146, and would rejoin MTV-6 at approximately milepost 147. MTV-6b would avoid a tall steep bank on the south side of the Redwater River that would be traversed by MTV-6. This variation would be less than 0.03 mile longer than MTV-6. The comparison of MTV-6b to the 2010 proposed route segment is essentially the same as that of MTV-6. MTV-6b was selected by MDEQ, in conjunction with MTV-6, to avoid the construction difficulties associated with the cliff on the south side of the Redwater River.

1-2.4.2-6c Route Variation MTV-6c (McCone/Dawson County Variation C)

MTV-6c (see Figure I-2.4.2-7 and Table I-2.4.2-6) would divert from MTV-6 near milepost 149 and rejoin MTV-6 near milepost 150. The adjustment would allow for relocation of pump station 12 on private land and for a different crossing of Gyp Creek. MTV-6c is about 0.04 mile longer than the equivalent segment of MTV-6, and would cross about 0.14 mile less state land, 14 fewer minor roads, and one less USGS stream.

When MTV-6 is combined with MTV-6c and compared to the portion of the 2010 proposed route segment, the biggest difference is that MTV-6 and 6c would cross 7.8 miles more state land, would cross 3.56 miles fewer hay land, and would cross 18 fewer streams. MTV-6c was selected by MDEQ in conjunction with MTV-6, to provide a better approach to the revised location for the proposed pump station 12.

I-2.4.2-7 Route Variation MTV-7 (Lone Tree Creek Variation)

MTV-7 (see Figure I-2.4.2-7 and Table I-2.4.2-7) was developed in response to a landowner request to avoid construction near a residence that would be about 550 feet from the edge of the construction ROW. Because the residence would be more than 500 feet from the edge of the proposed construction ROW, it was not listed in Table I-2.4.2-7. MTV-7 would connect to KEY-26 on the 2010 proposed route. MTV-7 would be about 0.1 mile longer than the 2010 proposed route segment it would replace. As shown in Figure I-2.5-7, the objectives of this landowner request would also be met by MTV-6, MTV-6a, MTV-6b, or MTV-6c.

Both routes would cross an intermittent stream but the 2010 proposed route segment would cross two additional USGS streams. In addition, the land cover database used for Table I-2.4.2-7 indicated that there was about 0.1 mile of wetland along the MTV-7 route and that there were no wetlands along the 2010 proposed route segment that it would replace. Therefore, that information was presented in the table, which lists wetland information only from that database for consistency in the comparisons. A Class III survey was not conducted for this variation. Class I research indicated that there were five cultural resources in the TSR data.

Due to the greater length of the variation, the total cost of construction of the variation would be greater than that of the 2010 proposed route segment.

Both MTV-6 and MTV-7 would be farther from the residence than the 2010 proposed route segment they would replace. Since MTV-6 is selected as the preferred route, MDEQ did not select either MTV-7 or the proposed route segment it would replace because of the reasons provided in MTV-6 (see Section I-2.4.2-6).

TABLE I-2.4.2-7
Comparison of Montana Route Variation 7 (MTV-7) with the Proposed Segment of the 2010 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	Miles of Land Crossed (except where noted) MTV-7	Difference	Item	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	Miles of Land Crossed (except where noted) MTV-7	Difference
Length	1.7	1.8	-0.1	**Slope**			
Land Cover				< 5%	0.25	0.20	+0.05
Developed	0.0	0.0	0.0	≥ 5% and ≤ 15%	1.41	1.50	-0.09
Forested/ Woodlands	0.0	0.0	0.0	> 15% and ≤ 30%	0.04	0.10	-0.06
Wetlands	0.0	0.1	-0.1	> 30%	0.0	0.0	0.0
Total	0.0	0.1	-0.1	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	0.1	0.1	0.0	Residences within 25 ft	0	0	0
Irrigated Land	0.0	0.0	0.0	Residences within 500 ft	0	0	0
Hay Land	1.6	1.7	-0.1	**Structures**			
Total	1.7	1.8	-0.1	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.0	0.0	0.0	**Cultural Resources (Class I)**			
Private Land	1.7	1.8	-0.1	Cultural Resources in 300-ft APE	0	0	0
U.S. Bureau of Land Management	0.0	0.0	0.0	Cultural Resources in TRS	5	5	0
Local Government	0.0	0.0	0.0	**Grouse (desktop data)**			
ROW	0.0	0.0	0.0	Sage-grouse Core Area crossed	0	0	0
Total	1.7	1.8	-0.1	Sage-grouse Leks within 1 mile	0	0	0
Number of Road Crossings				Sage-grouse Leks within 2 miles	0	0	0
Major Roads	0	0	0	Sage-grouse Leks within 3 miles	0	0	0
Minor Roads	1	1	0	Sage-grouse Leks within 4 miles	0	0	0
Total	1	1	0	Sharp-tailed Leks within 1 mile	0	0	0
Number of Railroad Crossings	0	0	0	Sharp-tailed Leks within 2 miles	0	0	0
Number of Stream Crossings				Sharp-tailed Leks within 3 miles	0	0	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 4 miles	0	0	0
Intermittent Streams	1	1	0	**Construction Costs**			
Additional USGS Streams	6	4	+2	Cost per mile	$2,100,000	$2,070,000	
Total	7	5	+2	Total Construction Cost	$3,570,000	$3,726,000	-$156,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

Montana Variations 8 through 10 in the area West and South of Lindsay, Montana

Prior to release of the draft EIS, MDEQ developed MTV-8 and MTV-9 to better use or maximize the use of public lands, so that an alternative was available to make the finding required under MFSA before a certificate of compliance could be issued. This finding requires "that the use of public lands for location of the facility was evaluated and public lands were selected whenever their use is as economically practicable as the use of private lands" (75-30-301(1)(h), MCA). MTV-10 was developed to avoid construction through a small reservoir.

After the draft EIS was circulated for public comments, area landowners suggested seven routing variations that would address individual concerns in this area. MDEQ staff met with area landowners on July 20, 2010, and five more routing variations were suggested. One additional variation was suggested at that time but later withdrawn because of concerns over cultural resources known to area residents. It is possible that some of the routing variations could be used singly or in combination with each other and portions of Keystone's proposed alignment.

These variations were suggested as ways to limit potential adverse impacts by avoiding:

- Productive cropland where alterations of soil characteristics might adversely affect production;
- Wells or springs where water supplies might be disrupted as a result of construction or operation;
- Residences;
- Steep topography that would make construction challenging or increase the potential for soil erosion;
- Private property;
- Downstream fish ponds; and
- Construction through a reservoir.

During the July 20, 2010 meeting and subsequent weeks when additional comments were sought from area landowners, it became clear that there was no community consensus about a route through the area.

Subsequently, more resource information was developed and evaluated. MDEQ staff reviewed the comments and potential impacts and reduced the number of possible routing variations carried forward for detailed consideration. The detailed analysis focused on those variations that would balance the required findings that the selected alternative minimized impacts, considering the state of available technology and cost, with the requirement to use public lands when their use was as economically practicable as the use of private lands.

The first segment not carried forward for further consideration was the portion of MTV-8 that would cross nearly vertical valley walls of an unnamed drainage west of milepost 178. This segment would result in greater construction disturbance and lead to greater challenges in reclaiming the disturbed areas than routing the pipeline farther east on the alternative portion of segment MTV-9. While MTV-8 would avoid being within 100 feet of a water well on MTV-9, MTV-8 was not supported by the affected landowner because construction would disrupt views of a deeply incised drainage from their house.

MTV-9a was suggested by a landowner in an attempt to increase local acceptance of a pipeline route. MTV-9a was not carried forward for further consideration because it would not maximize the use of public lands compared to other variations available. When used with Keystone's 2009 alignment, it would cross Clear Creek twice. Depending upon the routing segments used, this variation would avoid using 1.18 to 1.25 miles of state land located south of approximately milepost 179.9. Clear Creek is an intermittent stream located in a fairly wide flat valley. Aerial photos indicate that the creek has a meandering pattern, indicating past channel movement, and MDEQ staff did not think it appropriate to cross this drainage any more often than necessary.

MTV-9h was suggested by a landowner to avoid crossing dry cropland at the west end of MTV-9a. MTV-9h would instead be routed though irrigated land and like MTV-9a would cross Clear Creek twice. MDEQ did not carry MTV-9h forward because of the crossing of irrigated land and two crossings of Clear Creek.

MTV-9i was suggested by a landowner to avoid being in the vicinity of two private fish ponds. MTV-9i was not carried forward for further consideration because it would avoid using 1.18 to 1.25 miles of state land farther to the south.

MTV-9k and MTV-9c were not carried forward because they would avoid using approximately 1.18 to 1.25 miles of state land farther to the south. Similarly, segment MTV-9d, located south of segment MTV-9l, was not carried forward because it did not maximize the use of public land.

Although MTV-9l, located northwest of segment MTV-9e, would cross two fewer intermittent stream channels than the corresponding segment of MTV-9e, MTV-9l was not carried forward because it did not maximize the use of public land.

The segments not carried forward for detailed consideration are depicted in Figure I-2.4.2-8a.

Figure I-2.4.2-8b depicts the Montana variations carried forward for detailed consideration and the following sections describe the advantages and disadvantages of the remaining variations between milepost 165.5 and 189. Table I-2.4.2-9 provides more precise metrics for these remaining variations.

I-2.4.2-9 Route Variation MTV-9 (Clear Creek Variation 9)

MTV-9 (Figure I-2.4.2-8b and Table I-2.4.2-9) was developed in response to a request by a landowner to avoid a stream crossing in the viewshed of a residence and to move the pipeline out of the central portion of a field. It also would extend from near milepost 165.6 to milepost 189, and the majority of this 24.5-mile-long variation would be along the same route as MTV-8 (see Figure I-2.4.2-8a). MTV-9 would deviate slightly from the MTV-8 route in the area between mileposts 177 and 179 of the 2010 proposed route segment. MTV-9 would be about 1.06 miles longer and would cross 5.56 more miles of state land than the 2010 proposed route segment it would replace. Like other route variations in the vicinity of Lindsay, it would not cross BLM land.

As with MTV-8, MTV-9 would cross 0.12 mile less of developed land, one less minor road, and would be more than 500 feet away from eight structures than the 2010 proposed route segment. Field surveys identified one non-eligible cultural resource on MTV-9, and no paleontological sites for either route.

MTV-9 would cross 0.01 mile more of NLCD wetlands. Both routes would cross eight intermittent streams but the 2010 proposed route would cross 12 additional USGS streams. A biological survey found that the variation would cross two fewer PEM wetlands and five fewer noxious weed areas.

The increased costs associated with construction across one more minor road for the 2010 proposed route segment would be offset by the increased costs for MTV-9 associated with the greater pipeline length to be constructed along moderate slopes. As a result, the estimated construction cost per mile would be the same for each option. However, because of the longer distance, MTV-9 would be $2,226,000 more expensive to construct than the 2010 proposed route segment, assuming a cost of $2.1 million per mile.

MDEQ selected MTV-9 in place of the proposed route segment as part of the tentatively preferred route in the draft EIS. Since publication of the draft EIS, additional survey information has become available and is presented here as MTV-9. Keystone opposes MTV-9 and does not believe it satisfies the MFSA findings required for certification under 75-20-301 MCA or the preferred location criteria of Circular MFSA-2. They believe that the variation does not improve minimizing impacts (Circular MFSA-2 75-20-301(1)(c) MCA) nor is it economically practicable to the proposed route segment (75-20-301(1)(h) MCA). However, MTV-9 better uses public (state) land than does the 2010 proposed route, allowing MDEQ to make the finding required under 75-20-301(1). Keystone also does not believe that MTV-9 has the greatest potential for general local acceptance (Circular MFSA-2 3.1(1) (a)).

No landowner consensus has been reached about the route through the area; several variations to MTV-9 have been proposed through public comments and landowner meetings, and carried forward by MDEQ, which are presented as MTV-9b through MTV-9m in Table I-2.4.2-9 and Figure I-2.4.2-8b. MTV-9 variations begin at approximately milepost 165.5 and end approximately at milepost 189. In consideration of the greater length and slight increase in impacts, MTV-9 was not selected by MDEQ.

TABLE I-2.4.2-9
Comparison of Montana Route Variations 9a-m (MTV-9a-m with the Proposed Segment of the 2010 Route it Would Replace

Item	2010 Proposed Route Segment	MTV-9	MTV-9b	MTV-9e	MTV-9f	MTV-9g	MTV-9j	MTV-9m
	Miles of Land Crossed (except where noted)							
Length	23.42	24.48	23.44	24.52	23.62	23.46	24.99	24.57
Land Cover								
Developed	0.91	0.79	0.91	0.79	0.67	0.91	0.99	0.78
Forested/ Woodlands	0.00	0.00	0.00	0.09	0.02	0.00	0.00	0.09
Wetlands	0.19	0.20	0.18	0.21	0.19	0.42	0.21	0.22
Total	1.10	0.99	1.09	1.09	0.88	1.33	1.20	1.09
Revenue Final Land Unit Classification								
Range Land	9.18	12.72	9.79	13.04	11.16	9.24	12.99	14.58
Irrigated Land	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hay Land	14.24	11.76	13.65	11.48	12.46	14.22	12.00	9.99
Total	23.42	24.48	23.44	24.52	23.62	23.46	24.99	24.57
Land Ownership								
State of Montana	0.11	5.67	0.67	6.02	2.66	0.11	3.35	5.99
Private Land	23.31	18.81	22.77	18.50	20.96	23.35	21.64	18.58
U.S. Bureau of Land Management	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Local Government	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ROW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	23.42	24.48	23.44	24.52	23.62	23.46	24.99	24.57
Number of Road Crossings								
Major Roads	0	0	0	0	0	0	0	0
Minor Roads	21	20	21	20	20	21	20	20
Total	21	20	21	20	20	21	20	20
Number of Railroad Crossings	0	0	0	0	0	0	0	0
Number of Stream Crossings								
Perennial Streams	0	0	0	0	0	0	0	0
Intermittent Streams	8	8	9	8	7	8	7	8
Additional USGS Streams	28	16	29	19	24	28	29	27
Total	36	24	38	27	31	36	36	35
Slope								
< 5%	9.13	9.79	9.35	9.56	8.49	9.30	9.51	9.00
≥ 5% and ≤ 15%	12.89	13.66	12.66	13.71	13.69	12.71	13.88	14.17
> 15% and ≤ 30%	1.38	0.92	1.41	1.14	1.44	1.43	1.49	1.31
> 30%	0.02	0.11	0.02	0.11	0.00	0.02	0.11	0.09
Water Wells within 100 ft	1	1	1	1	1	1	1	1
Residences								
Residences within 25 ft	0	0	0	0	0	0	0	0
Residences within 500 ft	0	0	0	0	0	0	0	0

TABLE I-2.4.2-9
Comparison of Montana Route Variations 9a-m (MTV-9a-m with the Proposed Segment of the 2010 Route it Would Replace

Item	2010 Proposed Route Segment	MTV-9	MTV-9b	MTV-9e	MTV-9f	MTV-9g	MTV-9j	MTV-9m
	Miles of Land Crossed (except where noted)							
Structures								
Structures within 25 ft	0	0	0	0	0	0	0	0
Structures within 500 ft	8	0	8	0	7	8	4	0
Cultural Resources (Class III)								
Cultural Findings (% Surveyed)	0 (100%)	1 Not Elg. (68%)	0 (88%)	1 Not Elg. (68%)	0 (60%)	0 (97%)	0 (63%)	1 Not Elg. (68%)
Paleo Findings (% Surveyed)	0 (100%)	0 (68%)	0 (88%)	0 (68%)	0 (60%)	0 (97%)	0 (63%)	0 (68%)
Grouse (desktop data)								
Sage-grouse Core Area crossed	0	0	0	0	0	0	0	0
Sage-grouse Leks within 1 mile	0	0	0	0	0	0	0	0
Sage-grouse Leks within 2 miles	0	0	0	0	0	0	0	0
Sage-grouse Leks within 3 miles	0	0	0	0	0	0	0	0
Sage-grouse Leks within 4 miles	0	0	0	0	0	0	0	0
Sharp-tailed Leks within 1 mile	1	1	1	1	1	1	1	1
Sharp-tailed Leks within 2 miles	3	3	3	3	3	3	3	3
Sharp-tailed Leks within 3 miles	6	4	6	4	5	6	5	4
Sharp-tailed Leks within 4 miles	8	7	7	7	6	8	6	7
Biology (survey data)								
Biological Resources (%Surveyed)	5 Wetlands (PEM), 9 Noxious Weeds (100%)	3 Wetlands (PEM), 4 Noxious Weeds (90.1%)	N/A	N/A	N/A	N/A	N/A	N/A
Construction Costs								
Cost per mile	$2,100,000	$2,100,000	$2,100,000	$2,100,000	$2,100,000	$2,100,000	$2,100,000	$2,100,000
Total Construction Cost	$49,182,000	$51,408,000	$49,224,000	$51,492,000	$49,602,000	$49,266,000	$52,479,000	$51,597,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

I-2.4.2-9b Route Variation MTV-9b (Clear Creek Variation B)

MTV-9b (Figure I-2.4.2-8b and Table I-2.4.2-9) was a variation suggested by MDEQ to avoid irrigation dikes. It would deviate from the proposed route at approximately milepost 173 and reconnect at approximately milepost 176. This variation would be 0.02 mile longer than the 2010 proposed route and cross 0.56 mile more of state land. The variation would cross 0.01 mile less NLCD wetlands, one more intermittent stream, one more USGS stream, and would have one less sharp-tailed grouse lek within 4 miles. MTV-9b was not selected because it failed to meet with generalized local acceptance (Circular MFSA-2 3.1(1) (a)).

I-2.4.2-9e Route Variation MTV-9e (Clear Creek Variation E)

MTV-9e (Figure I-2.4.2-8b and Table I-2.4.2-9) would follow the route of MTV-9, except west of milepost 180 to milepost 182 where it would move 1,100 feet east for approximately 2.3 miles, at a landowner's request to avoid farmland in Section 21, Township 15 North, Range 52 East. MTV-9e would be 1.1 miles longer than the 2010 proposed route and cross 5.91 miles more of state land. MTV-9e would cross 0.12 mile less developed land and would not be within 500 feet of any structures, unlike the proposed segment which would be within 500 feet of eight structures. Surveys found that the variation could cross one non-eligible cultural resource. Neither route would affect any paleontological sites. The variation would cross 0.09 mile of forested/woodlands, 0.02 mile more of NLCD wetlands, nine fewer USGS streams, and would be within 4 miles of one fewer sharp-tailed grouse lek. The southern 1.5 miles of MTV-9e was selected by MDEQ because it made better use of state-owned land.

I-2.4.2-9f Route Variation MTV-9f (Clear Creek Variation F)

MTV-9f (Figure I-2.4.2-8b and Table I-2.4.2-9) would leave the 2010 proposed route at milepost 180 and connect to MTV-9d for the remainder of the variation, which would avoid more cultivated land than the 2010 proposed route. This variation would be 0.20 mile longer than the 2010 proposed route segment and cross 2.55 miles more of state land. The variation would cross 0.24 mile less developed land, one less minor road, and would be within 500 feet of one less structure. Surveys found that the variation would not cross cultural resources. Neither route would affect any paleontological sites. The variation would cross 0.02 mile more forested/woodlands, one less intermittent stream and four fewer USGS streams, and two fewer sharp-tailed grouse lek would be within 4 miles. MTV-9f was not selected because it is longer, and failed to meet with generalized local acceptance (Circular MFSA-2 3.1(1) (a)).

I-2.4.2-9g Route Variation MTV-9g (Clear Creek Variation G)

MTV-9g (Figure I-2.4.2-8b and Table I-2.4.2-9) was proposed as a new crossing of Clear Creek at milepost 175 to avoid a developed spring identified by the landowner. This variation would be 0.04 mile longer than the 2010 proposed route segment. MTV-9g and the 2010 proposed route segment would cross 0.91 mile of developed land. MTV-9g would cross 0.23 mile more NLCD wetlands and both the variation and proposed route segment would cross eight intermittent streams and 28 USGS streams. In addition, for both routes, field surveys identified subirrigated hay land, or lands irrigated with spreader dikes, and a small fringe wetland. A deep pool was also identified at the crossing for the 2010 proposed route. MTV-9g was selected by MDEQ because it avoided a developed spring and deep pool that was crossed by the 2010 proposed route.

I-2.4.2-9j Route Variation MTV-9j (Clear Creek Variation J)

MTV-9j (Figure I-2.4.2-8b and Table I-2.4.2-9) was a landowner suggested variation that would connect to the 2010 proposed route at milepost 179. The variation was suggested by the landowner to avoid the general vicinity of two fish ponds. The pipeline alternatives range in distance from approximately 0.25 mile to 0.5 mile away. This variation would be 1.57 miles longer than the proposed route and would cross 3.24 miles more of state land. MTV-9j would cross 0.08 mile more developed land and would be within 500 feet of four less structures. Surveys found that the variation would not cross cultural resources. Neither route would affect any paleontological sites. The variation would cross 0.02 mile more of NLCD wetlands and one additional USGS stream, but one less intermittent stream and two fewer sharp-tailed grouse leks would be within 4 miles. MTV-9j was not selected because of greater construction costs, increased length resulting in slightly greater impacts, and it failed to meet with generalized local acceptance (Circular MFSA-2 3.1(1) (a)).

I-2.4.2-9m Route Variation MTV-9m (Clear Creek Variation M)

MTV-9m (Figure I-2.4.2-8b and Table I-2.4.2-9) would follow the same route as MTV-9e to Section 22, Township 15 North, Range 53 East, where it would then follow MTV-9f to avoid cropland and pick up more rangeland. MTV-9m would be 1.15 miles longer than the 2010 proposed route and cross 5.88 more miles of state land. MTV-9m would cross 0.13 mile less of developed land and would be within 500 feet of any structures. Surveys found that the variation could cross one non-eligible cultural resource. Neither route would affect any paleontological sites. The variation would cross 0.03 mile more of NLCD wetlands and 0.09 mile more of forested/woodlands, but one fewer sharp-tailed grouse lek would be within 4 miles, and one less USGS identified stream would be crossed. MTV-9m was not selected because of greater construction costs, increased length resulting in slightly greater impacts, and it failed to meet with generalized local acceptance (Circular MFSA-2 3.1(1) (a)).

I-2.4.2-10 Route Variation MTV-10 (Clear Creek Tributary Variation)

MTV-10 (Figure I-2.4.2-8b and Table I-2.4.2-10) was developed in response to a request by a landowner to avoid a stock pond. MTV-10 would be about 0.01 mile longer than the 2010 route segment it would replace. The stock pond would also be avoided with implementation of MTV-8 or MTV-9 (see Sections I-2.4.2-8 and I-2.4.2-9). Table I-2.4.2-10 presents a comparison of key environmental characteristics and other data associated with MTV-10, to those of the 2010 route segment.

Although the estimated construction cost per mile is the same for each of the options, the estimated total construction cost of the variation is greater than that of the 2010 route segment because of its greater length. Neither MTV-10 or the 2010 proposed route would cross BLM-administered or state-owned lands. In order to satisfy the landowner’s request to avoid a stock pond, MDEQ has selected MTV-10 in conjunction with MTV-9g.

TABLE I-2.4.2-10
Comparison of Montana Route Variation 10 (MTV-10) with the Proposed Segment of the 2010 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	MTV-10	Difference	Item	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	MTV-10	Difference
Length	1.47	1.48	-0.01	**Slope**			
Land Cover				< 5%	0.27	0.27	0.00
Developed	0.07	0.05	+0.02	≥ 5% and ≤ 15%	0.93	0.99	-0.06
Forested/ Woodlands	0.0	0.0	0.0	> 15% and ≤ 30%	0.27	0.22	+0.05
Wetlands	0.0	0.0	0.0	> 30%	0.0	0.0	0.0
Total	0.07	0.05	+0.02	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	0.80	0.65	+0.15	Residences within 25 ft	0	0	0
Irrigated Land	0.0	0.0	0.0	Residences within 500 ft	0	0	0
Hay Land	0.67	0.83	-0.16	**Structures**			
Total	1.47	1.48	-0.01	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.0	0.0	0.0	**Cultural Resources (Class I)**			
Private Land	1.47	1.48	-0.01	Cultural Resources in 300-ft APE	0	0	0
U.S. Bureau of Land Management	0.0	0.0	0.0	Cultural Resources in TRS	3	3	0
Local Government	0.0	0.0	0.0	**Grouse (desktop data)**			
ROW	0.0	0.0	0.0	Sage-grouse Core Area crossed	0	0	0
Total	1.47	1.48	-0.01	Sage-grouse Leks within 1 mile	0	0	0
Number of Road Crossings				Sage-grouse Leks within 2 miles	0	0	0
Major Roads	0	0	0	Sage-grouse Leks within 3 miles	0	0	0
Minor Roads	2	2	0	Sage-grouse Leks within 4 miles	0	0	0
Total	2	2	0	Sharp-tailed Leks within 1 mile	1	1	0
Number of Railroad Crossings	0	0	0	Sharp-tailed Leks within 2 miles	1	1	0
Number of Stream Crossings				Sharp-tailed Leks within 3 miles	3	3	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 4 miles	3	3	0
Intermittent Streams	0	0	0	**Construction Costs**			
Additional USGS Streams	2	2	0	Cost per mile	$1,900,000	$1,900,000	
Total	2	2	0	Total Construction Cost	$2,793,000	$2,812,000	-$19,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of difference.

I-2.4.2-11 Route Variation MTV-11 (Cabin Creek Variation)

MTV-11 (Figure I-2.4.2-9 and Table I-2.4.2-11) was developed in response to a request by a landowner to avoid the Cabin Creek stream crossing and a crossing of land irrigated using spreader dikes. MTV-11 is also described as KEY-33 and KEY-34 in the 2010 proposed route and is compared to the 2009 proposed route in this section. The variation would be about 0.1 mile shorter than the 2009 proposed route segment it would replace.

Neither the variation nor the 2009 route segment would cross public land. The Revenue Final Land Unit Classification database used to obtain the data presented in Table I-2.4.2-11 did not list irrigated land along the 2009 proposed route segment or MTV-11. That database was used for consistency in the comparisons. However, the landowner indicated that the 2009 proposed route would cross irrigated land, and this was evident during subsequent review of recent aerial photographs.

The variation would cross 0.02 mile more developed land and three more minor roads. It would not be within 500 feet of a structure, unlike the 2009 proposed route segment. Surveys found that the variation would not affect any cultural resources, but would affect one more non-significant paleontological site. The variation would cross 0.13 mile less forested/woodland areas and 0.04 mile less NLCD wetlands, one less perennial stream, but one more USGS stream than the 2009 proposed route segment. Surveys found that MTV-11 would cross five noxious weed areas, whereas the 2009 route segment would not cross any.

The irrigated land on the proposed route (not listed in Table I-2.4.2-11 as described above) may require more costly reclamation than non-irrigated land. However, MTV-11 would extend along a greater distance of moderate to steeply sloped areas and cross three more minor roads than the 2009 route segment. Therefore, the estimated cost of construction per mile for MTV-11 would be greater than that of the 2009 proposed route segment. However, due to the greater length of the 2009 proposed route, it was estimated that total cost would be greater than that of the variation.

Because MTV-11 would meet the request of the landowner and would not cross irrigated land and a stream, MDEQ selected MTV-11. Keystone's evaluation of MTV-11 indicated that it was a reasonable variation to the 2009 proposed route, which has been included as KEY-33 and KEY-34 in the 2010 proposed route.

TABLE I-2.4.2-11
Comparison of Montana Route Variation 11 (MTV-11) with the Proposed Segment of the 2009 Route it Would Replace

	Miles of Land Crossed (except where noted)		
Item	**2009 Proposed Route Segment**	**MTV-11**	**Difference**
Length	3.58	3.48	+0.10
Land Cover			
Developed	0.08	0.10	-0.02
Forested/ Woodlands	0.21	0.08	+0.13
Wetlands	0.04	0.00	+0.04
Total	0.33	0.18	+0.15
Revenue Final Land Unit Classification			
Range Land	1.34	2.03	-0.69
Irrigated Land	0.00	0.00	0.00
Hay Land	2.24	1.45	+0.79
Total	3.58	3.48	-0.10
Land Ownership			
State of Montana	0.00	0.00	0.00
Private Land	3.58	3.48	+0.10
U.S. Bureau of Land Management	0.00	0.00	0.00
Local Government	0.00	0.00	0.00
ROW	0.00	0.00	0.00
Total	3.58	3.48	+0.10
Number of Road Crossings			
Major Roads	0	0	0
Minor Roads	4	7	-3
Total	4	7	-3
Number of Railroad Crossings	0	0	0
Number of Stream Crossings			
Perennial Streams	1	0	+1
Intermittent Streams	1	1	0
Additional USGS Streams	0	1	-1
Total	2	2	0

	Miles of Land Crossed (except where noted)		
Item	**2009 Proposed Route Segment**	**MTV-11**	**Difference**
Slope			
< 5%	1.81	1.31	+0.50
≥ 5% and ≤ 15%	1.77	1.94	-0.17
> 15% and ≤ 30%	0.00	0.23	-0.23
> 30%	0.00	0.00	0.00
Water Wells within 100 ft	0	0	0
Residences			
Residences within 25 ft	0	0	0
Residences within 500 ft	0	0	0
Structures			
Structures within 25 ft	0	0	0
Structures within 500 ft	1	0	+1
Cultural Resources (Class III)			
Cultural Findings (% Surveyed)	0 (100%)	0 (100%)	0
Paleo Findings (% Surveyed)	0 (100%)	1 Not Sig. (100%)	-1 Not Sig.
Grouse (desktop data)			
Sage-grouse Core Area crossed	0	0	0
Sage-grouse Leks within 1 mile	0	0	0
Sage-grouse Leks within 2 miles	0	0	0
Sage-grouse Leks within 3 miles	0	0	0
Sage-grouse Leks within 4 miles	0	0	0
Sharp-tailed Leks within 1 mile	0	0	0
Sharp-tailed Leks within 2 miles	0	0	0
Sharp-tailed Leks within 3 miles	0	0	0
Sharp-tailed Leks within 4 miles	0	0	0
Biology (survey data)			
Biological Resources (% Surveyed)	0 (100%)	5 Noxious Weeds (100%)	-5 Noxious Weeds
Construction Costs			
Cost per mile	$1,900,000	$1,940,000	
Total Construction Cost	$6,840,000	$6,790,000	+$50,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

I-2.4.2-12 Route Variation MTV-12 (Spring Creek Variation)

MTV-12 (Figure I-2.4.2-10 and Table I-2.4.2-12) was developed to address a landowner's request to avoid crossing the central portion of a field. As shown on Figure I-2.4.2-10, MTV-12 would cross the field farther west than the 2010 proposed route. The variation would be 0.05 mile longer than the 2010 route segment it would replace, and neither the variation nor the 2010 route segment would cross irrigated land.

Since construction and reclamation across the field would be similar for each route, the estimated construction cost per mile would be similar for each of the two options. However, as indicated on Figure I-2.5-10, MTV-12 would likely require construction through a drainage area and that would slightly increase the actual cost of construction. In addition, the estimated total cost of the variation would be greater than that of the 2010 route segment because of its greater length.

If implemented, this variation would likely cross the heads of draws and result in greater impacts than the 2010 proposed route segment. As result, MDEQ did not select MTV-12.

I-2.4.2-13 Route Variation MTV-13 (Dry Fork Creek Variation)

MTV-13 (Figure I-2.4.2-11 and Table I-2.4.2-13) was developed to increase the amount of public land crossed in comparison to the 2010 proposed route. The 2010 proposed route segment includes KEY-36 through KEY-39. MTV-13 would be about 1.2 miles longer than the 2010 route segment it would replace and would cross 7.1 fewer miles of private land. However, it would cross 2.1 more miles of state land and 6.2 more miles of BLM land than the route segment. There would be 3.0 miles less hay land along the variation.

MTV-13 would cross two fewer minor roads, would not be within 500 feet of two residences and five structures, or within 100 feet of an additional water well. A Class III field survey was not conducted for this variation. Class I research indicated that there are two cultural resources in the TRS data. The variation would cross 0.01 mile less of forested/woodland areas and 0.2 mile less of wetlands. MTV-13 would cross one less intermittent stream than the proposed route segment but 10 additional USGS streams. More known greater sage-grouse leks and sharp-tailed grouse leks would be located closer to MTV-13 than the 2010 proposed route.

Because MTV-13 would extend through a greater distance of moderate to steeply sloped areas than the 2010 proposed route segment, the greater cost of construction through those areas would only partially offset the greater cost of constructing the route segment through the areas noted above. As a result, the estimated construction cost per mile of the 2010 proposed route segment would be greater than that of MTV-13.

Because of the concern about potential effects to greater sage-grouse habitat, MDEQ did not select MTV-13 in place of the proposed route segment.

TABLE I-2.4.2-12
Comparison of Montana Route Variation 12 (MTV-12) with the Proposed Segment of the 2010 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	MTV-12	Difference	Item	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	MTV-12	Difference
Length	0.88	0.93	-0.05	**Slope**			
Land Cover				< 5%	0.47	0.43	+0.04
Developed	0.02	0.02	0.00	≥ 5% and ≤ 15%	0.41	0.50	-0.09
Forested/ Woodlands	0.00	0.04	-0.04	> 15% and ≤ 30%	0.00	0.00	0.00
Wetlands	0.00	0.00	0.00	> 30%	0.00	0.00	0.00
Total	0.02	0.06	-0.04	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	0.88	0.93	-0.05	Residences within 25 ft	0	0	0
Irrigated Land	0.00	0.00	0.00	Residences within 500 ft	0	0	0
Hay Land	0.00	0.00	0.00	**Structures**			
Total	0.88	0.93	-0.05	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.00	0.00	0.00	**Cultural Resources (Class I)**			
Private Land	0.88	0.93	-0.05	Cultural Resources in 300-ft APE	0	0	0
U.S. Bureau of Land Management	0.00	0.00	0.00	Cultural Resources in TRS	2	2	0
Local Government	0.00	0.00	0.00	**Grouse (desktop data)**			
ROW	0.00	0.00	0.00	Sage-grouse Core Area crossed	0	0	0
Total	0.88	0.93	-0.05	Sage-grouse Leks within 1 mile	0	0	0
Number of Road Crossings				Sage-grouse Leks within 2 miles	0	0	0
Major Roads	0	0	0	Sage-grouse Leks within 3 miles	0	0	0
Minor Roads	1	1	0	Sage-grouse Leks within 4 miles	0	0	0
Total	1	1	0	Sharp-tailed Leks within 1 mile	0	0	0
Number of Railroad Crossings	0	0	0	Sharp-tailed Leks within 2 miles	0	0	0
Number of Stream Crossings				Sharp-tailed Leks within 3 miles	0	0	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 4 miles	0	0	0
Intermittent Streams	0	0	0	**Construction Costs**			
Additional USGS Streams	2	2	0	Cost per mile	$1,900,000	$1,900,000	
Total	2	2	0	Total Construction Cost	$1, 672,000	$1,767,000	-$95,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.2-13
Comparison of Montana Route Variation 13 (MTV-13) with the Proposed Segment of the 2010 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	MTV-13	Difference	Item	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	MTV-13	Difference
Length	18.8	20.0	-1.2	**Slope**			
Land Cover				< 5%	5.47	3.97	+1.50
Developed	0.0	0.0	0.0	≥ 5% and ≤ 15%	11.72	13.87	-2.15
Forested/ Woodlands	0.1	0.0	+0.1	> 15% and ≤ 30%	1.64	2.11	-0.47
Wetlands	0.3	0.1	+0.2	> 30%	0.00	0.01	-0.01
Total	0.4	0.1	+0.3	**Water Wells within 100 ft**	2	1	+1
Revenue Final Land Unit Classification				**Residences**			
Range Land	10.8	15.0	-4.2	Residences within 25 ft	0	0	0
Irrigated Land	0.0	0.0	0.0	Residences within 500 ft	2	0	+2
Hay Land	8.0	5.0	+3.0	**Structures**			
Total	18.8	20.0	-1.2	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	5	0	+5
State of Montana	0.1	2.2	-2.1	**Cultural Resources (Class I)**			
Private Land	17.4	10.3	+7.1	Cultural Resources in 300-ft APE	1	0	+1
U.S. Bureau of Land Management	1.3	7.5	-6.2	Cultural Resources in TRS	35	39	-4
Local Government	0.0	0.0	0.0	**Grouse (desktop data)**			
ROW	0.0	0.0	0.0	Sage-grouse Core Area crossed	0	0	0
Total	18.8	20.0	-1.2	Sage-grouse Leks within 1 mile	0	2	-2
Number of Road Crossings				Sage-grouse Leks within 2 miles	2	3	-1
Major Roads	0	0	0	Sage-grouse Leks within 3 miles	5	4	+1
Minor Roads	16	14	+2	Sage-grouse Leks within 4 miles	7	7	0
Total	16	14	+2	Sharp-tailed Leks within 1 mile	1	0	+1
Number of Railroad Crossings	0	0	0	Sharp-tailed Leks within 2 miles	1	3	-2
Number of Stream Crossings				Sharp-tailed Leks within 3 miles	2	6	-4
Perennial Streams	0	0	0	Sharp-tailed Leks within 4 miles	6	7	-1
Intermittent Streams	10	9	+1	**Construction Costs**			
Additional USGS Streams	11	21	-10	Cost per mile	$1,900,000	$1,880,000	
Total	21	30	-9	Total Construction Cost	$35,720,000	$37,600,000	-$1,880,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

I-2.4.2-14 Route Variation MTV-14 (Sandstone Creek Variation)

MTV-14 (Figure I-2.4.2-12 and Table I-2.4.2-14) was developed to increase the amount of public land crossed in comparison to the 2010 proposed route. MTV-14 would be about 0.1 mile longer than the 2010 proposed route segment and would cross about 0.5 mile less private land and 0.2 mile less BLM land, but would cross 0.8 mile more state land. It also would parallel an existing pipeline.

MTV-14 would cross four more minor roads, two more cultural resources in the TRS, and would be within 500 feet of one structure, compared to no structures for the 2010 route segment. It would cross 0.1 mile less NLCD wetlands, and eight fewer intermittent streams and three fewer USGS streams than the 2010 route segment. The cost of construction across a larger number of roadway crossings along MTV-14 would be offset by the decreased number of stream and wetland crossings, and the greater distance along moderately sloped areas of the proposed route segment. As a result, the estimated cost of construction per mile would be the same for both options.

However, the variation also would be closer to greater sage-grouse habitat and one additional greater sage-grouse lek. Because of concern about the potential effects to greater sage-grouse habitat and the additional structure, MDEQ did not select MTV-14 in place of the proposed route segment.

I-2.4.2-15 Route Variation MTV-15 (Red Butte Creek Variation)

MTV-15 (Figure I-2.4.2-12 and Table I-2.4.2-15) was developed in response to a request by a landowner to avoid construction in the vicinity of two residences and a water well. The residence nearest the 2010 proposed route segment would be approximately 600 feet from the edge of the construction ROW and, therefore, the residences are not listed in Table I-2.4.2-15. The variation would be about 0.02 mile shorter than the 2010 proposed route segment, on private land, but would be located approximately 1,600 feet west of the nearest of the two residences. This landowner request would also be addressed by MTV-14, which would be farther from the residences than MTV-15 (see Section I-2.4.2-14 and Figure I-2.4.2-12).

MTV-15 would cross 0.03 mile less developed land but two more minor roads. Surveys did not find any cultural or paleontological resources for either route. The variation would not cross wetlands or eight intermittent streams, but would cross three additional USGS streams. Two greater sage-grouse leks were identified within 4 miles of both routes using desktop data, and field surveys confirmed that there was only one lek within 3 miles of each route.

Implementation of MTV-15 would meet the objective of the landowner by moving the pipeline farther from the two residences. It would also result in fewer stream crossings and slightly less distance of wetlands crossed, as compared to the 2010 proposed route segment. In consideration of this information, MDEQ has selected MTV-15 in place of the proposed route segment.

TABLE I-2.4.2-14
Comparison of Montana Route Variation 14 (MTV-14) with the Proposed Segment of the 2010 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	MTV-14	Difference	Item	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	MTV-14	Difference
Length	8.4	8.5	-0.1	**Slope**			
Land Cover				< 5%	3.4	3.7	-0.3
Developed	0.1	0.2	-0.1	≥ 5% and ≤ 15%	4.9	4.5	+0.4
Forested/ Woodlands	0.0	0.0	0.0	> 15% and ≤ 30%	0.1	0.3	-0.2
Wetlands	0.1	0.0	+0.1	> 30%	0.0	0.0	0.0
Total	0.2	0.2	0.0	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	5.3	5.2	+0.1	Residences within 25 ft	0	0	0
Irrigated Land	0.0	0.0	0.0	Residences within 500 ft	0	0	0
Hay Land	3.1	3.3	-0.2	**Structures**			
Total	8.4	8.5	-0.1	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	1	-1
State of Montana	0.0	0.8	-0.8	**Cultural Resources (Class I)**			
Private Land	7.7	7.2	+0.5	Cultural Resources in 300-ft APE	1	1	0
U.S. Bureau of Land Management	0.7	0.5	+0.2	Cultural Resources in TRS	27	29	-2
Local Government	0.0	0.0	0.0	**Grouse (desktop data)**			
ROW	0.0	0.0	0.0	Sage-grouse Core Area crossed	0	0	0
Total	8.4	8.5	-0.1	Sage-grouse Leks within 1 mile	0	0	0
Number of Road Crossings				Sage-grouse Leks within 2 miles	0	0	0
Major Roads	2	2	0	Sage-grouse Leks within 3 miles	1	2	-1
Minor Roads	5	9	-4	Sage-grouse Leks within 4 miles	3	3	0
Total	7	11	-4	Sharp-tailed Leks within 1 mile	0	0	0
Number of Railroad Crossings	1	1	0	Sharp-tailed Leks within 2 miles	0	0	0
Number of Stream Crossings				Sharp-tailed Leks within 3 miles	0	0	0
Perennial Streams	1	1	0	Sharp-tailed Leks within 4 miles	0	0	0
Intermittent Streams	9	1	+8	**Construction Costs**			
Additional USGS Streams	6	3	+3	Cost per mile	$2,000,000	$2,000,000	
Total	16	5	+11	Total Construction Cost	$16,800,000	$17,000,000	-$200,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.2-15
Comparison of Montana Route Variation 15 (MTV-15) with the Proposed Segment of the 2010 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	MTV-15	Difference	Item	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	MTV-15	Difference
Length	3.05	2.99	+0.06	**Slope**			
Land Cover				< 5%	0.97	0.75	+0.22
Developed	0.04	0.05	-0.01	≥ 5% and ≤ 15%	2.08	2.12	-0.04
Forested/ Woodlands	0.00	0.00	0.00	> 15% and ≤ 30%	0.00	0.12	-0.12
Wetlands	0.02	0.00	+0.02	> 30%	0.00	0.00	0.00
Total	0.06	0.05	+0.01	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	2.21	2.57	-0.36	Residences within 25 ft	0	0	0
Irrigated Land	0.00	0.00	0.00	Residences within 500 ft	0	0	0
Hay Land	0.84	0.42	+0.42	**Structures**			
Total	3.05	2.99	+0.06	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.00	0.00	0.00	**Cultural Resources (Class III)**			
Private Land	3.05	2.99	+0.06	Cultural Findings (% Surveyed)	0 (60%)	0 (100%)	0
U.S. Bureau of Land Management	0.00	0.00	0.00	Paleo Findings (% Surveyed)	0 (60%)	0 (100%)	0
Local Government	0.00	0.00	0.00	**Grouse (desktop data)**			
ROW	0.00	0.00	0.00	Sage-grouse Core Area crossed	0	0	0
Total	3.05	2.99	+0.06	Sage-grouse Leks within 1 mile	0	0	0
Number of Road Crossings				Sage-grouse Leks within 2 miles	0	0	0
Major Roads	1	1	0	Sage-grouse Leks within 3 miles	1	1	0
Minor Roads	1	3	-2	Sage-grouse Leks within 4 miles	2	2	0
Total	2	4	-2	Sharp-tailed Leks within 1 mile	0	0	0
Number of Railroad Crossings	0	0	0	Sharp-tailed Leks within 2 miles	0	0	0
Number of Stream Crossings				Sharp-tailed Leks within 3 miles	0	0	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 4 miles	0	0	0
Intermittent Streams	8	0	+8	**Biology (survey data)**			
Additional USGS Streams	1	4	-3	Biological Resources (% Surveyed)	0 (60%)	0 (100%)	0
Total	9	4	+5	**Construction Costs**			
				Cost per mile	$2,000,000	$1,960,000	
				Total Construction Cost	$6,100,000	$5,860,400	+$239,600

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

I-2.4.2-16 Route Variation MTV-16 (Little Beaver Creek Variation)

MTV-16 (Figure I-2.4.2-13 and Table I-2.4.2-16) was developed to increase the amount of public land crossed in comparison to the 2010 proposed route, which would include KEY-40. MTV-16 would be about 0.5 mile longer than the 2010 route segment but would cross about 1.5 miles less private land. MTV-16 would cross 1.6 miles more state land and 0.4 mile more BLM land than the 2010 route segment.

MTV-16 would cross 0.7 mile more hay land and five more minor roads. A Class III survey was not conducted for this variation. Class I research indicated that there were 16 more cultural resources in the TRS data. The variation would cross 0.1 mile less wetlands, two more intermittent streams, but one less USGS stream. The variation would be closer to four known greater sage-grouse leks. The 2010 proposed route would extend along more moderate to steeply sloped areas. However, there would be greater costs associated with the larger number of road and stream crossings of MTV-16. As a result, the estimated construction cost per mile of the MTV-16 would be greater than that of the route segment.

Because of the concern about potential effects to greater sage-grouse habitat, length, roads, streams, and cultural resources, MDEQ did not select MTV-16 in place of the proposed route segment.

I-2.4.2-17 Route Variation MTV-17 (Hidden Water Creek Variation)

MTV-17 (Figure I-2.4.2-13 and Table I-2.4.2-17) was developed to increase the amount of public land crossed, in comparison to the 2010 proposed route. MTV-17 would be about 0.23 mile longer than the 2010 route segment it would replace, but would cross about 0.77 mile less of private land.

MTV-17 would cross about 1 mile more of state land than the route segment, and neither route would cross BLM land. It also would cross about 0.15 mile less hay land than the route segment. Surveys did not find any cultural resource or paleontological sites for either route. MTV-17 and the 2010 proposed route segment would cross 0.04 mile of wetlands and one intermittent stream, and the variation would cross one additional USGS stream. Biological field surveys found that MTV-17 would cross one PEM wetland, whereas the 2010 proposed route segment was not found to cross any wetlands. Desktop data indicated that three greater sage-grouse leks were identified within 4 miles of both routes, and field surveys confirmed that there were two leks within 3 miles of each route.

The estimated construction cost per mile of each option would be the same, although the total estimated cost of construction of MTV-17 would be greater than that of the 2010 proposed route segment because of its greater length. Since publication of the draft EIS, additional information became available and is presented here as MTV-17. After analysis, MDEQ selected MTV-17 in place of the proposed route segment because it would cross more public land.

TABLE I-2.4.2-16
Comparison of Montana Route Variation 16 (MTV-16) with the Proposed Segment of the 2010 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	Miles of Land Crossed (except where noted) MTV-16	Difference	Item	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	Miles of Land Crossed (except where noted) MTV-16	Difference
Length	7.6	8.1	-0.5	**Slope**			
Land Cover				< 5%	1.7	3.0	-1.3
Developed	0.0	0.0	0.0	≥ 5% and ≤ 15%	5.1	4.7	+0.4
Forested/ Woodlands	0.1	0.1	0.0	> 15% and ≤ 30%	0.8	0.4	+0.4
Wetlands	0.1	0.0	+0.1	> 30%	0.0	0.0	0.0
Total	0.2	0.1	+0.1	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	6.3	6.2	+0.1	Residences within 25 ft	0	0	0
Irrigated Land	0.0	0.0	0.0	Residences within 500 ft	0	0	0
Hay Land	1.2	1.9	-0.7	**Structures**			
Total	7.6	8.1	-0.5	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.7	2.3	-1.6	**Cultural Resources (Class I)**			
Private Land	6.6	5.1	+1.5	Cultural Resources in 300-ft APE	0	0	0
U.S. Bureau of Land Management	0.3	0.7	-0.4	Cultural Resources in TRS	1	17	-16
Local Government	0.0	0.0	0.0	**Grouse (desktop data)**			
ROW	0.0	0.0	0.0	Sage-grouse Core Area crossed	0	0	0
Total	7.6	8.1	-0.5	Sage-grouse Leks within 1 mile	0	2	-2
Number of Road Crossings				Sage-grouse Leks within 2 miles	2	2	0
Major Roads	0	0	0	Sage-grouse Leks within 3 miles	4	6	-2
Minor Roads	4	9	-5	Sage-grouse Leks within 4 miles	8	12	-4
Total	4	9	-5	Sharp-tailed Leks within 1 mile	0	1	-1
Number of Railroad Crossings	0	0	0	Sharp-tailed Leks within 2 miles	1	1	0
Number of Stream Crossings				Sharp-tailed Leks within 3 miles	1	1	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 4 miles	1	1	0
Intermittent Streams	2	4	-2	**Construction Costs**			
Additional USGS Streams	6	5	+1	Cost per mile	$2,000,000	$2,020,000	
Total	8	9	-1	Total Construction Cost	$15,200,000	$16,362,000	-$1,162,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.2-17
Comparison of Montana Route Variation 17 (MTV-17) with the Proposed Segment of the 2010 Route it Would Replace

Item	2010 Proposed Route Segment	MTV-17	Difference
	Miles of Land Crossed (except where noted)		
Length	1.88	2.11	-0.23
Land Cover			
Developed	0.00	0.00	0.00
Forested/ Woodlands	0.00	0.00	0.00
Wetlands	0.04	0.04	0.00
Total	0.04	0.04	0.00
Revenue Final Land Unit Classification			
Range Land	1.50	1.88	-0.38
Irrigated Land	0.00	0.00	0.00
Hay Land	0.38	0.23	+0.15
Total	1.88	2.11	-0.23
Land Ownership			
State of Montana	0.00	1.00	-1.00
Private Land	1.88	1.11	+0.77
U.S. Bureau of Land Management	0.00	0.00	0.00
Local Government	0.00	0.00	0.00
ROW	0.00	0.00	0.00
Total	1.88	2.11	-0.23
Number of Road Crossings			
Major Roads	0	0	0
Minor Roads	1	1	0
Total	1	1	0
Number of Railroad Crossings	0	0	0
Number of Stream Crossings			
Perennial Streams	0	0	0
Intermittent Streams	1	1	0
Additional USGS Streams	0	1	-1
Total	1	2	-1

Item	2010 Proposed Route Segment	MTV-17	Difference
	Miles of Land Crossed (except where noted)		
Slope			
< 5%	0.89	0.62	+0.27
≥ 5% and ≤ 15%	0.99	1.49	-0.50
> 15% and ≤ 30%	0.00	0.00	0.00
> 30%	0.00	0.00	0.00
Water Wells within 100 ft	0	0	0
Residences			
Residences within 25 ft	0	0	0
Residences within 500 ft	0	0	0
Structures			
Structures within 25 ft	0	0	0
Structures within 500 ft	0	0	0
Cultural Resources (Class III)			
Cultural Findings (% Surveyed)	0 (100%)	0 (100%)	0
Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
Grouse (desktop data)			
Sage-grouse Core Area crossed	0	0	0
Sage-grouse Leks within 1 mile	0	0	0
Sage-grouse Leks within 2 miles	1	1	0
Sage-grouse Leks within 3 miles	2	2	0
Sage-grouse Leks within 4 miles	3	3	0
Sharp-tailed Leks within 1 mile	0	0	0
Sharp-tailed Leks within 2 miles	0	0	0
Sharp-tailed Leks within 3 miles	1	1	0
Sharp-tailed Leks within 4 miles	1	1	0
Biology (survey data)			
Biological Resources (% Surveyed)	0 (100%)	1 Wetland (PEM) (100%)	-1 Wetland (PEM)
Construction Costs			
Cost per mile	$2,000,000	$2,000,000	
Total Construction Cost	$3,800,000	$4,200,000	-$400,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

I-2.4.2-18 Route Variation MTV-18 (North Fork Coal Bank Creek Variation)

MTV-18 (Figure I-2.4.2-14 and Table I-2.4.2-18) was developed to increase the amount of public land crossed and to reduce the number of stream crossings, in comparison to the 2010 proposed route. MTV-18 would be about 1.1 miles longer and would cross 3.2 miles less private land than the 2010 proposed route segment it would replace. MTV-18 would cross 1.8 miles more state land and 2.5 miles more BLM land, compared to the route segment. MTV-18 would connect to KEY-41 or KEY-46 on the 2010 proposed route.

MTV-18 would cross eight more minor roads but would not be within 500 feet of two structures, compared to the 2010 proposed route segment. A Class III survey was not conducted for this variation. Class I research indicated that there were 15 more cultural resources in the TRS data. The variation would cross three fewer intermittent streams, but three additional USGS streams. It also would be closer to one additional greater sage-grouse lek, one additional sharp-tailed grouse lek, and would extend through more moderate to steeply sloped areas. Therefore, the estimated construction cost per mile of MTV-18 would be greater than that of the 2010 proposed route segment.

While MTV-18 would use 4.3 more miles of public land, there would be few other advantages to justify its added construction cost. Thus, MDEQ did not select MTV-18 in place of the proposed route segment.

I-2.4.2-19 Route Variation MTV-19 (South Fork Coal Bank Creek Variation)

MTV-19 (Figure I-2.4.2-14 and Table I-2.4.2-19) was developed to avoid a high, unstable valley wall and a tributary at the proposed crossing site of South Fork Coal Bank Creek, which is an intermittent stream. The stream crossing site of MTV-19 would be approximately 1,300 feet east (downstream) of the proposed crossing site, and the variation would be about 0.1 mile longer than the 2009 proposed route segment it would replace. MTV-19 is discussed in more detail in the Montana Stream Crossing Inspections Report for the proposed Project that is on file with MDEQ (see Section I-3.1 for a summary of key information presented in the report). The objective of this variation also would be met by MTV-18 and MTV-19a.

MTV-19 would not connect to KEY-46 on the 2010 proposed route, which is compared as MTV-19a. Neither the variation nor the 2009 route segment would cross public land, and field surveys did not find any cultural resources or paleontological sites on either route. The estimated cost of construction per mile is the same for each option. However, due to its longer distance, the total estimated construction cost of MTV-19 is greater than that of the 2009 route segment.

If implemented, MTV-19 would have avoided an unstable valley wall and would have been environmentally preferable to the proposed crossing of South Fork Coal Bank Creek. However, MDEQ did not select MTV-19 in place of the 2009 proposed route segment, but modified this recommendation as described under MTV-19a in response to landowner comments.

TABLE I-2.4.2-18
Comparison of Montana Route Variation 18 (MTV-18) with the Proposed Segment of the 2010 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	MTV-18	Difference	Item	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	MTV-18	Difference
Length	15.3	16.4	-1.1	**Slope**			
Land Cover				< 5%	7.2	7.1	+0.1
Developed	0.0	0.0	0.0	≥ 5% and ≤ 15%	7.1	8.4	-1.3
Forested/ Woodlands	0.0	0.0	0.0	> 15% and ≤ 30%	0.9	0.9	0.0
Wetlands	0.0	0.0	0.0	> 30%	0.1	0.0	+0.1
Total	0.0	0.0	0.0	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	11.2	14.8	-3.6	Residences within 25 ft	0	0	0
Irrigated Land	0.0	0.0	0.0	Residences within 500 ft	0	0	0
Hay Land	4.1	1.6	+2.5	**Structures**			
Total	15.3	16.4	-1.1	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	2	0	+2
State of Montana	0.0	1.8	-1.8	**Cultural Resources (Class I)**			
Private Land	14.8	11.6	+3.2	Cultural Resources in 300-ft APE	1	1	0
U.S. Bureau of Land Management	0.5	3.0	-2.5	Cultural Resources in TRS	11	26	-15
Local Government	0.0	0.0	0.0	**Grouse (desktop data)**			
ROW	0.0	0.0	0.0	Sage-grouse Core Area crossed	0	0	0
Total	15.3	16.4	-1.1	Sage-grouse Leks within 1 mile	0	0	0
Number of Road Crossings				Sage-grouse Leks within 2 miles	0	0	0
Major Roads	0	0	0	Sage-grouse Leks within 3 miles	0	1	-1
Minor Roads	5	13	-8	Sage-grouse Leks within 4 miles	1	2	-1
Total	5	13	-8	Sharp-tailed Leks within 1 mile	0	0	0
Number of Railroad Crossings	0	0	0	Sharp-tailed Leks within 2 miles	0	0	0
Number of Stream Crossings				Sharp-tailed Leks within 3 miles	0	0	0
Perennial Streams	1	1	0	Sharp-tailed Leks within 4 miles	0	1	-1
Intermittent Streams	8	5	+3	**Construction Costs**			
Additional USGS Streams	8	11	-3	Cost per mile	$2,100,000	$2,100,000	
Total	17	17	0	Total Construction Cost	$32,130,000	$34,440,000	-$2,310,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.2-19
Comparison of Montana Route Variation 19 (MTV-19) with the Proposed Segment of the 2009 Route it Would Replace

Item	Miles of Land Crossed (except where noted)			Item	Miles of Land Crossed (except where noted)		
	2009 Proposed Route Segment	MTV-19	Difference		2009 Proposed Route Segment	MTV-19	Difference
Length	0.5	0.6	-0.1	**Slope**			
Land Cover				< 5%	0.37	0.27	+0.10
Developed	0.0	0.0	0.0	≥ 5% and ≤ 15%	0.15	0.30	-0.15
Forested/ Woodlands	0.0	0.0	0.0	> 15% and ≤ 30%	0.00	0.01	-0.01
Wetlands	0.0	0.0	0.0	> 30%	0.00	0.00	0.0
Total	0.0	0.0	0.0	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	0.5	0.6	-0.1	Residences within 25 ft	0	0	0
Irrigated Land	0.0	0.0	0.0	Residences within 500 ft	0	0	0
Hay Land	0.0	0.0	0.0	**Structures**			
Total	0.5	0.6	-0.1	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.0	0.0	0.0	**Cultural Resources (Class III)**			
Private Land	0.5	0.6	-0.1	Cultural Findings (% Surveyed)	0 (100%)	0 (100%)	0.
U.S. Bureau of Land Management	0.0	0.0	0.0	Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
Local Government	0.0	0.0	0.0	**Grouse (desktop data)**			
ROW	0.0	0.0	0.0	Sage-grouse Core Area crossed	0	0	0
Total	0.5	0.6	-0.1	Sage-grouse Leks within 1 mile	0	0	0
Number of Road Crossings				Sage-grouse Leks within 2 miles	0	0	0
Major Roads	0	0	0	Sage-grouse Leks within 3 miles	0	0	0
Minor Roads	1	1	0	Sage-grouse Leks within 4 miles	0	0	0
Total	1	1	0	Sharp-tailed Leks within 1 mile	0	0	0
Number of Railroad Crossings	0	0	0	Sharp-tailed Leks within 2 miles	0	0	0
Number of Stream Crossings				Sharp-tailed Leks within 3 miles	0	0	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 4 miles	0	0	0
Intermittent Streams	1	1	0	**Construction Costs**			
Additional USGS Streams	0	0	0	Cost per mile	$2,000,000	$2,000,000	
Total	1	1	0	Total Construction Cost	$1,000,000	$1,200,000	-$200,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

I-2.4.2-19a Route Variation MTV-19a (Boxelder Creek Variation A)

MTV-19a (Figure I-2.4.2-14 and Table I-2.4.2-19a) would extend from milepost 278.2 to milepost 281.7. The variation would be about 0.31 mile longer than the 2010 proposed route segment, which is KEY-46. This variation was proposed by a landowner to avoid more of a cultivated field, buried water lines, and the proximity to their house. The variation would also avoid a vertical bank and connect back to the 2010 proposed pipeline at a gentler angle more suitable for construction.

MTV-19a and the 2010 proposed route segment would cross one perennial stream and one intermittent stream, but the variation would cross one additional USGS identified stream. Field surveys did not find any cultural resources, paleontological sites, wetlands, or noxious weed areas. Desktop data indicated that there was one greater sage-grouse lek within 4 miles of the variation and the 2010 proposed route segment. Field surveys in Harding County, South Dakota identified two additional leks within 3 miles of each of the routes.

After consideration of the potential impacts, MDEQ has selected MTV-19a because the variation would avoid an unstable valley wall and would address landowner concerns for avoiding more of a cultivated field, buried water lines, and proximity to a residence.

I-2.4.2-20 Route Variation MTV-20 (Cherry Creek Variation)

MTV-20 (Figure I-2.4.2-15 and Table I-2.4.2-20) was suggested in response to multiple landowner comments to move the proposed route farther away from a residential concentration named the Cherry Valley Estates. On the original certificate of survey for Cherry Valley Estates, the purpose of the survey was to subdivide the land into 20-acre lots for sale (Cherry Valley Estates, certificate of survey, 1977). MDEQ worked with existing area landowners to find a location that would address this concern and would better use public land. Keystone also worked with a few of the landowners in the vicinity of MTV-20 and developed KEY-13 and KEY-14 to address some of the landowner concerns about being close to residences. The variation from milepost 65.1 to milepost 72.6 would be 0.58 mile longer than the 2010 proposed route segment it would replace. MTV-20 would cross 1.71 miles more state land and 1.10 mile more BLM land, for a total of about 2.21 fewer miles of private land.

MTV-20 would cross 0.01 mile more developed land, three fewer minor roads, no water wells, and would be more than 500 feet away from two residences and one additional structure. A Class III cultural resources field survey identified one eligible cultural resource for both routes, and one potentially eligible resource and one non-eligible resource additionally for the variation. No paleontological sites were found. MTV-20 would cross 0.26 mile less wetlands, two more intermittent streams, and three additional USGS streams. During biological field surveys, one PEM wetland and one noxious weed area were identified for the 2010 proposed route, which would be avoided by the variation. Desktop data indicated that the variation would be closer to one greater sage-grouse lek, and field surveys confirmed that there was one lek within 3 miles of the variation. Desktop data indicated that both routes would also be within 2 miles of three sharp-tailed grouse leks.

Selection of MTV-20 would allow MDEQ to make the finding required by 75-20-301(1)(h),MCA which requires MDEQ to select the alternative that uses public (state and federal) lands whenever their use would be as economically practicable as the use of private lands. Although MTV-20 would increase costs by about $1,218,000, assuming an average cost per mile of $2.1 million, MDEQ selected MTV-20 rather than the 2010 proposed route to avoid the subdivision, use more public land, and it has a greater potential for local acceptance.

TABLE I-2.4.2-19a
Comparison of Montana Route Variation 19a (MTV-19a) with the Proposed Segment of the 2010 Route it Would Replace

Item	Miles of Land Crossed (except where noted) KEY-46	MTV-19a	Difference	Item	Miles of Land Crossed (except where noted) KEY-46	MTV-19a	Difference
Length	3.43	3.74	-0.31	**Slope**			
Land Cover				< 5%	2.24	2.17	+0.07
Developed	0.00	0.00	0.00	≥ 5% and ≤ 15%	1.18	1.47	-0.29
Forested/ Woodlands	0.00	0.00	0.00	> 15% and ≤ 30%	0.01	0.10	-0.09
Wetlands	0.00	0.00	0.00	> 30%	0.00	0.00	0.00
Total	0.00	0.00	0.00	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	1.99	2.80	-0.81	Residences within 25 ft	0	0	0
Irrigated Land	0.00	0.00	0.00	Residences within 500 ft	0	0	0
Hay Land	1.44	0.94	+0.50	**Structures**			
Total	3.43	3.74	-0.31	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.00	0.00	0.00	**Cultural Resources (Class III)**			
Private Land	3.43	3.74	-0.31	Cultural Findings (% Surveyed)	0 (100%)	0 (100%)	0.
U.S. Bureau of Land Management	0.00	0.00	0.00	Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
Local Government	0.00	0.00	0.00	**Grouse (desktop data)**			
ROW	0.00	0.00	0.00	Sage-grouse Core Area crossed	0	0	0
Total	3.43	3.74	-0.31	Sage-grouse Leks within 1 mile	0	0	0
Number of Road Crossings				Sage-grouse Leks within 2 miles	0	0	0
Major Roads	0	0	0	Sage-grouse Leks within 3 miles	0	0	0
Minor Roads	1	1	0	Sage-grouse Leks within 4 miles	1	1	0
Total	1	1	0	Sharp-tailed Leks within 1 mile	0	0	0
Number of Railroad Crossings	0	0	0	Sharp-tailed Leks within 2 miles	0	0	0
Number of Stream Crossings				Sharp-tailed Leks within 3 miles	0	0	0
Perennial Streams	1	1	0	Sharp-tailed Leks within 4 miles	0	0	0
Intermittent Streams	1	1	0	**Biology (survey data)**			
Additional USGS Streams	1	2	-1	Biological Resources (% Surveyed)	0 (100%)	0 (100%)	0
Total	3	4	-1	**Construction Costs**			
				Cost per mile	$2,100,000	$2,100,000	
				Total Construction Cost	$7,203,000	$7,854,000	-$651,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.2-20
Comparison of Montana Route Variation 20 (MTV-20) with the Proposed Segment of the 2010 Route it Would Replace

Item	2010 Proposed Route Segment	MTV-20	Difference	Item	2010 Proposed Route Segment	MTV-20	Difference
	Miles of Land Crossed (except where noted)				Miles of Land Crossed (except where noted)		
Length	7.49	8.07	-0.58	**Slope**			
Land Cover				< 5%	6.35	7.00	-0.65
Developed	0.11	0.12	-0.01	≥ 5% and ≤ 15%	1.10	1.02	+0.08
Forested/ Woodlands	0.00	0.00	0.00	> 15% and ≤ 30%	0.04	0.05	-0.01
Wetlands	0.35	0.09	+0.26	> 30%	0.00	0.00	0.00
Total	0.46	0.21	+0.25	**Water Wells within 100 ft**	1	0	+1
Revenue Final Land Unit Classification				**Residences**			
Range Land	3.78	4.27	-0.49	Residences within 25 ft	0	0	0
Irrigated Land	0.00	0.00	0.00	Residences within 500 ft	2	0	+2
Hay Land	3.71	3.80	-0.09	**Structures**			
Total	7.49	8.07	-0.58	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	2	1	+1
State of Montana	0.00	1.71	-1.71	**Cultural Resources (Class III)**			
Private Land	6.63	4. 42	+2.21				
U.S. Bureau of Land Management	0.84	1.94	-1.10	Cultural Findings (% Surveyed)	1 Elg. (100%)	1 Elg., 1 Pot. Elg., 1 Not Elg. (100%)	+ 1 Pot. Elg., + 1 Not Elg.
Local Government	0.00	0.00	0.00				
ROW	0.02	0.02	0.00	Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
Total	7.49	8.07	-0.58	**Grouse (desktop data)**			
Number of Road Crossings				Sage-grouse Core Area crossed	0	0	0
Major Roads	0	0	0	Sage-grouse Leks within 1 mile	0	0	0
Minor Roads	11	8	+3	Sage-grouse Leks within 2 miles	0	1	-1
Total	11	8	+3	Sage-grouse Leks within 3 miles	0	1	-1
Number of Stream Crossings				Sage-grouse Leks within 4 miles	1	1	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 1 mile	0	0	0
Intermittent Streams	5	7	-2	Sharp-tailed Leks within 2 miles	3	3	0
Additional USGS Streams	3	6	-3	Sharp-tailed Leks within 3 miles	3	3	0
Total	8	13	-5	Sharp-tailed Leks within 4 miles	3	3	0
				Biology (survey data)			
				Biological Resources (% Surveyed)	1 Wetland (PEM), 1 Noxious Weed (100%)	0 (100%)	+ 1 Wetland (PEM), +1 Noxious Weed
				Construction Costs			
				Cost per mile	$2,100,000	$2,100,000	
				Total Construction Cost	$15,729,000	$16,947,000	-$1,218,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

I-2.4.2-21 Route Variation MTV-21 (North of Missouri River Variation)

MTV-21 (Figure I-2.4.2-16 and Table I-2.4.2-21) was a landowner's request to avoid crossing irrigation ditches. The variation at milepost 88.1 would be about 0.02 mile shorter than the 2010 proposed route segment it would replace on private land. Both routes would cross irrigated land, one minor road, three USGS streams, and the 2010 proposed route would cross 0.02 mile of developed land. No cultural resources or paleontological sites were identified during field surveys. For biological resources, desktop data indicated that there were one greater sage-grouse lek and three sharp-tailed grouse leks within 4 miles of both routes. Field surveys confirmed that there were no greater sage-grouse leks within 3 miles of either route. MDEQ has selected MTV-21 over the 2010 proposed route because it would avoid the irrigation ditches and has a greater potential for local acceptance.

I-2.4.2-22 Route Variation MTV-22 (South of Missouri River Variation)

MTV-22 (Figure I-2.4.2-16 and Table I-2.4.2-22) was a MDEQ request to avoid crossing historical landslide areas and a landowner request to reach the top of the valley wall as quickly as possible while remaining as far from the Missouri River as possible. The river provides habitat for three species listed under the Endangered Species Act. The variation from milepost 89.9 to milepost 92.2 would be about 0.19 mile longer than the 2010 proposed route segment, which would include KEY-16 (see Section I-2.4.3.2.11). The variation would cross 0.37 mile more BLM land and 0.17 mile less Bureau of Reclamation land.

MTV-22 would be more than 100 feet from a water well. No cultural resources were identified during a Class III field survey. The variation could cross one additional significant paleontological site, but five fewer non-significant paleontological sites. It would not cross USGS streams, but would cross 0.11 mile less of forested/woodlands and 0.07 mile less of NLCD wetlands. Desktop data indicated that the variation would be closer to one greater sage-grouse lek, and field surveys confirmed that the variation would be located within 3 miles of one lek. Both routes would be within 4 miles of seven sharp-tailed grouse leks. No wetlands or noxious weed areas were identified during field surveys.

After consideration of MTV-22, the proposed 2010 route segment, and KEY-16, MDEQ has selected a combination of MTV-22 and the southern end of KEY-16 (see Section I-2.4.3.2.11). This will assist in minimizing the impacts from crossing a landslide area.

I-2.4.2-23 Route Variation MTV-23 (Vandalia Canal Variation)

MTV-23 (Figure I-2.4.2-17 and Table I-2.4.2-23) was proposed by MDEQ to cross the Vandalia Canal at a preferred location. The variation from milepost 84.8 to milepost 86.0 would be the same length as the 2010 proposed route segment it would replace. Both routes would be on private land, cross 0.02 mile of developed land, and one minor road. The variation would cross 0.03 mile more hay land while the 2010 proposed route segment would cross 0.03 mile more range land and one additional USGS stream. MTV-23 was selected over the 2010 proposed route to minimize impacts from the canal crossing.

TABLE I-2.4.2-21
Comparison of Montana Route Variation 21 (MTV-21) with the Proposed Segment of the 2010 Route it Would Replace

Item	Miles of Land Crossed (except where noted): 2010 Proposed Route Segment	Miles of Land Crossed (except where noted): MTV-21	Difference	Item	Miles of Land Crossed (except where noted): 2010 Proposed Route Segment	Miles of Land Crossed (except where noted): MTV-21	Difference
Length	0.54	0.52	+0.02	**Slope**			
Land Cover				< 5%	0.54	0.52	+0.02
Developed	0.02	0.00	+0.02	≥ 5% and ≤ 15%	0.00	0.00	0.00
Forested/ Woodlands	0.00	0.00	0.00	> 15% and ≤ 30%	0.00	0.00	0.00
Wetlands	0.00	0.00	0.00	> 30%	0.00	0.00	0.00
Total	0.02	0.00	+0.02	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	0.02	0.02	0.00	Residences within 25 ft	0	0	0
Irrigated Land	0.51	0.49	+0.02	Residences within 500 ft	0	0	0
Hay Land	0.01	0.01	0.00	**Structures**			
Total	0.54	0.52	+0.02	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.00	0.00	0.00	**Cultural Resources (Class III)**			
Private Land	0.54	0.52	+0.02	Cultural Findings (% Surveyed)	0 (100%)	0 (100%)	0
U.S. Bureau of Land Management	0.00	0.00	0.00	Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
Local Government	0.00	0.00	0.00	**Grouse (desktop data)**			
ROW	0.00	0.00	0.00	Sage-grouse Core Area crossed	0	0	0
Total	0.54	0.52	+0.02	Sage-grouse Leks within 1 mile	0	0	0
Number of Road Crossings				Sage-grouse Leks within 2 miles	0	0	0
Major Roads	0	0	0	Sage-grouse Leks within 3 miles	0	0	0
Minor Roads	1	1	0	Sage-grouse Leks within 4 miles	1	1	0
Total	1	1	0	Sharp-tailed Leks within 1 mile	0	0	0
Number of Railroad Crossings	0	0	0	Sharp-tailed Leks within 2 miles	0	0	0
Number of Stream Crossings				Sharp-tailed Leks within 3 miles	1	1	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 4 miles	3	3	0
Intermittent Streams	0	0	0	**Biology (survey data)**			
Additional USGS Streams	3	3	0	Biological Resources (% Surveyed)	0 (100%)	0 (100%)	0
Total	3	3	0	**Construction Costs**			
				Cost per mile	$2,100,000	$2,100,000	
				Total Construction Cost	$1,134,000	$1,092,000	+$42,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.2-22
Comparison of Montana Route Variation 22 (MTV-22) with the Proposed Segment of the 2010 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	MTV-22	Difference
Length	2.36	2.55	-0.19
Land Cover			
Developed	0.00	0.00	0.00
Forested/ Woodlands	0.15	0.04	+0.11
Wetlands	0.24	0.17	+0.07
Total	0.39	0.21	+0.18
Revenue Final Land Unit Classification			
Range Land	2.24	2.44	-0.20
Irrigated Land	0.00	0.00	0.00
Hay Land	0.12	0.11	+0.01
Total	2.36	2.55	-0.19
Land Ownership			
State of Montana	0.00	0.00	0.00
Private Land	0.00	0.00	0.00
U.S. Bureau of Land Management	1.00	1.37	-0.37
U.S. Bureau of Reclamation	1.33	1.16	+0.17
ROW	0.03	0.02	+0.01
Total	2.36	2.55	-0.19
Number of Road Crossings			
Major Roads	0	0	0
Minor Roads	3	3	0
Total	3	3	0
Number of Railroad Crossings	0	0	0
Number of Stream Crossings			
Perennial Streams	0	0	0
Intermittent Streams	0	0	0
Additional USGS Streams	1	0	+1
Total	1	0	+1

Item	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	MTV-22	Difference
Slope			
< 5%	0.25	0.15	+0.10
≥ 5% and ≤ 15%	0.92	0.95	-0.03
> 15% and ≤ 30%	0.99	1.22	-0.23
> 30%	0.20	0.23	-0.03
Water Wells within 100 ft	1	0	+1
Residences			
Residences within 25 ft	0	0	0
Residences within 500 ft	0	0	0
Structures			
Structures within 25 ft	0	0	0
Structures within 500 ft	0	0	0
Cultural Resources (Class III)			
Cultural Findings (% Surveyed)	0 (100%)	0 (100%)	0
Paleo Findings (% Surveyed)	1 Sig., 5 Not Sig. (100%)	2 Sig. (100%)	-1 Sig., +5 Not Sig.
Grouse (desktop data)			
Sage-grouse Core Area crossed	0	0	0
Sage-grouse Leks within 1 mile	0	0	0
Sage-grouse Leks within 2 miles	0	0	0
Sage-grouse Leks within 3 miles	0	1	-1
Sage-grouse Leks within 4 miles	1	1	0
Sharp-tailed Leks within 1 mile	0	0	0
Sharp-tailed Leks within 2 miles	2	3	-1
Sharp-tailed Leks within 3 miles	4	6	-2
Sharp-tailed Leks within 4 miles	7	7	0
Biology (survey data)			
Biological Resources (% Surveyed)	0 (100%)	0 (100%)	0
Construction Costs			
Cost per mile	$2,100,000	$2,100,000	
Total Construction Cost	$4,956,000	$5,355,000	-$399,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.2-23

Comparison of Montana Route Variation 23 (MTV-23) with the Proposed Segment of the 2010 Route it Would Replace

	Miles of Land Crossed (except where noted)				Miles of Land Crossed (except where noted)		
Item	**2010 Proposed Route Segment**	**MTV-23**	**Difference**	**Item**	**2010 Proposed Route Segment**	**MTV-23**	**Difference**
Length	1.19	1.19	0.00	**Slope**			
Land Cover				< 5%	0.77	0.71	+0.06
Developed	0.02	0.02	0.00	≥ 5% and ≤ 15%	0.42	0.48	-0.06
Forested/ Woodlands	0.00	0.00	0.00	> 15% and ≤ 30%	0.00	0.00	0.00
Wetlands	0.00	0.00	0.00	> 30%	0.00	0.00	0.00
Total	0.02	0.02	0.00	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	0.11	0.08	+0.03	Residences within 25 ft	0	0	0
Irrigated Land	0.00	0.00	0.00	Residences within 500 ft	0	0	0
Hay Land	1.08	1.11	-0.03	**Structures**			
Total	1.19	1.19	0.00	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.00	0.00	0.00	**Cultural Resources (Class I)**			
Private Land	1.19	1.19	0.00	Cultural Resources in 300-ft APE	0	0	0
U.S. Bureau of Land Management	0.00	0.00	0.00	Cultural Resources in TRS	11	11	0
Local Government	0.00	0.00	0.00	**Grouse (desktop data)**			
ROW	0.00	0.00	0.00	Sage-grouse Core Area crossed	0	0	0
Total	1.19	1.19	0.00	Sage-grouse Leks within 1 mile	0	0	0
Number of Road Crossings				Sage-grouse Leks within 2 miles	0	0	0
Major Roads	0	0	0	Sage-grouse Leks within 3 miles	0	0	0
Minor Roads	1	1	0	Sage-grouse Leks within 4 miles	0	0	0
Total	1	1	0	Sharp-tailed Leks within 1 mile	0	0	0
Number of Railroad Crossings	0	0	0	Sharp-tailed Leks within 2 miles	0	0	0
Number of Stream Crossings				Sharp-tailed Leks within 3 miles	0	0	0
Perennial Streams	1	1	0	Sharp-tailed Leks within 4 miles	0	0	0
Intermittent Streams	0	0	0	**Construction Costs**			
Additional USGS Streams	1	0	+1	Cost per mile	$2,100,000	$2,100,000	
Total	2	1	+1	Total Construction Cost	$2,499,000	$2,499,000	$0

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

I-2.4.2-24 Route Variation MTV-24 (Hay Creek Variation)

MTV-24 (Figure I-2.4.2-18 and Table I-2.4.2-24) was a landowner request to cross Hay Creek at a specific location and to avoid a water well near mileposts 162.2 and 162.9. Keystone had developed KEY-29 to avoid the water well, but the landowner reviewed KEY-29 and suggested developing MTV-24 instead to avoid the water well and cross Hay Creek at a specific location. The variation from milepost 161.5 to milepost 164.7 would be about 0.02 mile longer than the 2010 proposed route segment it would replace, which would be KEY-29.

MTV-24 would cross 0.01 mile less of developed land and one less minor road. A Class III cultural resources survey identified one eligible cultural resource for both the 2010 route and the variation; no paleontological sites were identified. The variation would cross 0.06 mile of forested/woodlands and five additional USGS streams. Biological surveys found one additional noxious weed area for MTV-24. Desktop data indicated that there was one sharp-tailed grouse lek within 3 miles of both routes.

Keystone has requested that MDEQ provide additional space beyond 500 feet at the Hay Creek crossing for construction. With this consideration, Keystone would replace the 2010 proposed route segment with MTV-24. MDEQ has agreed to this request and has selected MTV-24 in order to avoid the water well and will add a provision to allow additional work space beyond 500 feet at the Hay Creek crossing to help avoid disturbance to the stream.

I-2.4.2-25 Route Variation MTV-25 (North of Yellowstone River Variation)

MTV-25 (Figure I-2.4.2-19 and Table I-2.4.2-25) was a landowner request to avoid an irrigated field. The variation from milepost 193.4 to milepost 194.9 would be about 0.04 mile longer than the 2010 proposed route segment it would replace on private land. It also would cross 0.02 mile more developed land and 0.48 mile less of irrigated land.

There would be three fewer structures within 500 feet of MTV-25. A Class III field survey found that both routes would cross one non-eligible cultural resource but no paleontological sites. MTV-25 would cross 0.04 mile of wetlands, which the proposed route segment would not cross. Field surveys also found that the variation would cross one additional noxious weed area.

Keystone determined that MTV-25 would be a reasonable variation to the 2010 proposed route. MDEQ has selected MTV-25 to avoid irrigated cropland and to address landowner concerns.

I-2.4.2-26 Route Variation MTV-26 (South of Cabin Creek Variation)

MTV-26 (Figure I-2.4.2-20 and Table I-2.4.2-26) was a landowner requested variation to avoid corrals and a cut bank at a creek crossing. The variation would start on the KEY-35 (see Section I-2.4.3.2.23) realignment of the 2010 proposed route at milepost 214.4 and go to milepost 215.1. The variation would be about 0.09 mile longer than the 2010 proposed route segment it would replace and cross 0.28 mile more of BLM land.

Both routes would cross one minor road and two intermittent streams, but MTV-26 would cross within 100 feet of a water well. A Class III field survey did not find cultural resources or paleontological sites for either route. Field surveys found that the variation would cross one PEM wetland and one additional noxious weed area. Desktop data indicated that two greater sage-grouse leks were within 4 miles of both routes, and field surveys confirmed that these leks were within 3 miles of the routes.

Keystone determined that MTV-26 would be a reasonable variation to the proposed route. After consideration of MTV-26, the 2010 proposed route, and KEY-35 (see Section I-2.4.3.2.23), MDEQ has selected a combination of MTV-26 and KEY-35. MDEQ would widen the approved corridor 650 feet to the north of the selected route from the reference mileposts 214.8 to 215.5 to avoid a steep stream bank. MDEQ selected MTV-26 to avoid a water well and wooden corrals. The selected route consists of the widened portion of KEY-35 to the junction with MTV-26, then following MTV-26 to the far eastern end where it rejoins with the 2010 proposed route.

I-2.4.2-27 Route Variation MTV-27 (Pennel Creek Variation)

MTV-27 (Figure I-2.4.2-21 and Table I-2.4.2-27) was a landowner request to move the 2010 proposed route away from their house, barns, water well, spreader dikes, and irrigated cropland. The variation would run from milepost 233.0 to milepost 236.3 and would be about 0.62 mile longer than the 2010 proposed route segment it would replace on private land. Keystone has also suggested a realignment of their 2009 proposed route in this area (Key-38) that generally straightens the original proposal.

MTV-27 would generally follow steeper terrain farther away from Pennel Creek and would not be within 500 feet of three structures. A Class III field survey found one non-eligible cultural resource on the variation, and no paleontological sites were found for either route. The variation would cross 0.16 mile more wetlands and one less intermittent stream. However, field surveys did not find any wetlands or noxious weed areas for either route. Desktop data indicated that there were six greater sage-grouse leks within 4 miles of each route and one sharp-tailed grouse lek within 2 miles of each route. Field surveys found that there were four greater sage-grouse leks within 3 miles of the route segment, but that the variation had five leks within 3 miles, including one additional greater sage-grouse lek located 2.8 miles southwest of the variation on moderate sloping terrain. This sloping terrain would potentially screen the sage grouse lek from one or both alternatives. Two of the leks identified for both routes would be 2.5 miles south of MTV-27.

Keystone opposes MTV-27 and states the MFSA findings required for certification under 75-20-301 MCA or the preferred location criteria of Circular MFSA-2 would not be satisfied. The variation would not improve minimizing impacts (Circular MFSA-2 75-20-301(1) (c) MCA) due to the one additional greater sage-grouse lek found closer to MTV-27. The variation would result in estimated additional costs of about $1,302,000, assuming an average cost per mile of $2.1 million. After consideration of the impacts associated with the 2010 proposed route and KEY-38, MDEQ has selected MTV-27 to avoid crossing flood-irrigated land and to address a landowner concern.

TABLE I-2.4.2-24
Comparison of Montana Route Variation 24 (MTV-24) with the Proposed Segment of the 2010 Route it Would Replace

Item	Miles of Land Crossed (except where noted) KEY-29	MTV-24	Difference	Item	Miles of Land Crossed (except where noted) KEY-29	MTV-24	Difference
Length	3.10	3.12	-0.02	**Slope**			
Land Cover				< 5%	0.44	0.57	-0.13
Developed	0.08	0.07	+0.01	≥ 5% and ≤ 15%	1.90	2.04	-0.14
Forested/ Woodlands	0.00	0.06	-0.06	> 15% and ≤ 30%	0.73	0.43	+0.30
Wetlands	0.00	0.00	0.00	> 30%	0.03	0.08	-0.05
Total	0.08	0.13	-0.05	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	2.98	2.38	+0.60	Residences within 25 ft	0	0	0
Irrigated Land	0.00	0.00	0.00	Residences within 500 ft	0	0	0
Hay Land	0.12	0.74	-0.62	**Structures**			
Total	3.10	3.12	-0.02	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.00	0.00	0.00	**Cultural Resources (Class III)**			
Private Land	3.10	3.12	-0.02	Cultural Findings (% Surveyed)	1 Elg. (100%)	1 Elg. (96%)	0
U.S. Bureau of Land Management	0.00	0.00	0.00				
Local Government	0.00	0.00	0.00	Paleo Findings (% Surveyed)	0 (100%)	0 (96%)	0
ROW	0.00	0.00	0.00	**Grouse (desktop data)**			
Total	3.10	3.12	-0.02	Sage-grouse Core Area crossed	0	0	0
Number of Road Crossings				Sage-grouse Leks within 1 mile	0	0	0
Major Roads	0	0	0	Sage-grouse Leks within 2 miles	0	0	0
Minor Roads	5	4	+1	Sage-grouse Leks within 3 miles	0	0	0
Total	5	4	+1	Sage-grouse Leks within 4 miles	0	0	0
Number of Stream Crossings				Sharp-tailed Leks within 1 mile	0	0	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 2 miles	0	0	0
Intermittent Streams	1	1	0	Sharp-tailed Leks within 3 miles	1	1	0
Additional USGS Streams	2	7	-5	Sharp-tailed Leks within 4 miles	1	1	0
Total	3	8	-5	**Biology (survey data)**			
				Biological Resources (% Surveyed)	7 Noxious Weeds (100%)	8 Noxious Weeds (100%)	-1 Noxious Weed
				Construction Costs			
				Cost per mile	$2,100,000	$2,100,000	
				Total Construction Cost	$6,510,000	$6,552,000	-$42,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.2-25
Comparison of Montana Route Variation 25 (MTV-25) with the Proposed Segment of the 2010 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	MTV-25	Difference	Item	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	MTV-25	Difference
Length	1.50	1.54	-0.04	**Slope**			
Land Cover				< 5%	1.19	0.67	+0.52
Developed	0.02	0.04	-0.02	≥ 5% and ≤ 15%	0.26	0.86	-0.60
Forested/ Woodlands	0.00	0.00	0.00	> 15% and ≤ 30%	0.05	0.01	+0.04
Wetlands	0.00	0.04	-0.04	> 30%	0.00	0.00	0.00
Total	0.02	0.08	-0.06	**Water Wells within 100 ft**	1	1	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	1.02	1.54	-0.52	Residences within 25 ft	0	0	0
Irrigated Land	0.48	0.00	+0.48	Residences within 500 ft	0	0	0
Hay Land	0.00	0.00	0.00	**Structures**			
Total	1.50	1.54	-0.04	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	4	1	+3
State of Montana	0.00	0.00	0.00	**Cultural Resources (Class III)**			
Private Land	1.50	1.54	-0.04	Cultural Findings (% Surveyed)	1 Not Elg. (100%)	1 Not Elg. (100%)	0
U.S. Bureau of Land Management	0.00	0.00	0.00				
Local Government	0.00	0.00	0.00	Paleo Findings (% Surveyed)	0	0	0
ROW	0.00	0.00	0.00	**Grouse (desktop data)**			
Total	1.50	1.54	-0.04	Sage-grouse Core Area crossed	0	0	0
Number of Road Crossings				Sage-grouse Leks within 1 mile	0	0	0
Major Roads	0	0	0	Sage-grouse Leks within 2 miles	0	0	0
Minor Roads	1	1	0	Sage-grouse Leks within 3 miles	0	0	0
Total	1	1	0	Sage-grouse Leks within 4 miles	0	0	0
Number of Railroad Crossings	0	0	0	Sharp-tailed Leks within 1 mile	0	0	0
Number of Stream Crossings				Sharp-tailed Leks within 2 miles	0	0	0
Perennial Streams	1	1	0	Sharp-tailed Leks within 3 miles	0	0	0
Intermittent Streams	0	0	0	Sharp-tailed Leks within 4 miles	0	0	0
Additional USGS Streams	1	1	0	**Biology (survey data)**			
Total	2	2	0	Biological Resources (% Surveyed)	1 Noxious Weed (100%)	2 Noxious Weeds (100%)	- 1 Noxious Weed
				Construction Costs			
				Cost per mile	$2,100,000	$2,100,000	
				Total Construction Cost	$3,150,000	$3,234,000	-$84,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.2-26
Comparison of Montana Route Variation 26 (MTV-26) with the Proposed Segment of the 2010 Route it Would Replace

Item	Miles of Land Crossed (except where noted) KEY-35	MTV-26	Difference
Length	0.74	0.83	-0.09
Land Cover			
Developed	0.00	0.00	0.00
Forested/ Woodlands	0.00	0.00	0.00
Wetlands	0.00	0.00	0.00
Total	0.00	0.00	0.00
Revenue Final Land Unit Classification			
Range Land	0.74	0.83	-0.09
Irrigated Land	0.00	0.00	0.00
Hay Land	0.00	0.00	0.00
Total	0.74	0.83	-0.09
Land Ownership			
State of Montana	0.00	0.00	0.00
Private Land	0.22	0.03	+0.19
U.S. Bureau of Land Management	0.52	0.80	-0.28
Local Government	0.00	0.00	0.00
ROW	0.00	0.00	0.00
Total	0.74	0.83	-0.09
Number of Road Crossings			
Major Roads	0	0	0
Minor Roads	1	1	0
Total	1	1	0
Number of Railroad Crossings	0	0	0
Number of Stream Crossings			
Perennial Streams	0	0	0
Intermittent Streams	2	2	0
Additional USGS Streams	0	0	0
Total	2	2	0

Item	Miles of Land Crossed (except where noted) KEY-35	MTV-26	Difference
Slope			
< 5%	0.23	0.36	-0.13
≥ 5% and ≤ 15%	0.51	0.47	+0.04
> 15% and ≤ 30%	0.00	0.00	0.00
> 30%	0.00	0.00	0.00
Water Wells within 100 ft	0	1	-1
Residences			
Residences within 25 ft	0	0	0
Residences within 500 ft	0	0	0
Structures			
Structures within 25 ft	0	0	0
Structures within 500 ft	0	0	0
Cultural Resources (Class III)			
Cultural Findings (% Surveyed)	0 (100%)	0 (100%)	0 (100%)
Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0 (100%)
Grouse (desktop data)			
Sage-grouse Core Area crossed	0	0	0
Sage-grouse Leks within 1 mile	0	0	0
Sage-grouse Leks within 2 miles	1	1	0
Sage-grouse Leks within 3 miles	1	1	0
Sage-grouse Leks within 4 miles	2	2	0
Sharp-tailed Leks within 1 mile	1	1	0
Sharp-tailed Leks within 2 miles	2	2	0
Sharp-tailed Leks within 3 miles	3	3	0
Sharp-tailed Leks within 4 miles	3	3	0
Biology (survey data)			
Biological Resources (% Surveyed)	2 Noxious Weeds (100%)	1 Wetland (PEM), 3 Noxious Weeds (100%)	-1 Wetland (PEM), -1 Noxious Weed
Construction Costs			
Cost per mile	$2,100,000	$2,100,000	
Total Construction Cost	$1,554,000	$1,743,000	-$189,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.2-27

Comparison of Montana Route Variation 27 (MTV-27) with the Proposed Segment of the 2010 Route it Would Replace

Item	Miles of Land Crossed (except where noted)		
	2010 Proposed Route Segment	MTV-27	Difference
Length	3.34	3.96	-0.62
Land Cover			
Developed	0.00	0.00	0.00
Forested/ Woodlands	0.00	0.00	0.00
Wetlands	0.08	0.24	-0.16
Total	0.08	0.24	-0.16
Revenue Final Land Unit Classification			
Range Land	1.09	1.63	-0.54
Irrigated Land	0.14	0.00	+0.14
Hay Land	2.11	2.33	-0.22
Total	3.34	3.96	-0.62
Land Ownership			
State of Montana	0.00	0.00	0.00
Private Land	3.34	3.96	-0.62
U.S. Bureau of Land Management	0.00	0.00	0.00
Local Government	0.00	0.00	0.00
ROW	0.00	0.00	0.00
Total	3.34	3.96	-0.62
Number of Road Crossings			
Major Roads	0	0	0
Minor Roads	4	4	0
Total	4	4	0
Number of Railroad Crossings	0	0	0
Number of Stream Crossings			
Perennial Streams	0	0	0
Intermittent Streams	4	3	+1
Additional USGS Streams	1	1	0
Total	5	4	+1

Item	Miles of Land Crossed (except where noted)		
	2010 Proposed Route Segment	MTV-27	Difference
Slope			
< 5%	2.05	1.65	+0.40
≥ 5% and ≤ 15%	1.28	2.23	-0.95
> 15% and ≤ 30%	0.01	0.08	-0.07
> 30%	0.00	0.00	0.00
Water Wells within 100 ft	0	0	0
Residences			
Residences within 25 ft	0	0	0
Residences within 500 ft	0	0	0
Structures			
Structures within 25 ft	0	0	0
Structures within 500 ft	3	0	+3
Cultural Resources (Class III)			
Cultural Findings (% Surveyed)	0 (100%)	1 Not Elg. (100%)	-1 Not Elg.
Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0 (100%)
Grouse (desktop data)			
Sage-grouse Core Area crossed	0	0	0
Sage-grouse Leks within 1 mile	0	0	0
Sage-grouse Leks within 2 miles	0	0	0
Sage-grouse Leks within 3 miles	4	5	-1
Sage-grouse Leks within 4 miles	6	6	0
Sharp-tailed Leks within 1 mile	0	0	0
Sharp-tailed Leks within 2 miles	1	1	0
Sharp-tailed Leks within 3 miles	1	1	0
Sharp-tailed Leks within 4 miles	1	1	0
Biology (survey data)			
Biological Resources (% Surveyed)	0 (100%)	0 (100%)	0 (100%)
Construction Costs			
Cost per mile	$2,100,000	$2,100,000	
Total Construction Cost	$7,014,000	$8,316,000	-$1,302,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

I-2.4.2-28 Route Variation MTV-28 (Little Beaver Creek Variation)

MTV-28 (Figure I-2.4.2-22 and Table I-2.4.2-28) was proposed by MDEQ to relocate the Little Beaver Creek crossing to avoid a high vertical bank. Table I-2.4.2-28 shows no environmental differences between the variation and the 2010 proposed route segment. MDEQ has selected MTV-28 to avoid the high vertical bank.

I-2.4.2-29 Route Variation MTV-29 (Cracker Box Creek Variation)

MTV-29 (Figure I-2.4.2-23 and Table I-2.4.2-29) was proposed by a landowner to avoid trees and windbreaks and a transmission tower at milepost 192. The variation would be about 0.11 mile longer than the 2010 proposed route segment from mileposts 190.4 to 192.2. Both routes would be on private land, would cross one minor road, 0.02 mile of developed land, and would be approximately 1.8 miles east of a sharp-tailed grouse lek. The variation would cross 0.24 mile more range land while the 2010 proposed route segment would cross 0.13 mile more hay land. MDEQ has selected MTV-29 to avoid crossing wind breaks, a location near a transmission line structure, and to address a landowner concern.

I-2.4.2-30 Route Variation MTV-30 (Tributary to Frenchman Creek Variation)

MTV-30 (Figure I-2.4.2-24 and Table I-2.4.2-30) was proposed by MDEQ to avoid an unnamed intermittent tributary to Frenchman Creek and to utilize more public land. The variation would be about 0.14 mile shorter than the 2010 proposed route segment from about mileposts 19 to 22.5. The variation would cross 0.36 mile of BLM land while the 2010 proposed route segment would only cross private land. MTV-30 would avoid five minor roads but would be within 100 feet of a water well. The variation would not cross two intermittent streams and would cross two fewer USGS identified streams. Field surveys indicated that the variation would be about 0.3 mile (1.1 mile for the proposed route) east of one greater sage-grouse lek, which was not previously identified in the MFWP database or confirmed by field surveys within the past two years. Class III field surveys found that the 2010 proposed route segment APE would cross three additional potentially eligible cultural resources. Neither route would cross paleontological sites.

This variation was field reviewed by both MDEQ and Keystone in June of 2011. The variation APE would avoid crossing all but two potentially eligible cultural sites. The KEY-2 and KEY-3 realignments in this area would still cross through several cultural sites that would require testing to evaluate. MDEQ has selected MTV-30 to avoid crossing several streams and a greater number of cultural resources, and to utilize flatter terrain.

TABLE I-2.4.2-28
Comparison of Montana Route Variation 28 (MTV-28) with the Proposed Segment of the 2010 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	MTV-28	Difference
Length	0.17	0.17	0.00
Land Cover			
Developed	0.0	0.0	0.0
Forested/ Woodlands	0.0	0.0	0.0
Wetlands	0.0	0.0	0.0
Total	0.0	0.0	0.0
Revenue Final Land Unit Classification			
Range Land	0.17	0.17	0.00
Irrigated Land	0.00	0.00	0.00
Hay Land	0.00	0.00	0.00
Total	0.17	0.17	0.00
Land Ownership			
State of Montana	0.0	0.0	0.0
Private Land	0.17	0.17	0.00
U.S. Bureau of Land Management	0.0	0.0	0.0
Local Government	0.0	0.0	0.0
ROW	0.0	0.0	0.0
Total	0.17	0.17	0.00
Number of Road Crossings			
Major Roads	0	0	0
Minor Roads	0	0	0
Total	0	0	0
Number of Railroad Crossings	0	0	0
Number of Stream Crossings			
Perennial Streams	1	1	0
Intermittent Streams	0	0	0
Additional USGS Streams	0	0	0
Total	1	1	0

Item	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	MTV-28	Difference
Slope			
< 5%	0.07	0.07	0.00
≥ 5% and ≤ 15%	0.06	0.08	-0.02
> 15% and ≤ 30%	0.04	0.02	+0.02
> 30%	0.00	0.00	0.0
Water Wells within 100 ft	0	0	0
Residences			
Residences within 25 ft	0	0	0
Residences within 500 ft	0	0	0
Structures			
Structures within 25 ft	0	0	0
Structures within 500 ft	0	0	0
Cultural Resources (Class I)			
Cultural Resources in 300-ft APE	0	0	0
Cultural Resources in TRS	1	1	0
Grouse (desktop data)			
Sage-grouse Core Area crossed	0	0	0
Sage-grouse Leks within 1 mile	0	0	0
Sage-grouse Leks within 2 miles	0	0	0
Sage-grouse Leks within 3 miles	0	0	0
Sage-grouse Leks within 4 miles	1	1	0
Sharp-tailed Leks within 1 mile	0	0	0
Sharp-tailed Leks within 2 miles	0	0	0
Sharp-tailed Leks within 3 miles	0	0	0
Sharp-tailed Leks within 4 miles	0	0	0
Construction Costs			
Cost per mile	$2,100,000	$2,100,000	
Total Construction Cost	$357,000	$357,000	$0

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.2-29
Comparison of Montana Route Variation 29 (MTV-29) with the Proposed Segment of the 2010 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	MTV-29	Difference	Item	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	MTV-29	Difference
Length	1.85	1.96	-0.11	**Slope**			
Land Cover				< 5%	1.59	1.58	+0.01
Developed	0.02	0.02	0.00	≥ 5% and ≤ 15%	0.26	0.38	-0.12
Forested/ Woodlands	0.00	0.00	0.00	> 15% and ≤ 30%	0.00	0.00	0.00
Wetlands	0.00	0.00	0.00	> 30%	0.00	0.00	0.00
Total	0.02	0.02	0.00	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	0.18	0.42	-0.24	Residences within 25 ft	0	0	0
Irrigated Land	0.00	0.00	0.00	Residences within 500 ft	0	0	0
Hay Land	1.67	1.54	+0.13	**Structures**			
Total	1.85	1.96	-0.11	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.00	0.00	0.00	**Cultural Resources (Class I)**			
Private Land	1.85	1.96	-0.11	Cultural Resources in 300-ft APE	0	0	0
U.S. Bureau of Land Management	0.00	0.00	0.00	Cultural Resources in TRS	3	3	0
Local Government	0.00	0.00	0.00	**Grouse (desktop data)**			
ROW	0.00	0.00	0.00	Sage-grouse Core Area crossed	0	0	0
Total	1.85	1.96	-0.11	Sage-grouse Leks within 1 mile	0	0	0
Number of Road Crossings				Sage-grouse Leks within 2 miles	0	0	0
Major Roads	0	0	0	Sage-grouse Leks within 3 miles	0	0	0
Minor Roads	1	1	0	Sage-grouse Leks within 4 miles	0	0	0
Total	1	1	0	Sharp-tailed Leks within 1 mile	0	0	0
Number of Railroad Crossings	0	0	0	Sharp-tailed Leks within 2 miles	1	1	0
Number of Stream Crossings				Sharp-tailed Leks within 3 miles	1	1	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 4 miles	1	1	0
Intermittent Streams	0	0	0	**Construction Costs**			
Additional USGS Streams	0	0	0	Cost per mile	$2,100,000	$2,100,000	
Total	0	0	0	Total Construction Cost	$3,885,000	$4,116,000	-$231,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.2-30
Comparison of Montana Route Variation 30 (MTV-30) with the Proposed Segment of the 2010 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	MTV-30	Difference	Item	Miles of Land Crossed (except where noted) 2010 Proposed Route Segment	MTV-30	Difference
Length	3.46	3.32	+0.14	**Slope**			
Land Cover				< 5%	1.29	2.26	-0.97
Developed	0.00	0.00	0.00	≥ 5% and ≤ 15%	1.88	1.01	+0.87
Forested/ Woodlands	0.00	0.00	0.00	> 15% and ≤ 30%	0.25	0.05	+0.20
Wetlands	0.00	0.00	0.00	> 30%	0.04	0.00	+0.04
Total	0.00	0.00	0.00	**Water Wells within 100 ft**	0	1	-1
Revenue Final Land Unit Classification				**Residences**			
Range Land	3.40	3.32	+0.08	Residences within 25 ft	0	0	0
Irrigated Land	0.00	0.00	0.00	Residences within 500 ft	0	0	0
Hay Land	0.06	0.00	+0.06	**Structures**			
Total	3.46	3.32	+0.14	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.00	0.00	0.00	**Cultural Resources (Class III)**			
Private Land	3.46	2.96	+0.50	Cultural Findings (% Surveyed)	5 Pot. Elg. (100%)	2 Pot. Elg. (100%)	+3 Pot. Elg.
U.S. Bureau of Land Management	0.00	0.36	-0.36				
Local Government	0.00	0.00	0.00	Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
ROW	0.00	0.00	0.00	**Grouse (desktop data)**			
Total	3.46	3.32	+0.14	Sage-grouse Core Area crossed	0	0	0
Number of Road Crossings				Sage-grouse Leks within 1 mile	0	0	0
Major Roads	0	0	0	Sage-grouse Leks within 2 miles	0	0	0
Minor Roads	5	0	+5	Sage-grouse Leks within 3 miles	0	0	0
Total	5	0	+5	Sage-grouse Leks within 4 miles	0	0	0
Number of Railroad Crossings	0	0	0	Sharp-tailed Leks within 1 mile	0	0	0
Number of Stream Crossings				Sharp-tailed Leks within 2 miles	0	0	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 3 miles	0	0	0
Intermittent Streams	2	0	+2	Sharp-tailed Leks within 4 miles	0	0	0
Additional USGS Streams	4	2	+2	**Construction Costs**			
Total	6	2	+4	Cost per mile	$2,100,000	$2,100,000	
				Total Construction Cost	$7,266,000	$6,972,000	+$294,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

I-2.4.3 KEYSTONE REALIGNMENTS

This section describes the Keystone route changes proposed from February 15, 2009 to 2011 along the Steele City Segment in Montana. A total of 48 Keystone realignments were identified in Montana beginning at milepost 0 at the United States border and ending with a realignment crossing into South Dakota at milepost 282.6. Some realignments, specified under Section I-2.4.2, are also described for comparison as the whole or part of a 2010 proposed route segment or a Montana route variation. Keystone realignments would range in length from approximately 1,000 feet to 4 miles, and would diverge from the proposed Project route from about 40 feet to 3,350 feet.

MDEQ Circular MFSA-2, Section 2, item (13) (b) states, "(b) 'approved facility location' describes the precise location for a linear facility that is approved by the Department and accurately depicted to within 250 feet, unless otherwise specified by the Department, in the certificate on the map described in Section 3.3." For this reason, Keystone realignments described in this section have been separated into two categories, those that would diverge less than 250 feet from the 2009 proposed route and those that would diverge greater than 250 feet from the 2009 proposed route. Thus, of the total 48 Keystone realignments, 16 realignments were found to divert less than 250 feet from the 2009 proposed route and 32 realignments would divert more than 250 feet.

Keystone primarily proposed the 48 realignments to the 2009 proposed route to:

- Avoid existing facilities (e.g., compressor station, valve sites, etc.);
- Avoid cultural resources;
- Avoid steep or rough terrain to reduce disturbance or cost during construction;
- Avoid or realign a stream crossing location;
- Parallel an existing corridor; and
- Address landowner requests to avoid or move farther from a feature (e.g., residence, other types of structures, irrigation system, water well, stock pond, etc.) considered sensitive by the landowner.

I-2.4.3.1 Keystone Realignments Less than 250 Feet from the 2009 Proposed Project

Table I-2.4.3-1 provides an overview of the 16 Keystone suggested realignments that would divert less than 250 feet from the 2009 proposed Project route. Because these are minor realignments, a detailed analysis and comparison was not conducted and is not presented here. These realignments were not evaluated as part of MDEQ's preferred route but additional room would be granted (see Attachment 1, Environmental Specifications, Appendix E). However, two realignments less than 250 feet were combined with preferred route variations, including KEY-25 as part of MTV-5a (see Section I-2.4.2-5a) and KEY-34 as part of MTV-11 (see Section I-2.4.2-11).

TABLE I-2.4.3-1
Keystone Realignments Less than 250 feet from the 2009 Proposed Route

Keystone Realignment (Figure)	Reason for Realignment
KEY-5 (Figure I-2.4.3-4)	To minimize construction impacts on cultural resource site features.
KEY-7 (Figure I-2.4.3-5)	To avoid construction on side hills.
KEY-9 (Figure I-2.4.3-5)	To avoid a cultural site.

TABLE I-2.4.3-1 Keystone Realignments Less than 250 feet from the 2009 Proposed Route	
Keystone Realignment (Figure)	**Reason for Realignment**
KEY-10 (Figure I-2.4.3-6)	To minimize construction impacts on cultural resource site features.
KEY-11 (Figure I-2.4.3-6)	BLM request to avoid a tributary to Buggy Creek near milepost 55.
KEY-18 (Figure I-2.4.3-10)	To avoid construction impacts on cultural resources.
KEY-19 (Figure I-2.4.3-10)	To move farther away from a cultural resource site.
KEY-20 (Figure I-2.4.3-10)	To avoid cultural site.
KEY-22 (Figure I-2.4.3-12)	To avoid steep butte near milepost 120.35.
KEY-23 (Figure I-2.4.3-12)	To avoid water wells/tanks.
KEY-25 (Figure I-2.4.3-12)	To avoid construction impacts on East Fork Prairie Creek.
KEY-34 (Figure I-2.4.3-17)	To avoid water wells and water tanks.
KEY-38 (Figure I-2.4.3-20)	To move farther away from water wells near mileposts 235.5 and 234.6.
KEY-42 (Figure I-2.4.3-22)	To avoid gas wells.
KEY-43 (Figure I-2.4.3-23)	To avoid water wells/tanks.
KEY-44 (Figure I-2.4.3-23)	To avoid gas wells.

I-2.4.3.2 Keystone Realignments Greater than 250 Feet from the 2009 Proposed Project

This section describes the characteristics of the Keystone proposed 32 realignments in Montana that would be greater than 250 feet from the 2009 proposed route, considered as part of MDEQ's preferred route.

I-2.4.3.2.1 Keystone Realignment KEY-1 (U.S. /Canada Border Realignment)

KEY-1 (see Figure I-2.4.3-2 and Table I-2.4.3-2) was proposed to move the United States border crossing approximately 595 feet to the west, to avoid paralleling the Foothills/Northern Border Pipeline through the existing compressor station and valve site. KEY-1 would begin at the start of the Steele City Segment and extend to milepost 0.15. Table I-2.4.3-2 presents a comparison of key environmental characteristics and other data associated with KEY-1 to those of the 2009 route segment. Both routes would be located on BLM land but the realignment would be 0.04 mile longer than the 2009 proposed route. Resource impacts would be essentially the same for the 2009 proposed route segment and KEY-1. MDEQ has selected KEY-1 to avoid going through the pump station of the Northern Border Pipeline.

I-2.4.3.2.2 Keystone Realignment KEY-2 (Cottonwood Creek Realignment)

KEY-2 (see Figure I-2.4.3-3 and Table I-2.4.3-3) was proposed to avoid construction impacts to cultural resources. The realignment would be located 1,500 feet east of the 2009 proposed route segment, from mileposts 16.5 to 19.9. The realignment would be 0.5 mile shorter in length than the 2009 proposed segment, avoid state land, and cross three fewer minor roads, but it also would be within 25 feet of one structure. A Class III field survey found that it would cross one additional potentially eligible cultural resource. The realignment also would cross three additional USGS streams and would be located on steeper terrain. MDEQ selected KEY-2, combined with MTV-30 (see Section I-2.4.2-30), to better address protection of cultural resources, to use more public land, to avoid more steep terrain, and to cross fewer streams.

TABLE I-2.4.3-2
Comparison of Keystone Realignment 1 (KEY-1) with the Proposed Segment of the 2009 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-1	Difference	Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-1	Difference
Length	0.15	0.19	-0.04	**Slope**			
Land Cover				< 5%	0.15	0.19	-0.04
Developed	0.015	0.012	+0.03	≥ 5% and ≤ 15%	0.00	0.00	0.00
Forested/ Woodlands	0.00	0.00	0.00	> 15% and ≤ 30%	0.00	0.00	0.00
Wetlands	0.00	0.00	0.00	> 30%	0.00	0.00	0.00
Total	0.015	0.012	+0.03	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	0.15	0.19	-0.04	Residences within 25 ft	0	0	0
Irrigated Land	0.00	0.00	0.00	Residences within 500 ft	0	0	0
Hay Land	0.00	0.00	0.00	**Structures**			
Total	0.15	0.19	-0.04	Structures within 25 ft	1	0	+1
Land Ownership				Structures within 500 ft	2	2	0
State of Montana	0.00	0.00	0.00	**Cultural Resources (Class III)**			
Private Land	0.00	0.00	0.00	Cultural Findings (% Surveyed)	0 (100%)	0 (100%)	0
U.S. Bureau of Land Management	0.15	0.19	-0.04	Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
Local Government	0.00	0.00	0.00	**Grouse (desktop data)**			
ROW	0.00	0.00	0.00	Sage-grouse Core Area crossed	0	0	0
Total	0.15	0.19	-0.04	Sage-grouse Leks within 1 mile	0	0	0
Number of Road Crossings				Sage-grouse Leks within 2 miles	0	0	0
Major Roads	0	0	0	Sage-grouse Leks within 3 miles	0	0	0
Minor Roads	0	0	0	Sage-grouse Leks within 4 miles	0	0	0
Total	0	0	0	Sharp-tailed Leks within 1 mile	0	0	0
Number of Railroad Crossings	0	0	0	Sharp-tailed Leks within 2 miles	0	0	0
Number of Stream Crossings				Sharp-tailed Leks within 3 miles	0	0	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 4 miles	0	0	0
Intermittent Streams	0	0	0	**Construction Costs**			
Additional USGS Streams	0	0	0	Cost per mile	$2,100,000	$2,100,000	
Total	0	0	0	Total Construction Cost	$315,000	$399,000	-$84,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences

TABLE I-2.4.3-3
Comparison of Keystone Realignment 2 (KEY-2) with the Proposed Segment of the 2009 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-2	Difference
Length	3.43	3.38	+0.05
Land Cover			
Developed	0.00	0.00	0.00
Forested/ Woodlands	0.00	0.00	0.00
Wetlands	0.00	0.00	0.00
Total	0.00	0.00	0.00
Revenue Final Land Unit Classification			
Range Land	3.43	3.38	+0.05
Irrigated Land	0.00	0.00	0.00
Hay Land	0.00	0.00	0.00
Total	3.43	3.38	+0.05
Land Ownership			
State of Montana	0.40	0.00	+0.40
Private Land	3.03	3.38	-0.35
U.S. Bureau of Land Management	0.00	0.00	0.00
Local Government	0.00	0.00	0.00
ROW	0.00	0.00	0.00
Total	3.43	3.38	+0.05
Number of Road Crossings			
Major Roads	0	0	0
Minor Roads	7	4	+3
Total	7	4	+3
Number of Railroad Crossings	0	0	0
Number of Stream Crossings			
Perennial Streams	0	0	0
Intermittent Streams	0	0	0
Additional USGS Streams	4	7	-3
Total	4	7	-3

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-2	Difference
Slope			
< 5%	2.06	1.31	+0.75
≥ 5% and ≤ 15%	1.36	1.73	-0.37
> 15% and ≤ 30%	0.00	0.30	-0.30
> 30%	0.01	0.04	-0.03
Water Wells within 100 ft	0	0	0
Residences			
Residences within 25 ft	0	0	0
Residences within 500 ft	0	0	0
Structures			
Structures within 25 ft	0	1	-1
Structures within 500 ft	0	0	0
Cultural Resources (Class III)			
Cultural Findings (% Surveyed)	2 Pot. Elg. (100%)	3 Pot. Elg. (100%)	-1 Pot. Elg.
Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
Grouse (desktop data)			
Sage-grouse Core Area crossed	0	0	0
Sage-grouse Leks within 1 mile	0	0	0
Sage-grouse Leks within 2 miles	0	0	0
Sage-grouse Leks within 3 miles	0	0	0
Sage-grouse Leks within 4 miles	0	0	0
Sharp-tailed Leks within 1 mile	0	0	0
Sharp-tailed Leks within 2 miles	0	0	0
Sharp-tailed Leks within 3 miles	0	0	0
Sharp-tailed Leks within 4 miles	0	0	0
Construction Costs			
Cost per mile	$2,100,000	$2,100,000	
Total Construction Cost	$7,203,000	$7,098,000	+$105,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

I-2.4.3.2.3 Keystone Realignment KEY-3 (North of Frenchman Creek Realignment)

KEY-3 (see Figure I-2.4.3-3 and Table I-2.4.3-4) was proposed to avoid steep terrain near milepost 21.5 and cultural resources. A Class III field survey found that the proposed route would avoid six potentially eligible cultural resources found along the 2009 proposed segment. The realignment section from mileposts 21.1 to 21.7 was proposed to avoid construction across steep terrain.

KEY-3 would be about 0.1 mile shorter than the 2009 proposed segment, on private land, and cross four more minor roads and two additional USGS streams. Both routes would cross two intermittent streams. MDEQ selected KEY-3 to better address protection of cultural resources.

I-2.4.3.2.4 Keystone Realignment KEY-4 (Frenchman Creek Realignment)

KEY-4 (see Figure I-2.4.3-3 and Table I-2.4.3-5) was proposed to cross Frenchman Creek at a preferred crossing location and to avoid cultural resources. KEY-4 would parallel the Northern Border pipeline for approximately 7,000 feet. The realignment would be located 2,400 feet east of the 2009 proposed route segment from mileposts 24.8 to 27.0. Key-4 would be 0.4 mile shorter, cross two fewer minor roads, cross 0.16 mile less wetlands, and four additional USGS streams. A Class III field survey found that KEY-4 would also cross one additional potentially eligible cultural resource and one non-significant paleontological site. KEY-4 would also parallel an existing pipeline for about 1.4 miles across a relatively narrow portion of the Frenchman Creek Valley. MDEQ selected KEY-4 because it would parallel an existing pipeline and would provide a better crossing of Frenchman Creek than the 2009 proposed segment.

I-2.4.3.2.5 Keystone Realignment KEY-6 (Rock Creek Realignment)

KEY-6 (see Figure I-2.4.3-4 and Table I-2.4.3-6) was proposed to cross terrain features near Rock Creek at a preferred location suitable for construction. The realignment would be from mileposts 38.4 to 40 and about 0.18 mile longer than the 2009 proposed route segment. KEY-6 would cross 0.15 mile more state land and 0.03 mile more BLM land than the 2009 proposed route segment it would replace.

Both routes would cross range land, two minor roads, and one perennial stream, Rock Creek. The realignment would cross 0.06 mile of wetlands and one fewer USGS stream. The KEY-6 alignment would avoid a deep pool in Rock Creek by crossing the creek in a shallower area. A Class III field survey found that KEY-6 would also cross one additional potentially eligible cultural resource, but avoid one non-eligible cultural resource. Field surveys also found that the 2009 proposed route would cross one significant and one non-significant paleontological site, whereas KEY-6 would avoid them. MDEQ selected KEY-6 because it would cross less steep terrain and use more public land than the 2009 proposed route segment.

TABLE I-2.4.3-4
Comparison of Keystone Realignment 3 (KEY-3) with the Proposed Segment of the 2009 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-3	Difference
Length	2.90	2.89	+0.01
Land Cover			
Developed	0.00	0.00	0.00
Forested/ Woodlands	0.00	0.00	0.00
Wetlands	0.00	0.00	0.00
Total	0.00	0.00	0.00
Revenue Final Land Unit Classification			
Range Land	2.90	2.89	+0.01
Irrigated Land	0.00	0.00	0.00
Hay Land	0.00	0.00	0.00
Total	2.90	2.89	+0.01
Land Ownership			
State of Montana	0.00	0.00	0.00
Private Land	2.90	2.89	+0.01
U.S. Bureau of Land Management	0.00	0.00	0.00
Local Government	0.00	0.00	0.00
ROW	0.00	0.00	0.00
Total	2.90	2.89	+0.01
Number of Road Crossings			
Major Roads	0	0	0
Minor Roads	2	6	-4
Total	2	6	-4
Number of Railroad Crossings	0	0	0
Number of Stream Crossings			
Perennial Streams	0	0	0
Intermittent Streams	2	2	0
Additional USGS Streams	4	6	-2
Total	6	8	-2

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-3	Difference
Slope			
< 5%	1.19	1.66	-0.47
≥ 5% and ≤ 15%	1.61	1.10	+0.51
> 15% and ≤ 30%	0.10	0.13	-0.03
> 30%	0.00	0.00	0.00
Water Wells within 100 ft	0	0	0
Residences			
Residences within 25 ft	0	0	0
Residences within 500 ft	0	0	0
Structures			
Structures within 25 ft	0	0	0
Structures within 500 ft	0	0	0
Cultural Resources (Class III)			
Cultural Findings (% Surveyed)	13 Pot. Elg. (100%)	7 Pot. Elg. (100%)	+6 Pot. Elg.
Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
Grouse (desktop data)			
Sage-grouse Core Area crossed	0	0	0
Sage-grouse Leks within 1 mile	0	0	0
Sage-grouse Leks within 2 miles	0	0	0
Sage-grouse Leks within 3 miles	0	0	0
Sage-grouse Leks within 4 miles	0	0	0
Sharp-tailed Leks within 1 mile	0	0	0
Sharp-tailed Leks within 2 miles	0	0	0
Sharp-tailed Leks within 3 miles	0	0	0
Sharp-tailed Leks within 4 miles	0	0	0
Construction Costs			
Cost per mile	$2,100,000	$2,100,000	
Total Construction Cost	$6,090,000	$6,069,000	+$21,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.3-5
Comparison of Keystone Realignment 4 (KEY-4) with the Proposed Segment of the 2009 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-4	Difference
Length	2.16	2.12	+0.04
Land Cover			
Developed	0.00	0.00	0.00
Forested/ Woodlands	0.00	0.00	0.00
Wetlands	0.50	0.34	+0.16
Total	0.50	0.34	+0.16
Revenue Final Land Unit Classification			
Range Land	1.32	1.34	-0.02
Irrigated Land	0.00	0.00	0.00
Hay Land	0.84	0.78	+0.06
Total	2.16	2.12	+0.04
Land Ownership			
State of Montana	0.56	0.25	+0.31
Private Land	1.55	1.48	+0.07
U.S. Bureau of Land Management	0.05	0.14	-0.09
Local Government	0.00	0.25	-0.25
ROW	0.00	0.00	0.00
Total	2.16	2.12	+0.04
Number of Road Crossings			
Major Roads	0	0	0
Minor Roads	6	4	+2
Total	6	4	+2
Number of Railroad Crossings	0	0	0
Number of Stream Crossings			
Perennial Streams	1	1	0
Intermittent Streams	0	0	0
Additional USGS Streams	0	4	-4
Total	1	5	-4

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-4	Difference
Slope			
< 5%	1.60	1.48	+0.12
≥ 5% and ≤ 15%	0.25	0.32	-0.07
> 15% and ≤ 30%	0.17	0.22	-0.05
> 30%	0.14	0.10	+0.04
Water Wells within 100 ft	0	0	0
Residences			
Residences within 25 ft	0	0	0
Residences within 500 ft	0	0	0
Structures			
Structures within 25 ft	0	0	0
Structures within 500 ft	0	0	0
Cultural Resources (Class III)			
Cultural Findings (% Surveyed)	1 Pot. Elg. (100%)	2 Pot. Elg. (100%)	-1 Pot. Elg.
Paleo Findings (% Surveyed)	0 (100%)	1 Not Sig. (100%)	-1 Not Sig.
Grouse (desktop data)			
Sage-grouse Core Area crossed	0	0	0
Sage-grouse Leks within 1 mile	0	0	0
Sage-grouse Leks within 2 miles	0	0	0
Sage-grouse Leks within 3 miles	0	0	0
Sage-grouse Leks within 4 miles	0	0	0
Sharp-tailed Leks within 1 mile	0	0	0
Sharp-tailed Leks within 2 miles	0	0	0
Sharp-tailed Leks within 3 miles	0	0	0
Sharp-tailed Leks within 4 miles	0	0	0
Construction Costs			
Cost per mile	$2,100,000	$2,100,000	
Total Construction Cost	$4,536,000	$4,452,000	+$84,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.3-6
Comparison of Keystone Realignment 6 (KEY-6) with the Proposed Segment of the 2009 Route it Would Replace

Item	Miles of Land Crossed (except where noted)		Difference
	2009 Proposed Route Segment	KEY-6	
Length	1.60	1.78	-0.18
Land Cover			
Developed	0.00	0.00	0.00
Forested/ Woodlands	0.00	0.00	0.00
Wetlands	0.00	0.06	-0.06
Total	0.00	0.06	-0.06
Revenue Final Land Unit Classification			
Range Land	1.60	1.78	-0.18
Irrigated Land	0.00	0.00	0.00
Hay Land	0.00	0.00	0.00
Total	1.60	1.78	-0.18
Land Ownership			
State of Montana	0.93	1.08	-0.15
Private Land	0.14	0.14	0.00
U.S. Bureau of Land Management	0.53	0.56	-0.03
Local Government	0.00	0.00	0.00
ROW	0.00	0.00	0.00
Total	1.60	1.78	-0.18
Number of Road Crossings			
Major Roads	0	0	0
Minor Roads	2	2	0
Total	2	2	0
Number of Railroad Crossings	0	0	0
Number of Stream Crossings			
Perennial Streams	1	1	0
Intermittent Streams	0	0	0
Additional USGS Streams	2	1	+1
Total	3	2	+1

Item	Miles of Land Crossed (except where noted)		Difference
	2009 Proposed Route Segment	KEY-6	
Slope			
< 5%	0.58	0.76	-0.18
≥ 5% and ≤ 15%	0.64	0.54	+0.10
> 15% and ≤ 30%	0.20	0.38	-0.18
> 30%	0.18	0.10	+0.08
Water Wells within 100 ft	0	0	0
Residences			
Residences within 25 ft	0	0	0
Residences within 500 ft	0	0	0
Structures			
Structures within 25 ft	0	0	0
Structures within 500 ft	0	0	0
Cultural Resources (Class III)			
Cultural Findings (% Surveyed)	1 Pot. Elg., 1 Not Elg. (100%)	2 Pot. Elg. (100%)	-1 Pot. Elg., +1 Not Elg.
Paleo Findings (% Surveyed)	1 Sig., 1 Not Sig. (100%)	0 (100%)	+1 Sig., +1 Not Sig.
Grouse (desktop data)			
Sage-grouse Core Area crossed	0	0	0
Sage-grouse Leks within 1 mile	0	0	0
Sage-grouse Leks within 2 miles	0	0	0
Sage-grouse Leks within 3 miles	0	0	0
Sage-grouse Leks within 4 miles	0	0	0
Sharp-tailed Leks within 1 mile	0	0	0
Sharp-tailed Leks within 2 miles	0	0	0
Sharp-tailed Leks within 3 miles	0	0	0
Sharp-tailed Leks within 4 miles	0	0	0
Construction Costs			
Cost per mile	$2,100,000	$2,100,000	
Total Construction Cost	$3,360,000	$3,738,000	-$378,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of difference.

I-2.4.3.2.6 Keystone Realignment KEY-8 (Lime Creek Realignment)

KEY-8 (see Figure I-2.4.3-5 and Table I-2.4.3-7) was proposed to cross Lime Creek at a preferred crossing location and minimize construction impacts to cultural resources. The realignment would be located 840 feet east of the 2009 proposed route segment and would be 0.02 mile longer in length. KEY-8 would cross more local government land than the 2009 proposed route and the same amount of state land.

Field surveys found that the realignment would avoid one potentially eligible and one non-eligible cultural resources, and also would cross a non-significant paleontological site. The 2009 proposed route segment would cross a wetland at approximately milepost 45, which would be avoided by the realignment. Both routes would cross four USGS streams. Desktop data indicated that the realignment would cross 0.13 mile more of core greater sage-grouse area, and that both routes would be within 3 miles of one greater sage-grouse lek. Field surveys verified that greater sage-grouse lek, which would be located more than 2 miles from both routes, much of which would not be visible due to topography. Three sharp-tailed grouse leks would be within 4 miles of both alignments, the closest being about 0.75 mile away. MDEQ selected KEY-8 because it would avoid cultural resource sites and minimize impacts to Lime Creek.

I-2.4.3.2.7 Keystone Realignment KEY-12 (North of Cherry Creek Realignment)

KEY-12 (see Figure I-2.4.3-6 and Table I-2.4.3-8) was proposed to minimize impacts to cultural resources. The realignment would be the same length as the 2009 proposed route segment it would replace but would divert west for 300 feet, from milepost 62.8 to milepost 64.2. Both routes would cross 0.74 mile of BLM land, one minor road, and one USGS stream. A Class III field survey found that the realignment would avoid one additional potentially eligible cultural resource. Desktop data indicated that the realignment would cross 0.02 mile more core greater sage-grouse area, and that both routes would be within 4 miles of six sharp-tailed grouse leks, but KEY-12 would move the centerline about 20 yards away from the closest of these (less than 0.1 mile away from both alignments). MDEQ selected KEY-12 because it would avoid cultural resource sites.

I-2.4.3.2.8 Keystone Realignment KEY-13 (Cherry Creek Realignment)

KEY-13 (see Figure I-2.4.3-7 and Table I-2.4.3-9) was proposed to accommodate a landowner’s request to avoid wetlands, a natural spring, and highly alkali soils that have a poor soil structure and low infiltration capacity. The realignment from mileposts 64.9 to 68.2 would be 0.02 mile shorter than the 2009 proposed route segment it would replace and would cross 0.17 mile fewer of BLM land. The realignment would cross one more minor road and have three fewer structures within 500 feet. Field surveys found one potentially eligible cultural resource but no paleontological sites along the realignment. KEY-13 would cross 0.02 mile more wetlands, one more intermittent stream, and two fewer USGS streams. The proposed route and the realignment would be within 4 miles of one greater sage-grouse lek, but not visible from the lek, and within 2 miles of three sharp-tailed grouse leks. MDEQ did not select KEY-13 (see MTV-20 in Section I-2.4.2-20).

TABLE I-2.4.3-7
Comparison of Keystone Realignment 8 (KEY-8) with the Proposed Segment of the 2009 Route it Would Replace

Item	Miles of Land Crossed (except where noted)		
	2009 Proposed Route Segment	KEY-8	Difference
Length	2.89	2.91	-0.02
Land Cover			
Developed	0.00	0.00	0.00
Forested/ Woodlands	0.00	0.00	0.00
Wetlands	0.03	0.00	+0.03
Total	0.03	0.00	+0.03
Revenue Final Land Unit Classification			
Range Land	2.56	2.61	-0.05
Irrigated Land	0.00	0.00	0.00
Hay Land	0.33	0.30	+0.03
Total	2.89	2.91	-0.02
Land Ownership			
State of Montana	1.34	1.34	0.00
Private Land	1.30	1.29	+0.01
U.S. Bureau of Land Management	0.00	0.00	0.00
Local Government	0.25	0.28	-0.03
ROW	0.00	0.00	0.00
Total	2.89	2.91	-0.02
Number of Road Crossings			
Major Roads	0	0	0
Minor Roads	2	2	0
Total	2	2	0
Number of Railroad Crossing	0	0	0
Number of Stream Crossings			
Perennial Streams	0	0	0
Intermittent Streams	2	2	0
Additional USGS Streams	4	4	0
Total	6	6	0

Item	Miles of Land Crossed (except where noted)		
	2009 Proposed Route Segment	KEY-8	Difference
Slope			
< 5%	1.78	1.50	+0.28
≥ 5% and ≤ 15%	1.02	1.33	-0.31
> 15% and ≤ 30%	0.09	0.08	+0.01
> 30%	0.00	0.00	0.00
Water Wells within 100 ft	0	0	0
Residences			
Residences within 25 ft	0	0	0
Residences within 500 ft	0	0	0
Structures			
Structures within 25 ft	0	0	0
Structures within 500 ft	0	0	0
Cultural Resources (Class III)			
Cultural Findings (% Surveyed)	1 Pot. Elg., 1 Not Elg. (100%)	0 (100%)	+1 Pot. Elg., +1 Not Elg.
Paleo Findings (% Surveyed)	0 (100%)	1 Not Sig. (100%)	-1 Not Sig.
Grouse (desktop data)			
Sage-grouse Core Area crossed	2.34	2.47	-0.13
Sage-grouse Leks within 1 mile	0	0	0
Sage-grouse Leks within 2 miles	0	0	0
Sage-grouse Leks within 3 miles	1	1	0
Sage-grouse Leks within 4 miles	1	1	0
Sharp-tailed Leks within 1 mile	1	1	0
Sharp-tailed Leks within 2 miles	1	1	0
Sharp-tailed Leks within 3 miles	2	2	0
Sharp-tailed Leks within 4 miles	3	3	0
Construction Costs			
Cost per mile	$2,100,000	$2,100,000	
Total Construction Cost	$6,069,000	$6,111,000	-$42,000
Environmental Mitigation Cost	$18,720	$19,760	-$1,040

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.3-8
Comparison of Keystone Realignment 12 (KEY-12) with the Proposed Segment of the 2009 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-12	Difference
Length	1.45	1.45	0.00
Land Cover			
Developed	0.00	0.00	0.00
Forested/ Woodlands	0.00	0.00	0.00
Wetlands	0.00	0.00	0.00
Total	0.00	0.00	0.00
Revenue Final Land Unit Classification			
Range Land	1.45	1.45	0.00
Irrigated Land	0.00	0.00	0.00
Hay Land	0.00	0.00	0.00
Total	0.00	0.00	0.00
Land Ownership			
State of Montana	0.00	0.00	0.00
Private Land	0.70	0.70	0.00
U.S. Bureau of Land Management	0.74	0.74	0.00
Local Government	0.00	0.00	0.00
ROW	0.00	0.00	0.00
Total	1.45	1.45	0.00
Number of Road Crossings			
Major Roads	0	0	0
Minor Roads	1	1	0
Total	1	1	0
Number of Railroad Crossings	0	0	0
Number of Stream Crossings			
Perennial Streams	0	0	0
Intermittent Streams	0	0	0
Additional USGS Streams	1	1	0
Total	1	1	0

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-12	Difference
Slope			
< 5%	1.26	1.15	+0.11
≥ 5% and ≤ 15%	0.19	0.30	-0.11
> 15% and ≤ 30%	0.00	0.00	0.00
> 30%	0.00	0.00	0.00
Water Wells within 100 ft	0	0	0
Residences			
Residences within 25 ft	0	0	0
Residences within 500 ft	0	0	0
Structures			
Structures within 25 ft	0	0	0
Structures within 500 ft	0	0	0
Cultural Resources (Class III)			
Cultural Findings (% Surveyed)	1 Elg., 2 Pot. Elg. (100%)	1 Elg., 1 Pot. Elg. (100%)	+1 Pot. Elg.
Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
Grouse (desktop data)			
Sage-grouse Core Area crossed	1.07	1.09	-0.02
Sage-grouse Leks within 1 mile	0	0	0
Sage-grouse Leks within 2 miles	0	0	0
Sage-grouse Leks within 3 miles	0	0	0
Sage-grouse Leks within 4 miles	0	0	0
Sharp-tailed Leks within 1 mile	1	1	0
Sharp-tailed Leks within 2 miles	3	3	0
Sharp-tailed Leks within 3 miles	3	3	0
Sharp-tailed Leks within 4 miles	6	6	0
Construction Costs			
Cost per mile	$2,100,000	$2,100,000	
Total Construction Cost	$3,045,000	$3,045,000	$0
Environmental Mitigation Cost	$8,560	$8,720	-$160

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.3-9
Comparison of Keystone Realignment 13 (KEY-13) with the Proposed Segment of the 2009 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-13	Difference	Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-13	Difference
Length	3.30	3.28	+0.02	**Slope**			
Land Cover				< 5%	2.63	2.87	-0.24
Developed	0.00	0.00	0.00	≥ 5% and ≤ 15%	0.61	0.38	+0.23
Forested/ Woodlands	0.00	0.00	0.00	> 15% and ≤ 30%	0.06	0.03	+0.03
Wetlands	0.04	0.06	-0.02	> 30%	0.00	0.00	0.00
Total	0.04	0.06	-0.02	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	1.84	1.69	+0.15	Residences within 25 ft	0	0	0
Irrigated Land	0.00	0.00	0.00	Residences within 500 ft	0	0	0
Hay Land	1.46	1.59	-0.13	**Structures**			
Total	3.30	3.28	+0.02	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	4	1	+3
State of Montana	0.00	0.00	0.00	**Cultural Resources (Class III)**			
Private Land	2.29	2.44	-0.15	Cultural Findings (% Surveyed)	0 (100%)	1 Pot. Elg. (100%)	-1 Pot. Elg.
U.S. Bureau of Land Management	1.01	0.84	+0.17				
Local Government	0.00	0.00	0.00	Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
ROW	0.00	0.00	0.00	**Grouse (desktop data)**			
Total	3.30	3.28	+0.02	Sage-grouse Core Area crossed	0	0	0
Number of Road Crossings				Sage-grouse Leks within 1 mile	0	0	0
Major Roads	0	0	0	Sage-grouse Leks within 2 miles	0	0	0
Minor Roads	4	5	-1	Sage-grouse Leks within 3 miles	0	0	0
Total	4	5	-1	Sage-grouse Leks within 4 miles	1	1	0
Number of Railroad Crossings	0	0	0	Sharp-tailed Leks within 1 mile	1	1	0
Number of Stream Crossings				Sharp-tailed Leks within 2 miles	3	3	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 3 miles	3	3	0
Intermittent Streams	1	2	-1	Sharp-tailed Leks within 4 miles	3	3	0
Additional USGS Streams	2	0	+2	**Construction Costs**			
Total	3	2	+1	Cost per mile	$2,100,000	$2,100,000	
				Total Construction Cost	$6,930,000	$6,888,000	+$42,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

I-2.4.3.2.9 Keystone Realignment KEY-14 (East Cherry Creek Realignment)

KEY-14 (see Figure I-2.4.3-7 and Table I-2.4.3-10) was a landowner's request to avoid springs and wetlands. The realignment from mileposts 69.1 to 70.8 would be 0.01 mile longer than the 2009 proposed route segment it would replace on private land. Both KEY-14 and the 2009 proposed route segment would cross 0.04 mile of developed land, two minor roads, and be within 500 feet of one residence. The realignment would avoid being within 500 of two structures but would be within 100 feet one water well. Field surveys found one eligible cultural resource along both routes but no paleontological sites. Also, both routes would cross 0.18 mile of wetlands, two intermittent streams and one USGS stream, and desktop data indicated that they would be within 3 miles of one unconfirmed greater sage-grouse lek. MDEQ did not select KEY-14 (see MTV-20 in Section I-2.4.2-20).

I-2.4.3.2.10 Keystone Realignment KEY-15 (North of Missouri River Realignment)

KEY-15 (see Figure I-2.4.3-8 and Table I-2.4.3-11) was proposed to avoid two additional potentially eligible cultural resources. The realignment from mileposts 77.0 to 78.9 would be 0.03 mile longer than the 2009 proposed route segment it would replace. The realignment would cross 0.18 mile more state land and 0.15 mile less private land. KEY-15 would cross 0.02 mile less developed land and would be within 500 feet of four additional structures. Both routes would cross two minor roads, one intermittent stream, and one USGS stream. MDEQ selected KEY-15 because it would avoid crossing two potentially eligible cultural resources and would cross more public land.

I-2.4.3.2.11 Keystone Realignment KEY-16 (South of Missouri River Realignment)

KEY-16 (see Figure I-2.4.3-9 and Table I-2.4.3-12) would avoid construction along a steep side hill near milepost 91.6. The realignment from mileposts 90.8 to 93.0 would be about 0.05 mile longer than the 2009 proposed route segment it would replace. The realignment would cross 0.07 mile more BLM land, 0.02 mile less private land, and one fewer USGS stream. KEY-16 and the 2009 proposed route segment would cross range land and two minor roads. Field surveys did not find any cultural resources for either route but did find one non-significant paleontological site. Both routes also would cross 0.02 mile of forested/woodlands. Desktop data indicated that both routes would be within 4 miles of one greater sage-grouse lek, which would be out of view from the pipeline, and eight sharp-tailed grouse leks. All the sharp-tailed grouse leks would be more than a mile from the pipeline, and most would be screened from view of the pipeline by topography. MDEQ selected the southern 1.1 miles of KEY-16, together with MTV-22. While KEY-16 along its entire length would cross more of a landslide area south of the Missouri River, the selected portion of KEY-16 together with MTV-22 would cross the landslide area more directly (see Section I-2.4.2-22).

I-2.4.3.2.12 Keystone Realignment KEY-17 (West Fork Lost Creek Realignment)

KEY-17 (see Figure I-2.4.3-9 and Table I-2.4.3-13) was proposed to avoid a cultural resource. The realignment would be located 300 feet east of the 2009 proposed route segment. The 2009 proposed route segment would be within 100 feet of one water well. Both routes would be the same length on BLM land and cross one minor road, one intermittent stream, and one USGS stream. Desktop data indicated that both routes would be within 4 miles of two unconfirmed greater sage-grouse leks, which would be obscured by topography, and eight sharp-tailed grouse leks. Field surveys found one unevaluated cultural resource on both routes but no paleontological sites. MDEQ selected KEY-17 because it farther avoids the unevaluated cultural site.

TABLE I-2.4.3-10
Comparison of Keystone Realignment 14 (KEY-14) with the Proposed Segment of the 2009 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-14	Difference
Length	1.72	1.73	-0.01
Land Cover			
Developed	0.04	0.04	0.00
Forested/ Woodlands	0.00	0.00	0.00
Wetlands	0.18	0.18	0.00
Total	0.22	0.22	0.00
Revenue Final Land Unit Classification			
Range Land	1.42	1.46	-0.04
Irrigated Land	0.00	0.00	0.00
Hay Land	0.30	0.27	+0.03
Total	1.72	1.73	-0.01
Land Ownership			
State of Montana	0.00	0.00	0.00
Private Land	1.70	1.71	-0.01
U.S. Bureau of Land Management	0.00	0.00	0.00
Local Government	0.00	0.00	0.00
ROW	0.02	0.02	0.00
Total	1.72	1.73	-0.01
Number of Road Crossings			
Major Roads	0	0	0
Minor Roads	2	2	0
Total	2	2	0
Number of Railroad Crossings	1	1	0
Number of Stream Crossings			
Perennial Streams	0	0	0
Intermittent Streams	2	2	0
Additional USGS Streams	1	1	0
Total	3	3	0

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-14	Difference
Slope			
< 5%	1.29	1.34	-0.05
≥ 5% and ≤ 15%	0.42	0.38	+0.04
> 15% and ≤ 30%	0.01	0.01	0.00
> 30%	0.00	0.00	0.00
Water Wells within 100 ft	0	1	-1
Residences			
Residences within 25 ft	0	0	0
Residences within 500 ft	1	1	0
Structures			
Structures within 25 ft	0	0	0
Structures within 500 ft	2	0	+2
Cultural Resources (Class III)			
Cultural Findings (% Surveyed)	1 Elg. (100%)	1 Elg. (100%)	0
Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
Grouse (desktop data)			
Sage-grouse Core Area crossed	0	0	0
Sage-grouse Leks within 1 mile	0	0	0
Sage-grouse Leks within 2 miles	0	0	0
Sage-grouse Leks within 3 miles	1	1	0
Sage-grouse Leks within 4 miles	1	1	0
Sharp-tailed Leks within 1 mile	0	0	0
Sharp-tailed Leks within 2 miles	0	0	0
Sharp-tailed Leks within 3 miles	0	0	0
Sharp-tailed Leks within 4 miles	0	0	0
Construction Costs			
Cost per mile	$2,100,000	$2,100,000	
Total Construction Cost	$3,612,000	$3,633,000	-$21,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.3-11
Comparison of Keystone Realignment 15 (KEY-15) with the Proposed Segment of the 2009 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-15	Difference
Length	1.93	1.96	-0.03
Land Cover			
Developed	0.06	0.04	+0.02
Forested/ Woodlands	0.00	0.00	0.00
Wetlands	0.00	0.00	0.00
Total	0.06	0.04	+0.02
Revenue Final Land Unit Classification			
Range Land	1.42	1.46	-0.04
Irrigated Land	0.00	0.00	0.00
Hay Land	0.30	0.27	+0.03
Total	1.93	1.96	-0.03
Land Ownership			
State of Montana	0.78	0.96	-0.18
Private Land	1.15	1.00	+0.15
U.S. Bureau of Land Management	0.00	0.00	0.00
Local Government	0.00	0.00	0.00
ROW	0.00	0.00	0.00
Total	1.93	1.96	-0.03
Number of Road Crossings			
Major Roads	0	0	0
Minor Roads	2	2	0
Total	2	2	0
Number of Railroad Crossings	0	0	0
Number of Stream Crossings			
Perennial Streams	0	0	0
Intermittent Streams	1	1	0
Additional USGS Streams	1	1	0
Total	2	2	0

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-15	Difference
Slope			
< 5%	1.48	1.36	+0.12
≥ 5% and ≤ 15%	0.31	0.36	-0.05
> 15% and ≤ 30%	0.13	0.18	-0.05
> 30%	0.01	0.06	-0.05
Water Wells within 100 ft	0	0	0
Residences			
Residences within 25 ft	0	0	0
Residences within 500 ft	0	0	0
Structures			
Structures within 25 ft	0	0	0
Structures within 500 ft	1	5	-4
Cultural Resources (Class III)			
Cultural Findings (% Surveyed)	3 Pot. Elg. (100%)	1 Pot. Elg. (100%)	+2 Pot. Elg.
Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
Grouse (desktop data)			
Sage-grouse Core Area crossed	0	0	0
Sage-grouse Leks within 1 mile	0	0	0
Sage-grouse Leks within 2 miles	0	0	0
Sage-grouse Leks within 3 miles	0	0	0
Sage-grouse Leks within 4 miles	0	0	0
Sharp-tailed Leks within 1 mile	0	0	0
Sharp-tailed Leks within 2 miles	0	0	0
Sharp-tailed Leks within 3 miles	0	0	0
Sharp-tailed Leks within 4 miles	0	0	0
Construction Costs			
Cost per mile	$2,100,000	$2,100,000	
Total Construction Cost	$4,053,000	$4,116,000	-$63,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4-3.12
Comparison of Keystone Realignment 16 (KEY-16) with the Proposed Segment of the 2009 Route it Would Replace

Item	Miles of Land Crossed (except where noted): 2009 Proposed Route Segment	Miles of Land Crossed (except where noted): KEY-16	Difference
Length	2.24	2.29	-0.05
Land Cover			
Developed	0.00	0.00	0.00
Forested/ Woodlands	0.02	0.02	0.00
Wetlands	0.00	0.00	0.00
Total	0.02	0.02	0.00
Revenue Final Land Unit Classification			
Range Land	2.24	2.29	-0.05
Irrigated Land	0.00	0.00	0.00
Hay Land	0.00	0.00	0.00
Total	2.24	2.29	-0.05
Land Ownership			
State of Montana	0.00	0.00	0.00
Private Land	0.77	0.75	+0.02
U.S. Bureau of Land Management	1.47	1.54	-0.07
Local Government	0.00	0.00	0.00
ROW	0.00	0.00	0.00
Total	2.24	2.29	-0.05
Number of Road Crossings			
Major Roads	0	0	0
Minor Roads	2	2	0
Total	2	2	0
Number of Railroad Crossings	0	0	0
Number of Stream Crossings			
Perennial Streams	0	0	0
Intermittent Streams	0	0	0
Additional USGS Streams	2	1	+1
Total	2	1	+1

Item	Miles of Land Crossed (except where noted): 2009 Proposed Route Segment	Miles of Land Crossed (except where noted): KEY-16	Difference
Slope			
< 5%	0.18	0.18	0.00
≥ 5% and ≤ 15%	1.14	1.25	-0.11
> 15% and ≤ 30%	0.69	0.71	-0.02
> 30%	0.23	0.15	+0.08
Water Wells within 100 ft	0	0	0
Residences			
Residences within 25 ft	0	0	0
Residences within 500 ft	0	0	0
Structures			
Structures within 25 ft	0	0	0
Structures within 500 ft	0	0	0
Cultural Resources (Class III)			
Cultural Findings (% Surveyed)	0 (100%)	0 (100%)	0
Paleo Findings (% Surveyed)	1 Not Sig. (100%)	1 Not Sig. (100%)	0
Grouse (desktop data)			
Sage-grouse Core Area crossed	0	0	0
Sage-grouse Leks within 1 mile	0	0	0
Sage-grouse Leks within 2 miles	0	0	0
Sage-grouse Leks within 3 miles	0	0	0
Sage-grouse Leks within 4 miles	1	1	0
Sharp-tailed Leks within 1 mile	0	0	0
Sharp-tailed Leks within 2 miles	3	3	0
Sharp-tailed Leks within 3 miles	5	5	0
Sharp-tailed Leks within 4 miles	8	8	0
Construction Costs			
Cost per mile	$2,100,000	$2,100,000	
Total Construction Cost	$4,704,000	$4,809,000	-$105,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.3-13
Comparison of Keystone Realignment 17 (KEY-17) with the Proposed Segment of the 2009 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-17	Difference
Length	0.81	0.81	0.00
Land Cover			
Developed	0.00	0.00	0.00
Forested/ Woodlands	0.00	0.00	0.00
Wetlands	0.00	0.00	0.00
Total	0.00	0.00	0.00
Revenue Final Land Unit Classification			
Range Land	0.81	0.81	0.00
Irrigated Land	0.00	0.00	0.00
Hay Land	0.00	0.00	0.00
Total	0.81	0.81	0.00
Land Ownership			
State of Montana	0.00	0.00	0.00
Private Land	0.00	0.00	0.00
U.S. Bureau of Land Management	0.81	0.81	0.00
Local Government	0.00	0.00	0.00
ROW	0.00	0.00	0.00
Total	0.81	0.81	0.00
Number of Road Crossings			
Major Roads	0	0	0
Minor Roads	1	1	0
Total	1	1	0
Number of Railroad Crossings	0	0	0
Number of Stream Crossings			
Perennial Streams	0	0	0
Intermittent Streams	1	1	0
Additional USGS Streams	1	1	0
Total	2	2	0

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-17	Difference
Slope			
< 5%	0.02	0.00	+0.02
≥ 5% and ≤ 15%	0.34	0.38	-0.04
> 15% and ≤ 30%	0.40	0.42	-0.02
> 30%	0.05	0.01	+0.04
Water Wells within 100 ft	1	0	+1
Residences			
Residences within 25 ft	0	0	0
Residences within 500 ft	0	0	0
Structures			
Structures within 25 ft	0	0	0
Structures within 500 ft	0	0	0
Cultural Resources (Class III)			
Cultural Findings (% Surveyed)	1 Pot. Elg. (100%)	1 Pot. Elg. (100%)	0
Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
Grouse (desktop data)			
Sage-grouse Core Area crossed	0	0	0
Sage-grouse Leks within 1 mile	0	0	0
Sage-grouse Leks within 2 miles	0	0	0
Sage-grouse Leks within 3 miles	0	0	0
Sage-grouse Leks within 4 miles	2	2	0
Sharp-tailed Leks within 1 mile	0	0	0
Sharp-tailed Leks within 2 miles	3	3	0
Sharp-tailed Leks within 3 miles	6	6	0
Sharp-tailed Leks within 4 miles	8	8	0
Construction Costs			
Cost per mile	$2,100,000	$2,100,000	
Total Construction Cost	$1,701,000	$1,701,000	$0

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

I-2.4.3.2.13 Keystone Realignment KEY-21 (South Fork Shade Creek Realignment)

KEY-21 (see Figure I-2.4.3-11 and Table I-2.4.3-14) was proposed to avoid rough terrain near mileposts 112.3, 112.8, and 115. The realignment was shortened from mileposts 111.7 to 114.3, with the remaining section at milepost 115 being dropped with the consideration of KEY-48. The realignment would locate the pipeline on more vegetated slopes rather than unvegetated clayey badland soils. It would also extend the proximity to two small reservoirs by roughly 150 to 200 feet. The realignment would be 0.01 mile longer than the 2009 proposed route segment it would replace and would cross 0.01 mile less BLM land and 0.01 mile more state land.

KEY-21 would cross two more minor roads. A Class III field survey found one more potentially eligible cultural resource on the realignment. KEY-21 would cross two fewer intermittent streams. Desktop data indicated that both routes would be located within 4 miles of six greater sage-grouse leks, but some of those leks would be partially screened from views of the pipeline by topography. MDEQ selected the portion of KEY-21 north of KEY-48 to better avoid steep terrain.

I-2.4.3.2.14 Keystone Realignment KEY-24 (Middle Fork Prairie Elk Creek Realignment)

KEY-24 (see Figure I-2.4.3-12 and Table I-2.4.3-15) was proposed by a landowner to avoid one water well near milepost 124.6 and construction through a pond. The realignment would be located 1,100 feet west of the 2009 proposed route segment, from mileposts 123.1 to 125.3. KEY-24 would be 0.04 mile longer on private land, and cross 0.14 mile more developed land, two more minor roads, and would not be within 100 feet of a water well. Field surveys did not find any cultural resource or paleontological sites along either route. The realignment would not cross forested/woodlands, but it would cross a wetland and two additional USGS streams. MDEQ selected KEY-24 to address landowner objectives, and to avoid a water well and construction through a pond.

I-2.4.3.2.15 Keystone Realignment KEY-26 (Lone Tree Creek Realignment)

KEY-26 (see Figure I-2.4.3-13 and Table I-2.4.3-16) was proposed to accommodate a landowner's request to move the proposed route farther away from a residence and corrals. The realignment would be from mileposts 143.0 to 144.5 and would be about 0.01 mile longer than the 2009 proposed route segment on private land. KEY-26 and the 2009 proposed route segment would cross 0.02 mile of developed land and one minor road. Field surveys did not find any cultural resources or paleontological sites along either route. The realignment would cross five additional USGS streams. MDEQ selected MTV-6, MTV-6a, MTV-6b, and MTV-6c over the 2009 proposed route segment (see Section I-2.4.2-6); therefore, KEY-26 was not selected.

I-2.4.3.2.16 Keystone Realignment KEY-27 (Buffalo Springs Creek Realignment)

KEY-27 (see Figure I-2.4.3-13 and Table I-2.4.3-17) was proposed to accommodate a landowner's request to move the pipeline farther away from a residence and avoid wetlands and streams near milepost 147.6. The realignment would be from mileposts 146.5 to 148.5 and would be about 0.01 mile shorter than the 2009 proposed route segment, but would cross 0.10 mile more private land. KEY-27 would cross 0.01 mile more of developed land, one less minor road, and be within 25 feet and 500 feet of two fewer structures. Field surveys found that the realignment would cross one less non-eligible cultural resource, and neither route would cross a paleontological site. Both routes would cross two major roads and one intermittent stream. KEY-27 would cross 0.09 mile less wetlands and two fewer USGS streams. MDEQ selected MTV-6, MTV-6a, MTV-6b, and MTV-6c over the 2009 proposed route segment (see Section I-2.4.2-6); therefore, KEY-27 was not selected.

TABLE I-2.4.3-14
Comparison of Keystone Realignment 21 (KEY-21) with the Proposed Segment of the 2009 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-21	Difference
Length	2.15	2.16	-0.01
Land Cover			
Developed	0.00	0.00	0.00
Forested/ Woodlands	0.00	0.00	0.00
Wetlands	0.00	0.00	0.00
Total	0.00	0.00	0.00
Revenue Final Land Unit Classification			
Range Land	2.15	2.16	-0.01
Irrigated Land	0.00	0.00	0.00
Hay Land	0.00	0.00	0.00
Total	2.15	2.16	-0.01
Land Ownership			
State of Montana	1.18	1.19	-0.01
Private Land	0.81	0.82	-0.01
U.S. Bureau of Land Management	0.16	0.15	+0.01
Local Government	0.00	0.00	0.00
ROW	0.00	0.00	0.00
Total	2.15	2.16	-0.01
Number of Road Crossings			
Major Roads	0	0	0
Minor Roads	3	5	-2
Total	3	5	-2
Number of Railroad Crossings	0	0	0
Number of Stream Crossings			
Perennial Streams	0	0	0
Intermittent Streams	2	0	+2
Additional USGS Streams	1	1	0
Total	3	1	+2

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-21	Difference
Slope			
< 5%	0.38	0.43	-0.05
≥ 5% and ≤ 15%	1.40	1.44	-0.04
> 15% and ≤ 30%	0.33	0.25	+0.08
> 30%	0.04	0.04	0
Water Wells within 100 ft	0	0	0
Residences			
Residences within 25 ft	0	0	0
Residences within 500 ft	0	0	0
Structures			
Structures within 25 ft	0	0	0
Structures within 500 ft	0	0	0
Cultural Resources (Class III)			
Cultural Findings (% Surveyed)	1 Pot. Elg. (100%)	2 Pot. Elg. (100%)	-1 Pot. Elg.
Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
Grouse (desktop data)			
Sage-grouse Core Area crossed	0	0	0
Sage-grouse Leks within 1 mile	0	0	0
Sage-grouse Leks within 2 miles	0	0	0
Sage-grouse Leks within 3 miles	2	2	0
Sage-grouse Leks within 4 miles	6	6	0
Sharp-tailed Leks within 1 mile	0	0	0
Sharp-tailed Leks within 2 mile	0	0	0
Sharp-tailed Leks within 3 miles	0	0	0
Sharp-tailed Leks within 4 miles	0	0	0
Construction Costs			
Cost per mile	$2,100,000	$2,100,000	
Total Construction Cost	$4,515,000	$4,536,000	-$21,000
Environmental Mitigation Cost	$17,200	$17,280	-$80

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.3-15
Comparison of Keystone Realignment 24 (KEY-24) with the Proposed Segment of the 2009 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-24	Difference	Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-24	Difference
Length	2.15	2.19	-0.04	**Slope**			
Land Cover				< 5%	0.28	0.26	+0.02
Developed	0.04	0.18	-0.14	≥ 5% and ≤ 15%	1.57	1.58	-0.01
Forested/ Woodlands	0.01	0.00	+0.01	> 15% and ≤ 30%	0.30	0.35	-0.05
Wetlands	0.00	0.03	-0.03	> 30%	0.00	0.00	0.00
Total	0.05	0.21	-0.16	**Water Wells within 100 ft**	1	0	+1
Revenue Final Land Unit Classification				**Residences**			
Range Land	0.87	0.68	+0.19	Residences within 25 ft	0	0	0
Irrigated Land	0.00	0.00	0.00	Residences within 500 ft	0	0	0
Hay Land	1.28	1.51	-0.23	**Structures**			
Total	2.15	2.19	-0.04	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.00	0.00	0.00	**Cultural Resources (Class III)**			
Private Land	2.15	2.19	-0.04	Cultural Findings (% Surveyed)	0 (100%)	0 (100%)	0
U.S. Bureau of Land Management	0.00	0.00	0.00	Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
Local Government	0.00	0.00	0.00	**Grouse (desktop data)**			
ROW	0.00	0.00	0.00	Sage-grouse Core Area crossed	0	0	0
Total	2.15	2.19	-0.04	Sage-grouse Leks within 1 mile	0	0	0
Number of Road Crossings				Sage-grouse Leks within 2 miles	0	0	0
Major Roads	0	0	0	Sage-grouse Leks within 3 miles	0	0	0
Minor Roads	2	4	-2	Sage-grouse Leks within 4 miles	0	0	0
Total	2	4	-2	Sharp-tailed Leks within 1 mile	0	0	0
Number of Railroad Crossings	0	0	0	Sharp-tailed Leks within 2 miles	0	0	0
Number of Stream Crossings				Sharp-tailed Leks within 3 miles	0	0	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 4 miles	0	0	0
Intermittent Streams	0	0	0	**Construction Costs**			
Additional USGS Streams	3	5	-2	Cost per mile	$2,100,000	$2,100,000	
Total	3	5	-2	Total Construction Cost	$4,515,000	$4,599,000	-$84,000
				Environmental Mitigation Cost	$6,720	$4,880	+$1,840

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.3-16
Comparison of Keystone Realignment 26 (KEY-26) with the Proposed Segment of the 2009 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-26	Difference	Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-26	Difference
Length	1.48	1.49	-0.01	**Slope**			
Land Cover				< 5%	0.18	0.35	-0.17
Developed	0.02	0.02	0.00	≥ 5% and ≤ 15%	1.30	1.14	+0.16
Forested/ Woodlands	0.00	0.00	0.00	> 15% and ≤ 30%	0.00	0.00	0.00
Wetlands	0.00	0.00	0.00	> 30%	0.00	0.00	0.00
Total	0.02	0.02	0.00	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	0.06	0.02	+0.04	Residences within 25 ft	0	0	0
Irrigated Land	0.00	0.00	0.00	Residences within 500 ft	0	0	0
Hay Land	1.42	1.47	-0.05	**Structures**			
Total	1.48	1.49	-0.01	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.00	0.00	0.00	**Cultural Resources (Class III)**			
Private Land	1.48	1.49	-0.01	Cultural Findings (% Surveyed)	0 (100%)	0 (100%)	0
U.S. Bureau of Land Management	0.00	0.00	0.00	Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
Local Government	0.00	0.00	0.00	**Grouse (desktop data)**			
ROW	0.00	0.00	0.00	Sage-grouse Core Area crossed	0	0	0
Total	1.48	1.49	-0.01	Sage-grouse Leks within 1 mile	0	0	0
Number of Road Crossings				Sage-grouse Leks within 2 miles	0	0	0
Major Roads	0	0	0	Sage-grouse Leks within 3 miles	0	0	0
Minor Roads	1	1	0	Sage-grouse Leks within 4 miles	0	0	0
Total	1	1	0	Sharp-tailed Leks within 1 mile	0	0	0
Number of Railroad Crossings	0	0	0	Sharp-tailed Leks within 2 miles	0	0	0
Number of Stream Crossings				Sharp-tailed Leks within 3 miles	0	0	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 4 miles	0	0	0
Intermittent Streams	0	0	0	**Construction Costs**			
Additional USGS Streams	0	5	-5	Cost per mile	$2,100,000	$2,100,000	
Total	0	5	-5	Total Construction Cost	$3,108,000	$3,129,000	-$21,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.3-17
Comparison of Keystone Realignment 27 (KEY-27) with the Proposed Segment of the 2009 Route it Would Replace

Item	2009 Proposed Route Segment (Miles of Land Crossed, except where noted)	KEY-27	Difference	Item	2009 Proposed Route Segment (Miles of Land Crossed, except where noted)	KEY-27	Difference
Length	2.01	2.00	+0.01	**Slope**			
Land Cover				< 5%	0.74	0.50	+0.24
Developed	0.16	0.17	-0.01	≥ 5% and ≤ 15%	1.18	1.35	-0.17
Forested/ Woodlands	0.00	0.00	0.00	> 15% and ≤ 30%	0.09	0.15	-0.06
Wetlands	0.11	0.02	+0.09	> 30%	0.00	0.00	0.00
Total	0.27	0.19	-0.08	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	1.31	1.31	0.00	Residences within 25 ft	0	0	0
Irrigated Land	0.00	0.00	0.00	Residences within 500 ft	0	0	0
Hay Land	0.70	0.69	+0.01	**Structures**			
Total	2.01	2.00	+0.01	Structures within 25 ft	1	0	+1
Land Ownership				Structures within 500 ft	2	1	+1
State of Montana	0.00	0.00	0.00	**Cultural Resources (Class III)**			
Private Land	1.90	2.00	-0.10	Cultural Findings (% Surveyed)	1 Elg. (100%)	1 Elg., 1 Not Elg. (100%)	-1 Not Elg.
U.S. Bureau of Land Management	0.00	0.00	0.00				
Local Government	0.00	0.00	0.00	Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
ROW	0.11	0.00	+0.11	**Grouse (desktop data)**			
Total	2.01	2.00	+0.01	Sage-grouse Core Area crossed	0	0	0
Number of Road Crossings				Sage-grouse Leks within 1 mile	0	0	0
Major Roads	2	2	0	Sage-grouse Leks within 2 miles	0	0	0
Minor Roads	1	0	+1	Sage-grouse Leks within 3 miles	0	0	0
Total	3	2	+1	Sage-grouse Leks within 4 miles	0	0	0
Number of Railroad Crossings	1	1	0	Sharp-tailed Leks within 1 mile	0	0	0
Number of Stream Crossings				Sharp-tailed Leks within 2 miles	0	0	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 3 miles	0	0	0
Intermittent Streams	1	1	0	Sharp-tailed Leks within 4 miles	0	0	0
Additional USGS Streams	2	0	+2	**Construction Costs**			
Total	3	1	+2	Cost per mile	$2,100,000	$2,100,000	
				Total Construction Cost	$4,221,000	$4,200,000	+$21,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

I-2.4.3.2.17 Keystone Realignment KEY-28 (South of Buffalo Springs Creek Realignment)

KEY-28 (see Figure I-2.4.3-14 and Table I-2.4.3-18) was proposed to avoid a rough drainage wash area near milepost 153.7. The realignment would be from mileposts 153.2 to 154.1 and would be about 0.01 mile longer than the 2009 proposed route segment on private land. KEY-28 would cross 0.01 mile less of developed land and would be within 100 feet of one water well. Field surveys found that both routes would cross one eligible cultural resource but no paleontological sites. MDEQ selected MTV-6, MTV-6a, MTV-6b, and MTV-6c over the 2009 proposed route segment (see Section I-2.4.2-6); therefore, KEY-28 was not selected.

I-2.4.3.2.18 Keystone Realignment KEY-29 (Hay Creek Realignment)

KEY-29 (see Figure I-2.4.3-14 and Table I-2.4.3-19) was proposed to accommodate a landowner's request to avoid water wells near milepost 162.2 and milepost 162.9, and a tree line near milepost 163.2. After further discussions with the landowner, MDEQ developed MTV-24 which better avoided the water well and was more preferable to the landowner (see Section I-2.4.2-24). The realignment would be from mileposts 161.2 to 164.2 and would be about 0.01 mile longer than the 2009 proposed route segment on private land. The realignment would cross 0.01 mile more developed land, no forested/woodlands, and one more minor road. Field surveys found that both routes would cross one eligible and one non-eligible cultural resource, but no paleontological sites. Both routes would cross one intermittent stream, but the realignment would cross three fewer USGS streams. Desktop data indicated that two sharp-tailed grouse leks would be located within 3 miles of both routes. MDEQ did not select KEY-29 (see MTV-24 in Section I-2.4.3.2.17).

I-2.4.3.2.19 Keystone Realignment KEY-30 (Cracker Box Creek Realignment)

KEY-30 (see Figure I-2.4.3-15 and Table I-2.4.3-20) was proposed to address a landowner's request to avoid grain bins near milepost 183.1. The realignment would be from mileposts 182.0 to 184.4 and would be about 0.02 mile shorter than the 2009 proposed route segment on private land. The realignment would cross 0.02 mile more developed land, one fewer USGS stream, and no water wells would be within 100 feet. Both routes would cross four minor roads. The realignment would be within 500 feet of four structures whereas the 2009 proposed route would be within 25 feet of four structures. Field surveys did not find any cultural resources or paleontological sites along either route. Desktop data indicated that there were three sharp-tailed grouse leks located within 3 miles of the proposed route and KEY-30; the closest would be more than 2 miles away. MDEQ selected KEY-30 to address a landowner objective to avoid grain bins.

I-2.4.3.2.20 Keystone Realignment KEY-31 (Yellowstone River Realignment)

KEY-31 (see Figure I-2.4.3-16 and Table I-2.4.3-21) was proposed to avoid construction through rough drainage and terrain features between mileposts 196 and 196.8. Key-31 would be located 815 feet west of the 2009 proposed route segment and would be 0.10 mile longer. Field surveys did not find any cultural resource or paleontological sites along either route. Both Key-31 and the 2009 proposed route segment would cross forested/woodlands (sparsely wooded draws) between mileposts 197 and 197.5. KEY-31 would not cross three USGS streams. MDEQ selected KEY-31 to facilitate construction across rough terrain south of the Yellowstone River crossing.

TABLE I-2.4.3-18
Comparison of Keystone Realignment 28 (KEY-28) with the Proposed Segment of the 2009 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-28	Difference
Length	0.85	0.86	-0.01
Land Cover			
Developed	0.02	0.01	+0.01
Forested/ Woodlands	0.00	0.00	0.00
Wetlands	0.00	0.00	0.00
Total	0.02	0.01	+0.01
Revenue Final Land Unit Classification			
Range Land	0.26	0.29	-0.03
Irrigated Land	0.00	0.00	0.00
Hay Land	0.59	0.57	+0.02
Total	0.85	0.86	-0.01
Land Ownership			
State of Montana	0.00	0.00	0.00
Private Land	0.85	0.86	-0.01
U.S. Bureau of Land Management	0.00	0.00	0.00
Local Government	0.00	0.00	0.00
ROW	0.00	0.00	0.00
Total	0.85	0.86	-0.01
Number of Road Crossings			
Major Roads	0	0	0
Minor Roads	1	1	0
Total	1	1	0
Number of Railroad Crossings	0	0	0
Number of Stream Crossings			
Perennial Streams	0	0	0
Intermittent Streams	0	0	0
Additional USGS Streams	0	0	0
Total	0	0	0

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-28	Difference
Slope			
< 5%	0.02	0.05	-0.03
≥ 5% and ≤ 15%	0.57	0.55	+0.02
> 15% and ≤ 30%	0.23	0.25	-0.02
> 30%	0.03	0.01	+0.02
Water Wells within 100 ft	0	1	-1
Residences			
Residences within 25 ft	0	0	0
Residences within 500 ft	0	0	0
Structures			
Structures within 25 ft	0	0	0
Structures within 500 ft	0	0	0
Cultural Resources (Class III)			
Cultural Findings (% Surveyed)	1 Elg. (100%)	1 Elg. (100%)	0
Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
Grouse (desktop data)			
Sage-grouse Core Area crossed	0	0	0
Sage-grouse Leks within 1 mile	0	0	0
Sage-grouse Leks within 2 miles	0	0	0
Sage-grouse Leks within 3 miles	0	0	0
Sage-grouse Leks within 4 miles	0	0	0
Sharp-tailed Leks within 1 mile	0	0	0
Sharp-tailed Leks within 2 miles	0	0	0
Sharp-tailed Leks within 3 miles	0	0	0
Sharp-tailed Leks within 4 miles	0	0	0
Construction Costs			
Cost per mile	$2,100,000	$2,100,000	
Total Construction Cost	$1,785,000	$1,806,000	-$21,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculation of differences.

TABLE I-2.4.3-19
Comparison of Keystone Realignment 29 (KEY-29) with the Proposed Segment of the 2009 Route it Would Replace

Item	Miles of Land Crossed (except where noted): 2009 Proposed Route Segment	KEY-29	Difference
Length	3.09	3.10	-0.01
Land Cover			
Developed	0.07	0.08	-0.01
Forested/ Woodlands	0.05	0.00	+0.05
Wetlands	0.00	0.00	0.00
Total	0.12	0.08	+0.04
Revenue Final Land Unit Classification			
Range Land	2.63	2.98	-0.35
Irrigated Land	0.00	0.00	0.00
Hay Land	0.46	0.12	+0.34
Total	3.09	3.10	-0.01
Land Ownership			
State of Montana	0.00	0.00	0.00
Private Land	3.09	3.10	-0.01
U.S. Bureau of Land Management	0.00	0.00	0.00
Local Government	0.00	0.00	0.00
ROW	0.00	0.00	0.00
Total	3.09	3.10	-0.01
Number of Road Crossings			
Major Roads	0	0	0
Minor Roads	4	5	-1
Total	4	5	-1
Number of Railroad Crossings	1	1	0
Number of Stream Crossings			
Perennial Streams	0	0	0
Intermittent Streams	1	1	0
Additional USGS Streams	6	3	+3
Total	7	4	+3

Item	Miles of Land Crossed (except where noted): 2009 Proposed Route Segment	KEY-29	Difference
Slope			
< 5%	0.55	0.46	+0.09
≥ 5% and ≤ 15%	1.96	1.89	+0.07
> 15% and ≤ 30%	0.50	0.72	-0.22
> 30%	0.08	0.03	+0.05
Water Wells within 100 ft	0	0	0
Residences			
Residences within 25 ft	0	0	0
Residences within 500 ft	0	0	0
Structures			
Structures within 25 ft	0	0	0
Structures within 500 ft	0	0	0
Cultural Resources (Class III)			
Cultural Findings (% Surveyed)	1 Elg., 1 Not Elg. (100%)	1 Elg., 1 Not Elg. (100%)	0
Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
Grouse (desktop data)			
Sage-grouse Core Area crossed	0	0	0
Sage-grouse Leks within 1 mile	0	0	0
Sage-grouse Leks within 2 miles	0	0	0
Sage-grouse Leks within 3 miles	0	0	0
Sage-grouse Leks within 4 miles	0	0	0
Sharp-tailed Leks within 1 mile	0	0	0
Sharp-tailed Leks within 2 miles	0	0	0
Sharp-tailed Leks within 3 miles	2	2	0
Sharp-tailed Leks within 4 miles	2	2	0
Construction Costs			
Cost per mile	$2,100,000	$2,100,000	
Total Construction Cost	$6,489,000	$6,510,000	-$21,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.3-20
Comparison of Keystone Realignment 30 (KEY-30) with the Proposed Segment of the 2009 Route it Would Replace

Item	Miles of Land Crossed (except where noted)			Item	Miles of Land Crossed (except where noted)		
	2009 Proposed Route Segment	KEY-30	Difference		2009 Proposed Route Segment	KEY-30	Difference
Length	2.36	2.34	+0.02	**Slope**			
Land Cover				< 5%	1.56	1.78	-0.22
Developed	0.19	0.21	-0.02	≥ 5% and ≤ 15%	0.80	0.56	+0.24
Forested/ Woodlands	0.00	0.00	0.00	> 15% and ≤ 30%	0.00	0.00	0.00
Wetlands	0.00	0.00	0.00	> 30%	0.00	0.00	0.00
Total	0.19	0.21	-0.02	**Water Wells within 100 ft**	1	0	+1
Revenue Final Land Unit Classification				**Residences**			
Range Land	0.11	0.12	-0.01	Residences within 25 ft	0	0	0
Irrigated Land	0.00	0.00	0.00	Residences within 500 ft	0	0	0
Hay Land	2.25	2.22	+0.03	**Structures**			
Total	2.36	2.34	+0.02	Structures within 25 ft	4	0	+4
Land Ownership				Structures within 500 ft	0	4	-4
State of Montana	0.00	0.00	0.00	**Cultural Resources (Class III)**			
Private Land	2.36	2.34	+0.02	Cultural Findings (% Surveyed)	0 (100%)	0 (100%)	0
U.S. Bureau of Land Management	0.00	0.00	0.00	Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
Local Government	0.00	0.00	0.00	**Grouse (desktop data)**			
ROW	0.00	0.00	0.00	Sage-grouse Core Area crossed	0	0	0
Total	2.36	2.34	+0.02	Sage-grouse Leks within 1 mile	0	0	0
Number of Road Crossings				Sage-grouse Leks within 2 miles	0	0	0
Major Roads	0	0	0	Sage-grouse Leks within 3 miles	0	0	0
Minor Roads	4	4	0	Sage-grouse Leks within 4 miles	0	0	0
Total	4	4	0	Sharp-tailed Leks within 1 mile	0	0	0
Number of Railroad Crossings	0	0	0	Sharp-tailed Leks within 2 miles	0	0	0
Number of Stream Crossings				Sharp-tailed Leks within 3 miles	3	3	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 4 miles	3	3	0
Intermittent Streams	0	0	0	**Construction Costs**			
Additional USGS Streams	2	1	+1	Cost per mile	$2,100,000	$2,100,000	
Total	2	1	+1	Total Construction Cost	$4,956,000	$4,914,000	+$42,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.3-21
Comparison of Keystone Realignment 31 (KEY-31) with the Proposed Segment of the 2009 Route it Would Replace

Item	2009 Proposed Route Segment	KEY-31	Difference	Item	2009 Proposed Route Segment	KEY-31	Difference
	Miles of Land Crossed (except where noted)				Miles of Land Crossed (except where noted)		
Length	0.79	0.89	-0.10	**Slope**			
Land Cover				< 5%	0.16	0.12	+0.04
Developed	0.00	0.00	0.00	≥ 5% and ≤ 15%	0.53	0.75	-0.22
Forested/ Woodlands	0.05	0.05	0.00	> 15% and ≤ 30%	0.10	0.02	+0.08
Wetlands	0.00	0.00	0.00	> 30%	0.00	0.00	0.00
Total	0.05	0.05	0.00	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	0.79	0.89	-0.10	Residences within 25 ft	0	0	0
Irrigated Land	0.00	0.00	0.00	Residences within 500 ft	0	0	0
Hay Land	0.00	0.00	0.00	**Structures**			
Total	0.00	0.00	0.00	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.00	0.00	0.00	**Cultural Resources (Class III)**			
Private Land	0.79	0.89	-0.10	Cultural Findings (% Surveyed)	0 (100%)	0 (100%)	0
U.S. Bureau of Land Management	0.00	0.00	0.00	Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
Local Government	0.00	0.00	0.00	**Grouse (desktop data)**			
ROW	0.00	0.00	0.00	Sage-grouse Core Area crossed	0	0	0
Total	0.79	0.89	-0.10	Sage-grouse Leks within 1 mile	0	0	0
Number of Road Crossings				Sage-grouse Leks within 2 miles	0	0	0
Major Roads	0	0	0	Sage-grouse Leks within 3 miles	0	0	0
Minor Roads	0	0	0	Sage-grouse Leks within 4 miles	0	0	0
Total	0	0	0	Sharp-tailed Leks within 1 mile	0	0	0
Number of Railroad Crossings	0	0	0	Sharp-tailed Leks within 2 miles	0	0	0
Number of Stream Crossings				Sharp-tailed Leks within 3 miles	0	0	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 4 miles	0	0	0
Intermittent Streams	0	0	0	**Construction Costs**			
Additional USGS Streams	3	0	+3	Cost per mile	$2,100,000	$2,100,000	
Total	3	0	+3	Total Construction Cost	$1,659,000	$1,869,000	-$210,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

I-2.4.3.2.21 Keystone Realignment KEY-32 (South of Yellowstone River Realignment)

KEY-32 (see Figure I-2.4.3-16 and Table I-2.4.3-22) was a landowner request to avoid pivot irrigation areas between milepost 197 and milepost 199.5. The realignment would be located 1,750 feet east of the 2009 proposed route segment from milepost 196.8 to milepost 199.5. The realignment would be 0.15 mile shorter than the 2009 proposed route. Both routes would cross developed land in this area, which appears on aerial photography as minor roads.

KEY-32 would cross three more minor roads, but would avoid 0.58 mile of irrigated land on the private properties. Field surveys did not find any cultural resources or paleontological sites along either route. Key-32 would cross one intermittent stream but would avoid crossing one USGS stream. MDEQ selected KEY-32 to address a landowner request to avoid center pivot irrigation areas.

I-2.4.3.2.22 Keystone Realignment KEY-33 (Cabin Creek Realignment)

KEY-33 (see Figure I-2.4.3-17 and Table I-2.4.3-23) was proposed to avoid crossing dikes and stream crossings around milepost 202. This realignment would be similar to MTV-11. The realignment would be located about 3,000 feet west of the 2009 proposed route segment, from mileposts 200.7 to 203.1. KEY-33 would be 0.10 mile shorter than the 2009 proposed route on private land. The realignment would cross 0.02 mile more of developed land and three additional minor roads, but there would not be any structures within 500 feet. Field surveys did not find any cultural resource or paleontological sites along either route. KEY-33 would cross 0.09 mile less forested/woodlands, no wetlands, one less intermittent stream, and one additional USGS stream. MDEQ selected KEY-33 (see MTV-11 in Section I-2.4.2-11).

I-2.4.3.2.23 Keystone Realignment KEY-35 (South of McNaney Creek Realignment)

KEY-35 (see Figure I-2.4.3-18 and Table I-2.4.3-24) was proposed to avoid a cliff at milepost 214.4 and a corral at milepost 214.8. The realignment would be located 630 feet east of the 2009 proposed route segment and be 0.01 mile longer, crossing more private land but less BLM land. The 2009 proposed route would be located within 100 feet of one water well. Field surveys did not find any cultural resource or paleontological sites along either route. Both routes would cross one minor road and two intermittent streams. Desktop data indicated that there were two greater sage-grouse leks within 4 miles of both routes and three sharp-tailed grouse leks within 3 miles of both routes. MDEQ selected the western most portion of KEY-35 but widened the approved corridor (see MTV-26 in Section I-2.4.2-26).

I-2.4.3.2.24 Keystone Realignment KEY-36 (Lawrence Creek Realignment)

KEY-36 (see Figure I-2.4.3-19 and Table I-2.4.3-25) was proposed by a landowner to avoid a reservoir used as a water supply for cattle at milepost 226.7. The realignment would be located 1,400 feet east of the 2009 proposed route segment, from milepost 224.7 to milepost 227.2. KEY-36 would be located within 100 feet of two water wells. Field surveys did not find any cultural resource or paleontological sites along either route. The realignment would avoid forested/woodlands but cross 0.05 mile more wetlands and one more intermittent stream. Desktop data indicated that both routes would be located within 4 miles of three sharp-tailed grouse leks, the closest being about 2.8 miles away. MDEQ selected KEY-36 to address landowner objectives to avoid a reservoir used as a water supply.

TABLE I-2.4.3-22
Comparison of Keystone Realignment 32 (KEY-32) with the Proposed Segment of the 2009 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-32	Difference	Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-32	Difference
Length	2.69	2.54	+0.15	**Slope**			
Land Cover				< 5%	1.44	1.10	+0.34
Developed	0.11	0.17	-0.06	≥ 5% and ≤ 15%	1.24	1.41	-0.17
Forested/ Woodlands	0.00	0.02	-0.02	> 15% and ≤ 30%	0.01	0.03	-0.02
Wetlands	0.00	0.00	0.00	> 30%	0.00	0.00	0.00
Total	0.11	0.19	-0.08	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	1.28	1.48	-0.20	Residences within 25 ft	0	0	0
Irrigated Land	0.58	0.00	+0.58	Residences within 500 ft	0	0	0
Hay Land	0.83	1.06	-0.23	**Structures**			
Total	2.69	2.54	+0.15	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.00	0.00	0.00	**Cultural Resources (Class III)**			
Private Land	2.69	2.54	+0.15	Cultural Findings (% Surveyed)	0 (100%)	0 (100%)	0
U.S. Bureau of Land Management	0.00	0.00	0.00	Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
Local Government	0.00	0.00	0.00	**Grouse (desktop data)**			
ROW	0.00	0.00	0.00	Sage-grouse Core Area crossed	0	0	0
Total	2.69	2.54	+0.15	Sage-grouse Leks within 1 mile	0	0	0
Number of Road Crossings				Sage-grouse Leks within 2 miles	0	0	0
Major Roads	0	0	0	Sage-grouse Leks within 3 miles	0	0	0
Minor Roads	4	7	-3	Sage-grouse Leks within 4 miles	0	0	0
Total	4	7	-3	Sharp-tailed Leks within 1 mile	0	0	0
Number of Railroad Crossings	0	0	0	Sharp-tailed Leks within 2 miles	0	0	0
Number of Stream Crossings				Sharp-tailed Leks within 3 miles	0	0	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 4 miles	0	0	0
Intermittent Streams	0	1	-1	**Construction Costs**			
Additional USGS Streams	1	0	+1	Cost per mile	$2,100,000	$2,100,000	
Total	1	1	0	Total Construction Cost	$5,649,000	$5,334,000	+$315,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.3-23
Comparison of Keystone Realignment 33 (KEY-33) with the Proposed Segment of the 2009 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-33	Difference	Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-33	Difference
Length	2.41	2.31	+0.10	**Slope**			
Land Cover				< 5%	1.51	0.98	+0.53
Developed	0.06	0.08	-0.02	≥ 5% and ≤ 15%	0.90	1.11	-0.21
Forested/ Woodlands	0.15	0.06	+0.09	> 15% and ≤ 30%	0.00	0.22	-0.22
Wetlands	0.04	0.00	+0.04	> 30%	0.00	0.00	0.00
Total	0.25	0.14	+0.11	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	0.77	1.45	-0.68	Residences within 25 ft	0	0	0
Irrigated Land	0.00	0.00	0.00	Residences within 500 ft	0	0	0
Hay Land	1.64	0.86	+0.78	**Structures**			
Total	2.41	2.31	+0.10	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	1	0	+1
State of Montana	0.00	0.00	0.00	**Cultural Resources (Class III)**			
Private Land	2.41	2.31	+0.10	Cultural Findings (% Surveyed)	0 (100%)	0 (100%)	0
U.S. Bureau of Land Management	0.00	0.00	0.00	Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
Local Government	0.00	0.00	0.00	**Grouse (desktop data)**			
ROW	0.00	0.00	0.00	Sage-grouse Core Area crossed	0	0	0
Total	2.41	2.31	+0.10	Sage-grouse Leks within 1 mile	0	0	0
Number of Road Crossings				Sage-grouse Leks within 2 miles	0	0	0
Major Roads	0	0	0	Sage-grouse Leks within 3 miles	0	0	0
Minor Roads	3	6	-3	Sage-grouse Leks within 4 miles	0	0	0
Total	3	6	-3	Sharp-tailed Leks within 1 mile	0	0	0
Number of Railroad Crossings	0	0	0	Sharp-tailed Leks within 2 miles	0	0	0
Number of Stream Crossings				Sharp-tailed Leks within 3 miles	0	0	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 4 miles	0	0	0
Intermittent Streams	2	1	+1	**Construction Costs**			
Additional USGS Streams	0	1	-1	Cost per mile	$2,100,000	$2,100,000	
Total	2	2	0	Total Construction Cost	$5,061,000	$4,581,000	+$480,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.3-24
Comparison of Keystone Realignment 35 (KEY-35) with the Proposed Segment of the 2009 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-35	Difference
Length	1.13	1.14	-0.01
Land Cover			
Developed	0.00	0.00	0.00
Forested/ Woodlands	0.00	0.00	0.00
Wetlands	0.00	0.00	0.00
Total	0.00	0.00	0.00
Revenue Final Land Unit Classification			
Range Land	1.13	1.14	-0.01
Irrigated Land	0.00	0.00	0.00
Hay Land	0.00	0.00	0.00
Total	1.13	1.14	-0.01
Land Ownership			
State of Montana	0.00	0.00	0.00
Private Land	0.13	0.22	-0.09
U.S. Bureau of Land Management	1.00	0.92	+0.08
Local Government	0.00	0.00	0.00
ROW	0.00	0.00	0.00
Total	1.13	1.14	-0.01
Number of Road Crossings			
Major Roads	0	0	0
Minor Roads	1	1	0
Total	1	1	0
Number of Railroad Crossings	0	0	0
Number of Stream Crossings			
Perennial Streams	0	0	0
Intermittent Streams	2	2	0
Additional USGS Streams	0	0	0
Total	2	2	0

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-35	Difference
Slope			
< 5%	0.33	0.37	-0.04
≥ 5% and ≤ 15%	0.79	0.77	+0.02
> 15% and ≤ 30%	0.01	0.00	+0.01
> 30%	0.00	0.00	0.00
Water Wells within 100 ft	1	0	+1
Residences			
Residences within 25 ft	0	0	0
Residences within 500 ft	0	0	0
Structures			
Structures within 25 ft	0	0	0
Structures within 500 ft	0	0	0
Cultural Resources (Class III)			
Cultural Findings (% Surveyed)	0 (100%)	0 (100%)	0
Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
Grouse (desktop data)			
Sage-grouse Core Area crossed	0	0	0
Sage-grouse Leks within 1 mile	0	0	0
Sage-grouse Leks within 2 miles	1	1	0
Sage-grouse Leks within 3 miles	1	1	0
Sage-grouse Leks within 4 miles	2	2	0
Sharp-tailed Leks within 1 mile	1	1	0
Sharp-tailed Leks within 2 miles	2	2	0
Sharp-tailed Leks within 3 miles	3	3	0
Sharp-tailed Leks within 4 miles	3	3	0
Construction Costs			
Cost per mile	$2,100,000	$2,100,000	
Total Construction Cost	$2,373,000	$2,394,000	-$21,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.3-25
Comparison of Keystone Realignment 36 (KEY-36) with the Proposed Segment of the 2009 Route it Would Replace

	Miles of Land Crossed (except where noted)				Miles of Land Crossed (except where noted)		
Item	**2009 Proposed Route Segment**	**KEY-36**	**Difference**	**Item**	**2009 Proposed Route Segment**	**KEY-36**	**Difference**
Length	2.55	2.57	-0.02	**Slope**			
Land Cover				< 5%	0.68	0.99	-0.31
Developed	0.00	0.00	0.00	≥ 5% and ≤ 15%	1.79	1.58	+0.21
Forested/ Woodlands	0.002	0.00	+0.002	> 15% and ≤ 30%	0.08	0.00	+0.08
Wetlands	0.11	0.16	-0.05	> 30%	0.00	0.00	0.00
Total	0.112	0.16	-0.048	**Water Wells within 100 ft**	0	2	-2
Revenue Final Land Unit Classification				**Residences**			
Range Land	1.24	1.51	-0.27	Residences within 25 ft	0	0	0
Irrigated Land	0.00	0.00	0.00	Residences within 500 ft	1	1	0
Hay Land	1.31	1.06	+0.25	**Structures**			
Total	2.55	2.57	-0.02	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.00	0.00	0.00	**Cultural Resources (Class III)**			
Private Land	2.55	2.57	-0.02	Cultural Findings (% Surveyed)	0 (100%)	0 (100%)	0
U.S. Bureau of Land Management	0.00	0.00	0.00	Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
Local Government	0.00	0.00	0.00	**Grouse (desktop data)**			
ROW	0.00	0.00	0.00	Sage-grouse Core Area crossed	0	0	0
Total	2.55	2.57	-0.02	Sage-grouse Leks within 1 mile	0	0	0
Number of Road Crossings				Sage-grouse Leks within 2 miles	0	0	0
Major Roads	0	0	0	Sage-grouse Leks within 3 miles	0	0	0
Minor Roads	3	3	0	Sage-grouse Leks within 4 miles	0	0	0
Total	3	3	0	Sharp-tailed Leks within 1 mile	0	0	0
Number of Railroad Crossings	0	0	0	Sharp-tailed Leks within 2 miles	0	0	0
Number of Stream Crossings				Sharp-tailed Leks within 3 miles	1	1	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 4 miles	3	3	0
Intermittent Streams	1	2	-1	**Construction Costs**			
Additional USGS Streams	1	1	0	Cost per mile	$2,100,000	$2,100,000	
Total	2	3	-1	Total Construction Cost	$5,355,000	$5,397,000	-$42,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

I-2.4.3.2.25 Keystone Realignment KEY-37 (North of Pennel Creek Realignment)

KEY-37 (see Figure I-2.4.3-19 and Table I-2.4.3-26) was proposed by a landowner to avoid a road used in transporting farm equipment to pastures, fences that might isolate cattle during construction, rough terrain near milepost 229.5, and the pipeline proximity to a dam used as a reservoir. The realignment would be located 3,350 feet east of the 2009 proposed route segment. It would be the same length as the 2009 proposed route segment, would cross 0.05 mile of state land and 1.15 miles of BLM land, but would cross 1.20 miles less private land. Field surveys found that both routes would cross one non-eligible cultural resource, but no paleontological sites. KEY-37 would not cross forested/woodlands, 0.06 mile less wetlands, and five fewer USGS streams. Desktop data indicated that both routes would be located within 4 miles of one greater sage-grouse lek, which would be screened from view of the pipeline by topography, and four sharp-tailed grouse leks. KEY-37 would be about 0.3 mile farther away from the nearest sharp-tailed grouse lek. MDEQ selected KEY-37 to address landowner objectives, as stated above.

I-2.4.3.2.26 Keystone Realignment KEY-39 (South of Pennel Creek Realignment)

KEY-39 (see Figure I-2.4.3-20 and Table I-2.4.3-27) was proposed by Keystone to change the route through pump station 14, from mileposts 236.2 to 236.7. The realignment would be 0.01 mile longer than the 2009 proposed segment, and cross 0.02 mile less BLM land but more private land. Field surveys did not find cultural resource or paleontological sites along either route. Field surveys also did not find any wetlands or noxious weed areas. Desktop data indicated that there were four greater sage-grouse leks within 3 miles of both routes, and this was confirmed during field surveys. Topography screens the leks from KEY-39 and the corresponding segment of the 2009 route. MDEQ selected KEY-39 to improve the approach to the proposed pump station 14, to accommodate the Planned Bakken Marketlink Project installation.

I-2.4.3.2.27 Keystone Realignment KEY-40 (North of Hidden Water Creek Realignment)

KEY-40 (see Figure I-2.4.3-21 and Table I-2.4.3-28) was proposed by Keystone to avoid rough terrain from mileposts 252.1 to 255.7. The realignment would be 0.04 mile longer than the 2009 proposed route segment it would replace, and would cross 0.34 mile of BLM land. Field surveys found that KEY-40 would cross one significant paleontological site, and that neither route would cross any cultural resources. KEY-40 would cross one intermittent stream and four fewer USGS streams, but would be located closer to two small reservoirs and across an old breached reservoir. Field surveys also found that the realignment would cross one noxious weed area. Desktop data indicated that there were five greater sage-grouse leks within 4 miles of the route segment and six leks for the realignment. Field surveys confirmed that there were three greater sage-grouse leks within 3 miles of each route. MDEQ selected KEY-40 in order to avoid steep terrain while also crossing more public land.

TABLE I-2.4.3-26
Comparison of Keystone Realignment 37 (KEY-37) with the Proposed Segment of the 2009 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-37	Difference	Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-37	Difference
Length	4.09	4.09	0.00	**Slope**			
Land Cover				< 5%	1.07	0.85	+0.22
Developed	0.00	0.00	0.00	≥ 5% and ≤ 15%	2.35	2.99	-0.64
Forested/ Woodlands	0.12	0.00	+0.12	> 15% and ≤ 30%	0.58	0.25	+0.33
Wetlands	0.08	0.02	+0.06	> 30%	0.09	0.00	+0.09
Total	0.20	0.02	+0.18	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	3.75	3.78	-0.03	Residences within 25 ft	0	0	0
Irrigated Land	0.00	0.00	0.00	Residences within 500 ft	0	0	0
Hay Land	0.34	0.31	+0.03	**Structures**			
Total	4.09	4.09	0.00	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.00	0.05	-0.05	**Cultural Resources (Class III)**			
Private Land	4.09	2.89	+1.20	Cultural Findings (% Surveyed)	1 Not Elg. (100%)	1 Not Elg. (100%)	0
U.S. Bureau of Land Management	0.00	1.15	-1.15				
Local Government	0.00	0.00	0.00	Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
ROW	0.00	0.00	0.00	**Grouse (desktop data)**			
Total	4.09	4.09	0.00	Sage-grouse Core Area crossed	0	0	0
Number of Road Crossings				Sage-grouse Leks within 1 mile	0	0	0
Major Roads	0	0	0	Sage-grouse Leks within 2 miles	0	0	0
Minor Roads	4	2	+2	Sage-grouse Leks within 3 miles	0	0	0
Total	4	2	+2	Sage-grouse Leks within 4 miles	1	1	0
Number of Railroad Crossings	0	0	0	Sharp-tailed Leks within 1 mile	1	1	0
Number of Stream Crossings				Sharp-tailed Leks within 2 miles	1	1	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 3 miles	1	1	0
Intermittent Streams	2	2	0	Sharp-tailed Leks within 4 miles	4	4	0
Additional USGS Streams	6	1	+5	**Construction Costs**			
Total	8	3	+5	Cost per mile	$2,100,000	$2,100,000	
				Total Construction Cost	$8,589,000	$8,589,000	$0

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.3-27
Comparison of Keystone Realignment 39 (KEY-39) with the Proposed Segment of the 2009 Route it Would Replace

Item	Miles of Land Crossed (except where noted): 2009 Proposed Route Segment	Miles of Land Crossed (except where noted): KEY-39	Difference	Item	Miles of Land Crossed (except where noted): 2009 Proposed Route Segment	Miles of Land Crossed (except where noted): KEY-39	Difference
Length	0.56	0.57	-0.01	**Slope**			
Land Cover				< 5%	0.06	0.02	+0.04
Developed	0.00	0.00	0.00	≥ 5% and ≤ 15%	0.36	0.17	+0.19
Forested/ Woodlands	0.00	0.00	0.00	> 15% and ≤ 30%	0.14	0.24	-0.10
Wetlands	0.00	0.00	0.00	> 30%	0.00	0.14	-0.14
Total	0.00	0.00	0.00	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	0.46	0.51	-0.05	Residences within 25 ft	0	0	0
Irrigated Land	0.00	0.00	0.00	Residences within 500 ft	0	0	0
Hay Land	0.10	0.06	+0.04	**Structures**			
Total	0.56	0.57	-0.01	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.00	0.00	0.00	**Cultural Resources (Class III)**			
Private Land	0.49	0.52	-0.03	Cultural Findings (% Surveyed)	0 (100%)	0 (100%)	0
U.S. Bureau of Land Management	0.07	0.05	+0.02	Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
Local Government	0.00	0.00	0.00	**Grouse (desktop data)**			
ROW	0.00	0.00	0.00	Sage-grouse Core Area crossed	0	0	0
Total	0.56	0.57	-0.01	Sage-grouse Leks within 1 mile	0	0	0
Number of Road Crossings				Sage-grouse Leks within 2 miles	0	0	0
Major Roads	0	0	0	Sage-grouse Leks within 3 miles	4	4	0
Minor Roads	1	1	0	Sage-grouse Leks within 4 miles	4	4	0
Total	1	1	0	Sharp-tailed Leks within 1 mile	0	0	0
Number of Railroad Crossings	0	0	0	Sharp-tailed Leks within 2 miles	0	0	0
Number of Stream Crossings				Sharp-tailed Leks within 3 miles	0	0	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 4 miles	0	0	0
Intermittent Streams	0	0	0	**Biology (survey data)**			
Additional USGS Streams	0	0	0	Biological Resources (% Surveyed)	0 (100%)	0 (100%)	0
Total	0	0	0	**Construction Costs**			
				Cost per mile	$2,100,000	$2,100,000	
				Total Construction Cost	$1,176,000	$1,197,000	-$21,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.3-28
Comparison of Keystone Realignment 40 (KEY-40) with the Proposed Segment of the 2009 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-40	Difference
Length	3.58	3.62	-0.04
Land Cover			
Developed	0.00	0.00	0.00
Forested/ Woodlands	0.00	0.00	0.00
Wetlands	0.00	0.00	0.00
Total	0.00	0.00	0.00
Revenue Final Land Unit Classification			
Range Land	3.36	3.41	-0.05
Irrigated Land	0.00	0.00	0.00
Hay Land	0.22	0.21	+0.01
Total	3.58	3.62	-0.04
Land Ownership			
State of Montana	0.00	0.00	0.00
Private Land	3.58	3.28	+0.30
U.S. Bureau of Land Management	0.00	0.34	-0.34
Local Government	0.00	0.00	0.00
ROW	0.00	0.00	0.00
Total	3.58	3.62	-0.04
Number of Road Crossings			
Major Roads	0	0	0
Minor Roads	2	2	0
Total	2	2	0
Number of Railroad Crossings	0	0	0
Number of Stream Crossings			
Perennial Streams	0	0	0
Intermittent Streams	0	1	-1
Additional USGS Streams	5	1	+4
Total	5	2	+3

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-40	Difference
Slope			
< 5%	0.92	0.60	+0.32
≥ 5% and ≤ 15%	2.36	2.55	-0.19
> 15% and ≤ 30%	0.30	0.47	-0.17
> 30%	0.00	0.00	0.00
Water Wells within 100 ft	0	0	0
Residences			
Residences within 25 ft	0	0	0
Residences within 500 ft	0	0	0
Structures			
Structures within 25 ft	0	0	0
Structures within 500 ft	0	0	0
Cultural Resources (Class III)			
Cultural Findings (% Surveyed)	0 (100%)	0 (100%)	0
Paleo Findings (% Surveyed)	0 (100%)	1 Sig. (100%)	-1 Sig.
Grouse (desktop data)			
Sage-grouse Core Area crossed	0	0	0
Sage-grouse Leks within 1 mile	0	0	0
Sage-grouse Leks within 2 miles	1	1	0
Sage-grouse Leks within 3 miles	3	3	0
Sage-grouse Leks within 4 miles	5	6	-1
Sharp-tailed Leks within 1 mile	0	0	0
Sharp-tailed Leks within 2 miles	1	1	0
Sharp-tailed Leks within 3 miles	1	1	0
Sharp-tailed Leks within 4 miles	1	1	0
Biology (survey data)			
Biological Resources (% Surveyed)	0 (100%)	1 Noxious Weed (100%)	-1 Noxious Weed
Construction Costs			
Cost per mile	$2,100,000	$2,100,000	
Total Construction Cost	$1,176,000	$1,197,000	-$21,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

I-2.4.3.2.28 Keystone Realignment KEY-41 (Little Beaver Creek Realignment)

KEY-41 (see Figure I-2.4.3-22 and Table I-2.4.3-29) was proposed by Keystone to avoid construction near a pond at milepost 264.5. The realignment would be located 480 feet west of the 2009 proposed route segment, from mileposts 262.7 to 266.5. KEY-41 would be 0.01 mile longer than the proposed segment, and both routes would cross one minor road. Field surveys found that KEY-41 would cross one more non-significant paleontological site, and that neither route would cross any cultural resources. KEY-41 also would cross one additional USGS stream, but both routes would cross one intermittent stream. Desktop data indicated both routes would be located within 4 miles of one greater sage-grouse lek. This lek would be over a ridge and visually screened from both the 2009 route and Key-41. It is interesting to note that this sage-grouse lek appears to be located on top of or very close to an older pipeline. MDEQ selected KEY-41 to avoid construction near a pond.

I-2.4.3.2.29 Keystone Realignment KEY-45 (North Fork Coal Bank Creek Realignment)

KEY-45 (see Figure I-2.4.3-23 and Table I-2.4.3-30) was proposed by a landowner to avoid construction near natural springs at mileposts 275.1 and 275.7. KEY-45 would be located 820 feet east of the 2009 proposed route segment, from mileposts 274.1 to 275.9, and would be about 0.01 mile longer. Field surveys did not find cultural resource or paleontological sites along either route. Both routes would cross one intermittent stream and one USGS stream. MDEQ selected KEY-45 to address the landowner concern and to avoid crossing an area with springs.

I-2.4.3.2.30 Keystone Realignment KEY-46 (South Fork Coal Bank Creek Realignment)

KEY-46 (see Figure I-2.4.3-24 and Table I-2.4.3-31) was proposed to cross South Fork Coal Bank Creek and Box Elder Creek at preferred locations where there would be more gentle slopes on the banks. The realignment would be from mileposts 277.9 to 281.6 and about 0.21 mile shorter than the 2009 proposed route segment on private land. Both routes would cross two minor roads and field surveys found that both routes would cross one non-eligible cultural resource but no paleontological sites. Both routes also would cross one perennial stream and one intermittent stream. Desktop data indicated that both routes would be located within 4 miles of one greater sage-grouse lek.

Two landowners who would be potentially impacted by this realignment had objections because it would cross more cultivated land and be closer to buildings and a residence. MTV-19a was developed in response to this realignment by the landowners and MDEQ to have a more preferred crossing of South Fork Coal Bank Creek and Box Elder Creek, and incorporate the landowners’ concerns mentioned previously. MDEQ did not select KEY-46 (see MTV-19a in Section I-2.4.2-19a).

I-2.4.3.2.31 Keystone Realignment KEY-47 (Boxelder Creek Realignment)

KEY-47 (see Figure I-2.4.3-24 and Table I-2.4.3-32) was proposed by Keystone to shorten the route and to move the crossing of the tributary to Box Elder Creek to a location without steep banks in South Dakota. The realignment would be 0.04 mile shorter and would be located 800 feet west of the 2009 proposed route segment, from mileposts 281.8 to 282.5 in Montana. Many of the comparisons in Table I-2.4.3-32 stop at the Montana/South Dakota border, and are noted with an asterisk. Field surveys did not find cultural resources or paleontological sites along either route. Both routes would cross one USGS stream and desktop data indicated that they would be within 3 miles of one greater sage-grouse lek. Field surveys verified the greater sage-grouse lek from desktop data and identified six additional greater sage-grouse leks within 3 miles of both routes in Harding County, South Dakota. MDEQ selected KEY-47 to shorten the length and connect to the alignment in South Dakota that avoids steep streamside banks.

I-2.4.3.2.32 Keystone Realignment KEY-48 (South Fork Shade Creek Variation)

KEY-48 (see Figure I-2.4.3-11 and Table I-2.4.3-32) was a MDEQ and BLM request to avoid a steep butte on BLM land. MDEQ and Keystone examined the possibility of horizontally boring this steep butte but found that elevation differences on each side of the butte posed challenges to such a bore. In addition, construction equipment would still need to be moved around the butte. Consequently, Keystone developed a variation that would address these concerns. The variation from mileposts 114.3 to 115.6 would be about 0.29 mile longer than the 2009 proposed route segment it would replace. KEY-48 would cross 0.37 mile more of BLM land but 0.08 mile less of private land. Field surveys found that KEY-48 would cross one potentially eligible cultural resource but that one non-significant paleontological site was identified on the 2009 proposed route. Additionally, field surveys found one noxious weed area on the 2009 proposed route. Desktop data indicated that there were three greater sage-grouse leks within 4 miles of both routes, which were verified by field surveys. MDEQ selected KEY-48 to address terrain and access issues.

TABLE I-2.4.3-29
Comparison of Keystone Realignment 41 (KEY-41) with the Proposed Segment of the 2009 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-41	Difference	Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-41	Difference
Length	3.80	3.81	-0.01	**Slope**			
Land Cover				< 5%	1.55	1.39	+0.16
Developed	0.00	0.00	0.00	≥ 5% and ≤ 15%	2.18	2.34	-0.16
Forested/ Woodlands	0.00	0.00	0.00	> 15% and ≤ 30%	0.07	0.08	-0.01
Wetlands	0.00	0.00	0.00	> 30%	0.00	0.00	0.00
Total	0.00	0.00	0.00	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	2.68	2.69	-0.01	Residences within 25 ft	0	0	0
Irrigated Land	0.00	0.00	0.00	Residences within 500 ft	0	0	0
Hay Land	1.12	1.12	0.00	**Structures**			
Total	3.80	3.81	-0.01	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.00	0.00	0.00	**Cultural Resources (Class III)**			
Private Land	3.80	3.81	-0.01	Cultural Findings (% Surveyed)	0 (100%)	0 (100%)	0
U.S. Bureau of Land Management	0.00	0.00	0.00	Paleo Findings (% Surveyed)	1 Not Sig. (100%)	2 Not Sig. (100%)	-1 Not Sig.
Local Government	0.00	0.00	0.00				
ROW	0.00	0.00	0.00	**Grouse (desktop data)**			
Total	3.80	3.81	-0.01	Sage-grouse Core Area crossed	0	0	0
Number of Road Crossings				Sage-grouse Leks within 1 mile	0	0	0
Major Roads	0	0	0	Sage-grouse Leks within 2 miles	0	0	0
Minor Roads	1	1	0	Sage-grouse Leks within 3 miles	0	0	0
Total	1	1	0	Sage-grouse Leks within 4 miles	1	1	0
Number of Railroad Crossings	0	0	0	Sharp-tailed Leks within 1 mile	0	0	0
Number of Stream Crossings				Sharp-tailed Leks within 2 miles	0	0	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 3 miles	0	0	0
Intermittent Streams	1	1	0	Sharp-tailed Leks within 4 miles	0	0	0
Additional USGS Streams	0	1	-1	**Construction Costs**			
Total	1	2	-1	Cost per mile	$2,100,000	$2,100,000	
				Total Construction Cost	$3,969,000	$3,990,000	-$21,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.3-30
Comparison of Keystone Realignment 45 (KEY-45) with the Proposed Segment of the 2009 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-45	Difference	Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-45	Difference
Length	1.89	1.90	-0.01	**Slope**			
Land Cover				< 5%	0.52	0.51	+0.01
Developed	0.00	0.00	0.00	≥ 5% and ≤ 15%	1.16	1.21	-0.05
Forested/ Woodlands	0.00	0.00	0.00	> 15% and ≤ 30%	0.17	0.17	0.00
Wetlands	0.00	0.00	0.00	> 30%	0.04	0.01	+0.03
Total	0.00	0.00	0.00	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	1.55	1.56	-0.01	Residences within 25 ft	0	0	0
Irrigated Land	0.00	0.00	0.00	Residences within 500 ft	0	0	0
Hay Land	0.34	0.34	0.00	**Structures**			
Total	1.89	1.90	-0.01	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.00	0.00	0.00	**Cultural Resources (Class III)**			
Private Land	1.89	1.90	-0.01	Cultural Findings (% Surveyed)	0 (100%)	0 (100%)	0
U.S. Bureau of Land Management	0.00	0.00	0.00	Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
Local Government	0.00	0.00	0.00	**Grouse (desktop data)**			
ROW	0.00	0.00	0.00	Sage-grouse Core Area crossed	0	0	0
Total	1.89	1.90	-0.01	Sage-grouse Leks within 1 mile	0	0	0
Number of Road Crossings				Sage-grouse Leks within 2 miles	0	0	0
Major Roads	0	0	0	Sage-grouse Leks within 3 miles	0	0	0
Minor Roads	0	0	0	Sage-grouse Leks within 4 miles	0	0	0
Total	0	0	0	Sharp-tailed Leks within 1 mile	0	0	0
Number of Railroad Crossings	0	0	0	Sharp-tailed Leks within 2 miles	0	0	0
Number of Stream Crossings				Sharp-tailed Leks within 3 miles	0	0	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 4 miles	0	0	0
Intermittent Streams	1	1	0	**Construction Costs**			
Additional USGS Streams	1	1	0	Cost per mile	$2,100,000	$2,100,000	
Total	2	2	0	Total Construction Cost	$3,969,000	$3,990,000	-$21,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.3-31
Comparison of Keystone Realignment 46 (KEY-46) with the Proposed Segment of the 2009 Route it Would Replace

Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-46	Difference	Item	Miles of Land Crossed (except where noted) 2009 Proposed Route Segment	KEY-46	Difference
Length	3.74	3.53	+0.21	**Slope**			
Land Cover				< 5%	2.51	2.32	+0.19
Developed	0.00	0.00	0.00	≥ 5% and ≤ 15%	1.17	1.20	-0.03
Forested/ Woodlands	0.00	0.00	0.00	> 15% and ≤ 30%	0.06	0.01	+0.05
Wetlands	0.00	0.00	0.00	> 30%	0.00	0.00	0.00
Total	0.00	0.00	0.00	**Water Wells within 100 ft**	0	0	0
Revenue Final Land Unit Classification				**Residences**			
Range Land	2.81	2.00	+0.81	Residences within 25 ft	0	0	0
Irrigated Land	0.00	0.00	0.00	Residences within 500 ft	0	0	0
Hay Land	0.93	1.53	-0.60	**Structures**			
Total	3.74	3.53	+0.21	Structures within 25 ft	0	0	0
Land Ownership				Structures within 500 ft	0	0	0
State of Montana	0.00	0.00	0.00	**Cultural Resources (Class III)**			
Private Land	3.74	3.53	+0.21	Cultural Findings (% Surveyed)	1 Not Elg. (100%)	1 Not Elg. (100%)	0
U.S. Bureau of Land Management	0.00	0.00	0.00				
Local Government	0.00	0.00	0.00	Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
ROW	0.00	0.00	0.00	**Grouse (desktop data)**			
Total	3.74	3.53	+0.21	Sage-grouse Core Area crossed	0	0	0
Number of Road Crossings				Sage-grouse Leks within 1 mile	0	0	0
Major Roads	0	0	0	Sage-grouse Leks within 2 miles	0	0	0
Minor Roads	2	2	0	Sage-grouse Leks within 3 miles	0	0	0
Total	2	2	0	Sage-grouse Leks within 4 miles	1	1	0
Number of Railroad Crossings	0	0	0	Sharp-tailed Leks within 1 mile	0	0	0
Number of Stream Crossings				Sharp-tailed Leks within 2 miles	0	0	0
Perennial Streams	1	1	0	Sharp-tailed Leks within 3 miles	0	0	0
Intermittent Streams	1	1	0	Sharp-tailed Leks within 4 miles	0	0	0
Additional USGS Streams	0	0	0	**Construction Costs**			
Total	2	2	0	Cost per mile	$2,100,000	$2,100,000	
				Total Construction Cost	$7,854,000	$7,413,000	+$441,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

TABLE I-2.4.3-32
Comparison of Keystone Realignment 47 (KEY-47) with the Proposed Segment of the 2009 Route it Would Replace

	Miles of Land Crossed (except where noted)				Miles of Land Crossed (except where noted)		
Item	2009 Proposed Route Segment	KEY-47	Difference	Item	2009 Proposed Route Segment	KEY-47	Difference
Length	1.82	1.78	+0.04	**Slope***			
Land Cover				< 5%	0.60	0.98	-0.38
Developed	0.00	0.00	0.00	≥ 5% and ≤ 15%	1.02	0.72	+0.30
Forested/ Woodlands	0.00	0.00	0.00	> 15% and ≤ 30%	0.20	0.08	+0.12
Wetlands	0.00	0.00	0.00	> 30%	0.00	0.00	0.00
Total	0.00	0.00	0.00	**Water Wells within 100 ft***	0	0	0
Revenue Final Land Unit Classification*				**Residences***			
Range Land	0.52	0.58	-0.06	Residences within 25 ft	0	0	0
Irrigated Land	0.00	0.00	0.00	Residences within 500 ft	0	0	0
Hay Land	0.00	0.00	0.00	**Structures***			
Total	0.52	0.58	-0.06	Structures within 25 ft	0	0	0
Land Ownership*				Structures within 500 ft	0	0	0
State of Montana	0.00	0.00	0.00	**Cultural Resources* (Class III)**			
Private Land	0.52	0.58	-0.06	Cultural Findings (% Surveyed)	0 (100%)	0 (100%)	0
U.S. Bureau of Land Management	0.00	0.00	0.00	Paleo Findings (% Surveyed)	0 (100%)	0 (100%)	0
Local Government	0.00	0.00	0.00	**Grouse* (desktop data)***			
ROW	0.00	0.00	0.00	Sage-grouse Core Area crossed	0	0	0
Total	0.52	0.58	-0.06	Sage-grouse Leks within 1 mile	0	0	0
Number of Road Crossings				Sage-grouse Leks within 2 miles	0	0	0
Major Roads	0	0	0	Sage-grouse Leks within 3 miles	1	1	0
Minor Roads	0	0	0	Sage-grouse Leks within 4 miles	1	1	0
Total	0	0	0	Sharp-tailed Leks within 1 mile	0	0	0
Number of Railroad Crossings	0	0	0	Sharp-tailed Leks within 2 miles	0	0	0
Number of Stream Crossings				Sharp-tailed Leks within 3 miles	0	0	0
Perennial Streams	0	0	0	Sharp-tailed Leks within 4 miles	0	0	0
Intermittent Streams	0	0	0	**Construction Costs**			
Additional USGS Streams	1	1	0	Cost per mile	$2,100,000	$2,100,000	
Total	1	1	0	Total Construction Cost	$3,822,000	$3,738,000	+$84,000

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences. *Data sources only available in Montana.
* These resource comparisons stop at the Montana/South Dakota border at about one-half mile.

TABLE I-2.4.3-33
Comparison of Keystone Realignment 48 (KEY-48) with the Proposed Segment of the 2009 Route it Would Replace

Item	Miles of Land Crossed (except where noted): 2009 Proposed Route Segment	Miles of Land Crossed (except where noted): KEY-48	Difference
Length	1.31	1.60	-0.29
Land Cover			
Developed	0.00	0.00	0.00
Forested/ Woodlands	0.00	0.00	0.00
Wetlands	0.00	0.00	0.00
Total	0.00	0.00	0.00
Revenue Final Land Unit Classification			
Range Land	0.87	1.25	-0.38
Irrigated Land	0.00	0.00	0.00
Hay Land	0.44	0.35	+0.09
Total	1.31	1.60	-0.29
Land Ownership			
State of Montana	0.00	0.00	0.00
Private Land	1.00	0.92	+0.08
U.S. Bureau of Land Management	0.31	0.68	-0.37
Local Government	0.00	0.00	0.00
ROW	0.00	0.00	0.00
Total	1.31	1.60	-0.29
Number of Road Crossings			
Major Roads	0	0	0
Minor Roads	2	2	0
Total	2	2	0
Number of Railroad Crossings	0	0	0
Number of Stream Crossings			
Perennial Streams	0	0	0
Intermittent Streams	1	1	0
Additional USGS Streams	3	4	-1
Total	4	5	-1

Item	Miles of Land Crossed (except where noted): 2009 Proposed Route Segment	Miles of Land Crossed (except where noted): KEY-48	Difference
Slope			
< 5%	0.49	0.56	-0.07
≥ 5% and ≤ 15%	0.62	0.94	-0.32
> 15% and ≤ 30%	0.17	0.10	+0.07
> 30%	0.03	0.00	+0.03
Water Wells within 100 ft	0	0	0
Residences			
Residences within 25 ft	0	0	0
Residences within 500 ft	0	0	0
Structures			
Structures within 25 ft	0	0	0
Structures within 500 ft	0	0	0
Cultural Resources (Class III)			
Cultural Findings (% Surveyed)	0 (100%)	1 Pot. Elg. (100%)	-1 Pot. Elg.
Paleo Findings (% Surveyed)	1 Not Sig. (100%)	0 (100%)	+1 Not Sig.
Grouse (desktop data)			
Sage-grouse Core Area crossed	0	0	0
Sage-grouse Leks within 1 mile	0	0	0
Sage-grouse Leks within 2 miles	1	1	0
Sage-grouse Leks within 3 miles	2	2	0
Sage-grouse Leks within 4 miles	3	3	0
Sharp-tailed Leks within 1 mile	0	0	0
Sharp-tailed Leks within 2 miles	0	0	0
Sharp-tailed Leks within 3 miles	0	0	0
Sharp-tailed Leks within 4 miles	0	0	0
Biology (survey data)			
Biological Resources (% Surveyed)	1 Noxious Weed (100%)	0 (100%)	+ 1 Noxious Weed
Construction Costs			
Cost per mile	$2,100,000	$2,100,000	
Total Construction Cost	$2,751,000	$3,360,000	-$609,000
Environmental Mitigation Cost	$7,120	$10,000	-$2,880

Source: see Section I-2.4.1 for information on the items listed, the data sources used, and the calculations of differences.

I-2.5 PREFERRED ROUTE IN MONTANA

MDEQ identified and assessed potential alternatives for the proposed Keystone XL Project in Montana. Those assessments included consideration of the No Action Alternative (Section 4.1 of the EIS and Section I-2.2), the system and route alternatives presented in Sections 4.2 and 4.3 of the EIS, and the route alternatives identified in Section I-2.3. During the screening process it was determined that the identified alternatives were either not considered reasonable or did not offer a significant environmental advantage over the proposed Project route (Alternative SCS-B) and were therefore eliminated from further evaluation. However, in Section I-2.4.2, MDEQ identified 50 variations to the proposed route that would increase the use of public land where economically as practicable as the use of private land (as required by MFSA), avoid or minimize impacts to specific resources, avoid or minimize conflicts with existing or proposed residential and agricultural land uses, or respond to requests submitted by concerned landowners. In addition, in Section I-2.4.3 Keystone indentified 48 realignments to the proposed route that would avoid or minimize impacts to specific resources. The 16 realignments less than 250 feet (see Table I-2.4.3-1) were not evaluated as part of MDEQ's preferred route but additional room would be provided (see Attachment 1, Environmental Specifications, Appendix E). However, two realignments less than 250 feet were combined with preferred route variations, including KEY-25 as part of MTV-5a (see Section I-2.4.2-5a) and KEY-34 as part of MTV-11 (see Section I-2.4.2-11).

After evaluating the 50 variations (MTVs), MDEQ determined that 23 of the variations were preferable to the segments of the proposed route they would replace (see Sections I-2.4.2-1 through I-2.4.2-30 and Figures I-2.4.2-1 through I-2.4.2-24). The Montana route variations selected consist of the following:

- MTV-5a (combined with KEY-25)
- MTV-6
- MTV-6a
- MTV-6b
- MTV-6c
- MTV-9e (southern 1.5 miles)
- MTV-9g
- MTV-10
- MTV-11(combined as KEY-33 and KEY-34)
- MRV-15
- MTV-17
- MTV-19a
- MTV-20
- MTV-21
- MTV-22 (combined with KEY-16)
- MTV-23
- MTV-24
- MTV-25

- MTV-26 (combined with KEY-35)
- MTV-27
- MTV-28
- MTV-29
- MTV-30

After evaluating the 32 Keystone realignments (KEYs) greater than 250 feet, MDEQ determined that 25 of the realignments were preferable to the segments of the proposed route that they would replace (see Sections I-2.4.3-1 through I-2.4.3-32 and Figures I-2.4.3-1 through I-2.4.3-24). The Keystone realignments selected consist of the following:

- KEY-1
- KEY-2 (combined with MTV-30)
- KEY-3 (combined with MTV-30)
- KEY-4
- KEY-6
- KEY-8
- KEY-12
- KEY-15
- KEY-16 (southern 1.1 miles, combined with MTV-22)
- KEY-17
- KEY-21 (portion north of KEY-48)
- KEY-24
- KEY-30
- KEY-31
- KEY-32
- KEY-33 (northern portion of MTV-11)
- KEY-35 (western portion, combined with MTV-26)
- KEY-36
- KEY-37
- KEY-39
- KEY-40
- KEY-41
- KEY-45
- KEY-47
- KEY-48

As a result, MDEQ has selected the proposed Project route (Alternative SCS-B), as modified by the variations and realignments listed above, as the preferred alternative route in Montana. Figure I-2.5-1 depicts that route. This route is approximately 285.5 miles long in Montana, with approximately 72.7 miles of variations and 45.0 miles realignments replacing proposed route segments.

I-2.6 REFERENCES CITED

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I-3.0 ENVIRONMENTAL ANALYSIS OF THE PROPOSED KEYSTONE XL PROJECT IN MONTANA

The overall approach used to assess the impacts of the proposed Project is presented in Section 3.0 of the EIS. The sections of the EIS listed below present discussions about the potential impacts of the proposed Project that comply with MEPA requirements and provide supporting information for the determinations under MFSA:

- Geology (Section 3.1);
- Soils and Sediments (Section 3.2);
- Threatened and Endangered Species (Section 3.8);
- Cultural Resources (Section 3.11);
- Risk Analysis and Environmental Consequences (Section 3.13); and
- Cumulative Impacts (Section 3.14).

The DOS EIS also provides information required by MEPA and supporting information for the determinations under MFSA for Water Resources; Wetlands; Terrestrial Vegetation; Wildlife; Fisheries; Land Use, Recreation, and Visual Resources; Socioeconomics; and Air Quality and Noise. This appendix provides supplemental information for those resource areas in the following sections:

- Water Resources (Section I-3.1);
- Wetlands (Section I-3.2);
- Terrestrial Vegetation (Section I-3.3);
- Wildlife (Section I-3.4);
- Fisheries (Section I-3.5);
- Land Use, Recreation, and Visual Resources (Section I-3.6);
- Socioeconomics (Section I-3.7); and
- Air Quality and Noise (Section I-3.8).

In some cases, information from the DOS EIS has been repeated in this appendix to provide continuity with the discussion about existing conditions and the potential environmental impacts of the proposed Project. It should be noted that this section of the appendix provides an overview of the affected environment and potential impacts of the original 2009 Keystone proposed pipeline alignment. Detailed review of the potentially affected resources of the 2010 Keystone proposed realignments and the 2010 and 2011 MDEQ proposed variations were presented in the previous section.

As stated in Section 3.0 of the EIS, the environmental consequences of constructing and operating the proposed Project could be adverse or beneficial and would vary in duration and magnitude. Four levels of impact duration were considered: temporary, short term, long term, and permanent. Temporary impacts generally occur during construction, with the resources returning to pre-construction conditions almost immediately afterward. Short-term impacts could continue for approximately three years following construction. Impacts were considered long term if the resources would require more than three years to recover. Permanent impacts would occur as a result of activities that modified resources to the extent that they would not return to pre-construction conditions during the life of the proposed Project, such as with construction of aboveground structures. An impact resulting in a substantial adverse change in the environment would be considered significant.

The sections below address the affected environment, construction and operations impacts, and mitigation, where appropriate. Keystone has indicated that it would implement certain measures to reduce environmental impacts. These measures have been evaluated and additional measures that might be necessary to further reduce impacts are recommended. In addition, MDEQ has developed its Environmental Specifications to provide additional mitigation to potential impacts; those specifications are included in this appendix as Attachment 1.

Conclusions in this appendix are based on analyses of environmental impacts and the following assumptions:

- Keystone would comply with all applicable laws and regulations;
- The proposed facilities would be constructed as described in Section 2.0 of the EIS;
- Keystone would implement the measures designed to avoid or minimize impacts that are described in its application to MDEQ for a MFSA certificate and in supplemental filings to that application;
- Keystone would implement the measures designed to avoid or minimize impacts that are described in its Environmental Report and supplemental filings to DOS, including its Construction, Mitigation, and Reclamation (CMR) Plan (presented in Appendix B to the EIS); and
- Keystone would implement the required measures presented in the MDEQ Environmental Specifications presented in Attachment 1 to this appendix.

As noted in Section I-1.0, information regarding the proposed Project (e.g., design, location, schedule, workforce, miles of specific types of land crossed, and other details needed to conduct an environmental assessment of the proposed Project) was obtained from four main sources: (1) Keystone's application for a MFSA Certificate of Compliance and subsequent submittals associated with the application, (2) Keystone's application for a Presidential Permit and associated submittals to DOS, (3) Keystone's proposed Plan of Development for a ROW grant from the Bureau of Land Management (BLM), and (4) Keystone's supplemental information for Section 2 of the EIS, Project Description. Information from those sources is not specifically cited in the following sections.

In addition, limited field work was conducted by MDEQ staff. Information about the existing environment in Montana that was included in the documents submitted by Keystone was partially reviewed for accuracy by MDEQ, and the documents were reviewed for accuracy by the third-party environmental contractor to DOS and MDEQ. Where appropriate, information from those documents was used in this impact analysis section. Information about existing conditions and potential environmental impacts associated with implementation of the proposed Project was also obtained from literature research and field studies conducted by the third-party environmental contractor, from MDEQ and MFWP sources of information publicly available in Montana, and from MDEQ files and knowledge of the area in the vicinity of the routes of the proposed Project and the alternatives.

I-3.1 WATER RESOURCES

Section 3.3 of the main body of the EIS provides information about the affected environment and potential impacts of proposed Project implementation on water resources, including information for Montana. Section I-3.1.1 provides site-specific information about selected waterbody crossings in

Montana, in accordance with the provisions of MEPA and MFSA, and Section I-3.1.2 addresses floodplains along the proposed route in Montana.

I-3.1.1 WATERBODIES

Prior to making a decision under MFSA and the Montana Water Quality Act (75-5-318, MCA), MDEQ must conduct a review of stream crossings for Keystone's proposed route and make a determination on its Joint Application 318 Authorization. Under MFSA, that decision must be made concurrently with a decision on Keystone's application for a MFSA Certificate of Compliance. The third-party environmental contractor for DOS and MDEQ conducted on-site inspections of selected crossing sites for Keystone's proposed route in Montana and submitted a report about the inspections to MDEQ (*Keystone XL Pipeline Montana Stream Crossing Inspections Report* [SCIR]). That report provides information about the proposed crossing methods, the process used to select crossing sites for field inspection, office and field methods used, and the results of the analyses for each crossing site assessed. It also describes the procedures that Keystone would incorporate into design and construction of the crossings to minimize impacts and potential site-specific mitigation measures for consideration by MDEQ. MDEQ has adopted the SCIR by reference as part of the EIS for the proposed Project.

The information presented below summarizes key aspects of the SCIR, the measures that Keystone would incorporate into the proposed Project to avoid or minimize impacts, and the mitigation measures that MDEQ would require as a part of its Environmental Specifications for the proposed Project (see Attachment 1 to this appendix) to minimize the impacts of stream crossings in Montana. In addition, a draft of the MDEQ requirements for the 318 Authorization is presented in Attachment 2 of this appendix.

I-3.1.1.1 Methods and Analyses

Waterbody Crossings for Analysis

The proposed pipeline would cross a total of 389 waterbodies in Montana. Of that total, MDEQ selected 55 crossing sites for detailed review because they met at least one of the following criteria:

- The proposed route crossed a perennial stream;
- The proposed crossing site was within a designated floodplain of the state;
- The proposed route crossed a waterbody containing fish designated as Species of Concern to the state or which was known to include the habitats of those fish species; or
- The proposed route crossed a stream of special interest to the state.

Of the 55 crossings in Montana that required further review, 20 are perennial streams and 35 are intermittent streams. All 20 perennial stream crossings were inspected in the field. MDEQ required that all 35 proposed crossings of intermittent streams receive a desktop review because of their listing as a potential concern. Proposed intermittent stream crossings were inspected in the field only if they either contained fish Species of Concern or were known to include the habitats of those fish species, or if they were streams of special interest to the state.

Using these criteria, 16 of the reviewed 35 intermittent streams were identified for site inspections. The remaining 19 intermittent stream crossings were evaluated using the in-office analytical procedures described below.

Analysis of Intermittent Streams Not Field Inspected

Desktop analyses of the proposed crossings were conducted to provide context, background, and support for the field investigations. The analyses included a review of available literature and addressed flood flow and geomorphic characterization of the proposed crossing sites. Flood flow frequency analyses were conducted for each proposed crossing site using a regional regression equation (Omang 1992) to calculate the discharge for the 2-, 5-, 10-, 50-, and 100-year storm recurrence intervals. The nearest gauge station was included in the analysis using Federal Emergency Management Agency's (FEMA) Bulletin 17B method (FEMA 1981). Checks were conducted of arbitrarily selected stations by using either a second flood flow calculation or an exceedance probability curve from historical annual peak flow data. Although the potential for lateral stream migration was examined and documented, scour depths were not calculated.

The geomorphic assessments were conducted using GIS and several sources of data: aerial photographs from 2005; USGS topographic maps in 1:24,000 scale from 1940 to 1995; geologic maps in 1:100,000 scale from the Montana Bureau of Mines and Geology; and digital surface water data from the USGS National Hydrograph Database. Data were obtained for the channels to be crossed and for the surrounding floodplains and valleys. Channel characterization included measurements of the width, form, gradient, and sinuosity of each channel. Valley characteristics examined included the width, gradient, geology, and the presence of landslides or floodplain features such as relict channels. Infrastructure in the vicinity of each crossing, including the presence of in-stream structures, was also catalogued.

The literature review consisted of online searches in Montana's Natural Resource Information System and other state and national agency databases for previous channel migration zone studies. It also included review of reports about hydrology, hydraulics, sediment transport, bridge scour, ice jams, and turbidity.

Field Methods

Site specific information collected in the field included characterization of stream form and geometry, alluvial substrate, soils, vegetation, evidence of current and previous instability, and natural and artificial disturbance affecting the crossing site. Field maps and valley cross-sections were developed for each proposed crossing site; this included a topographic, geologic, and soils map for each site, as well as current and historic air photos.

Valley cross-sections along the proposed route were developed using USGS 30-minute digital terrain models. This reach-level information was used to place the proposed crossing location in context with the surrounding topography, geology, soils, and hydrology, and to identify natural or artificial disturbances adjacent to the crossing that might affect the crossing site. The results of the flood frequency analyses were used as a check of the field interpretations of the locations and extents of the bankfull channel and recurrence intervals for identified floodplains. Although the potential for lateral stream migration was examined and documented, scour depths were not calculated.

On-site evaluations of each of the crossing sites focused on the following considerations:

- Likelihood that the pipeline crossing as currently designed would withstand stream scour, incision, and lateral stream movement over the life of the proposed Project;
- Likelihood that the proposed crossing method would minimize turbidity during construction and operation; and
- Assessments of the potential environmental effects of the proposed design of the crossings and consideration of potential mitigation of those effects.

I-3.1.1.2 Affected Environment, Potential Impacts, and Mitigation

The studies conducted for the SCIR indicated that several proposed crossing sites had indicators of bank or other geomorphologic instability, or the presence of geomorphologic features that could lead to future instability. Indicators of instability that could lead to future incision or lateral migration were present at 27 of the 35 crossing sites listed in Table I-3.1-1. Examples of these indicators included areas with nearly vertical banks, areas with actively slumping or undercut banks, areas with side channels on floodplains adjacent to the bank-full channel, and areas with perennial or intermittent in-stream impoundments.

TABLE I-3.1-1
Crossing Sites Inspected to Determine the Potential for Incision or Lateral Migration from Proposed Pipeline Construction in Montana

	Concern				
Stream	**Turbidity**	**Incision**	**Channel Migration**	**Consider Adaptive Management Plan**	**Consider Alternative Crossing Technique**
Corral Coulee (A)	No	Yes	Yes	Yes	No
Corral Coulee (B)	No	Yes	Yes	Yes	No
Frenchman Creek	No	Yes	Yes	Yes	Yes
Hay Coulee	No	No	No	Yes	No
Rock Creek	No	Yes	Yes	Yes	Yes
Willow Creek	No	Yes	Yes	Yes	Yes
Lime Creek	No	Yes	Yes	Yes	No
Brush Fork	No	Yes	Yes	Yes	No
Bear Creek	No	Yes	Yes	Yes	No
Unger Coulee	No	Yes	Yes	Yes	No
Buggy Creek	No	Yes	Yes	Yes	No
Spring Creek	No	Yes	Yes	Yes	No
Cherry Creek	No	Yes	Yes	Yes	No
Spring Coulee	No	Yes	Yes	Yes	No
East Fork Cherry Creek	No	Yes	Yes	Yes	No
Espeil Coulee	No	Yes	Yes	Yes	No
Milk River	No	No	No	No	No
Missouri River	No	No	No	No	No
West Fork Lost Creek	No	No	No	Yes	Yes
Tributary to West Fork Lost Creek	No	No	No	Yes	Yes
East Fork Prairie Elk Creek	No	Yes	Yes	Yes	Yes
Redwater River	No	Yes	Yes	Yes	Yes
Buffalo Springs Creek	No	Yes	Yes	Yes	Yes
Berry Creek	No	Yes	Yes	Yes	Yes
Clear Creek	No	Yes	No	Yes	Yes

TABLE I-3.1-1
Crossing Sites Inspected to Determine the Potential for Incision or Lateral Migration from Proposed Pipeline Construction in Montana

Stream	Concern: Turbidity	Concern: Incision	Concern: Channel Migration	Consider Adaptive Management Plan	Consider Alternative Crossing Technique
Side Channel Yellowstone River	No	No	No	No	No
Yellowstone River	No	No	No	No	No
Cabin Creek (A)	No	Yes	Yes	Yes	Yes
Cabin Creek (B)	No	Yes	Yes	Yes	Yes
Dry Fork Creek	No	Yes	Yes	Yes	Yes
Pennel Creek	No	Yes	Yes	Yes	Yes
Little Beaver Creek	No	Yes	Yes	Yes	Yes
North Fork Coal Bank Creek	No	No	No	Yes	No
South Fork Coal Bank Creek	No	Yes	Yes	Yes	No
Boxelder Creek	No	Yes	Yes	Yes	Yes

For crossings where a field assessment was not conducted, the SCIR provides potential mitigation measures based on the desktop analysis. Potential mitigation measures would include adjustments to the proposed cover depths along the crossing approaches, site reclamation measures, post-construction management plans, and potential preventative protection measures. In some cases, potential adjustments to cover depth would exceed the cover depth maximums included in Keystone’s Construction Mitigation and Reclamation Plan (CMR Plan, presented in Appendix B of the EIS). In general, cover depths at stream crossing approaches and the width that these cover depths would be carried laterally would be important for providing a buffer to maintain the integrity of the pipeline if the stream were to migrate during operation of the proposed Project. Additionally, the approach buffer would provide construction workspace for implementation of preventative protection measures, if advisable.

As a potential mitigation measure, the management plan described in the SCIR allows adaptive management procedures to be implemented if indications of potentially troublesome geomorphologic changes in bank, channel, or floodplain configurations were identified during routine pipeline inspections. If such indicators were observed during routine inspections, an assessment would be conducted to identify mechanisms contributing to the instability and the appropriate mitigation measures would be identified and implemented to reduce instability. Possible mitigation measures would include spur dikes, engineered wood structures, bendway weirs, live crib walls, and rock toes. Those procedures would reduce the potential for long-term impacts to the surface waters of Montana crossed by the proposed route.

Preventative protection measures applicable to the evaluated crossings would include spur dikes, engineered wood structures, longitudinal stone toes, longitudinal stone toes with spurs, trench fill revetment, vegetated gabion basket, and soil- and grass-covered riprap. If insufficient workspace was available for placement of preventative protection measures in the floodplain, instream applications would be needed to mitigate channel migration or scour. Applicable preventative instream protection measures would include spur dikes, vanes, bendway weirs, engineered-wood structures, longitudinal stone toes, longitudinal stone toes with spurs, vegetated gabion basket, live crib walls, and soil- and grass-covered riprap.

For crossing sites studied in the field, the SCIR provides potential mitigation measures, such as alternative cover depths and additional post-construction site reclamation measures. The report also includes potential draft management plans that could be instituted to monitor the sites after construction was completed. For a few crossings, the report presents potential alternative crossing locations (route variations, as described Section I-2.4.2) that would reduce the potential for problems resulting from long-term channel geomorphologic instability. These suggested variations were identified to reduce the impacts of crossing a waterbody or to address landowner concerns.

Prior to final design of the permitted proposed Project route in Montana, Keystone would conduct additional engineering assessments of all waterbody crossings. The results of the assessments would be used to design and construct crossings to minimize the short- and long-term impacts of the crossings. At each crossing, the assessment would consider the potential for vertical scour based on substrate type, streamflow during a 100-year flood, the channel cross section, and other factors. Keystone would consider field data and a more in-depth analysis for each stream with a possible scour depth greater than 5 feet. In evaluating the potential for lateral migration, Keystone would include a review of the vertical scour analysis, a linear discriminant analysis, an analysis based on examining evidence of lateral migration, inspection of current and historic aerial photographs, and other relevant factors. The results from the vertical scour and lateral migration assessments would be incorporated into the engineering and design of the crossings, including the method of crossing, depth of crossing, and extra depth extents of the crossing. Additional information about the specific methods and procedures that Keystone would incorporate into the proposed Project to minimize the impacts of waterbody crossings in Montana is presented in Keystone's MFSA application and supplemental submittals to the application.

Implementation of the measures proposed by Keystone to minimize the impacts of waterbody crossings along with the appropriate mitigation measures presented above and in the SCIR, including incorporation of applicable route variations, would help to ensure that maintenance activities that would further disturb the stream channel during operations were minimized.

I-3.1.2 FLOODPLAINS

Floodplains are relatively low, flat areas of land that surround waterbodies and hold overflows during flood events. Floodplains form where overbank floodwaters spread out laterally and deposit fine-grained sediments. The combination of rich soils, proximity to water, riparian forests, and the dynamic reworking of sediments during floods creates a diverse landscape with high habitat quality.

Changing climatic and land use patterns in much of the western U.S. has resulted in region-wide incision of many stream systems. As these stream systems incise channel cuts deeper into the surrounding floodplains, high floodplain terraces are created along valley margins. These floodplain terraces are common throughout Montana and receive floodwaters less frequently than the adjacent low floodplain next to the rivers.

From a policy perspective, the FEMA defines a floodplain as being any land area susceptible to being inundated by waters from any source (FEMA 2005). FEMA prepares Flood Insurance Rate Maps that delineate the flood hazard areas, such as floodplains, for communities. These maps are used to administer floodplain regulations and to mitigate flood damage. Typically, these maps indicate the locations of the 100-year floodplains, which are the areas with a 1-percent chance of flooding in any single year.

Executive Order 11988, Floodplain Management, states that actions by federal agencies are to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplain development wherever there is a practicable alternative. Each agency is to provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities for: (1) acquiring, managing, and disposing of federal lands and facilities; (2) providing federally undertaken, financed, or assisted construction and improvements; and (3) conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.

I-3.1.2.1 Affected Environment

In Montana, low floodplain terraces occur at many stream crossings. For smaller intermittent and ephemeral drainages, these are typically narrow and infrequently flooded. At crossings of rivers and larger perennial streams, floodplains are generally wider and can flood more frequently than the smaller streams and drainages. Designated floodplains crossed by the proposed route are listed in Table I-3.1-2.

TABLE I-3.1-2
Designated Floodplain Areas Crossed
by the Proposed Keystone XL Pipeline Route in Montana

County	Approximate Mileposts	Watercourse Associated with Floodplain
Valley	81 – 84	Milk River
Valley/McCone	87 – 90	Missouri River
McCone	146 – 147	Redwater River
Dawson	193 – 196	Yellowstone River

I-3.1.2.2 Potential Impacts and Mitigation

The pipeline would be constructed under river channels having a potential for lateral scour, as described in Section I-3.1.1.5. In floodplain areas adjacent to waterbodies, Keystone would restore the contours to as close to previously existing contours as practical and would revegetate the construction ROW in accordance with its CMR Plan (Appendix B) and the requirements of the MDEQ Environmental Specifications (Attachment 1 to this appendix). Therefore, after construction the pipeline would not obstruct flows over designated floodplains. In addition, there would be no aboveground facilities (pump stations or valves) in floodplains in Montana.

As a result, the proposed Project would not affect floodplains in Montana.

I-3.1.3 REFERENCES CITED

Federal Emergency Management Agency (FEMA). 1981. Guidelines for Determining Flood Flow Frequency.

FEMA. 2005. National Flood Insurance Program, Flood Insurance Definitions. Available at: http://www.fema.gov/business/nfip/19def2.shtm.

Omang, R.J. 1992. Analysis of the Magnitude and Frequency of Floods and the Peak-Flow Gauging Network in Montana: U.S. Geological Survey Water-Resources Investigations Report 92-4048, 70 p.

I-3.2 WETLANDS

Section 3.4 of the main body of the EIS provides information about the affected environment and potential impacts of proposed Project implementation on wetlands, including information for Montana. This section of the appendix provides supplemental information about those topics specific to Montana and in accordance with the provisions of MEPA and MFSA.

Wetland types in the vicinity of the proposed Project in Montana include emergent wetlands, scrub/shrub wetlands, and forested wetlands. Waters in the vicinity of the proposed route include ephemeral, intermittent, and perennial streams and open water (Cowardin et al. 1979). Keystone provided information about specific wetlands along the proposed corridor in Montana in its application for a MFSA Certificate of Compliance (Keystone 2008). Information presented in this appendix describing wetland communities that would be crossed by the proposed route was based on the Keystone reports and additional information in the public records or available from resource agency files.

I-3.2.1 AFFECTED ENVIRONMENT

Emergent wetlands with fowl bluegrass (*Poa palustris*) and foxtail barley (*Hordeum jubatum*) dominate areas that typically contain spring snowmelt water for several weeks. In areas where water persists for several months each spring, shallow-marsh vegetation typically includes common spikerush (*Eleocharis palustris*) and wheat sedge (*Carex atherodes*). In areas where water persists throughout the year, deep-marsh vegetation typically includes cattails (*Typha latifolia* and *T. angustifolia*) and hardstem bulrush (*Schoenoplectus acutus*).

Scrub-shrub wetlands are characterized by woody vegetation less than 15 feet tall, which can include shrubs, sapling trees, or stunted trees. Scrub-shrub vegetation can include willows (*Salix* spp.), redosier dogwood (*Cornus sericea*), greasewood (*Sarcobatus vermiculatus*), and fourwing saltbush and shadscale saltbush (*Atriplex canescens* and *A. confertifolia*).

Forested wetlands are characterized by woody vegetation 15 or more feet tall, with common Montana trees including boxelder (*Acer negundo*), plains cottonwood (*Populus deltoides*), green ash (*Fraxinus pennsylvanica*), and peachleaf willow (*Salix amygdaloides*). Common wetland shrubs within forested wetlands include redosier dogwood, Drummond's willow and narrowleaf (sandbar) willow (*Salix drummondiana* and *S. exigua*), silver buffaloberry (*Shepherdia argentea*), and snowberry (*Symphoricarpos* spp.). Exotic trees or shrubs within forested wetlands and riparian areas include Russian olive (*Elaeagnus angustifolia*) and, in limited areas, tamarisk (*Tamarix* spp.). Riparian forests include stands of cottonwood or mixed cottonwood-conifer forests. For the purposes of this analysis, riparian forest areas greater than 300 feet by 30 feet with an average canopy height of 50 feet or more and with more than 20 trees per acre were considered forested wetlands.

A total of 5.3 miles of wetlands would be crossed by the proposed route in Montana (see Table I3.2-1). Section 3.4.2 of the EIS provides information about the wetlands that would be crossed by the proposed Project that are considered of special concern or value, occur within conservation areas and reserves, are wetland easements or wildlife areas, represent sensitive landscapes, or have sensitive wetland vegetation communities.

TABLE I-3.2-1 Wetlands Crossed by the Proposed Project in Montana			
Wetland Type	**Length of Wetlands Crossed (miles)**	**Wetland Area Affected during Construction (acres) [1]**	**Number of Wetlands Crossed**
Emergent Wetlands	4.2	60	259
Forested Wetlands [1]	0.9	13	27
Scrub-shrub Wetlands	0.2	2	7

Source: Keystone 2009a.
[1] For the purposes of this analysis, riparian forests 300 feet by 30 feet or larger were classified as forested wetlands.

I-3.2.2 POTENTIAL IMPACTS AND MITIGATION

Construction of the pipeline would affect wetlands and their functions primarily during and immediately following construction activities, but permanent changes also would be possible. Potential construction- and operations-related effects on wetlands are discussed in Section 3.4.3 of the EIS. The proposed lengths, estimated areas, and numbers of wetlands crossed by the proposed route are summarized in Table I-3.2-1. A list of the wetlands and waterbodies crossed by the proposed route is presented in Appendix E of the EIS. Jurisdictional and non-jurisdictional wetlands would be delineated prior to the issuance of required permits. Impacts to wetlands that are non-jurisdictional under the Clean Water Act (CWA) Section 404 would not require mitigation by the U.S. Army Corps of Engineers.

Keystone's CMR Plan requires that it restore the ROW to near pre-construction conditions, including elevation, grade, and soil structure. As a result, the wetland vegetation communities would, in general, eventually transition back into communities that were functionally similar to those of the wetlands prior to construction. In emergent wetlands, the herbaceous vegetation would regenerate quickly (typically within three to five years). Following restoration and revegetation, there would be few permanent effects on emergent wetland vegetation because these areas naturally consist of and would remain as herbaceous communities. Herbaceous wetland vegetation in the permanent ROW generally would not be mowed or otherwise maintained, although the Keystone CMR Plan (Appendix B of the EIS) allows for annual maintenance of a 30-foot-wide strip centered over the pipeline. As a result, the impact of construction of the proposed Project on emergent wetlands in Montana would range from short term to long term in duration and be of a minor magnitude, and the impact during operation would be minor but would last for the life of the proposed Project.

In forested and scrub-shrub wetlands (Table I-3.2-2), the effects of construction would extend beyond the three to five-year period needed for emergent wetlands because of the longer period needed to regenerate a mature forest or shrub community. Tree species that typically dominate forested wetlands in the vicinity of the proposed Project in Montana (primarily cottonwood and green ash) have regeneration periods of 10 to 30 years or more. Willows and other non-sagebrush riparian shrubs would likely regenerate within five to 15 years. Trees and shrubs would not be allowed to grow within the maintained ROW except within some portions of the ROW associated with HDD crossings. Therefore, removal of forested and scrub-shrub wetland habitats during pipeline construction would result in minor to moderate impacts to those wetlands for the life of the proposed Project. The maintained ROW would result in a permanent conversion of forested and scrub-shrub wetlands to herbaceous wetlands and would result in a moderate impact to those wetlands.

TABLE I-3.2-2 Forested and Scrub-Shrub Wetlands Crossed by the Proposed Project in Montana				
County	**Milepost**	**Associated River or Stream**	**Wetland Classification[1,2]**	**Reported Vegetation**
Phillips	25.63	Unnamed	PFO	Not available[3]
Phillips	25.66	Unnamed	PFO	Not available
Valley	25.87	Frenchman Creek	PSS	Willows
Valley	25.92	Frenchman Creek	PSS	Willows
Valley	36.16	Unnamed (Intermittent)	PFO	Not available
Valley	36.18	Unnamed (Intermittent)	PFO	Not available
Valley	40.97	Unnamed	PFO	Not available
Valley	55.24	Buggy Creek	PFO	Young cottonwoods
Valley	55.29	Buggy Creek	PFO	Young cottonwoods
Valley	66.85	Cherry Creek	PFO	Mature trees
Valley	66.89	Cherry Creek	PFO	Mature trees
Valley	66.95	Cherry Creek	PFO	Mature trees
Valley	66.96	Cherry Creek	PFO	Mature trees
Valley	67.02	Cherry Creek	PFO	Mature trees
Valley	67.07	Cherry Creek	PFO	Mature trees
Valley	82.12	Unnamed	PSS	Not available
Valley	82.18	Unnamed	PSS	Not available
Valley	82.45	Unnamed	PSS	Not available
Valley	82.56	Unnamed	PFO	Not available
Valley	82.70	Milk River	PFO	Mature cottonwoods
McCone	89.73	Missouri River	PFO	Trees and shrubs
McCone	122.16	Unnamed	PFO	Not available
Dawson	158.83	Cottonwood Creek	PFO	Not available
Dawson	158.90	Cottonwood Creek	PFO	Not available
Dawson	159.57	Unnamed (Intermittent)	PFO	Not available
Dawson	159.60	Unnamed (Intermittent)	PFO	Not available
Dawson	177.19	Unnamed (Intermittent)	PFO	Not available
Dawson	177.22	Unnamed (Intermittent)	PFO	Not available
Dawson	195.64	Yellowstone River	PFO	Mature cottonwoods
Fallon	221.87	Unnamed	PFO	Not available
Fallon	231.04	Unnamed (Intermittent)	PSS	Not available
Fallon	261.06	Unnamed	PSS	Not available

Sources: ENTRIX 2009, Keystone 2009a.

[1] PFO = Palustrine forested wetland; PSS = Palustrine scrub-shrub wetland.

[2].For the purposes of this analysis, riparian forests 300 feet by 30 feet or larger were classified as forested wetlands.

[3] Information on vegetation was not reported in the sources used to prepare this table.

In an assessment of modeled heat flux, Keystone determined that operation of the proposed Project would result in an increase of 5 to 8 ˚F in soil temperature at the soil surface above the pipeline in Montana from November to May (Keystone 2009b). At a depth of 6 inches below the ground surface, the modeled heat flux evaluation indicated that operation of the proposed Project would cause increases in soil temperature over the pipeline of 5 to 12 ˚F, with the largest increases occurring during March and April in Montana. While many herbaceous annual plants do not produce root systems that would penetrate much below 6 inches, some plants – notably native prairie grasses, trees, and shrubs – have root systems penetrating well below 6 inches. Keystone also found that, in general, increased soil temperatures during early spring would cause early germination and emergence and increased productivity for wetland plant species (Keystone 2009b).

Operation of the proposed Project also would cause slight increases in water temperatures where the pipeline crossed through wetlands. The effects would be most pronounced in small ponds and wetlands since any excess heat would be quickly dissipated in large waterbodies and flowing waters. Small ponded wetlands over the pipeline might remain unfrozen a few days later than surrounding wetlands and might thaw a few days sooner than surrounding wetlands. The seasonal increase in temperatures over the pipeline would last for the life of the proposed Project but would result in a minor impact to wetlands along the proposed route.

I-3.2.3 REFERENCES CITED

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Keystone. 2009b. Keystone XL Project Supplemental Environmental Report. TransCanada Keystone Pipeline, LP. Document No.: 10623-006, July 2009. Wetlands.

I-3.3 TERRESTRIAL VEGETATION

Section 3.5 of the main body of the EIS provides information about the affected environment and potential impacts of proposed Project implementation on terrestrial vegetation, including information for Montana. This section of the appendix provides supplemental information about those topics specific to Montana and in accordance with the provisions of MEPA and MFSA.

I-3.3.1 AFFECTED ENVIRONMENT

Land cover across the proposed Project in Montana is dominated by native range and agricultural lands (Table I-3.3-1). Terrestrial vegetation occurring along the proposed route in Montana, as determined from data sources different from those used in this appendix, is also described in Section 3.5.2 of the EIS.

TABLE I-3.3-1
Land Cover Types Crossed by the Proposed Pipeline Route in Montana

Cover Type	Length Through Cover Type (miles)	Area in Construction ROW (acres)[1]	Percent of Total Area in Construction ROW[1]
Open water	0.3	4.0	0.1
Developed land (e.g., road, buildings, cleared areas)	3.3	44.0	1.2
Wetlands	0.2	2.7	0.1
Riparian	7.5	100.0	2.6
Greasewood flats	1.0	13.3	0.3
Agricultural (crop and hay lands)	74.8	997.3	26.5
Badlands	14.5	193.3	5.1
Conifer forest	1.8	24.0	0.6
Wooded draws	1.9	25.3	0.7
Sagebrush steppe	32.1	428.0	11.4
Native range (mixed-grass prairie)	145.1	1,934.7	51.4
Total	**282.5**	**3,766.6**	**100.0**

Source: Montana Natural Heritage Program (MNHP) 2009a database was used for identification of established land categories along the proposed route; some lengths listed in this table differ from the more specific information obtained by Keystone during route surveys and provided elsewhere in this appendix

[1] Acreage is based on a construction ROW width of 110 feet.

Native rangeland vegetation communities primarily consist of mixed-grass prairie dominated by blue grama (*Bouteloua gracilis*)[5], green needlegrass (*Nassella viridula*), needle-and-thread (*Hesperostipa comata*), and western wheatgrass (*Pascopyrum smithii*); sagebrush communities dominated by silver sagebrush (*Artemisia cana*), big sagebrush (*Artemisia tridentata*), and rubber rabbitbrush (*Ericameria nauseosus*); and greasewood (*Sarcobatus vermiculatus*) or Nuttall's saltbush (*Atriplex nuttallii*) in the alkali flats.

[5] Common names of plants are used in this section. Scientific names for plants are used after their initial mention in text or tables following nomenclature in the U.S. Department of Agriculture, Natural Resources Conservation Service's PLANTS database (USDA NRCS 2009)

Mixed-grass prairies have floristic components of tall-grass and short-grass prairies and are characterized by grasses of the short-grass prairie (e.g., blue grama) and some grasses of the tall-grass prairie including wheatgrasses (*Elymus* spp., and *Pascopyrum smithii*)) and bluestem species (*Andropogon gerardii* and *Schizachyrium scoparium*). The primary upland shrub communities that occur throughout the proposed Project area are big sagebrush on dry uplands having heavier soils and silver sagebrush on sites having greater levels of soil moisture. Sagebrush shrub communities are susceptible to fire and might have a natural fire return interval of 100 to 200 years, depending on topography and exposure, while sagebrush communities on more mesic sites might have a natural fire interval of decades (USFWS 2008). Post-fire reestablishment of sagebrush communities might require 20 to 50 years.

Most of the forests in eastern Montana occur along streams and rivers, in rugged topography (breaks) or where rolling hills are dissected by drainages. Riparian communities along many perennial streams are dominated by an overstory of green ash (*Fraxinus pennsylvanica*), boxelder (*Acer negundo*), and plains cottonwood. Upland forest communities include isolated, small patches of quaking aspen (*Populus tremuloides*) on cool, moist microsites (mostly confined to the Bitter Creek area in north-central Montana), and Rocky Mountain juniper (*Juniperus scopulorum*) and ponderosa pine (*Pinus ponderosa*) on breaks and on areas with shallow sandstone bedrock. Native forest communities are an integral component of the prairie landscape throughout Montana and the Great Plains and provide important breeding, feeding, and security habitat for many types of wildlife. Native forest communities also support a distinct assemblage of plant species not found on upland sites and are important sources of plants of ethnobotanical importance (cultural and spiritual) to Indian tribes.

Indian tribes have traditionally used many plants for food, construction materials, forage for livestock, fuel, medicine, and spiritual purposes (Johnston 1987, Hart and Moore 1976, Gilmore 1977). Although the dependence on plants for many aspects of survival in the natural environment has become less pronounced in recent times, plants continue to be of substantial importance to the culture of most Indian tribes. The plants are important and in some cases are sacred to indigenous peoples. However, it is not only the plants that possess spiritual qualities, places where important plants grow and have been collected for millennia can have spiritual and cultural significance.

Plants of ethnobotanical importance known or likely to occur in the proposed Project area include species from all native vegetation communities (Table I-3.3-2). A large proportion of the plants used by Native Americans grow in wetlands and riparian areas. Although these habitats are a small percentage of the land area, they are disproportionately important as sources for plants of ethnobotanical importance. In addition to plants that are used by the Indian tribes in the vicinity of the proposed route, plants such as prairie coneflower are widely used by the non-Indian population as herbal supplements and collected for sale outside of the general area of the proposed Project. Locally, collection and sale of echinacea is an important source of income for residents of the Fort Peck Reservation. Although the proposed route would not directly affect Reservation lands, residents of the Fort Peck Reservation collect plants of ethnobotanical importance outside of the Reservation on land that might include land within the construction ROW.

TABLE I-3.3-2
Plants of Ethnobotanical Importance in the Vicinity of the Proposed Pipeline Route in Montana[1]

English Common Name (Scientific Name)	Habitat	Use
Northern sweetgrass (*Hierochloe hirta*)	Moist meadows and margins of wetlands	Incense, perfume, smoked with tobacco
Cattail (*Typha latifolia/angustifolia*)	Emergent in wetlands	Down used to dress wounds; starchy roots eaten
Field (wild) mint (*Mentha arvensis*)	Wetlands	Used as a flavoring and tea; dried leaves used to treat chest pains
Cow parsnip (*Heracleum maximum*)	Riparian areas and wooded draws	Stems eaten; used in Sun Dance ceremony
Stinging nettle (*Urtica dioica*)	Riparian areas and margins of wetlands	Decoction made from root; fibers used as cordage
Horsetail (*Equisetum arvense/hyemale*)	Moist meadows and margins of wetlands	Used for polishing; children's whistles
Seaside arrow-grass (*Triglochin maritima*)	Saline wetlands	Seeds parched and eaten
Arumleaf arrowhead (*Sagittaria cuneata*)	Emergent in perennial wetlands	Roots eaten
Baltic rush (*Juncus arcticus)*)	Wet meadows and wetlands	Used to make a brown dye
Plains cottonwood (*Populus deltoides*)	Riparian area along major rivers and streams	Used as center post for Sun Dance Medicine Lodge; firewood; inner bark eaten
Chokecherry (*Prunus virginiana*)	Riparian areas and wooded draws	Fruit eaten
Silver buffaloberry (*Shepherdia argentea*)	Riparian areas and wooded draws	Fruit eaten; used to make red dye
Golden currant (*Ribes aureum*)	Riparian areas and wooded draws	Fruit eaten
Red baneberry (*Actaea rubra*)	Riparian areas and wooded draws	Roots used as remedy for colds and for women after child birth
Hawthorn (*Crataegus* spp)	Riparian areas and wooded draws	Fruit eaten and wood used for objects requiring hard wood
Willow (*Salix* spp.)	Riparian areas	Twigs boiled as decoction to cure fever or as a pain killer
Red-osier dogwood (*Cornus sericea*)	Riparian areas and wetlands	Inner bark smoked with tobacco and used to make tea
Silverberry (*Elaeagnus commutata)*	Moist uplands	Fruits used as famine food; seeds used as beads
Western water hemlock (*Cicuta douglasii*)	Wetlands	Used as medicine to induce vomiting and as a treatment for sores
Juniper (*Juniperus* spp.)	Uplands in prairie grasslands	Berries steeped in water to make medicine for various ailments
Blue grama (*Bouteloua gracilis*)	Dry native prairie	Used to forecast weather
Wild onion (*Allium* spp.)	Prairie grasslands	Bulbs and leaves eaten
Indian ricegrass (*Achnatherum hymenoides*)	Prairie grasslands	Large seeds eaten
Sedges (*Carex* spp.)	Prairie grasslands and wetlands	Used to line moccasins in winter
Yellow bell (*Fritillaria pudica*)	Prairie grasslands	Bulbs eaten
Sego lily (*Calochortus nuttallii*)	Prairie grasslands	Bulbs eaten

TABLE I-3.3-2
Plants of Ethnobotanical Importance in the Vicinity of the Proposed Pipeline Route in Montana[1]

English Common Name (Scientific Name)	Habitat	Use
Wild rose (*Rosa* spp.)	Prairie grasslands, riparian areas and wooded draws	Fruits eaten
Saskatoon (*Amelanchier alnifolia*)	Riparian areas and wooded draws	Fruits eaten
Winterfat (*Krascheninnikovia lanata*)	Prairie grasslands	Leaves used to make tea and as hair rinse
Spring beauty (*Claytonia* spp.)	Prairie grasslands and shrublands	Corms eaten
Prairie sagewort (*Artemisia frigida*)	Prairie grasslands and shrublands	Leaves boiled and used for various ailments
White sage (*Artemisia ludoviciana*)	Prairie grasslands and shrublands	Leaves used as incense in purification ceremonies
Shrubby cinquefoil (*Dasiphora fruticosa*)	Shrublands	Dry flakey bark used as tinder
Wild licorice (*Glycyrrhiza lepidota*)	Riparian areas and edges of moist meadows	Decoction from roots used for various ailments
Pasque flower (*Pulsatilla patens*)	Prairie grasslands	Crushed leaves used as poultice
Wild strawberry (*Fragaria virginiana*)	Grasslands	Fruits eaten; roots used as a medicine for diarrhea
Large Indian breadroot (*Pediomelum esculenta*)	Prairie grasslands	Tubers eaten and made into flour
Prairie clover (*Dalea* spp.)	Prairie grasslands and shrublands	Bruised leaves steeped in water and applied to wounds
Prairie coneflower (*Echinacea angustifolia*)	Prairie grasslands and shrublands	Roots of plants used to treat tooth aches
Narrowleaf stoneseed (*Lithospermum incisum*)	Prairie grasslands and shrublands	Seeds and tops used as incense; root used to make violet dye
Scarlet globemallow (*Sphaeralcea coccinea*)	Prairie grasslands and shrublands	Plant chewed and applied to cuts and sores
Plains prickly pear cactus (*Opuntia polyacantha*)	Prairie grasslands and shrublands	Fruit and stems eaten; juice applied to sores

Sources: Johnston 1987, Hart and Moore 1976, Gilmore 1977.
[1] Table does not list all plants used by Indian tribes in the vicinity of the proposed Project.

Riparian areas are transitional between wetland and upland habitats, generally lacking the amount or duration of water present in wetlands. Riparian habitats in the vicinity of the proposed route identified as conservation priorities include wooded draws, dominated by green ash, and broadleaf riparian, dominated by plains cottonwood (MFWP 2005). The proposed route crosses significant Montana riparian habitats near the confluence of the Milk and Missouri rivers, and near the Yellowstone River. Wooded draws are present in central and southeastern Montana along the proposed route.

Noxious weeds and invasive plants are non-native, undesirable native, or introduced species that are able to exclude and out-compete desirable native species, thereby decreasing overall species diversity. Montana has experienced the rapid introduction and spread of noxious weeds and invasive plants on all types of land ownership. Ground disturbing activities such as agriculture, construction, and development of transportation corridors increase the spread of weeds due to transport by heavy machinery and vehicles during construction or through post-construction revegetation using contaminated seed sources. Up to 32 noxious weed species could occur within the construction ROW in Montana, including four aquatic or wetland weeds, 22 upland weeds, and six weeds that can occur in either wetland or upland habitats

(USDA NRCS 2009). Table 3.5.4-1 in the main body of the EIS lists the noxious weed species along the proposed route, including species in Montana.

Fourteen plants tracked by the Montana Natural Heritage Program as Species of Special Concern, six of which are also managed as Sensitive Species by the BLM, might be present in the vicinity of the proposed route in Montana (Table I-3.3-3). Surveys for special-status plants along the construction ROW have not been completed; however, the proposed route would cross suitable habitats and known ranges for these plants.

TABLE I-3.3-3
Plants of Special Concern Potentially Present in the Vicinity of the Proposed Pipeline Route in Montana

Common Name and Species	Occurrence and Conservation Status[1]	Habitat
Raceme milkvetch (*Astragalus racemosus*)	Fallon and Carter counties; S2	Sagebrush and grassland communities on heavy soils derived from shale with high levels of alkalinity
Poison suckleya (*Suckleya suckleyana*)	Known from one extant population in Dawson County and three historic collections; S1	Drying mud along ponds and streams, often on alkali soils
Crawe's sedge (*Carex crawei*)	BLM sensitive. One occurrence near the proposed Project area; S2	Wet gravelly or sandy soils along streams and ponds
Nine-anther dalea (*Dalea enneandra*)	Five occurrences in eastern Montana; S1	Gravelly soils of grasslands and slopes
Showy prairie gentian (*Eustoma exaltatum*)	One occurrence in Montana in McCone County; S1	Wet meadows and pond margins
Bractless blazing star (*Mentzelia nuda*)	BLM sensitive. At the periphery of range in Montana; S1	Sandy or gravelly soils on open hills and roadsides
Chaffweed (*Anagallis minima*)	BLM sensitive. Three occurrences in eastern Montana: S2	Vernally wet, sparsely vegetated soils along ponds and stream margins
Texas toadflax (*Nuttallanthus texanus*)	Known from occurrence near Glendive and Alzada; S1	Open sandy or acidic soil of grasslands and woodlands
Broadbeard beardtongue (*Penstemon angustifolius*)	BLM sensitive. At the periphery of range in Montana; S1S2	Sandy soils of prairie grasslands, often most abundant in blowouts
Hotspring phacelia (*Phacelia thermalis*)	Known from a small number of sites in northeastern Montana; disjunct from its primary range in Idaho and California; S1	Variable habitat, often on disturbed sites
Prairie phlox (*Phlox andicola*)	BLM sensitive. At periphery of range in Montana; S2	Sandy soils in grasslands and ponderosa pine woodlands, often associated with sparsely vegetated blowouts
Sand cherry (*Prunus pumila*)	Known from two collections in Fallon and McCone counties; S1	Sandy and rocky soils in prairie grasslands
Persistent-sepal yellowcress (*Rorippa calycina*)	BLM sensitive, regional endemic, known from four records in Montana; S1	Moist sandy to muddy margins of streams, ponds, and reservoirs near the high-water line
American bittersweet (*Celastrus scandens*)	Known from one site in Dawson County, at periphery of range in Montana; S1	Riparian woodlands and thickets

Sources: MNHP 2009b, BLM 2009.

[1] MNHP State Rankings
S1 = State critically imperiled
S2 = State imperiled
S1S2 = State status uncertain, critically imperiled to imperiled

I-3.3.2 POTENTIAL IMPACTS AND MITIGATION

Most of the land that would be crossed by the proposed route in Montana would be native range and land managed for agriculture (e.g., cropland, non-native pasture, and hay land). Approximately 21 percent of the length of the proposed route would cross other land cover categories (see Table I-3.3-1). Potential construction- and operations-related impacts and mitigation methods for terrestrial vegetation along the entire proposed route are discussed in Section 3.5.5 of the EIS.

The primary impacts on vegetation from construction and operation of the proposed Project in Montana would result from cutting, clearing, or removing the existing vegetation within the construction ROW. In addition, those activities would increase the potential for invasion by noxious weeds in the construction ROW. Impacts on croplands would likely be short term and limited to the then-current growing season. However, Keystone would compensate landowners or tenants for the loss of crops. Impacts on pastures, rotated croplands, and native rangeland generally would range from short term to long term, with vegetation typically becoming reestablished within one to five years after construction. However, re-established vegetation could differ from adjacent native plant communities in diversity, canopy structure, and productivity. The rate of development of reestablished plant communities (i.e., ecological succession) would be influenced by localized factors such as climatic conditions, levels of grazing and trampling, seed mixes, and soil amendments. The impacts to these vegetation communities would range from short term to long term and would be of minor to moderate magnitude.

Clearing trees within upland and riparian forest communities would result in long-term impacts to these vegetation communities because of the length of time needed for the communities to mature to pre-construction conditions. Forest and shrub communities within the 10-foot-wide riparian and the 30-foot-wide upland permanent ROW centered on the pipeline would experience impacts for the life of the proposed Project, as would areas where trees would be removed and prevented from reestablishing as a result of the periodic mowing and brush clearing required for pipeline operation and inspections. Routine maintenance involving vegetation clearing would occur every one to three years.

Most shrubs would likely reestablish within the non-maintained portion of the ROW within five to 15 years. However, longer periods might be required for the development of pre-construction levels of biodiversity and productivity. The native-species composition of post-construction plant communities might not develop to pre-construction levels for 30 to 50 years or longer. Shrubs and warm-season grasses are slow to colonize on sites that have developed vigorous stands of cool-season wheatgrasses and other species typically used in reclamation seed mixes. Seed mixes for reclamation are primarily developed to rapidly establish ground cover to minimize erosion and the invasion of noxious weeds. The dominance of rapidly germinating and vigorous grasses is effective in stabilizing soils but can also inhibit the development of plant communities with diversities of native forbs, shrubs, and warm-season grasses comparable to undisturbed native prairie communities. These impacts would range from long term to permanent (i.e., lasting for at least the life of the proposed Project) and would be of minor to moderate magnitude. However, during operation the effect on plant communities established along the ROW after the completion of construction would be minimal because these areas would be allowed to recover following construction and typically would not require maintenance mowing.

In an assessment of temperature increases of soil surrounding the pipeline, Keystone determined that operation of the proposed Project would cause an increase of 5 to 8 ˚F in soil temperatures at the soil surface over the pipeline in Montana, from November to May (Keystone 2009). At a depth of 6 inches below the ground surface, the study indicated that operation of the proposed Project would cause increases of 5 to 12 ˚F in soil temperature over the pipeline, with the greatest increases occurring during March and April in Montana. While many herbaceous annual plants would not produce root systems that would penetrate much below 6 inches, some plants, notably native prairie grasses, trees, and shrubs, have root systems that would penetrate well below 6 inches. Soil temperatures closer to the pipeline burial depth of 6 feet might be as much as 40 ˚F warmer than the ambient surrounding soil temperatures (Keystone 2009). Keystone also found that, in general, increased soil temperatures during early spring would cause early germination and emergence and increased productivity in annual crops, and that in some cases increased soil temperatures could lead to increased soil drying and decreased plant-available soil water. However, this effect has not been documented to occur with similar pipelines (Keystone 2009).

After removal of vegetation cover and disturbance to the soil, re-establishment of native vegetation communities could be delayed or prevented by infestations of noxious weeds and invasive plants. A total of 47 noxious weed sources have been identified along the proposed route in Montana. Approximately 4.6 miles of the proposed route would extend through those sources (Table I-3.3-4). Section 3.5.4 of the EIS addresses noxious weeds, including potential impacts and the procedures that Keystone would incorporate into the proposed Project to minimize the spread of noxious weeds. As described in that section of the EIS, Keystone has committed to control the introduction and spread of noxious weeds by implementing the construction and restoration procedures detailed in its CMR Plan (Appendix B to the EIS). Keystone would also incorporate the MDEQ Environmental Specifications (Attachment 1 to this appendix) into the proposed Project.

TABLE I-3.3-4
Noxious Weed Sources Occurring Along the Proposed Pipeline Route in Montana

Number of Counties	Weed Type	Length of Pipeline Through the Sources (miles)	Number of Sources Crossed
Four of six	Bindweeds (*Convolvulus* spp.)	0.98	5
One of six	Common tansy (*Tanacetum vulgare*)	0.09	1
One of six	Hawkweeds (*Hieracium* spp.)	0.01	1
Three of six	Knapweeds (*Centaurea* spp.)	1.24	21
Two of six	Leafy spurge (*Euphorbia esula*)	2.02	13
Two of six	Plumeless Thistles (*Carduus* spp.)	0.20	5
One of six	Thistles – Canada and Bull (*Cirsium* spp.)	0.01	1
Total		**4.55**	**47**

Source: Keystone 2009.

Sensitive plants potentially affected by construction through native vegetation communities would include raceme milkvetch, prairie clover, bractless blazing star, Texas toadflax, broadbeard beardtongue, prairie phlox, and sand cherry. Sensitive plants potentially affected by construction through wetlands and riparian communities would include poison suckleya, Crawe's sedge, showy prairie gentian, chaffweed, persistent-sepal yellowcress, and American bittersweet. Based on the availability of potential suitable habitats, known population distributions, and the protective measures in the Keystone CMR Plan that would be incorporated into the proposed Project, construction of the proposed Project would result in some reduction of available suitable habitat for sensitive plants and could result in the loss of some individual plants. However, the viability of the plants over their range would not be adversely affected. As a result, the impact to sensitive species would be long term but minor.

I-3.3.3 REFERENCES CITED

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I-3.4 WILDLIFE

Section 3.6 of the main body of the EIS provides information about the affected environment and potential impacts of proposed Project implementation on wildlife, including information for Montana. This section of the appendix provides supplemental information about those topics specific to Montana and in accordance with the provisions of MEPA and MFSA.

I-3.4.1 AFFECTED ENVIRONMENT

There is a diversity of wildlife habitat in the vicinity of the proposed Project in eastern Montana. The combination of native prairie, sagebrush steppe, riparian forest, and wetlands supports a high diversity of wildlife including mule deer[6] (*Odocoileus hemionus*), white-tailed deer (*O. virginianus*), pronghorn (*Antilocapra americana*), coyote (*Canis latrans*), swift fox (*Vulpes velox*), striped skunk (*Mephitis mephitis*), American badger (*Taxidea taxus*), black-tailed prairie dog (*Cynomys ludovicianus*), North American porcupine (*Erethizon dorsatum*), ground squirrels (*Spermophilus* spp.), greater sage-grouse (*Centrocercus urophasianus*), sharp-tailed grouse (*Tympanuchus phasianellus jamesi*), gray partridge (*Perdix perdix*), prairie falcon (*Falco mexicanus*), red-tailed hawk (*Buteo jamaicensis*), ferruginous hawk (*Buteo regalis*), Swainson's hawk (*Buteo swainsoni*), burrowing owl, mourning dove (*Zenaida macroura*), long-billed curlew (*Numenius americanus*), upland sandpiper (*Bartramia longicauda*), Baird's sparrow (*Ammodramus bairdii*), Sprague's pipit (*Anthus spragueii*), horned lark (*Eremophila alpestris*), western meadowlark (*Sturnella neglecta*), and other passerines typically found on rangelands and croplands (also see Sections 3.6 and 3.8 of the EIS.).

Grassland and sagebrush communities in the vicinity of the proposed Project provide habitat for sharp-tailed grouse and greater sage-grouse and contain strutting grounds (leks) and nesting habitat. Native prairie grasslands are sought exclusively for breeding by Baird's sparrow, burrowing owl, clay-colored sparrow (*Spizella pallida*), long-billed curlew, Sprague's pipit, and upland sandpiper. Many of the remaining native grasslands have been reduced and fragmented and are present as discontinuous blocks surrounded by cultivated fields. Because of the loss of native prairie and sagebrush communities in the United States and Canada, resource agencies and conservation groups are concerned about the viability of species that are obligate users of these habitats.

The vegetation on large portions of land in the vicinity of the proposed route in Montana has been converted from native plants to agricultural fields, primarily on floodplains and upland benches. Most farmland is planted in small grains or is in the Conservation Reserve Program (CRP). Wildlife species associated with farmland and adjacent native habitats include American goldfinch (*Spinus tristis*), brown-headed cowbird (*Molothrus ater*), gray partridge, ring-necked pheasant (*Phasianus colchicus*), sharp-tailed grouse, mule deer, white-tailed deer, and red fox (*Vulpes vulpes*).

Northern harriers (*Circus cyaneus*), red-tailed hawks, and American kestrels (*Falco sparverius*) are the most common raptors in the vicinity of the proposed route. Northern harriers prefer to nest in marshy areas near water but forage in all habitats. Typically, Swainson's and red-tailed hawks nest in trees, and prairie falcons and peregrine falcons nest on cliffs. Ferruginous hawks nest in trees, shrubs, and on rocky outcrops. Potential Swainson's and red-tailed hawk nesting sites occur in cottonwood trees along drainages, in woody draws, and shelterbelts. There are few cliffs suitable for peregrine and prairie falcon nests in the vicinity of the proposed route. Rough-legged hawks (*Buteo lagopus*) are common winter

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[6] For animals discussed in this section, common names are used in the text with the scientific name as per nomenclature of the NatureServe Explorer database (NatureServe 2009) provided after the first reference of the common name.

residents in the area, migrating from arctic and sub-arctic regions of North America. Gyrfalcons (*F. rusticolus*) and snowy owls (*Bubo scandiacus*) are also periodic winter visitors, particularly during severe winters in northern Canada.

Wetlands are present along perennial and ephemeral drainages, in association with reservoirs and stock ponds, and in poorly drained depressions. Wildlife commonly associated with wetlands include black-crowned night heron (*Nycticorax nycticorax*), Canada goose (*Branta canadensis*), mallard (*Anas platyrhynchos*), boreal chorus frog (*Pseudacris maculata*), and northern leopard frog (*Rana pipiens*). The Missouri and Yellowstone rivers provide habitat for American white pelican (*Pelecanus erythrorhyncus*), least tern (*Sternula antillarum*), piping plover (*Charadrius melodus*), North American beaver (*Castor canadensis*), American mink (*Neovison vison*), common muskrat (*Ondatra zibethicus*), northern painted turtle (*Chrysemys picta*), snapping turtle (*Chelydra serpentine*), and spiny softshell (*Apalone spinifera*).

Other amphibians and reptiles present in the vicinity of the proposed route use a variety of habitats and include Great Plains toad (*Bufo cognatus*), Woodhouse's toad (*Bufo woodhousii*), plains spadefoot (*Spea bombifrons*), tiger salamander (*Ambystoma tigrinum*), garter snakes (*Thamnophis* spp.), gopher snake (*Pituophis catenifer*), eastern racer (*Coluber constrictor*), western hog-nosed snake (*Heterodon nasicus*), western (prairie) rattlesnake (*Crotalus viridis*), greater short-horned lizard (*Phrynosoma hernandesi*), and common sagebrush lizard (*Sceloporus graciosus*).

The following sections address the existing conditions for prairie grouse (Section I-3.4.1.1) and special-status wildlife (Section I-3.4.1.2) in Montana.

I-3.4.1.1 Prairie Grouse

Prairie grouse in Montana include the greater sage-grouse and sharp-tailed grouse. Both of these grouse congregate at strutting grounds or "leks," where males perform courtship displays and where breeding occurs. Prairie grouse exhibit a high degree of fidelity to lek locations and return to the same location each spring, although leks might shift in location over time. Disturbances at or near leks can disrupt breeding activities and limit reproductive success. Important habitats for both of these grouse, including habitats for lek sites, occur in and near the proposed construction ROW in Montana.

Greater Sage-Grouse

The greater sage-grouse is a game species in Montana. It is designated as a sensitive species by the BLM and is a species of concern in Montana. Greater sage-grouse is of conservation concern because of long-term population declines from the loss and degradation of sagebrush habitat (Knick and Connelly 2009, Schroeder et al. 2004). Several petitions have occurred to have the greater sage-grouse considered for federal listing as a threatened or endangered species. In April 2004, the USFWS determined that listing the greater sage-grouse under the Endangered Species Act (ESA) might be warranted and initiated a status review. The 12-month finding of the status review determined that listing was not warranted (70 FR 2244). However, this determination was ruled arbitrary and capricious by the U.S. District Court of Idaho. The USFWS initiated a status review to reevaluate this finding, and on March 5, 2010 announced that listing the greater sage-grouse (rangewide) was warranted, but precluded by higher priority listing actions (USFWS 2010; 75 FR 55, March 23, 2010).

Sage-grouse are sagebrush-obligate birds that prefer sagebrush stands with a canopy cover of at least 20 percent and a height of 8 inches or higher. Research conducted in Montana found that breeding habitat usually occurred in sagebrush habitat with 20 to 50 percent sagebrush canopy cover (Montana Sage Grouse Work Group [MSGWG] 2005). Optimum sagebrush densities for sage-grouse are more than 4,000 plants per hectare (Pyke 2009). Leks are typically located in areas of bare ground or low-density vegetation such as ridge tops. Nesting typically occurs within 2 to 4 miles of the lek and in areas with a sagebrush canopy cover of between 15 to 30 percent. Although sagebrush habitat is crucial for all seasons and life stages, wet meadows and riparian areas are critical for the brood-rearing. Wet meadows and riparian habitats provide a diversity of insects for chicks to feed on and a variety of forbs for juveniles and hens. Sage-grouse winter in tall and large expanses of dense sagebrush with an average canopy cover of 20 percent and a height of 10 inches (MSGWG 2005). The proposed route passes through mapped sage-grouse habitat (MFWP 2001a).

Sharp-Tailed Grouse

The plains variety of sharp-tailed grouse is a game species in Montana, with no special conservation status. Sharp-tailed grouse are primarily a grassland species and their preferred habitats are grasslands and mixed-shrubs (Connelly et al. 1998, Montana Natural Heritage Program [MNHP] 2009a). Sharp-tailed grouse numbers have declined across much of the Great Plains and intermountain west due to habitat loss (Connelly et al. 1998). Populations in Montana have been more secure than in other areas of their range (Connelly et al. 1998). Many populations depend on cropland to varying degrees. Leks are often located on elevated areas with less vegetation than surrounding areas. Structural diversity of habitat (grasses, forbs, and shrubs) provides high-quality nesting habitat, although sharp-tailed grouse might nest in cultivated hayfields (grass and alfalfa) and wheat stubble. Nests are often located within 2 miles of leks (Connelly et al. 1998). The diet of the sharp-tailed grouse includes a variety of forbs, fruits, grains, buds, and insects. In winter, sharp-tailed grouse use riparian areas, deciduous hardwood shrub draws, and deciduous and open coniferous woods. Potential sharp-tailed grouse habitat (mixed-grass prairie, riparian, conifer forest, and crop and hay lands) occurs along most of the proposed route (MFWP 2001b).

Lek Surveys

Aerial lek surveys of the proposed Project route that were completed by Keystone (2009) found no new sage-grouse or sharp-tailed grouse leks within 0.6 mile of the proposed centerline in Montana or within 2 miles of proposed pump station locations; however, those surveys were not comprehensive. In spring 2009, MFWP (Regions 6 and 7) conducted a lek survey in areas near a short portion of the proposed route (the survey was conducted along about 10 percent of the proposed route in Montana). Data from that survey indicated that 36 sage-grouse leks and 36 sharp-tailed grouse leks were active within 4 miles of the proposed route (Table I-3.4-1). The Keystone survey along that part of the proposed route did not document activity at several of the known active leks near the route. In addition, it is likely that additional sage-grouse and sharp-tailed grouse leks are present within areas not surveyed by MFWP in the vicinity of the proposed route (P. Gunderson, pers. comm. 2009; W. Davis, pers. comm. 2009).

TABLE I-3.4-1
Prairie Grouse Lek Sites Observed During Surveys in the Vicinity of the Proposed Project Route in Montana

	Leks Within Specified Distances of ROW Centerline			
Species	**1 mile**	**2 miles**	**3 miles**	**4 miles**
Greater sage-grouse	5	11	24	36
Sharp-tailed grouse	8	19	29	36

Sources: MFWP 2009a, 2009b, 2009c.

I-3.4.1.2 Special-Status Wildlife

Special-status wildlife are animals listed as threatened, endangered, or candidate species under the ESA of 1973; species managed as "sensitive" by the BLM; and species of special concern tracked by the Montana Natural Heritage Program. Animals of special concern are considered by the Montana Natural Heritage Program to be vulnerable to extirpation across their range or across the state due to rarity, significant loss of habitat, or sensitivity to human-caused mortality or habitat disturbances. Special-status wildlife species that are potentially present in the vicinity of the proposed Project in Montana include four federally protected species and 67 species listed as conservation concerns by BLM and Montana (15 mammals, 42 birds, seven reptiles, and three amphibians). Federally protected and BLM sensitive species are addressed in the main body of the EIS in Section 3.8. Montana wildlife of concern that are not federally listed or designated BLM sensitive species and are analyzed in this section and listed in Table I-3.4-2. Because of the large number of Montana species of concern, the descriptions presented below are aggregated into the following groups based on habitats used: grassland birds, wetland and water birds, forest birds, bats, shrews, and reptiles. The greater sage-grouse is a conservation concern for BLM and Montana, but for the purposes of this discussion that species is presented with the sharp-tailed grouse in the prairie grouse section above.

TABLE I-3.4-2
Special-Status Wildlife Potentially Occurring in the Vicinity of the Proposed Project in Montana

Common and Scientific Names	Distribution and State Rank[1]	Habitat Associations
Mammals of Conservation Concern		
Arctic shrew (*Sorex arcticus*)	Known only from extreme northeast Montana (Sheridan County), alternate routes could include occupied habitat; S1S3.	Primarily found in moist sites, such as wet meadows, swamps, and marshes; also, sandy flats of floodplains.
Dwarf shrew (*Sorex nanus*)	Predicted distributions include eastern Montana, south of the Missouri River; S2S3	A variety of habitats from short-grass prairie and sagebrush to alpine tundra.
Eastern red bat (*Lasiurus borealis*)	The distribution in Montana is not well documented, expected to occur across eastern Montana; S2S3	Wooded riparian areas, solitary and roosts in tree foliage
Hoary bat (*Lasiurus cinereus*)	Potentially present throughout the proposed Project area; S3	Forested areas
Merriam's shrew (*Sorex merriami*)	Predicted distribution includes portions of eastern Montana, south of the Missouri River ;S2	Arid sagebrush-grassland habitats
Preble's shrew (*Sorex preblei*)	Known to occur in Valley and Dawson counties and elsewhere in western and central Montana; S3	Arid to semi-arid grassland and sagebrush habitats from plains to subalpine zones.
Birds of Conservation Concern		
American bittern (*Botaurus lentiginosus*)	Not likely breeding in proposed Project area; S3B	Freshwater wetlands with tall emergent vegetation and perennial water
American white pelican (*Pelecanus erythrorhyncus*)	It is unlikely that the proposed Project would affect nesting or foraging habitat; S3B	Colonial nester on islands of lakes and reservoirs; forages over large areas in rivers, lakes, and ponds.
Black-billed cuckoo (Coccyzus erythropthalmus)	Potentially present in riparian habitats in proposed Project area; S3B.	Species prefers thick, forested areas, usually near water.

TABLE I-3.4-2
Special-Status Wildlife Potentially Occurring in the Vicinity of the Proposed Project in Montana

Common and Scientific Names	Distribution and State Rank[1]	Habitat Associations
Black-crowned night heron (*Nycticorax nycticorax*)	Breeding not documented in the proposed Project area; S3B	Shallow marshes with cattail and bulrush, often in grassland matrix
Black-necked stilt (*Himantopus mexicanus*)	Breeding is documented in Phillips County and is transient in the proposed Project area; S3B	Nest in medium to large wetland complexes consisting of open marsh and meadows, including alkali areas.
Bobolink (*Dolichonyx oryzivorus*)	Breeding documented for counties in proposed Project area; S2B	Meadows with dense grass cover
Caspian tern (*Hydroprogne caspia*)	It is unlikely that the proposed Project would affect nesting habitat; S2B	Islands in large lakes or reservoirs with rocky or sandy shores for nesting
Common tern (*Sterna hirundo*)	It is unlikely that the proposed Project would affect nesting habitat; S3B	Nests on sparsely vegetated islands in large lakes and reservoirs
Forster's tern (*Sterna forsteri*)	It is unlikely that the proposed Project would affect nesting habitat; S3B	Large marshes with extensive reed beds or muskrat houses for nesting.
Grasshopper sparrow (*Ammodramus savannarum*)	Breeds in counties of the proposed Project area; S3B	Open prairies with intermittent shrubs
Great blue heron (*Ardea herodias*)	Occurs throughout Montana and breeds in counties in the proposed Project area; S3	Colonial nester in riparian. cottonwood forests
Greater sage-grouse (*Centrocercus urophasianus*)	Breeds in counties of the proposed Project area; S2	Breeds using lek system, uses sagebrush habitat for nesting and wintering
Horned grebe (*Podiceps auritus*)	Breeds in counties of the proposed Project area; S3B.	Breeds on shallow freshwater ponds and marshes with beds of emergent vegetation.
Pinyon jay (*Gymnorhinus cyanocephalus*)	Breeding not documented in counties of the proposed Project area; S3	Colonial nester in juniper and pine trees.
Veery (*Catharus fuscescens*)	Breeding is documented in counties of the proposed Project area; S3B.	Shaded, moist deciduous forest habitats.
Yellow-billed cuckoo (*Coccyzus americanus*)	Breeding not recorded for counties of the proposed Project area; S3B	Willow and cottonwood riparian forests
Reptiles and Amphibians of Conservation Concern		
Common sagebrush lizard (*Sceloporus graciosus*)	Potentially present throughout proposed Project area; S3	Sagebrush and grassland communities and open juniper and ponderosa pine forests
Smooth greensnake (*Liochlorophis vernalis*)	Known only from Daniels, Roosevelt, and Sheridan counties: alternate routes could include occupied habitat; S2	Grasslands, wetlands, and fringes of woodlands.

Sources: Adams 2003, BLM 2009, Lenard et al. 2003, Maxell et al. 2003, Werner et al. 2004, Foresman 2001, MNHP 2009a, MNHP and MFWP 2009, Reichel and Flath 1995, van Zyll de Jong 1985.

[1] MNHP State Rankings (Rankings S1 through S3 are considered species of concern)

S1 – Critically imperiled

S2 – Imperiled because of rarity or factors that make it vulnerable to extinction

S3 – Rare, uncommon, or threatened, but not immediately imperiled

B – Breeding

Grassland Birds

Bobolink

The bobolink (*Dolichonyx oryzivorus*) is a bird of native and agricultural grasslands that prefers areas of dense, relatively tall grass with intermediate amounts of litter, including hayfields, wet meadows, and abandoned cropland (Ehrlich et al. 1988, MNHP 2009a). Nests are well concealed on the ground in dense cover. Their diet consists of seeds, insects, and insect larvae (MNHP 2009a). The breeding distribution of this bird includes grassland habitats across the entire state of Montana.

Grasshopper Sparrow

Grasshopper sparrows (*Ammodramus savannarum*) prefer open prairies with intermittent brush and patches of bare ground, including grassland, cultivated fields, old fields, and open savanna (Ehrlich et al. 1988, MNHP 2009a). Nests are on the ground, usually in a depression, and are concealed by overhanging vegetation (Ehrlich et al. 1988). Their diet consists primarily of insects during the summer and invertebrates, grasses, and seeds during the winter (MNHP 2009a). This bird is distributed across Montana.

Wetland and Water Birds

American White Pelican

American white pelicans nest and forage in aquatic and wetland habitats, including rivers, lakes, reservoirs, and marshes. They are colonial nesters with four nesting colonies in Montana, including a colony on Medicine Lake in the vicinity of the proposed Project. Nesting colonies usually are on islands where they are isolated from mammalian predators. Pelican nesting colonies in Montana are shared with double-crested cormorants (*Phalacrocorax auritus*) and California gulls (*Larus californicus*) (MNHP 2009a).

Horned Grebe

The predicted breeding range of horned grebe (*Podiceps auritus*) in Montana includes areas in the vicinity of the proposed Project located north of the Missouri River (MNHP 2009a). Confirmed or suspected breeding has been recorded for Phillips, Roosevelt, Valley, and Sheridan counties (MNHP 2009a). Breeding habitat includes shallow freshwater ponds and marshes with beds of emergent vegetation (Stedman 2000).

Black-necked Stilt

The black-necked stilt (*Himantopus mexicanus*) is a large shorebird associated with wetlands. In Montana, stilts nest on medium to large wetland complexes with open marshes and meadows, often in alkali areas (MNHP 2009a). They forage in shallow water, feeding on invertebrates and small fish (Robinson et al. 1999). Breeding has been documented at Bowdoin National Wildlife Refuge in Phillips County (MNHP 2009a).

Black-crowned Night Heron

The black-crowned night-heron, a colonial nester, occupies shallow marshes and other wetlands for breeding and foraging. There are over 30 known nesting locations in Montana. This bird often nests on islands that can afford them protection from predators, and often nests in association with the white-faced ibis (*Plegadis chihi*) and Franklin's gull (*Larus pipixcan*) (MNHP 2009a).

Great Blue Heron

Great blue herons (*Ardea herodias*) nest primarily in cottonwoods in riparian zones, but also use drier, coniferous sites. They are widespread in the vicinity of the proposed route and forage in streams, lakes, marshes, and other wetlands. Great blue herons generally nest in the largest available trees.

American Bittern

The American bittern (*Botaurus lentiginosus*) is a secretive marsh-dwelling heron with an estimated breeding distribution across Montana, although records are sparse (MNHP 2009a). Most breeding records are from the northern portion of Montana and within managed wetlands, such as wildlife refuges (MNHP 2009a). Breeding habitat is freshwater wetlands with tall, emergent vegetation, and to a lesser extent sparsely vegetated wetlands. The diet of bitterns includes insects, amphibians, fish, crayfish, and small mammals.

Caspian Tern

Caspian terns (*Hydroprogne caspia*) are migratory and begin arriving in Montana from late April to mid-May. Limited breeding has been documented in Montana, where they might occasionally nest on the same island as double-crested cormorants. The Caspian tern nests at about 10 locations in Montana, including islands in the Fort Peck Reservoir and Medicine Lake National Wildlife Refuge in the vicinity of the proposed Project.

Common Tern

Common terns (*Sterna hirundo*) are colonial nesters, generally nesting on sparsely vegetated islands in large bodies of water, such as the Medicine Lake National Wildlife Refuge. Nesting habitat includes sandy, pebbly, or stony substrate with emergent vegetation covering more than 25 percent of the shoreline.

Forster's Tern

Forster's tern (*Sterna forsteri*) breeds in large marshes, often greater than 100 acres and usually with substantial amounts of open water and large stands of dense emergent vegetation (MNHP 2009a). Nests are deeply hollowed, compactly woven platforms on floating mats of vegetation or on clumps of vegetation close to open water. Sometimes nests can consist of an unlined scrape in mud or sand (Ehrlich et al. 1988). Their diet consists of insects, fish, and frogs (Ehrlich et al. 1988).

Forest Birds

Pinyon Jay

Pinyon jays (*Gymnorhinus cyanocephalus*) are sporadically present year-round in open woodlands and prairies in eastern Montana, although there is limited evidence of breeding in the vicinity of the proposed Project (Lenard et al. 2003). They breed and roost in colonies, usually in juniper or pine trees (Ehrlich et al. 1988).

Veery

The veery (*Catharus fuscescens*) inhabits damp, deciduous forests and riparian habitats and prefers forests with denser understory (Moskoff 2005). It also might use shrubby habitats with small trees. The veery forages on the ground, consuming insects and fruit, and nests on or near the ground (Moskoff 2005). The veery has a statewide predicted distribution (MNHP 2009a); its occurrence in eastern Montana would be limited to riparian habitats.

Black-billed Cuckoo

The black-billed cuckoo (*Coccyzus erythropthalmus*) prefers thick-forested areas, usually near water. Although nesting has not been documented in the vicinity of the proposed Project, evidence of nesting in counties crossed by the proposed route has been reported (MNHP 2009a).

Yellow-billed Cuckoo

Yellow-billed cuckoo (*Coccyzus americanus*) breeding habitat includes open woodland with thick undergrowth and deciduous riparian woodland, where yellow-billed cuckoos often nest in cottonwood and willow communities. The western subspecies of the yellow-billed cuckoo requires patches of at least 10 hectares (25 acres) of dense, riparian forest with a canopy cover of at least 50 percent in both the understory and overstory (MNHP 2009a). There is no direct evidence of breeding in Montana in publicly available records; however, observed breeding behavior indirectly suggests that nesting might occur in Montana.

Bats

Eastern Red Bat

The eastern red bat (*Lasiurus borealis*) is distributed from southern Canada southward throughout the continental U.S., Central America, and most of South America (Foresman 2001). Red bats are expected to occur throughout eastern Montana (MNHP 2009a). They are solitary and roost in foliage, most often along forest edges where they feed primarily on large insects near the top of the tree canopy (Foresman 2001).

Hoary Bat

The hoary bat (*Lasiurus cinereus*), a summer resident in Montana, is a tree species that roosts in foliage (Foresman 2001). The distribution of the hoary bat includes the entire continental United States. The hoary bat is solitary during the breeding season, but concentrations might form during migration (van Zyll de Jong 1985). Most hoary bats are thought to winter in the southern United States and Mexico.

Shrews

Arctic Shrew

The arctic shrew (*Sorex arcticus*) is distributed across Canada, from the southern Yukon southward through British Columbia to Nova Scotia (Foresman 2001). The southern range extensions occur in North and South Dakota and eastward through Michigan. In Montana, the arctic shrew has been collected at the Medicine Lake National Wildlife Refuge (Sheridan County). This shrew appears to prefer moist sites, such as wet meadows, swamps, and marshes, but has been observed on sandy flats of floodplains

(MNHP 2009a). Arctic shrews are often sympatric with masked shrews (*Sorex cinereus*) (Foresman 2001), and they likely feed primarily on insects and other invertebrates similar to other shrews.

Dwarf Shrew

The dwarf shrew (*Sorex nanus*) is distributed through north-central Montana; southward through Wyoming, Utah, Colorado, New Mexico, and Arizona; and eastward into southwestern South Dakota (Foresman 2001). The predicted distribution in Montana includes eastern Montana, south of the Missouri River. The dwarf shrew is found in a variety of habitats including rocky areas, meadows in alpine tundra and subalpine coniferous forest, rocky slopes and meadows in lower-elevation forest with a mixed shrub component, sedge marsh, subalpine meadow, arid sagebrush slopes, arid shortgrass prairie, dry stubble fields, and pinyon-juniper woodland (MNHP 2009a). While little is known of the food habits of dwarf shrew in the wild, in captivity they feed on vertebrate carcasses, as well as spiders and insects.

Merriam's Shrew

The distribution of Merriam's shrew (*Sorex merriami*) is not well known, but it has been collected in the Great Basin, Columbia Plateau, and parts of the Great Plains and southeastern Rocky Mountains (Foresman 2001). Merriam's shrews have been documented in several central and eastern Montana counties, including Phillips, McCone, and Prairie counties where they were found in dry sagebrush or sagebrush-grassland habitats. They feed primarily on caterpillars, beetles, and crickets.

Preble's Shrew

The Preble's shrew (*Sorex preblei*) occurs from eastern Washington to eastern Montana and southward to northeastern California, northern Nevada, Utah, and southwestern Wyoming (Foresman 2001). Specimens have been collected sporadically across Montana, and occurrence has been documented in Valley and Dawson counties. This shrew appears to prefer arid and semi-arid grass and sagebrush habitats in Montana, sometimes in openings surrounded by subalpine coniferous forest. Food habits are probably similar to other shrews, consisting mostly of insects and small invertebrates (MNHP 2009a).

Reptiles

Common Sagebrush Lizard

Common sagebrush lizards occur throughout the western United States. In Montana, they are present in the lower Missouri River basin and lower Yellowstone basin (Werner et al. 2004). This lizard occurs in sagebrush-steppe habitats, sometimes in the presence of sedimentary rock outcrops (limestone and sandstone), and in areas with open stands of limber pine (*Pinus flexilis*) and Utah juniper (*Juniperus osteosperma*) (MNHP 2009a).

Smooth Greensnake

The smooth greensnake (*Liochlorophis vernalis*) has the most restricted distribution of any snake occurring in Montana, and it is known to only occur in Daniels, Roosevelt, and Sheridan counties. Very little is known about its breeding biology and general ecology in Montana (Werner et al. 2004). Habitat used by the smooth greensnake includes grasslands, wetlands, and fringes of wooded areas.

I-3.4.2 POTENTIAL IMPACTS AND MITIGATION

Potential impacts of the proposed Project on wildlife and wildlife habitats are described in Section 3.6.2 of the main body of the EIS along with the procedures Keystone would incorporate into the proposed Project to minimize impacts. Those procedures are described in the Keystone CMR Plan (presented in Appendix B of the EIS) and the MDEQ Environmental Specifications (presented in Attachment 1 of this appendix).

The proposed Project would result in loss, alteration, and fragmentation of wildlife habitat used for hiding, foraging, breeding, nesting, and thermal cover. Construction would directly remove or degrade habitat, and wildlife dependent on the lost habitat would die or be displaced to adjacent habitats. Depending on variables such as species, behavior, density, and habitat, adjacent wildlife populations might experience increased mortality, decreased reproductive rates, or other compensatory or additive responses.

In addition to a direct loss of habitat, some wildlife would be displaced from adjacent habitats during construction as a result of the increase in human activity and noise associated with construction. Wildlife vary in their response to noise and human activities. Wildlife that might be most sensitive to displacement during construction activities would include breeding birds, including nesting raptors (e.g., red-tailed hawk) and greater sage-grouse and sharp-tailed grouse that are on leks.

Construction activities could result in direct mortality to some wildlife that would have limited mobility such as mice, voles, reptiles, amphibians, and young birds if they were present within the construction ROW during the active construction period. More mobile species such as swift fox and adult birds would move into adjacent habitats. A loss of migratory birds or their nests could occur where construction went through native prairie, rangelands, CRP fields, pastures, and riparian areas during the nesting season. Losses could be minimized by timing construction to avoid the period when birds were nesting and rearing young (May 1 through mid-August) or by avoiding known nest sites. However, it might not be practical to entirely avoid impacts to all migratory birds. According to Executive Order 13186 (Protection of Migratory Birds), adverse effects on migratory birds and their habitats must be minimized to the extent practical and should include restoration and enhancement of habitat, development and implementation of migratory bird conservation plans, and other measures to minimize mortality to migratory birds. Increased traffic during construction would result in slight increases in direct wildlife mortality from vehicle-wildlife collisions.

The construction of new roads, upgrading of existing roads, and the use of those roads generally would result in adverse impacts to a wide range of wildlife (Madson 2006, Montana Board of Oil and Gas Conservation [MBOGC] 1989, Wyoming Game and Fish Department [WYG&F] 2004), including elk and deer (Canfield et al. 1999), carnivores (Claar et al. 1999), small mammals (Hickman et al. 1999), birds (Hamann et al. 1999), and amphibians and reptiles (Maxell and Hokit 1999). In addition to the direct loss of habitat, negative impacts from roads could include direct mortality from vehicle-animal collisions, legal and illegal killing of wildlife, displacement of wildlife, increased stress, and fragmentation of habitat. In Montana, Keystone would use existing public and private access roads to the extent possible and all except three access roads would be temporary (i.e., used only during construction). After construction, the new, temporary access roads would be restored in accordance with the Keystone CMR Plan. As a result, the increased presence and use of roads would primarily occur during construction and would result primarily in a temporary and minor impact on wildlife in Montana.

In an assessment of modeled heat flux, Keystone determined that operation of the proposed Project would result in an increase of 5 to 8 ˚F in soil temperatures at the soil surface over the pipeline in Montana from November to May (Keystone 2009). At a depth of 6 inches below the ground surface, the modeled heat flux evaluation indicated that operation of the proposed Project would cause increases of 5 to 12 ˚F in soil temperature over the pipeline, with the greatest increases during March and April in Montana. The heat generated by the pipeline would warm the soils up to 11 feet from the centerline of the pipeline. Slight increases in soil temperatures could result in earlier plant growth in the spring and increased moisture stress to vegetation during the growing season. The vegetation community composition and seasonal development sequence of vegetation on the ROW, and consequently, available habitat for wildlife, could be altered by these changes in soil temperatures.

Total wildlife habitat loss from construction would be small in the context of available habitat and because Keystone would restore the ROW after construction in accordance with its CMR Plan. However, the effects of habitat loss on wildlife would depend on the amount, quality, and spatial arrangement of habitats adjacent to and near the ROW. Approximately 3,764 acres of land would be disturbed during construction (Table I-3.4-3), not including access roads. Mixed-grass prairie and sagebrush steppe cover types would account for approximately 62 percent of the disturbed area. These habitats are particularly important to grassland- and sagebrush-dependent wildlife. Although riparian and wooded draw cover types would comprise only 3 percent of the construction ROW, these habitats are disproportionately important to wildlife (Ohmart and Anderson 1986). Agricultural crop and hay lands would account for 27 percent of the construction ROW. Agricultural lands provide habitat for a variety of generalist animals and animals adapted to disturbed conditions such as mule deer, white-tailed deer, red fox, raccoon, common raven, and gray partridge.

TABLE I-3.4-3
Estimated Wildlife Habitat Impacted by the Proposed Project in Montana

Cover Type	Length Through Cover Type (miles)	Area in Construction ROW (acres)[1]	Percent of Area in Construction ROW[1]
Open water	0.3	4.0	0.1
Developed land (e.g., roads, buildings, cleared areas)	3.3	44.0	1.2
Agricultural (crop and hay lands)	74.8	997.3	26.5
Wetlands	0.2	2.7	0.1
Riparian	7.5	100.0	2.6
Wooded draws	1.9	25.3	0.7
Badlands	14.5	193.3	5.1
Native range (mixed-grass prairie)	145.1	1,934.70	51.4
Sagebrush steppe	32.1	428.0	11.4
Greasewood flats	1.0	13.3	0.3
Conifer forest	1.8	24.0	0.6
Total	**282.5**	**3,766.6**	**100.0**

Source: MNHP 2009b database was used for identification of established land categories along the proposed route; some lengths listed in this table differ from the more specific information obtained by Keystone during route surveys and provided elsewhere in this appendix.

[1] Acreage is based on a construction ROW width of 110 feet.

Habitat loss, alteration, and fragmentation would occur until vegetation was reestablished. However, the habitat might remain degraded after revegetation as a result of the maintenance of the permanent ROW, and the spread of noxious and invasive weeds. For wildlife that use trees and shrubs for cover, forage, and nesting, losses of these habitats in the 30-foot-wide maintained portion of the permanent ROW would last for the life of the proposed Project because that area would be maintained free of trees and large shrubs. In the portion of the construction ROW located outside of the maintained ROW, the loss would be long term because trees and shrubs would require 5 to 30 years or more to reestablish.

Loss of shrublands would be long term (from 5 to 30 years or longer) within reclaimed areas of the construction ROW. While reclamation would reestablish vegetation on the ROW, some areas dominated by native species would likely be converted to non-native species. Such conversion would likely reduce the value of the habitat for wildlife. If disturbances removed important habitats (nesting habitat), habitat loss and displacement could affect local and regional sagebrush-dependent species.

Construction, including establishment of new access roads, would increase habitat fragmentation by reducing the size of contiguous patches of habitat and through loss of habitat or changes in habitat structure. Habitat fragmentation effects are discussed in general and as they relate to specific types of wildlife within Section 3.6.2 of the EIS. Fragmentation effects would be most important relative to cumulative impacts and are discussed in the Cumulative Impacts section of the EIS (Section 3.14).

Construction through native grassland and shrub communities would remove vegetation including sagebrush and native grasses, temporarily creating an unvegetated strip along much of the construction ROW. Subsequent revegetation might not provide habitat features comparable to pre-Project conditions. Typically, seed mixes for reclamation would include non-native species that quickly become established. Sagebrush often does not quickly become established on ROWs and other disturbed sites, especially if these sites are seeded with grasses and other species that more rapidly germinate and grow. Maintenance of the permanent ROW would include removal of trees and shrubs; however, Keystone would allow sagebrush up to 2 feet in height to grow along the permanent ROW.

After revegetation of the ROW, seeded grasses would become attractive to livestock and wildlife. Cattle, sheep, and horses often graze more intensively on newly reclaimed areas than on adjacent rangeland. Livestock access to the ROW prior to development of a self-sustaining vegetation cover would inhibit successful reclamation of productive wildlife habitat, thereby extending the time required for habitat linkages to re-establish across the ROW.

Removal of vegetation from the ROW would also increase the potential for noxious weeds and other invasive species to colonize. Noxious weeds and other undesirable plants could then spread onto adjacent habitats not directly disturbed by construction. Noxious weeds could displace native plant species important to wildlife and degrade overall habitat values. However, to minimize the spread of noxious weeds, Keystone would follow the procedures in its CMR Plan and in the MDEQ Environmental Specifications. Therefore, as described in Section 3.5 of the EIS and in Section I-3.3 of this appendix, the impact of the spread of noxious weeds into adjacent habitats from construction of the proposed Project would likely be minor.

During construction, pipelines could present a significant temporary barrier to wildlife movement. An open trench and unburied welded pipe could prevent movement across the ROW. To minimize impacts to wildlife movements from the presence of an open trench during construction, Keystone would leave hard plugs (short lengths of unexcavated trench) or install soft plugs (areas where the trench is excavated and replaced with minimal compaction) in the trench to allow wildlife to cross the trench safely. Soft plugs would be constructed with a ramp on each side to facilitate egress from the trench for animals that might fall into the trench. In addition, the trench would be backfilled as soon as possible after excavation and pipe lowering. As a result, the impact on wildlife, including small mammals, amphibians, and reptiles, would be temporary and likely minor unless construction coincided with migratory movements. To further reduce that impact, the following mitigation method was recommended by several agencies:

- During construction, when trenches are open, conduct daily inspections to locate and remove animals that have been trapped in the open trench.

During operation in Montana, Keystone would use existing roads for most access to the permanent ROW and would maintain only three new access roads for the life of the proposed Project. There would be occasional use of the new permanent access roads and the existing access roads and occasional human activity along the permanent ROW as a part of maintenance activities. In addition, although the permanent ROW would not have an associated access road, off-road vehicle users might travel on it in some areas; such use would not be legal without permission from Keystone and the property owner. The increased human access to those areas could increase displacement of wildlife that were sensitive to human presence. Further, increased access to land via the permanent ROW could increase hunting mortality for local game populations, although all hunting would be subject to the rules and regulations administered by the state. Because there would not likely be a substantial increase in human activity associated with the ROW in Montana, impacts to wildlife would likely be minor but would last for the life of the proposed Project.

Normal operation of the proposed Project would result in minor effects on wildlife. Direct impacts from maintenance activities, such as ROW maintenance or pipeline repair that would require excavating the pipeline, would be the same as those for construction but would affect a small area. The expected increase in wildlife-vehicle collisions from the use of the new and existing access roads would be negligible, and the impacts on wildlife in adjacent areas from the presence of the new roads and use of those roads and the existing access roads would be minor but would last for the life of the proposed Project. During operation, burrowing animals might be attracted by the warmth generated by the pipeline, especially during winter. Migratory waterfowl might be attracted to the permanent ROW during early spring if it became snow-free earlier than surrounding habitats. Changes from surrounding soil temperature at the ground surface would be most noticeable during spring. Operation of the pipeline would increase soil temperatures at depths near the pipeline by as much as 40 °F, by as much as 10 to 15 °F at a depth of 6 inches, and at the surface might increase by 4 to 8 °F during the spring (Keystone 2009).

I-3.4.2.1 Deer and Pronghorn Winter Range

Winter range is particularly important for ungulates (e.g., mule deer, white-tailed deer, and pronghorn) because of the lack of high-quality forage in winter, cold temperatures, and the increased energy demand. Depending on winter conditions, ungulates in the vicinity of the proposed route could be susceptible to adverse effects of construction and maintenance of the permanent ROW across winter ranges. Table I-3.4-4 presents the locations where the proposed route would cross the winter ranges for these animals. In Montana, the proposed route would cross a total of about 49.9 miles of white-tailed deer winter range in 11 locations, 119.4 miles of mule deer winter range in 19 locations, and 80.2 miles of pronghorn winter range in 14 locations.

Additional measures identified for mule deer and pronghorn summarized below and presented in detail in the MDEQ Environmental Specifications (see Attachment 1 to this appendix) include:

- Within big game winter ranges, timing restrictions may be applicable for construction activities after November 15, based upon severity of winter conditions and consultation with FWP biologists.

TABLE I-3.4-4
White-tailed Deer, Mule Deer, and Pronghorn Winter Ranges Crossed by the Proposed Project in Montana

Range Type	Location		Total Length Crossed (miles)	Acreage Affected during Construction[1]
	Beginning Milepost	Ending Milepost		
White-tailed deer winter range	54.38	57.42	3.0	40.5
	65.77	68.17	2.4	32.0
	79.79	84.92	5.1	68.4
	87.31	91.03	3.7	49.6
	121.30	124.35	3.1	40.7
	137.73	142.86	5.1	68.4
	152.97	171.01	18.0	240.5
	193.56	196.93	3.4	44.9
	244.51	247.23	2.7	36.3
	248.48	248.57	0.1	1.2
	279.12	282.28	3.2	42.1
Total			**49.9**	**664.7**
Mule deer winter range	9.13	28.2	19.03	253.7
	28.44	29.7	1.3	17.3
	32.81	33.8	1.0	13.6
	34.29	35.2	0.9	11.8
	35.77	36.6	0.8	10.4
	37.25	65.8	28.5	380.3
	66.96	67.0	0.1	1.1
	88.54	89.4	0.8	11.1
	89.72	130.9	40.5	539.5
	131.44	131.7	0.3	3.6
	152.97	161.9	8.9	118.8
	202.92	204.2	1.2	16.4
	211.98	225.7	13.2	175.7
	244.51	247.2	2.7	36.3
	248.48	248.6	0.1	1.2
	256.71	259.9	3.2	42.8
	260.95	264.8	3.8	50.9
	269.02	280.2	11.2	148.8
	280.69	281.6	0.1	12.0
Total			**119.4**	**1,845.3**

TABLE I-3.4-4 White-tailed Deer, Mule Deer, and Pronghorn Winter Ranges Crossed by the Proposed Project in Montana				
	Location			
Range Type	Beginning Milepost	Ending Milepost	Total Length Crossed (miles)	Acreage Affected during Construction[1]
Pronghorn winter range	11.39	12.38	1.0	13.2
	12.68	13.82	1.1	15.2
	14.08	20.27	6.2	82.5
	21.55	26.85	5.3	70.7
	38.75	65.77	27.0	360.3
	74.63	82.67	8.0	107.2
	83.73	83.74	0.0	0.1
	111.66	129.00	17.3	231.2
	162.17	163.12	0.1	12.7
	163.91	164.33	0.4	5.6
	219.19	219.49	0.3	4.0
	254.97	255.69	0.7	9.6
	258.25	258.89	0.6	8.5
	267.97	280.18	12.2	162.8
Total			**80.2**	**1,083.6**

Source: MFWP 2009b.
[1] Acreage is based on a ROW width of 110 feet.

I-3.4.2.2 Prairie Grouse

Greater Sage-Grouse

Approximately 190 miles of the proposed route would extend through areas with sage-grouse habitat (MFWP 2001a). Of this distance, 94 miles are classified as moderate to high-quality habitat for greater sage-grouse and 96 miles are classified as marginal habitat. MFWP (2009b) has mapped core sage-grouse habitat[7] in Montana, where sage-grouse densities are highest and/or where leks and associated sage-grouse habitat occur. The proposed route would pass through approximately 20 miles of core sage-grouse habitat. One 2.75-mile-long permanent access road and one pump station would also be constructed within core sage-grouse habitat.

[7] MFWP (2009b) indicates that sage-grouse core areas are habitats associated with (1) Montana's highest densities of sage-grouse (25 percent quartile), based on male counts, and/or (2) sage-grouse lek complexes and associated habitat important to sage-grouse distribution. The data are intended for display of sage grouse core areas in Montana and initial resource review and conservation planning.

The revised Montana GAP[8] vegetation data indicated that the proposed route would cross approximately 34 miles of sagebrush steppe habitat in Montana, with the potential for directly removing 446 acres of this habitat and indirectly affecting a larger buffer area around sage-grouse leks (Table I-3.4-5). The proposed route would also cross within 1 mile of at least five greater sage-grouse leks and within 4 miles of at least 36 greater sage-grouse leks in Montana. Using a 4-mile buffer around only the known greater sage-grouse leks that occur within 4 miles of the proposed route, the proposed Project route would cross approximately 111.7 miles of greater sage-grouse buffer zone in nine locations (Table I-3.4-5).

TABLE I-3.4-5
Greater Sage-Grouse Lek 4-Mile Buffer Zones Crossed by the Proposed Project in Montana

Location by Milepost		Buffer Zone Length Crossed (miles)	Buffer Zone Acreage Affected during Construction[1]
Beginning Milepost	Ending Milepost		
17.0	25.3	8.3	111.3
43.2	49.9	6.7	89.8
50.2	61.8	11.6	155.4
67.1	72.1	5.0	66.6
87.7	121.9	34.2	455.4
207.7	220.0	12.3	164.4
229.3	243.6	14.3	191.3
247.1	264.5	17.4	232.1
280.4	282.3	1.9	26.0
Totals	**9 locations**	**111.7**	**1,492.3**

Sources: MFWP 2009a, 2009b, 2009c.
[1] Acreage is based on a ROW width of 110 feet.

Studies of the effects of energy development on greater sage-grouse indicate a variety of adverse impacts to sage-grouse from sources of disturbance, such as construction and operation of facilities, road construction and use, and development of transmission lines (Naugle et al. 2009). However, many studies evaluated impacts resulting from different and higher-density types of disturbance and development than the proposed Project (i.e., a single pipeline as compared to oil and gas field developments). Although similar types of impacts would likely occur from construction of the proposed Project, the magnitude would likely be different.

Sage-grouse would be especially vulnerable to pipeline construction activities in the spring when birds were concentrated on strutting grounds (leks) and where the pipeline and access roads were constructed through sagebrush communities with leks and nesting sage-grouse. Partial field surveys and public databases indicate that at least 36 known sage-grouse leks are present within 4 miles of the proposed route, and at least five leks are present within 1 mile of the route (MFWP 2009a, 2009b, and 2009c). Construction near leks could displace breeding birds from leks or disturb nests, resulting in a decrease in local reproduction. Traffic on roads near active leks could cause vehicle collision mortality.

[8] The Gap Analysis Program, or GAP, is a scientific program intended to identify species that are not adequately represented on existing conservation lands. For this EIS, information was used from the recently updated ecological land cover mapping developed as a part of the Gap Analysis.

Disruption of courtship and breeding behavior could be minimized by scheduling construction after birds had left the leks (usually by mid-May). Mortality to sage-grouse and the loss of nests, eggs, and young could be avoided by scheduling construction through occupied sagebrush steppe habitats after young sage-grouse became mobile and were able to fly (usually by mid-August). Sage-grouse chicks are precocious and capable of leaving the nest immediately after hatching, but they are not sufficiently mobile to avoid construction related impacts until after they can fly.

After construction, reestablishment of sagebrush on the ROW might take 30 years or more. During this period, vegetation on reclaimed areas would likely be dominated by grasses with low densities of native forbs and shrubs. Typically, communities of big sagebrush have proven to be difficult to reestablish on reclaimed lands (Schuman and Booth 1998, Vicklund et al. 2004). Growth of big sagebrush on reclaimed land has been shown to benefit from the application of mulch, compacting soil after seeding, and reduced competition with herbaceous species (lower seeding rate of grasses and forbs) (Schuman and Booth 1998). Management of a 30-foot-wide area of the permanent ROW to prevent shrub and tree growth could prevent reestablishment of sagebrush communities for at least the life of the proposed Project. A maintained path over the pipeline that was free of shrubs could facilitate predator movement along the ROW and increase predation risk for grouse nesting or foraging on or near the ROW. Maintenance of the ROW and the three new permanent access roads might also encourage recreational use of the ROW. Recreational use (e.g., motorized vehicles, wildlife viewing, etc.) of the area during the breeding season could have an adverse effect on sage-grouse reproduction.

In Montana, the new permanent access roads would be constructed within 4 miles of at least three greater sage-grouse leks; one new access road would be constructed within 2 miles of at least one greater sage-grouse lek. The 4-mile distance from the six new pump stations would include at least eight greater sage-grouse leks; however, all leks would be at least 2 miles from the nearest pump station. Sound generated by the pump stations would attenuate to background levels within about 0.5 mile of the pump stations, and because the pump stations are at least 2 miles from nearest lek, the increased sound levels from operation of the pump stations would not affect the use of known sage-grouse leks.

If construction and future activities were to disturb the 36 or more leks and associated nesting habitat near the ROW during the breeding season, local and regional populations of greater sage-grouse could decline. Limiting construction to periods outside of the breeding season would protect nesting grouse and offspring. In addition, several agencies, including MFWP, identified mitigation measures to minimize the impact of the proposed Project on greater sage-grouse. The key measures are summarized below and are included in detail in the MDEQ Environmental Specifications for the proposed Project (see Attachment 1 to this appendix), along with other mitigation measures:

- Conduct surveys of greater sage-grouse leks prior to construction using appropriate methods to detect leks and the peak number of males in attendance at the leks within 3 miles of the edge of the construction ROW or a facility, unless a facility is screened by topography;
- Avoid construction within 3 miles of active greater sage-grouse leks in suitable nesting habitat not screened by topography from March 1 to June 15, with the following exceptions -
    - Equipment may pass as a single group along the permitted ROW or approved location through a restricted lek buffer area
    - Equipment would only pass through a restricted lek buffer between 10:00 am and 2:00pm, to avoid disturbing displaying birds during critical times of the day
    - If major grading is required to pass equipment along the permitted ROW or approved location, this grading would take place outside of the March 1 through June 15 restriction period and

- As equipment passes through the areas, if any large hummocks or rocks impede the travel lane, the lead dozer would lower its blade on the way through to move the obstruction to the side and/or smooth out any larger hummocks or rocks;

- In sagebrush habitat, reduce the mound left over the trench in areas where settling would not present a path for funneling runoff down slopes, where settling could occur implement additional measures to compact backfilled spoils;
- Contact BLM and MFWP to determine what mitigation measures are needed for a lek found within the construction ROW;
- During operation, inspection flights would be limited to afternoons from March 1 to June 15, as practicable in sage brush habitat designated by MFWP;
- Implement reclamation measures (i.e., application of mulch or compaction of soil after broadcast seeding, and reduced seeded rates for non-native grasses and forbs) that favor the establishment of silver sagebrush and big sagebrush in disturbed areas, where compatible with the surrounding land use and habitats;
- Establish a compensatory mitigation fund of $600 per acre to be used by MDEQ, BLM, and MFWP to enhance and preserve sagebrush communities for greater sage-grouse and other sagebrush-obligate species in eastern Montana at designated mileposts;
- Under the direction of MDEQ, MFWP, and BLM, fund a study for four years to determine whether the presence of proposed Project facilities have affected sage-grouse numbers, based on the peak number of male greater sage-grouse in attendance at leks within 3 miles of facilities. If a decrease is observed, it will be offset with an increase in the number of greater sage-grouse elsewhere;
- Prior to construction, conduct studies along the route to identify areas that support stands of big sagebrush and silver sagebrush and incorporate these data into reclamation activities to prioritize reestablishment of sagebrush communities;
- Monitor establishment of sagebrush on reclaimed areas annually for at least four years to ensure that sagebrush plants become established at densities similar to densities in adjacent sagebrush communities, and implement additional seeding or plantings of sagebrush if necessary;
- Under the direction of MDEQ, MFWP, and BLM, establish criteria to determine when reclamation of sagebrush communities has been successful, based on the pre- and post construction studies described above, and meet revegetation standards specified in Attachment 1;
- Use locally adapted sagebrush seed, collected within 100 miles of the areas to be reclaimed;
- Where facilities would permanently remove sagebrush communities, implement compensatory mitigation nearby to restore, enhance, and preserve sagebrush communities for greater sage-grouse and other sagebrush-obligate species;
- For five years following initial seeding, monitor cover and densities of native and non-native perennial forbs and perennial grasses, exclusive of noxious weeds, on reclaimed native prairie, pasture, and riparian areas and reseed with native forbs and grasses where densities are not comparable to adjacent communities;
- In conjunction with the landowner, appropriately manage livestock grazing of reclaimed areas until successful reclamation of sagebrush communities has been achieved, as described above; and

- Implement measures to reduce or eliminate colonization of reclaimed areas by noxious weeds and invasive annual grasses such as cheatgrass (*Bromus tectorum*), to the extent that these species do not exist in undisturbed areas adjacent to the ROW.

With incorporation of the Keystone CMR Plan and the mitigation measures described above and additionally presented in the MDEQ Environmental Specifications (see Attachment 1 to this appendix), construction and operation of the proposed Project would not likely affect greater sage-grouse courtship activities on leks and would likely result in a minor impact on nesting birds. However, construction would likely result in an incremental loss of big sagebrush habitat that is currently used for foraging and nesting by greater sage-grouse for 30 years or longer.

Sharp-Tailed Grouse

The proposed route would cross approximately 55.8 miles of sharp-tailed grouse habitat (Table I-3.4-6). Effects to sharp-tailed grouse as a result of disturbance from construction and maintenance activities would be similar to those described for the greater sage-grouse. Although energy development has been occurring in the Great Plains, the effects of this development on sharp-tailed grouse have received little attention. One short-term study in the Little Missouri Grasslands of North Dakota (Williams 2009) found no differences in reproductive success from oil and gas development. However, that same study recommended protecting leks and surrounding habitats, because leks are the focal point for reproduction.

In Montana, the three new permanent access roads would be constructed within 4 miles of at least six sharp-tailed grouse leks; one of the new access roads would be constructed within 1 mile of at least one sharp-tailed grouse lek. The 4-mile distance from the six new pump stations would include at least seven sharp-tailed grouse leks; however, all leks would be at least 2 miles from the nearest pump station. Sound generated by the pump stations would attenuate to background levels within about 0.5 mile of the pump stations and, because the pump stations are at least 2 miles from nearest lek, the increased sound levels from operation of the pump stations would not affect the use of known sharp-tailed grouse leks.

Disturbance of leks and nesting habitat might result in reduced reproduction of sharp-tailed grouse present in the vicinity of the ROW. At least eight known sharp-tailed grouse leks would be within 1 mile of the proposed route and at least 19 leks would be within 2 miles of the route (Table I-3.4-6). However, MFWP has not monitored or surveyed sharp-tailed grouse leks as intensively as greater sage-grouse leks. In spring 2009, MFWP (Regions 6 and 7) conducted a lek survey in areas near a short portion of the proposed route (the survey was conducted along about 10 percent of the route in Montana) and identified 16 new sharp-tailed grouse leks near the ROW (P. Gunderson, pers. comm. 2009; W. Davis, pers. comm. 2009). It is likely that more sharp-tailed grouse leks are present near the ROW and some might be within 2 miles of the proposed route.

Sharp-tailed grouse have broader habitat tolerances than do sage-grouse (Connelly et al. 1998, Schroeder et al. 2004). Consequently, effects to sharp-tailed grouse from habitat loss and alteration would likely be minor, and reclaimed grassland and grassland-shrub habitats would likely provide suitable habitat for sharp-tailed grouse. The maintained ROW could attract recreational use (e.g., motorized vehicles, wildlife viewing, and photography) and increased recreational use during the breeding season could reduce local sharp-tailed grouse reproduction. The maintained ROW might also facilitate predator movement along the ROW, increasing predation risk for sharp-tailed grouse nesting or foraging on or near the ROW.

TABLE I-3.4-6 Sharp-tailed Grouse Lek 2-Mile Buffer Zones Crossed by the Proposed Project in Montana			
Location by Milepost			
Beginning Milepost	Ending Milepost	Buffer Zone Length Crossed (miles)	Buffer Zone Acreage Affected during Construction[1]
49.6	65.0	15.4	71.6
94.6	110.8	16.2	216.1
159.2	160.5	1.3	17.3
175.9	181.8	5.9	78.8
188.1	190.3	2.2	28.7
209.5	213.2	3.7	49.2
213.3	217.7	4.4	58.4
229.7	233.5	3.8	50.7
254.7	257.6	2.9	38.3
Totals	**9 locations**	**55.8**	**609.1**

Sources: MFWP 2009a, 2009b, 2009c.
[1] Acreage is based on a ROW width of 110 feet.

If construction and future activities were to disturb the 19 or more leks and associated nesting habitat near the ROW during the breeding season, local populations of sharp-tailed grouse could decline. Limiting construction activities to periods outside of the breeding season would protect nesting grouse and their offspring. In addition, several agencies, including MFWP, identified mitigation measures to minimize the impact of the proposed Project on sharp-tailed grouse. Those measures include the mitigation measures identified for the greater sage-grouse above (except for the surveys and construction restrictions specific to greater sage-grouse) as well as the additional measures summarized below and presented in detail in the MDEQ Environmental Specifications (see Attachment 1 to this appendix):

- Conduct surveys of sharp-tailed grouse leks prior to construction using methods approved by MDEQ and MFWP, to detect leks that can be seen from the construction ROW and associated power lines; and
- Avoid construction within 0.25 mile of active sharp-tailed grouse leks that can be seen from the construction ROW from March 1 to June 15.

With incorporation of the Keystone CMR Plan into the proposed Project and implementation of the mitigation measures described above, construction and operation of the proposed Project would not likely affect sharp-tailed grouse courtship activities on leks and would have a minor impact on nesting birds. However, construction might result in subtle fragmentation effects that could affect individual grouse (e.g., increased risk of predation) in areas next to the maintained ROW.

I-3.4.2.3 Special-Status Wildlife

The impacts of the proposed Project in Montana on species of concern are discussed by the following groups that were established based on habitats used: grassland birds, wetland and water birds, forest birds, bats, shrews, and reptiles.

Grassland Birds

Grassland bird populations in the Great Plains have declined in abundance primarily due to loss of habitat (Madden et al. 2000). Breeding bird surveys indicate that almost 70 percent of the 29 grassland-dependent birds have negative population trends (U.S. Department of the Interior 1996). Grassland birds of concern that would be affected by habitat losses associated with construction would include the bobolink and grasshopper sparrow.

The proposed route would cross approximately 145.1 miles of mixed-grass prairie habitat (Table I-3.4-3). If construction were to take place during the nesting and brood-rearing period, some mortality would likely occur to birds of concern. Fragmentation of grassland habitats could increase mortality risk to grasslands birds from predation and nest parasitism by brown-headed cowbirds. Grasslands in the vicinity of the proposed route vary in plant composition and structural features. Madden et al. (2000) indicated that a mosaic of successional types was necessary to maximize diversity of grassland birds. Post-construction vegetation within the restored ROW would likely initially be less diverse than adjacent undisturbed grassland habitats. Some grassland birds would adapt to the reclaimed vegetation while others might be displaced by the vegetation change. Construction could destroy bobolink and grasshopper sparrow nests if they were present within the construction ROW. Construction would also result in a short-term to long-term loss and long-term alteration of native grassland habitat used for foraging and nesting by these species.

Although no specific mitigation measures have been proposed for the bobolink and grasshopper sparrow, Keystone would develop a Migratory Bird Conservation Plan in consultation with the USFWS to avoid, minimize, and mitigate for impacts to migratory birds and migratory bird habitats as required by the Migratory Bird Act. Implementing the procedures included in the plan would benefit the bobolink and grasshopper sparrow. The impact of the proposed Project on these grassland birds would likely be short term and potentially moderate in magnitude for direct construction-related impacts, and long term in duration and minor to moderate in magnitude for habitat-related impacts.

Wetland and Water Birds

The proposed route would cross about 5.3 miles of wetlands and riparian forests (see Section I-3.2) and about 3.3 miles of riverine and open water habitats (see Section 3.4 of the EIS). Montana birds of concern associated with large wetland complexes and water bodies discussed in this section would include the American bittern, American white pelican, black-crowned night heron, black-necked stilt, Caspian tern, common tern, Forster’s tern, great blue heron, and horned grebe. No large wetlands or water bodies that provide nesting habitat for these species would be directly affected by construction. The great blue heron is a colonial nester in cottonwood forests along major perennial streams and no nesting colonies were documented along the proposed route. However, potential heron nesting habitat might be present within 0.9 mile of forested wetlands that would be crossed by the proposed route. The American white pelican, Caspian tern, common tern, and Forster’s tern also are colonial nesters, nesting in water bodies and wetlands, often on islands. Several of these species forage widely in the vicinity of the proposed route (e.g., great blue heron and white pelican).

Avoidance and mitigation measures to reduce impacts to wetlands would minimize adverse effects to these species. Many of these sensitive water birds nest colonially on large wetland complexes with open water. No large wetland complexes would be crossed by the proposed route. Risk to these wetland and water birds would be relatively small because these species are most common in the northeast corner of Montana near Medicine Lake, an area that would not be crossed by the proposed route. Keystone would incorporate the procedures in its CMR Plan and in the MDEQ Environmental Specifications to avoid or minimize impacts to wetlands, as described in Sections 3.4 and 3.7 of the EIS, and use of the horizontal directional drilling (HDD) method of pipeline installation under large water bodies would also minimize impacts to wetland and water birds.

Although no specific mitigation measures have been proposed for wetland birds and water birds, Keystone would develop a Migratory Bird Conservation Plan in consultation with USFWS to avoid, minimize, and mitigate impacts to migratory birds and migratory bird habitats as required by the Migratory Bird Act. Implementing the procedures included in the plan would benefit wetland birds and water birds. The impact of the proposed Project on these species would likely be primarily short term during construction and minor in magnitude.

Forest Birds

The proposed route would cross about 11.2 miles of forested habitats (i.e., riparian, wooded draws, and conifer forest) (Table I-3.4-3). Special-status birds associated with forested habitats include the black-billed cuckoo, pinyon jay, veery, and yellow-billed cuckoo. Construction through forested habitats would remove trees and shrubs important for nesting and foraging. If construction occurred during the nesting period, eggs and young could be lost. Although riparian forest and upland wooded draws comprise a small part of the landscape, they have disproportionately large wildlife values (Ohmart and Anderson 1986, Thomas et al. 1979). Thompson (1978) found that the highest total biomass and species diversity of breeding birds in McCone County habitats in Montana was within wooded draws. Habitat impacts to forest birds would be long term because trees would not be allowed to recolonize within the maintained ROW, and the regeneration of trees within the construction ROW would require 10 to 30 years or more. Many cavity nesting birds re-use nest cavities, and displacement from occupied habitats because of the loss of nest trees might result in reduced productivity in subsequent years.

Although no specific mitigation measures have been proposed for forest birds, Keystone would follow the procedures in its CMR Plan and in the MDEQ Environmental Specifications to minimize impacts to forested wetlands and uplands (described in Section 3.5 of the EIS). In addition, Keystone would develop a Migratory Bird Conservation Plan in consultation with the USFWS to avoid, minimize, and mitigate for impacts to migratory birds and migratory bird habitats as required by the Migratory Bird Act. Implementing the procedures included in the plan would benefit special-status forest birds. The impact of the proposed Project on forest birds would likely be moderate in magnitude and would last for at least the life of the proposed Project.

Keystone would implement the mitigation measures in the CMR Plan that are designed to reduce the impact to wildlife. Additional mitigation measures designed to further reduce the impact to grassland, wetland, water, and forest birds were identified by agencies and tribes. The mitigation measures that the DOS considers to be appropriate to incorporate into the proposed Project area are listed below:

- Defer activities that affect nesting habitat until after the nesting and brood-rearing period (from April 15 to July 15); and
- If construction would occur during the period from April 15 to July 15, conduct surveys for nesting migratory birds and maintain a 100-foot buffer of undisturbed vegetation around all discovered nests until the young have fledged.

Additional measures identified for the special status birds are summarized below and presented in detail in the MDEQ Environmental Specifications (see Attachment 1 to this appendix) include:

- To protect nesting for Sprague's pipit, a sensitive species in Montana, if construction would occur during the April 15 to July 15 grassland ground-nesting bird nesting season, nest-drag surveys must be completed to determine the presence or absence of nests on lands in Phillips and Valley counties and implement timing restrictions recommended by USFWS and MFWP;

- To minimize destruction of mountain plover nests and disturbance of breeding mountain plovers; no construction, reclamation, or other non-emergency ground disturbing activities will occur from April 10 to July 10 in suitable nesting habitats in Fallon and northern and central Valley counties unless surveys conducted consistent with the Plover Guidelines or other methods approved by the USFWS find that no plovers are nesting in the area. If an active nest is identified, construction activities within 0.25 mile of the nest would be delayed for 37 days (typical fledging duration) or until fledging, whichever is sooner. If a brood of flightless chicks is identified, construction activities would be delayed for at least seven days or until fledging, whichever is sooner. Routine, non-emergency, maintenance activities would be scheduled outside the April 10 to July 10 period in mountain plover habitat unless surveys indicate that no plovers are nesting in the area and that flightless chicks are not present;
- Conduct pre-construction surveys for interior least tern within 0.25 mile from suitable breeding habitat at the Yellowstone River during the breeding season to ensure that there are no nesting pairs within 0.25 miles of the construction area. Conduct daily surveys for nesting terns during the nesting season if construction activities would occur within 0.25 miles of potential nesting habitat. Construction would not be permitted within 0.25 mile from an occupied nest site during the breeding season (April 15 through August 15) or until the fledglings have left the nesting area;
- Prior to and during construction, conduct surveys for active bald eagle nests and communal roost sites prior to construction, if any active nests are found implement measures in the Montana Bald Eagle Management Plan (if active) or implement the current guidance from the US Fish and Wildlife Service;
- Prior to March 15 each year of construction conduct survey of approved location and nearby areas for the presence of golden eagle nests, if an active golden nest is found, restrict construction, reclamation and non-emergency maintenance activities within 1000 m of the nest from March 15 until July 15 or until the young have fledged;
- Conduct surveys for ferruginous hawk nests, if an active nest is found, no construction, reclamation, or non-emergency maintenance activities would take place within 1000 m of the nest between March 15 and July 15 or until young have fledged;
- Conduct surveys for nesting burrowing owls in Phillips, Valley, southern McCone, and southern Dawson counties during the period between April 15 and August 1, if nesting burrowing owls are found, no construction, reclamation, or non-emergency maintenance activities will occur within 500 m of an active nest until chicks have fledged;
- Conduct surveys for nests of other raptor species, if an active nest is found, no construction and reclamation activities would occur within 1000 m of an active nest between March 15 and July 15 or until the young have fledged; and
- Great blue heron rookeries would be avoided by 500 feet.

Bats

Eastern red bat and hoary bat are solitary, roost in foliage, and are migratory. Concentrations of these bats might form during fall migration. No communal bat roost sites have been recorded along the proposed Project route. However, impacts to these species in the vicinity of the proposed route would result from the short-term reduction of potential foraging habitat and habitat fragmentation until reclamation was completed and native vegetation became reestablished. The proposed route would cross about 11.2 miles of forest habitat and result in the loss of approximately 149.3 acres of forest from the construction ROW (Table I-3.4-3), and trees would be permanently removed from the 50-foot-wide permanent ROW.

Although no mitigation measures have been developed specifically for the eastern red bat or the hoary bat, the procedures that Keystone would incorporate into the proposed Project to minimize the impacts to forested wetland and upland habitats and migratory birds (described above) would also benefit bats. The impact of the proposed Project on bats would likely be moderate in magnitude and would last for at least the life of the proposed Project.

Additional measures identified for bats are summarized below and presented in detail in the MDEQ Environmental Specifications (see Attachment 1 to this appendix) include:

- Conduct surveys in forested riparian habitat between June 1 and August 15 using the methods described in the Handbook of Inventory Methods and Standard Protocols for Surveying Bats in Alberta to determine the location of bat maternity roosts or roost trees; if active bat roosts are identified, roosts should be avoided where possible until bats have left the area in late summer or fall and removal of roost trees should be avoided wherever practicable; and
- Minimize tree clearing by narrowing of the construction ROW and final centerline location near crossings of certain streams identified in Appendix L of these specifications.

Shrews

Little is known about specific habitat use and distribution of special-status shrews in eastern Montana. If special-status shrews were present in the construction ROW during construction, they would likely be affected by construction activities. Impacts to the arctic shrew, dwarf shrew, Merriam's shrew, and Preble's shrew could occur during the clearing of prairie and shrubland vegetation and during trenching, which would collapse dens and tunnels if they were present within the construction ROW. Adults and young within the construction ROW could also be killed by excavation and vehicle traffic. On state and federal land, the construction ROW would be seeded with plants appropriate for soil and range conditions in the area. During operation, the permanent ROW would provide suitable habitat for shrews, including uncompacted soils for dens and burrows, and plants and insects for forage.

Although no specific mitigation measures have been proposed for special-status shrews, the procedures that Keystone would incorporate into the proposed Project to minimize the impacts to vegetation and wildlife (discussed in Sections 3.5 and 3.6 of the EIS) would benefit these shrews if they occurred along the construction ROW.

Reptiles

Impacts to special-status reptiles (common sagebrush lizard and smooth greensnake) would most likely occur during construction. If either of these species were present in the construction ROW during the active construction period, there could be direct mortality of individuals from construction activities and vehicle traffic. These reptiles could also be trapped in open pipeline trenches. However, as noted above, Keystone would leave hard plugs (short lengths of unexcavated trench) or install soft plugs (areas where the trench was excavated and replaced with minimal compaction) to allow wildlife to cross the trench safely. Soft plugs would be constructed with a ramp on each side to facilitate egress from the trench for animals that might fall into the trench. In addition, the trench would be backfilled as soon as possible after excavation and pipe lowering. Access roads might serve as barriers to the movement of reptiles and serve as a source of mortality during operations for reptiles (Maxell and Hokit 1999). However, Keystone would primarily use existing access roads during construction and would use all but three new access roads only during construction. Impacts also would result from the long-term reduction of suitable habitat until reclamation of the construction ROW and access roads was completed and vegetation became reestablished.

Common sagebrush lizards would likely occur within sagebrush steppe habitat crossed by the proposed route and would be vulnerable to direct mortality from construction activities and access road construction and use. An estimated 32.1 miles and 428 acres of sagebrush steppe habitat would be lost or altered during construction (Table I-3.4-3). This habitat loss and alteration would produce moderate and long-term impacts on sagebrush habitat because it would require about 20 to 50 years to fully regenerate. Although no specific mitigation measures have been proposed for the common sagebrush lizard, mitigation measures developed for conservation of sagebrush habitat and the greater sage-grouse discussed in Section 3.8 of the EIS would benefit the common sagebrush lizard. The impact of the proposed Project on this special-status lizard would be moderate and would be long term to permanent (i.e., last for the life of the proposed Project).

The known distribution of the smooth greensnake is in northeastern Montana, and therefore this species would not likely be affected by the proposed Project.

As described above, to minimize impacts Keystone would incorporate the procedures in its CMR Plan (presented in Appendix B of the EIS) and the measures presented in the MDEQ Environmental Specifications (see Attachment 1 to this appendix). As a result, the impacts to special-status species would likely be minor and temporary during construction. During operation, the impacts would be minor but would last for the life of the proposed Project.

Additional measures identified for small mammals, reptiles, and amphibians are summarized below and presented in detail in the MDEQ Environmental Specifications (see Attachment 1 to this appendix) include:

- During construction, when trenches are open, conduct daily inspections to locate and remove animals that have been trapped in the open trench;
- To protect small animals from entanglement, do not use erosion control netting composed of material incorporating plastic netting with openings less than two inches across which can entangle small animals;
- If a western hog-nosed snake or milksnake hibernacula are found within the construction ROW during construction restrict construction between October 1 and May 1 to prevent the loss of a large number of individual snakes;
- To protect habitat of the Great Plains toad and plains spadefoot, restrict construction within 100 m of ephemeral wetlands from April 15 to July 15.

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I-3.5 FISHERIES

Section 3.7 of the main body of the EIS provides information about the affected environment and potential impacts of proposed Project implementation on fisheries resources, including information for Montana. This section of the appendix provides supplemental information about those topics specific to Montana and in accordance with the provisions of MEPA and MFSA. It includes supplemental information about proposed crossings of intermittent and ephemeral waterbodies that have been identified as contributing to maintaining water quality, and that might provide seasonal habitat that contributes to the viability of fish populations of recreational or commercial value. This section also provides additional information on Montana fish of conservation concern that could be affected by perennial stream crossings and the use of hydrostatic test water.

I-3.5.1 AFFECTED ENVIRONMENT

I-3.5.1.1 Waterbodies

The proposed route would cross 42 intermittent or ephemeral streams that connect to waters supporting recreational or commercial fishery resources in Montana. These streams, which are listed in Table I-3.5-1, likely contribute to maintaining water quality and might provide seasonally used habitat that contributes to the maintenance of non-salmonid fisheries in Montana (Berry et al. 2004, MDEQ 2006a and 2006b).

TABLE I-3.5-1
Fishery Categories for Intermittent and Ephemeral Waterbodies Crossed by the Proposed Project Route in Montana

County	Approximate Milepost	Waterbody Name	Stream Flow Regime[1]	Proposed Crossing Technique[2]	Number of Crossings
Phillips	9.1	Dunham Coulee	Ephemeral	OC	1
Phillips	20.8 – 24.0	Corral Coulee	Ephemeral/ Intermittent	OC	3
Valley	32.5	East Fort Cache Creek	Ephemeral	OC	1
Valley	38.0	Hay Coulee	Intermittent	OC	1
Valley	44.9	Lime Creek	Intermittent	OC	1
Valley	51.1	Brush Fork	Intermittent	OC	1
Valley	52.3	Bear Creek	Intermittent	OC	1
Valley	53.3	Unger Coulee	Intermittent	OC	1
Valley	55.3	Buggy Creek	Intermittent	OC	1
Valley	57.0	Alkali Coulee	Ephemeral	OC	1
Valley	59.3	Wire Grass Coulee	Ephemeral	OC	1
Valley	59.8	Spring Creek	Intermittent	OC	1
Valley	61.7	Mooney Coulee	Ephemeral	OC	1
Valley	66.9	Cherry Creek	Intermittent	OC	1
Valley	68.4	Foss Coulee	Intermittent	OC	1
Valley	70.4	Spring Coulee	Intermittent	OC	1

TABLE I-3.5-1
Fishery Categories for Intermittent and Ephemeral Waterbodies Crossed by the Proposed Project Route in Montana

County	Approximate Milepost	Waterbody Name	Stream Flow Regime[1]	Proposed Crossing Technique[2]	Number of Crossings
Valley	70.9	East Fork Cherry Creek	Intermittent	OC	1
Valley	75.9	Lindeke Coulee	Ephemeral	OC	1
Valley	77.9	Espiel Coulee	Intermittent	OC	1
McCone	95.3	Jorgensen Coulee	Ephemeral	OC	1
McCone	96.7	Lost Creek	Ephemeral	OC	1
McCone	101.3 – 101.4	Cheer Creek	Ephemeral	OC	2
McCone	105.3	Bear Creek	Ephemeral	OC	1
McCone	110.4 – 110.5	Shade Creek	Intermittent	OC	2
McCone	114.2	South Fork Shade Creek	Intermittent	OC	1
McCone	118.3 – 118.6	Flying V Creek	Ephemeral/ Intermittent	OC	2
McCone	122.3	Figure Eight Creek	Intermittent	OC	1
McCone	123.1	Middle Fork Prairie Elk Creek	Ephemeral	OC	1
McCone	146.2	Lone Tree Creek	Intermittent	OC	1
McCone	147.5 – 153.3	Buffalo Springs Creek	Perennial/ Intermittent	OC	3
Dawson	156.7	Cottonwood Creek	Intermittent	OC	1
Dawson	163.1	Hay Creek	Intermittent	OC	1
Dawson	166.2	Upper Seven Mile Creek	Intermittent	OC	1
Dawson	188.1	Cracker Box Creek	Ephemeral	OC	1
Prairie	208.0	West Fork Hay Creek	Intermittent	OC	1
Prairie	209.1	Hay Creek	Intermittent	OC	1
Fallon	244.3	Sandstone Creek	Intermittent	OC	1
Fallon	246.2	Red Butte Creek	Intermittent	OC	1
Fallon	258.4	Hidden Water Creek	Intermittent	OC	1
Fallon	272.1-272.2	Soda Creek	Intermittent	OC	2
Fallon	276.1	North Fork Coal Bank Creek	Intermittent	OC	1
Fallon	279.2	South Fork Coal Bank Creek	Intermittent	OC	1

[1] Perennial = a stream that flows continuously throughout the year; Ephemeral = a stream which flows only after rain or snow-melt and has no base flow component; Intermittent = a stream in contact with the ground water table that flows only certain times of the year, such as when the groundwater table is high or when it receives water from the surface sources.

[2] OC = open cut and consists of conventional upland construction techniques if the streambed is dry or open-cut wet methods for flowing, flume, or dam and pump crossings (see Sections 2.3.4.5 and 2.3.4.6 of the EIS for additional information on those methods).

I-3.5.1.2 Special-Status Fish

Special-status fish are fish listed as threatened, endangered, or candidate species under the ESA of 1973, fish managed as "sensitive" by the BLM, and fish of special concern tracked by the Montana Natural Heritage Program. Fish of special concern are considered by the Montana Natural Heritage Program to be vulnerable to extirpation across their range or across the state due to rarity, significant loss of habitat, or sensitivity to human-caused mortality or habitat disturbances. Section 3.7 of the main body of the EIS presents information about special-status fish that are potentially present in the vicinity of the proposed Project in Montana, including one federally protected fish, eight fish listed as conservation concerns by BLM and Montana, and BLM sensitive fish, which include some Montana fish species of concern. The three additional Montana fish of concern that are not discussed in the body of the EIS are addressed in this section: the blue sucker (*Cycleptus elongatus*), shortnose gar (*Lepisosteus platostomus*), and sicklefin chub (*Macrhybopsis meeki*). Information about the presence of those species and their state ranks is presented in Table I-3.5-2.

TABLE I-3.5-2
Special-Status Fish Potentially Present in the Vicinity of the Proposed Project Route in Montana

Common and Scientific Names	Distribution and State Rank[1]	Habitat Associations
Fish of Conservation Concern		
Blue Sucker (*Cycleptus elongatus*)	Present in the Missouri and Yellowstone rivers within the proposed Project area; S2S3.	Prefers swift current areas of large rivers, feeding on insects in cobble areas.
Shortnose gar (*Lepisosteus platostomus*)	Known only from Missouri River dredge cuts below Fort Peck Dam and a single specimen from the lower Yellowstone River; S1.	Large rivers, quiet pools, backwaters, and oxbow lakes.
Sicklefin chub (*Macrhybopsis meeki*)	Found in the Missouri River below Great Falls; S1.	Main channels of large, turbid rivers where they live in a strong current over a bottom of sand or fine gravel.

Sources: American Fisheries Society [AFS] 2009, BLM 2009, Brown 1971, Holton and Johnson 2003, MNHP 2009a, MNHP 2009b, MNHP and MFWP 2009.

[1] MNHP State Rankings (Rankings S1 through S3 are considered species of concern)
S1 – Critically imperiled
S2 – Imperiled because of rarity or factors that make it vulnerable to extinction
S3 – Rare, uncommon, or threatened, but not immediately imperiled

Blue suckers are present in the Missouri and Yellowstone rivers in Montana. They prefer swift current areas of large rivers with low turbidity, where they feed on insects in cobble areas (AFS 2009). Blue suckers migrate upriver in spring to congregate in fast, rocky areas for spawning. They often migrate up tributary streams (e.g., the Milk River) to spawn.

Shortnose gar are distributed throughout the Mississippi-Missouri River drainage. In Montana, this species is known to occur only in the Missouri River dredge cuts below Fort Peck Dam (Brown 1971), except for a single specimen found in the Yellowstone River approximately 15 miles upstream of the confluence with the Missouri River (AFS 2009, MNHP and MFWP 2009). The shortnose gar typically occurs in large rivers, quiet pools, backwaters, and oxbow lakes, and exhibits a tolerance for turbid water. Spawning occurs in May or June when adhesive eggs are deposited in small clumps attached to aquatic plants or other submerged objects in shallow water (Brown 1971). Eggs hatch eight to nine days after spawning.

The sicklefin chub is considered one of the rarest fish in Montana and is present in large, turbid streams in the plains region of Montana (MNHP 2009a). They are limited to the main channels of large, turbid rivers where they live in a strong current over a bottom of sand or fine gravel. Their known distribution in Montana includes the Missouri River, above and below Fort Peck Lake, and the lower Yellowstone River, from the Intake Diversion Dam to the confluence with the Missouri River (AFS 2009). The species reaches a maximum age of four years and generally becomes sexually mature at the age of two years. Spawning occurs in main channel areas of large turbid rivers during the summer months (AFS 2009).

I-3.5.2 POTENTIAL IMPACTS AND MITIGATION

I-3.5.2.1 Waterbodies

All proposed crossings of ephemeral and intermittent streams in Montana would use either conventional upland construction techniques if the streambed was dry or had non-moving water at the time of crossing, or an open-cut wet crossing (flowing, dry flume, or dam and pump). In general, flowing open-cut wet crossings would be used unless a specific stream was identified as potentially supporting sensitive aquatic species. Construction of crossings at dry ephemeral or dry intermittent stream beds would have no direct impact to fisheries or aquatic resources. When flows were returned to the streambeds, however, some increased turbidity would likely occur because of the disturbance to the banks and streambed. The returning water would pick up loose soil and fines, contributing to an increase in sediment load and downstream turbidity. Impacts to ephemeral and intermittent streams that were flowing and crossed using open-cut wet construction would be similar to impacts of open-cut wet crossings of perennial streams and would include direct mortality to fishery and aquatic resources, loss and alteration of habitat structure, changes in benthic communities, loss of riparian vegetation, and increased suspended sediment and sediment deposition.

Keystone would minimize construction-related effects to ephemeral and intermittent streams by implementation of the procedures identified in its CMR Plan (presented in Appendix B to the EIS) and implementation of the MDEQ Environmental Specifications (presented in Attachment 1 to this appendix). Impacts caused by the removal of riparian cover would be minimized by cutting vegetation at ground level, leaving the root systems intact to provide streambank stability. Removal of tree stumps would be limited to the area directly over the trench line. Construction across ephemeral and intermittent streams would generally be completed within a 24-hour period and streambanks would be stabilized with sediment barriers within 24 hours of completing the crossing. Riparian vegetation would be restored with native plants and conservation grasses, and if the streambed maintained wetland vegetation, wetland mitigation measures would be implemented. Project-related impacts and recommended mitigation measures for fisheries are presented in Section 3.7 of the EIS, and potential Project-related impacts to intermittent and ephemeral streams are discussed in Section 3.3 of the EIS and in Section I-3.1 of this appendix.

I-3.5.2.2 Special-Status Fish

The three Montana fish of concern addressed in this section (the blue sucker, sicklefin chub, and shortnose gar) are only associated with large rivers and streams that often have turbid or muddy water (AFS 2009, MNHP 2009a). The known distributions of these species in Montana are limited to the Missouri, Yellowstone, and Milk rivers. These rivers would be crossed using the HDD method, which would avoid direct disturbance to aquatic habitat and stream banks (see Section 2.3.4.5 of the EIS for additional information about the HDD method). This method of stream crossing would not directly affect these species if they were present in the rivers near the proposed crossing sites. There could be an inadvertent release of drilling lubricant into the aquatic environment if there was a break-through during the drilling operation that released these drilling fluids into the river. The drilling fluids would be non-toxic, but would contain bentonite. Bentonite is naturally occurring fine clay that could physically inhibit respiration of fishes and aquatic invertebrates, potentially resulting in suffocation. Exposure would likely be short term and limited in extent. Longer-term effects to fish populations could result from bentonite spills if larval fish were covered and suffocated from fouled gills and/or a lack of oxygen.

Disturbance to upland plant communities and environment could have direct impacts on aquatic habitats through increased sedimentation from wind and water erosion, and a reduction in filtering capacity and infiltration of runoff from reduced vegetative cover. While the effects of upland disturbance on aquatic habitat could be immediate, there could also be substantial response time lags for various components of the aquatic systems (Baxter et al. 1999). Most disturbances to vegetation from construction activities in uplands next to the Missouri, Yellowstone, and Milk rivers would be avoided by using HDD to cross these rivers.

Invasive aquatic species could be introduced into waterways and wetlands and spread by improperly cleaned vehicles and equipment operating in water, stream channels, or wetlands (Montana Aquatic Nuisance Species Technical Committee 2002). Introduced non-native plants and animals could degrade aquatic habitats, compete with native plants and animals, and transmit fish diseases (e.g., whirling disease) that could adversely impact fish of concern.

Withdrawal of hydrostatic test water in Montana is planned for the Missouri River (approximately 11.4 million gallons) and the Yellowstone River (approximately 11.6 million gallons). In addition, small withdrawals of water for HDD and miscellaneous uses are planned for the Missouri, Yellowstone, and Milk rivers. The MFWP has reserved instream flow water rights for some tributaries of these rivers (Table I-3.5-3). Keystone, as a junior user, would be required to ensure that the listed flow rate would be maintained in the stream while it was withdrawing water for hydrostatic testing.

TABLE I-3.5-3
Montana Fish, Wildlife, and Parks Instream Water Reservations

			Minimum Flows		
Stream	**Reach**	**Dates**	**Cubic ft/sec**	**Acre-ft/year**	**Total Volume for Period (acre-ft)**
Frenchman Creek	International boundary to mouth	Jan., Feb., Mar., and Dec.	2.0	2,900	480
		Apr. through Nov.	5.0	2,900	2,420
Rock Creek	International boundary to mouth	Jan., Feb., Mar., and Dec.	2.0	4,352	480
		Apr. through Nov.	8.0	4,352	3,872
Missouri River #8	Milk River to Montana state line	Year-round	5,178	3,748,500	3,748,500
Redwater River #1	Circle to East Redwater Creek	Jan., Feb., Mar., and Dec.	2.0	1,932	480
		Apr. through Nov.	3.0	1,932	1,452
Redwater River #2	East Redwater Creek to mouth	Jan., Feb., Mar., and Dec.	2.0	2,416	480
		Apr. through Nov.	4.0	2,416	1,936
Boxelder Creek	1 mile west of Belltower to Montana state line	Jan., Feb., Mar., and Dec.	4.0	4,348	960
		Apr. through Nov.	7.0	4,348	3,388
Little Beaver Creek	Russell Creek to Montana state line	Year-round	3.0	2,171	2,171

During water withdrawal, eggs and small fish could become entrained. However, water withdrawal for hydrostatic testing in Montana would likely occur during the fall, avoiding potential impacts to fish eggs and larvae. Intake hoses would be screened to prevent the entrainment of fish or debris, and hose intakes would be kept at least 1 foot off of the river bottom. After use, the water would be discharged onto upland areas.

Contaminants could be introduced into aquatic systems through fluid leaks from equipment operation in or near water bodies or wetlands, or fuel spills during equipment refueling (impacts of accidental releases from the pipeline are addressed in Section 3.13 of the EIS). The release of toxic levels of oil, fuel, or other fluids could result in the loss of individual fish. Dilution of hazardous materials accidentally released in the aquatic environment would reduce the potential for lethal effects. Sublethal effects to fish from exposure to oil or petrochemicals could include reduced survival and productivity, reduced forage availability, and displacement.

Herbicides would be used to control vegetation before and after construction. The use of herbicides near a water body could affect aquatic organisms, including fish of concern. Herbicides could enter a water body through runoff, seepage through the soils, and direct introduction to water during application (e.g., wind drift).

Implementation of the procedures in Keystone's CMR Plan and in MDEQ's Environmental Specifications associated with HDD, water use, hydrostatic testing (see Section 3.7 of the EIS), and fuel handling would minimize the potential impacts to Montana fish of concern. HDD would prevent direct disturbance to larger river habitats and the sensitive fish that occupied those habitats (i.e., blue sucker, sicklefin chub, and shortnose gar). Water withdrawal for hydrostatic testing would likely occur during the fall and would not be likely to entrain fish eggs or larvae.

As a result, impacts to sensitive fish species in Montana would likely be temporary and minor.

I-3.5.3 REFERENCES CITED

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I-3.6 LAND USE, RECREATION, AND VISUAL RESOURCES

Section 3.9 of the main body of the EIS provides information about the affected environment and potential impacts of proposed Project implementation for land use, recreation, and visual resources, including information for Montana. This section of the appendix provides supplemental information about those topics specific to Montana and in accordance with the provisions of MEPA and MFSA.

I-3.6.1 LAND USE AFFECTED ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATION

I-3.6.1.1 Agriculture and Forest Land

The proposed route would cross approximately 94 miles of agricultural land in Montana. As shown in Table I-3.6-1, the majority of cropland crossed would be fallowed (87.9 percent). The remaining agricultural land crossed would be dryland (8.1 miles), flood irrigation (2.7 miles), and pivot irrigation (0.6 mile).

TABLE I-3.6-1
Agricultural Land in Montana Crossed by the Proposed Project Route[1]

Cropland Irrigation Method	Miles of Cropland Crossed	Percentage of Total Agricultural Land Crossed (%)
Dryland	8.1	8.6
Pivot Irrigated	0.6	0.6
Sprinkler Irrigated	0.0	0.0
Flood Irrigated	2.7	2.9
Fallow	82.6	87.9
Total	**94.0**	**100.0**

[1] Data from Keystone (2009) is based on surveys along the proposed route; data differ from tables that use MNHP databases for comparisons of cover types in Sections I-3.3 and I-3.4.

As described in Section 3.9.1.3 of the EIS, where construction would affect agricultural land, including irrigation systems and water supply lines, Keystone would negotiate the timing of construction and use of the existing irrigation equipment with the landowner to the extent practical. Agricultural land would be returned to pre-construction conditions to the extent practical, including repair and replacement of irrigation equipment, as stipulated in the Keystone CMR Plan (Appendix B) and in the MDEQ Environmental Specifications (Attachment 1).

In Montana, portions of the proposed route would cross small areas of upland forest land. As shown in Table I-3.6-2, the proposed route would cross a total of less than 1.2 miles of forest land, including 0.1 mile in Phillips County, 0.3 mile in Valley County, 0.3 mile in McCone County, 0.4 mile in Dawson County, and 0.1 mile in Fallon County.

TABLE I-3.6-2 Forest Land Crossed by the Proposed Project Route in Montana[1]				
County	**Milepost Begin**	**Milepost End**	**Miles of Forestland Crossed**	**Forest Type**
Phillips	25.5	25.7	0.1	Upland
Valley	36.1	36.2	0.1	Upland
Valley	66.9	67.2	0.1	Upland
Valley	82.6	82.7	0.1	Upland
McCone	89.2	89.3	0.1	Upland
McCone	89.8	90.0	0.2	Upland
Dawson	158.9	159.0	0.1	Upland
Dawson	159.7	159.7	0.1	Upland
Dawson	177.3	177.3	0.1	Upland
Dawson	195.7	195.8	0.1	Upland
Fallon	229.5	229.6	0.1	Upland
Total			**< 1.2**	

[1] Data from Keystone (2009) is based on surveys along the proposed route; data differ from tables that use MNHP databases for comparisons of cover types in Sections I-3.3 and I-3.4.

I-3.6.1.2 Developed Land: Residential, Commercial, and Industrial

In Montana, construction of the proposed Project would affect 44 acres of developed land and operation would affect 18 acres of developed land. The proposed route would extend across commercial land (0.1 mile), industrial land (0.1 mile), residential land9 (0.1 mile), other ROWs (3.3 miles of roadways, railroads, and utility corridors), and special use lands (less than 0.1 mile along a windbreak).

Keystone and MDEQ identified 17 structures in Montana within 25 feet of the construction ROW and 118 within 500 feet of the construction ROW (Table I-3.6-3). No residences would be located within 25 feet of the construction ROW. As discussed in Section 3.9.1.3 of the EIS and in the Keystone CMR Plan (Appendix B), site-specific construction plans would be developed for commercial/industrial buildings that were within 25 feet of the construction ROW, to avoid or minimize impacts to the structures and to minimize impacts to the users of those structures. Construction in those areas would be conducted in accordance with the requirements of the MDEQ Environmental Specifications (Attachment 1). Where groundwater wells were within 100 feet of a proposed facility, Keystone would construct the facilities in accordance with the requirements of the MDEQ Environmental Specifications to avoid or minimize impacts to the wells.

[9] Although the proposed route crosses residential land, there are no residences within 25 feet of the construction ROW (see Table I-3.9-3).

TABLE I-3.6-3 Structures In the Vicinity of the Proposed Project Construction ROW in Montana		
	Number of Structures	
Structure Type	Within 25 feet of the Construction ROW	≤ 500 feet and > 25 feet from the Construction ROW
Industrial	2	1
Groundwater well	0	4
Other	3[1]	41[2]
Outbuilding	1	48
Power Pole	11	18
Residence[3]	0	6
Total	**17**	**118**

Sources: Keystone, 2009; Montana Basemap Service Center, 2010; and a January 2010 MDEQ field survey.

[1] Includes a cattle trough, a dam, and an unidentified structure.

[2] Includes a bridge, a cattle trough, a dam, a dam with a road, a gravel pit, underground pipe, a spring box, telephone/buried cable posts, troughs, a windmill, and several unidentified structures.

[3] Single residential structures are near MPs 5.7, 23.3, 70.3, and 71.0, and two residential structures are near MP 227.5.

A total of 155 individual residences and one small cluster of about 16 residences would be within approximately 1 mile of the ROW (Montana Basemap Service Center, 2010; U.S. Department of Agriculture, Farm Service Agency, 2005). The cluster of residences is located just south of Baker, near milepost 247.

I-3.6.2 TRANSPORTATION AFFECTED ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATION

Roadways are divided into two categories: major roadways and minor roadways. Major roadways include highways with limited access, U.S. highways with unlimited access, and state and secondary highways. They serve large-scale transportation needs and are major connectors to municipal centers. Minor roadways are local roads and city streets. They serve smaller traffic volumes than major roadways and serve local transportation within the state.

I-3.6.2.1 Roadways

Major roadways and railroads that would be crossed by the proposed route in Montana are listed in Table I-3.6-4. The proposed route would cross two U.S. highways, seven Montana state highways, one interstate highway, and six railroad ROWs. The proposed route would cross Montana State Highway 13, which BLM considers to be a scenic byway. The BNSF Railway would be the only railroad crossed by the proposed route.

The classifications of roadways and railroads crossed by the proposed route are listed in Table I-3.6-5. The majority of the roadways crossed would be local neighborhood, rural, and city roads. Keystone would cross all paved roads, primary gravel roads, highways, and railroads using conventional boring techniques, as described in its CMR Plan (Appendix B of the EIS). Therefore, there would be little or no impact to those roadways and railroads. Open cut construction would be used to cross most smaller, unpaved roads and driveways where permitted by local authorities or private owners.

To minimize the impacts to traffic during construction across roadways, Keystone would provide traffic control, including temporary detours where appropriate for crossings of smaller unpaved roads. Keystone consulted with the Montana Department of Transportation (MDT) about traffic control guidelines and program and policy analysis. MDT determined that the Manual on Uniform Traffic Control Devices is a suitable guide for traffic control.

TABLE I-3.6-4
Major Roadways and Railroads Crossed by the Proposed Project Route in Montana

Road Name	Milepost
U.S. Highway 2	82.30
U.S. Highway 12	244.50
Montana State Highway 7	248.34
Montana State Highway 247	269.03
Montana State Highway 24	69.68
Montana State Highway 200	146.87
Montana State Highway 200S	147.73
Montana State Highway 13[1]	145.98
Montana State Highway 117	83.74
Interstate Highway 94	193.04
BNSF Railway	82.40
BNSF Railway	147.77
BNSF Railway	154.18
BNSF Railway	163.23
BNSF Railway	196.01
BNSF Railway	243.92

[1] Classified as a Scenic Byway by BLM.

TABLE I-3.6-5
Other Roadways and Railroads Crossed by the Proposed Project Route In Montana

Road Class	Number of Crossings	Percent of Total Crossings
Local neighborhood road, rural road, city	98	81.7
Private road for service vehicles (logging)	7	5.8
Railroad feature (main, spur, or yard)	7	5.8
Secondary road	5	4.2
Primary road	2	1.7
Scenic byway	1	0.8
Total Crossings	**120**	**100.0**

On previous projects in Montana, MDEQ expressed concern about the ability of bridges, culverts, and cattle guards to accommodate the construction equipment and trucks hauling pipe and other heavy materials. As a result, MDEQ has recommended that prior to construction, Keystone consult with MDT to determine whether it would be appropriate to field check the road infrastructure (e.g., bridges, culverts, and cattle guards) to determine if the structures could accommodate the anticipated loads. For those structures determined to be unable to accommodate the loads, Keystone should develop a plan to avoid or reinforce those structures.

As a result of implementation of the procedures incorporated into the proposed Project to minimize impacts (including the Keystone CMR Plan, presented in Appendix B to the EIS, and the MDEQ Environmental Specifications, presented as Attachment 1 to this appendix), the proposed Project would not result in significant impacts to roadways and railroads in Montana. Potential impacts to traffic along the roadways during construction and operation are addressed in Sections 3.10.3.2 of the EIS.

I-3.6.2.2 Access Roads

Construction of the proposed Project would require a total of 50 access roads in Montana. Keystone would use existing roads for access roads to the extent practical, and all except three access roads would be temporary (i.e., used only during construction). The three permanent access roads would be used occasionally by maintenance and monitoring crews during operation of the proposed Project.

A total of 111.5 miles of access roads would be required in Montana, and 85.5 miles of those roads would be privately owned (Table I-3.6-6). The 50 access roads would affect approximately 265 acres of land, based on a 30-foot width. After construction, the newly constructed temporary access roads that would not be used during operation of the proposed Project would be restored to pre-construction conditions to the extent practical and in accordance with the Keystone CMR Plan (Appendix B) and the MDEQ Environmental Specifications (Attachment 1). Access roads crossing BLM land would require authorization under Title V of the Federal Land Policy and Management Act.

TABLE I-3.6-6
Ownership of Access Roads Used for the Proposed Project in Montana

Ownership	Length of Access Roads (miles)	Percent of Ownership
Federal	23.06	20.7
State	2.94	2.6
Private	85.50	76.7
Total	**111.50**	**100.0**

Keystone would limit construction traffic on existing and new access roads to the extent practical. The majority of the existing access roads proposed for the proposed Project are used for agriculture and/or livestock purposes. Most are dirt or gravel roads and are not maintained, and some roads might require improvements prior to their use for proposed Project construction. Each spread would require six to nine months to complete, including mobilization and demobilization, and a maximum of two spreads would be constructed simultaneously during a work season.[10] During operation, the access roads would occasionally be used by maintenance and monitoring crews.

Use of access roads during construction of the proposed Project could result in an occasional inconvenience to those currently using the roadways, as a result of the presence of construction vehicles and equipment; however, the impacts would be temporary and minor. Use of the access roads during construction and operation of the proposed Project would not result in significant adverse land use impacts.

I-3.6.3 RECREATION RESOURCES AFFECTED ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATION

In Montana, the proposed route would not cross any state wildlife management areas, state parks, national primitive areas, national monuments, national recreation areas, national forests, or any rivers in reaches designated as wild and scenic. In addition, the proposed route does not cross any national natural landmarks, natural areas, researched natural areas, areas of critical environmental concern, research botanical areas, or outstanding natural areas. One special interest area, the Phillips County USFWS Wetland Easement, is crossed on the proposed route. No long-term effects are anticipated for this wetland easement. One Class I and one Class II fishery would be crossed by the proposed Project; however, both crossings would be constructed using the HDD method (see Section 2.0 of the EIS for construction methods), and therefore no impacts are anticipated.

Hunting and fishing along the proposed route could be temporarily disrupted in some locations during construction, but could resume as soon as construction was completed. Although the proposed route would cross the Lewis and Clark National Historic Trail at two locations, there would be no campsites or other recreational facilities within 2 miles of the proposed crossing site.

Disruptions to recreational activities and areas would be temporary and limited to areas within the construction ROW. After construction was completed, the ROW would be available for use where permitted by law and recreational activities would not be affected. Impacts to recreational visual quality are addressed below. Proposed transmission lines for Pump Stations 12 and 14 would not cross any recreation areas named above. Although 0.9 mile of State Trust land would be crossed by the proposed line for Pump Station 12 and 1.0 mile of State Trust land would be crossed by the proposed line for Pump Station 14, effects to any dispersed recreation activities that may occur there would be short-term and limited to construction.

I-3.6.4 VISUAL RESOURCES

Visual resources are landscape characteristics that have an aesthetic value to residents and visitors from sensitive viewpoints such as residences, recreation areas, rivers, and highways. Characteristics include the aesthetics of natural and developed landscapes, and are considered an element of land use on federally managed lands. BLM is responsible for identifying and protecting scenic values on the public lands it manages. The Visual Resource Management (VRM) system was developed by BLM to assist in the identification and protection of scenic lands in a systematic and interdisciplinary manner.

The VRM system uses several aesthetic value classes to define the rehabilitation objective when landscapes are altered. The system classifies resources based on scenic quality, viewer sensitivity to

[10] Spread 4 begins in Baker, Montana, extends approximately 9 miles to the Montana/South Dakota border, and continues into South Dakota for approximately 63 miles.

visual change, and viewing distance. The system includes four visual inventory classes: Classes I and II are the most valued, Class III represents a moderate value, and Class IV is of least value. BLM's objectives for each class are as follows:

- Class I: preserve the existing character of the landscape, including the natural ecological qualities. Some very limited management activity is permitted;
- Class II: preserve the existing character of the landscape and keep landscape changes at a minimum. Landscape changes should reflect the ambient colors, textures, and form of the surrounding features;
- Class III: keep landscape changes moderate and retain some portion of the existing character of the landscape. Management activities should not attract much attention or dominate the view. Landscape changes should reflect the basic features found in the landscape character; and
- Class IV: allow management activities that require major alterations in the existing character of the landscape. The view may be dominated by management activities. However, the location, disturbance, and blending with the surrounding landscape should be minimized.

BLM visual resource analysts for the Malta and Miles City Field Offices conducted the land inventories within their respective jurisdictions. Both offices recognize that even though BLM lands are intermingled among private lands along the proposed route, the quality of the landscape is not limited by ownership. As a result, the VRM classifications were applied to both public and private lands within the vicinity of the proposed Project in Montana. The Malta and Miles City Field Offices took slightly different approaches to the classification process for highways. The Miles City Field Office opted to classify a 2-mile-wide corridor for all interstate and U.S. highways as Class II and classified a 2-mile-wide corridor for all state and other highways as Class III. The Malta Field Office was not as specific. Therefore, the analysis presented below conforms to the Miles City Field Office approach.

The BLM VRM system incorporates a scenic quality rating system. Scenic quality is evaluated using adjacent scenery, color, cultural modifications, landforms, scarcity, vegetation, water, and the character of the surrounding landscape. Table I-3.6-7 presents descriptions of each of the three scenic quality classes within the VRM system.

TABLE I-3.6-7
BLM VRM Scenic Quality Classification System

Class	Description
A	Scenery is distinctive with considerable variety in form, line, color, and texture.
B	Scenery is above average in relation to the surrounding area, has variety in form, line, color, and texture.
C	Scenery is considered common or typical throughout the region.

I-3.6.4.1 Affected Environment

Table I-3.6-8 lists the VRM classifications along the proposed route in Montana. The proposed route would not pass through areas designated as Class I. The proposed route would extend through seven areas designated as Class II, based on their unique qualities (approximately 14.2 percent of the proposed route in Montana). As indicated in Table I-3.6-8, approximately 71 percent of the area in the vicinity of the proposed route in Montana is rated as Class IV. Along those portions of the proposed route, the terrain would be generally flat or gently rolling and the vegetation would be mainly grassy rangeland. Between mileposts 102 and 116, the proposed route would extend through and around some barren badland areas. The proposed route would also cross three rivers with scenic quality classified as Class B: the Milk River, Missouri River, and Yellowstone River. The proposed 3.3-mile 115-kV transmission line for Pump Station 12 southeast of Circle would pass through areas rated as Class III and would parallel SH 200 for 3/4 mile. The proposed 5.2-mile 115-kV transmission line for Pump Station 14 would pass though areas rated as Class III and IV.Residential Viewpoints

Table I-3.6-9 lists the communities near the proposed pipeline route. The community nearest to the proposed route is Nashua, which would be about 1.5 miles (straight-line distance) from the proposed route. A total of 70 individual residences and one small cluster of about 16 residences would be located within 0.75 mile of the proposed route. The cluster of residences is just south of Baker (near milepost 247). Portions of the proposed Project could be observed from approximately 70 residences. At 33 of the residences, there would be some degree of vegetative screening between viewers and the proposed Project. The vegetative screens would vary from heavy, dense windbreaks to light residential landscaping. About 20 of the residences are within a BLM VRM Class II area.

TABLE I-3.6-8
VRM Classifications in the Vicinity of the Proposed Project in Montana

Approximate Location	Starting Milepost	Ending Milepost	Length (miles) by VRM Class			
			Class II	Class III	Class IV	Total
Frenchman Creek	0	11.99	-	-	11.99	**11.99**
	11.99	25.70	13.71	-	-	**13.71**
	25.70	35.11	-	-	9.41	**9.41**
Rock Creek	35.11	43.43	8.32	-	-	**8.32**
	43.43	68.18	-	-	24.75	**24.75**
Montana State Highway 24	68.18	71.11	-	2.93	-	**2.93**
	71.11	78.93	-	-	7.82	**7.82**
Old Smoky Road	78.93	80.88	-	1.95	-	**1.95**
U.S. Highway 2, BNSF/AMTRAK, Milk River	80.88	84.10	3.22	-	-	**3.22**
	84.10	87.08	-	-	2.98	**2.98**
Missouri River	87.08	91.42	4.34	-	-	**4.34**
	91.42	92.99	-	-	1.57	**1.57**
Parallel to Montana State Highway 24	92.92	103.35	-	10.36	-	**10.36**
	103.35	107.97	-	-	4.62	**4.62**
Nickels Road	107.97	109.97	-	2.00	-	**2.00**
	109.97	125.47	-	-	15.50	**15.50**
East Fork Prairie Elk Creek	125.47	128.98	3.51		-	**3.51**
	128.98	145.03	-	-	16.05	**16.05**
Montana State Highways 13, 200, and 200S	145.03	162.01	-	16.98	-	**16.98**
	162.01	192.07	-	-	30.06	**30.06**
Interstate Highway 94, Yellowstone River	192.07	197.02	4.95	-	-	**4.95**
	197.02	203.21	-	-	6.19	**6.19**
County Road 504	203.21	206.44	-	3.23	-	**3.23**
	206.44	206.78	-	-	0.34	**0.34**
	206.78	206.79	-	0.01	-	**0.01**
	206.79	243.64	-	-	36.85	**36.85**
U.S. Highway 12	243.64	245.76	2.12	-	-	**2.12**

TABLE I-3.6-8 VRM Classifications in the Vicinity of the Proposed Project in Montana						
			Length (miles) by VRM Class			
Approximate Location	**Starting Milepost**	**Ending Milepost**	**Class II**	**Class III**	**Class IV**	**Total**
	245.76	247.39	-	-	1.63	**1.63**
Montana State Highway 7	247.39	249.77	-	2.38	-	**2.38**
	249.77	264.00	-	-	14.23	**14.23**
County Road 7 Little Beaver Road	264.00	266.00	-	2.00	-	**2.00**
	266.00	282.50	-	-	16.50	**16.50**
Totals			**40.17**	**41.84**	**200.49**	**282.5**
Percent of Total			**14.2**	**14.8**	**71.0**	**100.0**

TABLE I-3.6-9 Communities Nearest the Proposed Project in Montana	
Community	**Distance (miles) from Proposed Route**[1]
Circle	2.2
Nashua	1.5
Baker	2.1
Glasgow	5.8
Glendive	17.2

[1] Approximate straight-line distance.

Recreation and Transportation Viewpoints

The proposed route would cross two sections of the Lewis and Clark National Historic Trail, one near the proposed pipeline crossing of the Missouri River and the second near the proposed crossing of the Yellowstone River. While the precise boundaries of the Lewis and Clark Trail are unknown, many visitors come to the area for the historic experience. The proposed route would be within 0.25 mile of the Charles M. Russell National Wildlife Refuge boundary. The proposed route would be more than 5 miles from any other identified recreation areas; the nearest such areas would be the Dredge Cuts Swimming Area, which would be about 5.5 miles from the proposed route, and the Downstream Campground at the base of Fort Peck Dam, which is about 6 miles from the proposed route.

As described above, the proposed route would cross several highways in Montana (see Table I-3.6-4), and travelers along those roadways would be able to observe portions of the proposed Project during construction and observe some aboveground proposed Project features during operation. Traffic volumes for those roadways are listed in Table I-3.6-10. In addition, the proposed route would be parallel to Montana State Highway 24 for several miles southeast of the Missouri River and parallel to Montana State Highway 200S for several miles southeast of Circle.

TABLE I-3.6-10 Highway Viewpoints Crossed by the Proposed Project in Montana	
Highway	**Usage (vehicles per day)**
U.S. Highway 94	More than 3,000
U.S. Highway 2	Approximately 1,500
U.S. Highway 12	Approximately 1,100
Montana State Highway 24	200 to 800
Montana State Highway 117	200 to 800
Montana State Highway 13	200 to 800
Montana State Highway 200	200 to 800
Montana State Highway 200S	200 to 800
Montana State Highway 7	200 to 800

Other significant roadway viewpoints that would be crossed by the proposed route are listed in Table I-3.6-11. All of these smaller roads are lightly traveled, gravel surfaced, and do not have available traffic counts.

TABLE I-3.6-11 Other Roadway Viewpoints with Potential Vistas of the Proposed Project in Montana	
Road	**Approximate Location**
Old Smoky Road	North of U.S. Highway 2
Nickels Road	South of the Missouri River
County Road 504	East of Fallon
County Road 247	South of Baker

The proposed route would also cross the BNSF Railway/AMTRAK railroad which carries a substantial number of business and recreational travelers who would have views of the proposed Project. The railroad line parallels the Missouri River and U.S. Highway 2.

I-3.6.4.2 Potential Impacts and Mitigation

Construction

Temporary impacts to visual resources would result from both construction activities and the presence of workers, equipment, and vehicles along the construction ROW. Visual impacts would result from clearing and removal of existing vegetation, exposure of bare soils, trenching, rock formation alteration, the presence of machinery and stored pipe, the presence of new aboveground structures, and in some locations, changes to the existing contours of the land. During the final stages of construction, backfilling and grading would restore the construction ROW to its approximate previous contours, and reclamation and revegetation would ultimately return the ROW to its approximate previous condition except in currently forested areas. In addition, vegetative buffers would be planted around the pump stations to reduce the visual impacts of the facilities.

Under MEPA and MFSA, MDEQ assesses potential visual impacts of proposed linear facilities. Keystone proposes to incorporate measures into the proposed Project that would minimize the visual effects of the proposed Project, as described in the CMR Plan (Appendix B of the EIS). Keystone would also comply with the MDEQ Environmental Specifications (presented as Attachment 1 to this appendix), which include measures to minimize visual impacts.

The visual impacts of construction would last only through the construction period; construction would last approximately six to nine months along each of the four construction spreads in Montana. Construction would likely be completed within about one month of initiation at any single location. Changes to visual resources during construction would be both temporary (e.g., trenching along the alignment) and permanent (e.g., construction of pump stations). Impacts from permanent changes are addressed below under the impacts of operation.

The majority of viewers of the proposed Project during construction would be travelers along the transportation corridors in the vicinity of the proposed Project. Their views would typically be limited to short periods of time and small portions of the ROW. Although recreational travelers would generally be more sensitive to changes in scenic quality, there would not be major recreation areas in the vicinity of the proposed route and few recreationists would be affected. Some individuals viewing the route from the 70 residences within 0.75 mile of the proposed ROW might be able to observe portions of the construction activities throughout the construction period.

Due to the small number of observers and the short construction period, the impact of construction of the proposed Project in Montana on visual resources would be temporary and would not be significant.

Operation

Shortly after the completion of construction of the proposed Project in Montana, the ROW would be visible as a strong linear feature with some associated aboveground aspects that might adversely affect some viewers. However, previous pipeline projects indicate that after a period of one to five years, the proposed ROW would not be discernible in many areas, and in many other areas the adverse visual effects would be substantially reduced. Visual effects in agricultural areas would likely be eliminated with the first crop growth.

The Milk, Missouri, and Yellowstone rivers would be crossed using the HDD method to minimize impacts in the river and along adjacent areas. At the Milk River, the borehole would be located north of U.S. Highway 2 and the proposed pipeline would pass under the highway, the railroad, and river. As a result, there would be minimal adverse visual effects throughout this Class II area. Similarly, through the use of HDD, there would be minimal adverse visual effects for the steeper slopes of the Class II area along the Missouri River. The HDD-installed crossing of the Yellowstone River would extend from the flats north of the river, proceed under both the railroad and the river, and emerge on the plateau above the river to the south. The HDD method would likely be used to construct the pipeline crossing of U.S. Highway 94, which would be in a Class II area. Use of that construction method would minimize or avoid visual changes in the vicinity of the river during operation of the proposed Project.

The remaining Class II areas (i.e., Frenchman Creek, Rock Creek, East Fork Prairie Elk Creek, and U.S. Highway 12) would be crossed using the open-cut construction method. The visual effects in these areas would be similar to those of other open-cut segments of the proposed route. After revegetation and reclamation were completed (i.e., the vegetation has become established), the terrain and surface conditions would be similar to those of the surrounding areas. Although there would be observable changes in the landscape along some portions of the proposed ROW during operation, the objectives for all Class II areas (i.e., maintaining the existing character of the landscape and not attracting the attention of the casual observer) would likely be achieved.

The proposed Project would have six pump stations in Montana: four would be in BLM VRM Class IV areas (Pump Stations 9, 10, 13, and 14) and two in Class III areas (Pump Stations 11 and 12). All pump stations would be painted in colors that blended into the surrounding landscape and would have vegetative buffers installed to screen the facilities from viewers. Pump Station 11 would be located at milepost 97.9, which would be approximately 1 mile from State Highway 24, and would not be readily observable from the roadway. The pump station would also be located 9 miles south of the Missouri River and would not be observable from the river. Although the 115-kV transmission lines for Pump Stations 12 and 14 would add new linear features to the landscape, the lines would not be inconsistent with other transmission lines in the area. Objectives for Class III and IV areas would be achieved.

Pump Station 12 would be located at milepost 148.5, which would be approximately 2 miles southeast of the community of Circle and within 500 feet of State Highway 200S. Drivers and passengers using the highway and looking toward the pump station would observe a change in the landscape compared to current conditions, and some viewers might consider that an adverse impact. The intensity of the effect would be reduced by the vegetative buffer around the pump station.

The majority of viewers during proposed Project operation would be travelers along the transportation corridors in the vicinity of the proposed Project. Their views would typically be limited to short periods of time and small portions of the ROW. Although recreational travelers would generally be more sensitive to changes in scenic quality, there would not be major recreation areas in the vicinity of the proposed route and few recreationists that would be affected. Some individuals viewing the proposed Project from the 70 residences in the vicinity of the proposed ROW and from residences at the small cluster of residences located south of Baker might be able to observe portions of the proposed Project on a regular basis.

Where reclamation and revegetation would result in returning the proposed ROW to visual conditions either identical to or similar to existing conditions, there would be either no impact or only minor impacts to visual resources during operation. For portions of the proposed Project that would remain visually different from existing conditions during operation, the change to visual resources would be permanent (i.e., they would exist for the duration of the proposed Project). However, due to the small number of observers and the measures included in the proposed Project design to minimize the impacts to visual resources, the impact of operation of the proposed Project on visual resources in Montana would not be significant.

I-3.6.5 REFERENCES CITED

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Montana Basemap Service Center. 2010. Montana Spatial Data Infrastructure, Structures Framework; accessed online at: http://giscoordination.mt.gov/structures/msdi.asp.

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I-3.7 SOCIOECONOMICS

Section 3.10 of the main body of the EIS provides information on the affected environment and potential impacts of proposed Project implementation for socioeconomics, including information for Montana. This section of the appendix provides supplemental information about those topics specific to Montana and in accordance with the provisions of MEPA and MFSA.

The assessment of potential socioeconomic impacts presented in this appendix includes information about communities in the vicinity of the proposed Project. However, it focuses on impacts at the county level rather than the community level for two primary reasons. First, due to the rural nature of the majority of the potentially affected environment, socioeconomic data used for comparisons are limited primarily to the county level. Secondly, economic impacts may occur in communities and rural areas that are not near the proposed route.

I-3.7.1 AFFECTED ENVIRONMENT

I-3.7.1.1 Population

The proposed route would cross six counties in Montana including, from north to south, Phillips, Valley, McCone, Dawson, Prairie, and Fallon counties. Population-related characteristics of the counties and the state are summarized in Table I-3.7-1. As indicated in the table, the proposed route would extend through predominantly rural and sparsely populated areas, with population densities ranging from less than one to four people per square mile for the majority of the proposed route. Each of the counties had declining populations from 1990 to 2007.

TABLE I-3.7-1
Population Characteristics Along the Proposed Route in Montana

	Population			Annual Average Change in Population	Annual Average Change in Population	Population Density (per square mile)	
County	**1990**	**2000**	**2007**	**1990-2000**	**2000-2007**	**2000**	**Population Center**
Phillips	5,163	4,601	3,934	-1.1%	-2.2%	<1	Malta
Valley	8,239	7,675	6,884	-0.7%	-1.5%	2	Glasgow
McCone	2,276	1,977	1,716	-1.4%	-2.0%	1	Circle
Dawson	9,505	9,059	8,554	-0.5%	-0.8%	4	Glendive
Prairie	1,383	1,199	1,043	-1.4%	-2.0%	<1	Terry
Fallon	3,103	2,811	2,690	-9.4%	-4.3%	2	Baker
Total	**29,669**	**27.322**	**24,821**	**-7.9%**	**-9.2%**		

Sources: U.S. Census Bureau, 2000, 2007a, and no date.

Similar to county trends, the potentially affected communities along the proposed route have experienced an average annual reduction in population between 2000 and 2007. Potentially affected communities in this assessment are defined as those within a driving distance of approximately 3.0 miles from the proposed route. Table I-3.7-2 lists the populations of the communities within that distance.

TABLE I-3.7-2 Communities Within 3.0 Miles of the Proposed Project in Montana				
			Population	
Community	County	Proximity to Project (miles)[1]	2000	2007
Nashua	Valley	1.8	325	291
Circle	McCone	2.8	644	558
Baker	Fallon	2.3	1,695	1,616
Total			**2,664**	**2,465**

Sources: U.S. Census Bureau 2000 and 2007a.
[1] Approximate driving distance.

I-3.7.1.2 Housing

Table I-3.7-3 lists the existing short-term housing resources in the six counties along the proposed route. The availability of short-term accommodations varies throughout the year and depends on a number of factors, including seasonal fluctuations and timing of local events. However, previous vacancy rates can be used to compare potential vacancies with the proposed Project's housing needs during construction.

The total number of rental housing units was about 3,250 in 2000. Throughout the area near the proposed Project, the weighted average vacancy rate was 13.9 percent at that time. That would equate to a total of about 448 rental units at the present time, with most of the units in Dawson and Phillips counties. Table I-3.7-3 also lists the number of hotels/motels and campgrounds. The fewest number of hotel/motel rooms were in Prairie County (9) and McCone County (14).

TABLE I-3.7-3 Housing in Counties Along the Proposed Project Route in Montana						
County	Total Housing Units (2000)	Number of Rental Housing Units (2000)	Rental Vacancy Rate (%) (2000)	Estimated Current Rental Vacancies	Number of Hotel/Motel Rooms	Number of Recreational Vehicle Sites
Phillips	2,502	632	14.1	89	135	52
Valley	4,847	826	7.9	65	503	79
McCone	1,087	240	25.8	62	14	0
Dawson	4,168	1,076	12.5	135	258	72
Prairie	718	143	15.4	22	9	18
Fallon	1,410	333	22.5	75	82	0
Total	**14,732**	**3,250**	**13.9**	**448**	**1001**	**221**

Sources: Keystone 2009a, which used the following primary data sources: Rentals = Census 2000; RV sites = Delorme Gazetteers; total hotel and motel rooms = www.travelpost.com/hotels.aspx, www.aaacolorado.com/travel/, www.tripadvisor.com/.

I-3.7.1.3 Economic Activity

Using the most recent data available, Table I-3.7.4 lists the 2007 personal income and employment by industry in the six counties that would be crossed by the proposed route. The table lists only industries that had personal income equal to or greater than 5.0 percent of the respective county's total personal income, with the exception of farming. Major industries in the counties included government, transportation and warehousing, wholesale trade, health care and social assistance, and rail and transportation.

TABLE I-3.7-4
Employment by Major Industry in Counties Crossed by the Proposed Route in Montana[1]

County	Industry	Number of Employees	Total Personal Income ($1,000)	Percent of County Total Personal Income
Phillips	Farm	613	2,224	3.6
	Government	430	17,759	29.1
	Health Care and Social Assistance	213	5,126	8.4
	Transportation and Warehousing	107	4,939	8.1
	Retail Trade	229	4,406	7.2
	Wholesale Trade	113	3,995	6.6
	Other Services	187	3,920	6.4
	Construction	145	3,598	5.9
	Finance and Insurance	82	3,124	5.1
	Other Categories	568	11,844	5.1
	Non-Farm Subtotal	*2,074*	*58,711*	*96.4*
	County Total	*2,687*	*60,935*	*100.0*
Valley	Farm	826	6,455	4.9
	Government	762	35,426	27.1
	Transportation and Warehousing	168	13,242	10.1
	Retail Trade	459	9,371	7.2
	Finance and Insurance	186	7,186	5.5
	Other Categories	2,419	58,897	45.1
	Non-Farm Subtotal	*3,994*	*124,122*	*95.1*
	County Total	*4,820*	*130,577*	*100.0*
McCone	Farm	444	4,667	17.0
	Government	189	5,809	21.2
	Wholesale Trade	75	3,175	11.6
	Construction	50	1,513	5.5
	Other Categories	539	12,248	44.7
	Non-Farm Subtotal	*853*	*22,745*	*83.0*
	County Total	*1,297*	*27,412*	*100.0*
Dawson	Farm	581	9,622	3.7
	Government	792	32,948	18.4`
	Health Care and Social Assistance	729	23,668	13.2
	Rail Transportation	68[1]	27,591	15.4
	Retail Trade	661	13,102	7.3
	Other Categories	2,245	72,086	40.3
	Non-Farm Subtotal	*5,108*	*169,395*	*94.6*
	County Total	*5,689*	*179,017*	*100.0*
Prairie	Farm	221	3,517	22.4
	Government	175	6,998	44.6

TABLE I-3.7-4 Employment by Major Industry in Counties Crossed by the Proposed Route in Montana[1]				
County	**Industry**	**Number of Employees**	**Total Personal Income ($1,000)**	**Percent of County Total Personal Income**
	Other Categories	277	5,170	33.0
	Non-Farm Subtotal	*452*	*12,168*	*77.6*
	County Total	*673*	*12,168*	*100.0*
Fallon	Farm	398	7,045	8.1
	Mining	250 - 499[2]	18,039	20.7
	Government	283	11,288	13.0
	Construction	108[2]	7,909	9.1
	Transportation and Warehousing	140	7,598	8.7
	Health Care and Social Assistance	158	4,711	5.4
	Other Categories	196	30,359	34.9
	Non-Farm Subtotal	*1,842*	*79,904*	*91.9*
	County Total	*2,240*	*86,949*	*100.0*

Source: U.S. Bureau of Economic Analysis 2009.

[1] Data presented only for industries with personal income equal to or greater than 5.0 percent of the respective county's total personal income.

[2] Data not available in U.S. Bureau of Economic Analysis 2009; data from U.S. Census Bureau 2009.

In 2007, there was a relatively wide range of total personal income among the six counties. In Dawson and Valley counties, the total personal incomes for that year were about $179 million and $131 million, respectively, and in McCone and Prairie counties they were about $27 million and $12 million, respectively.

Personal income generated from farming ranged from about 3.6 percent of the total personal income in Phillips County, to 22.4 percent of the total in Prairie County. Table I-3.7.5 lists the number of farms for each of the six counties for 2007 and 2002. The census definition of a farm is any place from which $1,000 or more of agricultural products were produced and sold, or normally would have been sold, during the census year. Valley County had 420 farms in 2007, up from the 336 in 2002. The county with the fewest farms was Prairie County, with 105. A comparison between the 2007 agricultural census data and the 2002 data shows that the number of farms in each county increased.

TABLE I-3.7-5 Farm Income in Counties Crossed by the Proposed Project Route in Montana								
	2007			2002			Percent Change from 2002	
County	Number of Farms	Gross Income ($1,000)	Percent of State Total	Number of Farms	Gross Income ($1,000)	Percent of State Total	Number of Farms	Gross Income
Phillips	241	6,034	3.0	190	2,259	2.2	27	167
Valley	420	9,719	4.8	336	3,024	2.9	25	221
McCone	315	4,950	2.5	263	1,751	1.7	20	183
Dawson	295	2,641	1.3	263	1,810	1.7	12	46
Prairie	105	1,664	0.8	91	906	0.9	15	84
Fallon	165	1,538	0.8	140	658	0.6	18	134
Montana	11,344	201,752	100	9,968	103,574	100	14	95

Sources: U.S. Department of Agriculture 2002 and 2007.

Per capita income and median household income for each county crossed by the proposed route are listed in Table I-3.7-6, along with data for the state and the U.S. In most counties, the 2007 per capita income and the 2007 median household income were less than those of the state, and in every county the 2007 per capita income and median household income were less than the national levels.

Prairie County had the lowest median household income in 2007 with $32,857, which was $10,143 less than the state's median household income. Dawson County had the highest 2007 median household income with $43,678, which was $678 greater than the state's median household income.

TABLE I-3.7-6 Per Capita Income for Counties Crossed by the Proposed Route in Montana						
	Per Capita Income[1] ($)			Median Household Income[2] ($)		
County	2007	1999	Difference Between County and State in 2007	2007	2004	Difference Between County and State in 2007
Phillips	26,876	17,288	-6,349	33,798	31,742	-9,202
Valley	31,556	23,247	-1,669	37,019	34,514	-5,981
McCone	24,857	20,499	-8,368	38,535	29,746	-4,465
Dawson	29,268	20,307	-3,957	43,678	35,740	678
Prairie	28,874	21,524	-4,351	32,857	31,221	-10,143
Fallon	35,405	20,281	2,180	42,408	37,822	-592
Montana	33,225	21,585	-5,390	43,000	35,574	-7,740
United States	38,615	27,939	NA	50,740	44,334	NA[3]

[1] Sources: U.S. Bureau of Economic Analysis 1999 and 2007.
[2] Sources: U.S. Census Bureau 1999, 2004, and 2007b.
[3] NA = not available.

As noted above, the major industries in the six counties were government, transportation and warehousing, wholesale trade, health care and social assistance, and rail and transportation. In the general area (eastern Montana), there were approximately 20,180 semi-skilled labor jobs and 32,280 skilled labor jobs in 2008 (Ockert 2008). The median wage was $21,366 for semi-skilled labor and $36,587 for skilled labor.

Unemployment data for the six counties, the state, and the U.S. are listed in Table I-3.7-7. The October 2009 unemployment rate in each county was lower than the U.S. level for the same time period, and generally less than that of the state.

TABLE I-3.7-7
Unemployment Rates for Counties Along the Proposed Route in Montana

Location	Rate (%)			Difference Between County and State in October 2009 (%)
	October 2009[1]	2008	2002	
Phillips	4.9	4.5	4.5	-1.0
Valley	4.7	3.8	4.1	-1.2
McCone	3.1	2.6	2.7	-2.8
Dawson	3.9	3.3	3.4	-2.0
Prairie	3.0	3.8	5.1	-2.9
Fallon	2.8	2.3	3.3	-3.1
Montana	5.9	4.5	4.5	-
United States	10.2	5.8	5.8	-

Source: U.S. Bureau of Labor Statistics 2009.
[1] Preliminary.

I-3.7.1.4 Tax Revenue

Table I-3.7-8 lists the 2007 property taxes levied by taxing entities in each county along the proposed route, the assessed value of property, and the implied effective tax rate. Effective property tax rates in the area of influence ranged from a low of 1.61 percent for the rural taxes assessed on property value in Fallon County to a high of 3.09 for the rural taxes assessed on property value in Dawson County. The average rate of the assessed rural taxes for the counties was 2.39 percent.

I-3.7.1.5 Public Services

Table I-3.7-9 lists the key public services and facilities that serve the area within approximately 50 miles of the proposed route in each of the six counties. Each county has at least one medical facility.

There are multiple law enforcement service providers in the counties along the proposed route, including state patrols, county sheriff departments, local police departments, and special law enforcement agencies, such as university police. In many cases, mutual aid or cooperative agreements allow one agency to provide support to other agencies in emergencies. On average, two law enforcement agencies serve each county that would be crossed by the proposed Project. Valley County is served by four law enforcement agencies.

A network of fire departments and districts provides fire protection and suppression services across the region. Many of the fire districts across the region are staffed by volunteers and are housed in stations located in the larger communities.

Although it is unlikely that construction workers would bring school-aged children to the area during the construction period, schools are included in Table I-3.7-9.

Table I-3.7-10 provides the 2002 operations budgets for significant public services supplied by the municipalities potentially affected. In 2002, Glendive had the largest police, fire, highway, and solid waste management operations budgets. During that same year, Nashua had the smallest police, fire, and solid waste management operations budget and Terry had the smallest highway operations budget.

I-3.7.2 POTENTIAL IMPACTS AND MITIGATION

I-3.7.2.1 Overall Societal Benefits and Costs of the Project

The main benefit to society of the proposed Project would be the transport of crude oil from the WCSB to the U.S. to meet the growing demand by refineries and their markets in Petroleum Administration for Defense District (PADD) III. An additional benefit to society would be the transport of crude oil to some refineries in PADD II. Crude oil would be delivered primarily to existing delivery points near Nederland and Houston, Texas (PADD III), with some deliveries to the Cushing facility in Oklahoma (PADD II). Crude oil would be transported from these delivery points to various refineries. As described in Section 1.2 of the EIS, PADD III refineries are projected to have an increasing need for foreign oil, and would benefit from imports from relatively stable and secure nations such as Canada. This need is in part documented by the fact that at the time of issuance of the EIS, Keystone had binding contracts for approximately 380,000 bpd of WCSB crude oil, which would be more than half of the initial 700,000 bpd capacity of the proposed pipeline. The proposed Project would benefit residents of the United States, particularly those that obtained fuel from PADD III and PADD II refineries. In other words, the main benefits from this proposed Project would be regional and national rather than local to Montana.

As with any type of economic activity, building the proposed Project would produce a social opportunity cost to the economy, when compared to alternative uses of those same economic resources. The opportunity cost would be the next best use that could be made of the jobs, energy, and materials devoted to the proposed Project in the U.S. or world economy. Conceptually, the resources used to construct the proposed Project could be used to invest in energy efficiency, improve gas mileage efficiency to reduce crude oil consumption, build other projects such as buildings or bridges, or saved for later use. This opportunity cost would mainly be in the form of irretrievable materials, energy, worker hours, and capital used for the proposed Project. However, because the financial costs of the proposed Project would be provided by Keystone, it is not likely that the funds required for the proposed Project would be spent on any of the alternatives listed above.

The social opportunity cost of constructing and operating the proposed Project could also include alternative methods to meet the primary need that the proposed Project would meet (i.e., providing crude oil to PADD III refineries). Alternative ways to meet the need for additional oil transfer capacity might include expanding existing pipelines (this alternative is addressed in Section 4.0 of the EIS), using less oil overall, improvements in oil use efficiency, more domestic production close to PADD III, and developing alternatives to the use of oil as a fuel source. Any social benefits derived from implementation of these alternatives, instead of the proposed Project (including energy efficiency), would be an opportunity cost of the proposed Project. However, as described in Sections 1.2 and 4.0 of the EIS, the proposed Project is likely the only feasible alternative to meet the projected oil import needs of PADD III, and thus the opportunity cost in this case would likely be less than the social benefits of the proposed Project. In other words, energy efficiency and other alternatives would not be enough to meet the projected crude oil need in PADD III that the proposed Project is designed to serve.

TABLE I-3.7-8
Assessed 2007 Tax Revenues and Assessed Property Valuation in Counties Crossed by the Proposed Project Route In Montana

County	Property Valuation ($)	Tax by Assessing Entity ($)							Total All Taxes	Effective Tax Rate (%)
		State	County	Local Schools	Countywide Schools	Misc Fire Districts	Average City	SIDs[1] and Fees		
Phillips	321,173,215	1,454,022	1,072,155	2,348,783	388,631	101,757	280,298	1,428,280	7,073,926	2.20
Valley	485,988,933	2,288,509	2,616,238	4,256,067	1,109,805	393,838	824,998	1,917,211	13,406,666	2.76
McCone	191,888,122	617,586	1,330,050	956,802	243,504	16,778	136,958	28,409	3,330,087	1.74
Dawson	389,463,999	1,508,449	2,899,065	4,339,497	757,015	151,662	1,009,983	1,384,520	12,050,191	3.09
Prairie	94,403,567	332,198	760,371	427,445	118,587	14,598	76,641	468,104	2,197,944	2.33
Fallon	334,310,467	2,056,667	2,661,678	0	0	123,032	320,706	232,547	5,394,630	1.61
Total	**1,817,228,303**	**8,257,431**	**11,339,557**	**12,328,594**	**2,617,542**	**801,665**	**2,649,584**	**5,459,071**	**43,453,444**	**2.39 (avg)**

Source: Montana Department of Revenue 2009a.
[1] SIDs = Special Improvement Districts.

TABLE I-3.7-9 Public Services and Facilities within 50 Miles of the Proposed Project in Montana				
County	**Police/Sheriff Departments[1]**	**Fire Departments[1]**	**Nearest Medical Facilities[2]**	**Schools[3]**
Phillips	1	2	Phillips County Hospital (Malta)	1 district with 5 elementary schools, 7 middle schools, and 4 high schools
Valley	4	3	Frances Mahon Deaconess Hospital (Glasgow)	8 districts with 15 elementary schools, 18 middle schools, and 8 high schools
McCone	2	1	McCone County Health Center (Circle)	1 district with 2 elementary schools, 2 middle schools, and 1 high school
Dawson	2	4	Glendive Medical Center (Glendive)	1 district with 4 elementary schools, 4 middle schools, and 2 high schools
Prairie	2	1	Prairie Community Health Center (Terry)	2 districts with 3 elementary schools, 3 middle schools, and 1 high school
Fallon	2	2	Fallon Medical Complex (Baker)	1 district with 2 elementary schools, 3 middle schools, and 2 high schools

[1] Source: Capital Impact 2008.
[2] Source: HomeTownLocator 2008.
[3] Source: Great Schools 2008.

TABLE I-3.7-10 Operations Budgets for Public Services in the Communities Near the Proposed Project in Montana[1]					
	Operations Budget ($)				
City/Town	**Police Protection**	**Fire Protection**	**Regular Highways**	**Solid Waste Management**	**Housing and Community Development[1]**
Malta	151,000	24,000	87,000	275,000	294,000
Glasgow[2]	587,000	51,000	538,000	228,000	14,000
Nashua	8,000	3,000	27,000	8,000	NA
Circle	80,000	4,000	28,000	74,000	64,000
Glendive[2]	704,000	280,000	406,000	764,000	28,000
Terry	40,000	6,000	22,000	91,000	240,000
Baker	168,000	28,000	120,000	159,000	NA

Source: City Data 2008.
[1] Data are for 2002, except where noted.
[2] 2006 Operations Budget.

There might be indirect national or regional (i.e., PADD III and II) benefits and costs from the proposed Project, including the effect on oil prices (likely to be insignificant) and any secondary effects on the oil market and crude oil transportation grid as a result of the new propose pipeline. Also, it is likely that obtaining additional oil from a stable and secure source would reduce the need to obtain oil from unfriendly or less stable sources and might reduce the overall costs of obtaining oil from unfriendly sources.
There could be local impacts if additional electrical distribution lines were built in Montana to provide electrical power to the pump stations. These would likely be relatively small distribution lines with minimal economic impact from their construction.

Proposed Project construction might result in some social stresses on those who either opposed the proposed Project or who did not like change (e.g., the temporary presence of a large number of construction workers). However, most social stresses that would occur would most likely fade or end when construction was completed. In addition, as described in this appendix and in the EIS, costs from environmental damage and a lessening of recreational quality would be minimal.

The benefits and costs to Keystone would be private benefits and costs. While this EIS is not concerned with private benefits and costs, it is useful to generally identify these benefits and costs. Private benefits to Keystone would primarily consist of gross revenues earned from transporting crude oil for shippers. These revenues would accrue to Keystone and might be shared with its stockholders. Gross revenues would translate into profits for Keystone if the proposed Project earned enough to offset its costs over time. Profits could take the form of higher salaries, bonuses, and promotions for its employees. Profits might also increase the ability of Keystone to expand or invest in other projects, and/or be used to provide a higher return for shareholders. It might take several years for the proposed Project to be profitable, as revenues increased, costs were recovered, and interest costs on financing decreased. Profits could last for the life of the proposed Project.

The main private costs of the proposed Project would be borne by Keystone and include construction; operation and maintenance; local, state and federal taxes; implementing environmental mitigation measures; financing (debt payments); permitting; landowner payments; contingencies; and any fines that might be imposed. If such costs were too great, if proposed Project revenues were not sufficiently high, or if the proposed Project was not constructed, net losses could accrue to Keystone and to the shareholders, either in the short term (e.g., the proposed Project was not constructed and Keystone had to absorb the costs incurred to date) or in the long term (e.g., the proposed Project was constructed and operated, but operated at a net loss for many years).

The secondary benefits and costs to those who live in proximity to the proposed Project (e.g., personal income from working on the proposed Project, tax revenues to a local taxing district, and inconvenience during construction) are discussed below.

I-3.7.2.2 Construction

Construction Workforce and Work Camps

Construction of the proposed Project pipeline would occur in four construction spreads in Montana (Table I-3.7-11). Each spread would require six to nine months to complete, including mobilization and demobilization. The proposed Project would require construction of six pump stations in Montana, with each pump station anticipated to be constructed in 18 to 24 months. A maximum of two spreads would be constructed simultaneously during a work season. Construction of the proposed Project would begin as soon as Keystone obtained all necessary permits, approvals, and authorizations. Based on the current permitting schedule, the proposed Project would be placed into service in 2013.

TABLE I-3.7-11 Pipeline Construction Spreads for the Proposed Project in Montana				
Spread Number	**Approximate Location**	**Approximate Length (miles)**	**County**	**Community Base for Construction**
Spread 1	MP 0 to 64	64	Phillips and Valley	Hinsdale and Glasgow
Spread 2	MP 64 to 164	100	McCone and Dawson	Glasgow and Circle
Spread 3	MP 164 to 273	109	Dawson, Prairie, and Fallon	Glendive and Baker
Spread 4[1]	MP 273 to 282	9	Fallon	Buffalo, South Dakota

[1] Spread 4 would begin in Baker, Montana, extend approximately 9 miles to the Montana/South Dakota border, and would continue into South Dakota for approximately 63 miles.

[2] The worker base for construction of Spread 4 would be in South Dakota.

Keystone anticipates a maximum construction workforce of 500 to 600 personnel for each spread and 20 to 30 for each pump station (see Table I-3.7-12). Pump stations would not be constructed concurrently and the workers might be assigned to more than one pump station. However, the assessments below consider the maximum work force that would involve a separate workforce for each pump station.

Keystone would attempt to hire local construction workers to the extent practical. If a sufficient number of qualified workers were available, Keystone estimates that approximately 10 to 15 percent of the workforce might be hired from the local pool of construction workers for each pipeline spread (about 50 to 100 workers per spread) and each pump station (about two to four workers per spread). However, there might not be a sufficient number of workers available in some areas of Montana to achieve this goal.

TABLE I-3.7-12 Estimated Number of Construction Workforce for the Proposed Project in Montana					
	Number of Workers per Facility		**Number of Facilities[1]**	**Total Construction Workforce[1]**	
Facility	**Low**	**High**		**Low**	**High**
Spread	500	600	4	2,000	2,400
Pump Station	20	30	6	120	180
Cumulative Total	**520**	**630**	**10**	**2,120**	**2,580**

[1] Only two of the four spreads in Montana would be under construction concurrently. Construction workers on Spread 4 would be housed in South Dakota. The peak pipeline workforce to be housed in the Montana work camps would be up to 1,200 during either of the two work seasons. The total workforce listed in this table is the cumulative total over two work seasons.

Keystone recognizes that the rural areas in Montana along the proposed route would not have sufficient temporary housing to accommodate the planned construction workforce. As a result, Keystone would install temporary work camps to provide accommodations for workers during construction of the proposed pipeline (as further described in Section 2.2.7.4 of the EIS). There would be two camps in Montana, one near Nashua and the other near Baker, to accommodate workers from Spreads 1, 2, and 3. Workers from Spread 4 would be housed in South Dakota. As noted above, no more than two spreads would be under construction during each of the two work seasons. Pump station workers would not be housed in the work camps.

Each construction camp site would be established on approximately 80 acres of land, of which 30 acres would be used as a contractor yard and 50 acres for housing and administration. The camps would be designed to provide accommodations for approximately 600 people each and would include prefabricated, modular dormitory-style units with heating and air conditioning systems. The camps would provide sleeping areas with shared and private wash rooms, recreation facilities, telecommunications/media rooms, kitchen/dining facilities, laundry facilities, security units, and an infirmary unit.

Potable water would be provided by drilling a well, where feasible. If an adequate water supply could not be obtained from a well, water would be obtained from municipal sources or trucked to each camp. A wastewater treatment facility would be constructed for each camp. Electricity for the camps would either be generated on site through diesel-fired generators or provided by local utilities from interconnections to distribution systems.

Population

During construction, there would be a temporary increase in population in each county along the proposed route from the presence of construction workers. Population impacts in the region of influence would depend on the composition of the local and non-local construction workforces and the existing population in the area. Keystone would use local construction workers where possible, with an estimated 10 to 15 percent of the total construction workforce possibly hired from local communities. Local workers could leave their existing jobs for higher-paying Project-related construction jobs, but that effect would likely be insignificant in the long term. Few non-local workers would likely be accompanied by their children or other family members because of the mobile nature of the workforce along the proposed pipeline route during construction.

As described above, pipeline workers in Montana would be housed in work camps established by Keystone. This would reduce the effect of the temporary population increase on residents of the rural areas. As noted above, a maximum of two spreads would be constructed simultaneously and, therefore, the 1,200-person total capacity of the two work camps in Montana would be sufficient to accommodate all of the pipeline construction workers for each work season.

With use of the work camps for the majority of the construction workforce in Montana, the temporary population increase would result in a minor and temporary impact on the social structure of the area in the proposed Project vicinity. However, work camps would be in the vicinity of Baker and Nashua, and after work hours a portion of the pipeline workers would likely occasionally leave the camps. Similarly, pump station construction workers using local housing would be a part of the local population during non-working hours for the duration of the construction period of each work season. This could result in occasional temporary minor to moderate impacts in Baker and Nashua and in the vicinity of the pump stations, primarily in the form of social stresses and an increased demand on local public services. Those impacts would end after construction was completed.

Housing

Assuming that 10 to 15 percent of the workforce would be local construction workers, approximately 440 to 570 housing units would be required for workers on each construction spread, assuming that each worker would require his or her own unit. However, it is unlikely that a sufficient number of temporary housing units would be available, even if some workers lived in their own campers or motor homes. Therefore, as described above, to accommodate most of the construction workers in Montana, Keystone would establish two construction work camps in the area. Because a maximum of two spreads would be constructed simultaneously, the 1,200-person total capacity for the two work camps in Montana would be sufficient to accommodate all of the pipeline construction workers for each work season.

Workers associated with the pump stations would not be housed in the work camps. Use of temporary housing in the vicinity of the pump stations might result in a temporary, minor impact to other potential users of temporary housing during each work season (e.g., tourists and anglers). However, the owners of the temporary housing would experience a positive impact if the housing would have otherwise remained vacant during construction.

Although there would be some temporary housing units rented by workers, use of the camps by the majority of workers would avoid using all of the available temporary housing and allow normal use of those housing units. As a result, there might be a minor, temporary impact on temporary housing in the vicinity of the proposed route from construction of the proposed Project.

Public Services

The influx of construction workers in local communities also would have the potential to generate additional demands on local public services. The magnitude of public service impacts would vary by community, depending on the size of the non-local workforce and their accompanying families, the size of the community, and the duration of their stay. However, few non-local workers would likely be accompanied by family members because of the short construction period and transient nature of the work. With a relatively large construction workforce temporarily in the area, the primary increases in public service needs would include responses to emergencies and disturbances during construction. However, at least the majority of the construction workforce would be housed in the work camps where there would be medical care facilities and security staff to respond to emergencies and disturbances. The camps would also include water supplies and sanitary waste treatment facilities. As a result, construction impacts to existing public services in the vicinity of the proposed Project, including the towns of Baker and Nashua, would be minor and temporary.

Local Economies

The proposed Project would generate direct and indirect economic benefits for local and regional economies along the proposed pipeline route. During construction, these benefits would be derived from wages earned by local construction workers that were above the wages that might otherwise have been earned at other jobs by those workers, from construction-related expenditures made at local businesses, construction worker spending in the local economy that would not have occurred without the proposed Project, and taxes on both wages and expenditures that would go to local and state governments. Overall, construction of the proposed Project in Montana would result in a positive economic impact to the businesses and taxing jurisdictions in counties along the proposed route and in some of the communities near the route.

Construction through active cropland would result in the loss of income from at least a portion of the crop for at least one growing season. It might also affect income and land value in the long term along the proposed ROW, as well as the ability of the landowner to sell the property. However, Keystone stated it would compensate farmers for crop losses, reclaim the land in the construction ROW to match pre-construction conditions to allow farming to continue, and provide payments for easements along the proposed route. As a result, the impact of the proposed Project on farm income would be temporary. The significance of the impact to each landowner would depend on the terms of payment agreed to between the landowner and Keystone.

During operation, the pump stations would consume at least as much electrical power as other customers currently use in the area. That could result in long-term stability of the usage rates of electricity and increased profits to local electric co-ops. It might also result in issues for local co-ops regarding procurement of additional energy supplies.

I-3.7.2.3 Operation

Population, Housing, and Public Services

Operation of the proposed Project would require approximately four to eight permanent employees in Montana. Even assuming that none of those workers would be local residents, that number of new residents would not have an adverse effect on local populations, housing, or public services in the counties along the proposed route in Montana or in the nearby communities.

Local Economies

During operation, activities associated with maintenance, monitoring, and repair of the proposed Project would generate a demand for goods and services, including electrical power, that would result in long-term economic benefits to the region. The beneficial impact would likely be minor in comparison to the overall economies of the counties and the communities near the proposed Project.

Tax Revenue and Fiscal Resources

Once constructed, the proposed Project would generate long-term property tax revenues for the counties traversed by the pipeline that would last for the life of the proposed Project. The increase in tax revenue was estimated by staff at the Montana Department of Revenue (MDR 2009a and b). Table I-3.7-13 lists the estimated property taxes by taxing district within each county. Based on those estimates, the proposed Project would generate approximately $63 million in annual property tax revenues in Montana, or about 46 percent more in property taxes than was generated in 2007 in those same counties. About $47 million of that amount would be paid to McCone, Valley, and Dawson counties.

In estimating the property taxes, the MDR applied the existing tax rate (12.0 percent) for Class 9 properties (Utilities Mileage, Pipelines Mileage) to the estimated capital cost of the proposed pipeline in Montana. The property taxes generated by the proposed Project would have a long-term positive economic impact on the counties. The magnitude of the impact would vary from county to county and would range from minor to major.

Some tax revenue would also be generated for the state general fund and the federal government. If the proposed Project received lower tax rates than estimated in Table I-3.7-13, the revenues would also be lower than the estimates presented in the table. There would be relatively minor costs to state agencies for monitoring the proposed Project during construction and operation. These costs would likely be offset by fees collected from Keystone.

TABLE I-3.7-13
Estimated Taxes by Special Districts in Counties Along the Proposed Project Route in Montana

County	Portion of Total Length of Project Pipeline in County (%)	Market Value (Capital Cost of Project)	Class 9 Tax Rate (%)	Taxable Value	Average Rural Mills	Estimated Total Taxes	95-Mill Statewide School Equalization Tax	6-Mill Statewide University System Tax	Total Local Taxes
Phillips	1.88	$130,941,355	12	$15,712,963	378.93	$5,954,069	$1,492,731	$94,278	$4,367,060
Valley	4.60	$320,388,422	12	$38,446,611	487.53	$18,743,712	$3,652,428	$230,680	$14,860,604
McCone	4.89	$340,586,823	12	$40,870,419	542.36	$22,166,302	$3,882,690	$245,223	$18,038,389
Dawson	2.96	$206,162,985	12	$24,739,558	671.99	$16,624,844	$2,350,258	$148,437	$14,126,149
Prairie	1.55	$107,956,968	12	$12,954,836	554.08	$7,178,068	$1,230,709	$77,729	$5,869,630
Fallon	4.68	$325,960,395	12	$39,115,247	246.62	$9,646,602	$3,715,948	$234,691	$5,695,963
Total	**20.56**	**$1,431,996,948**		**$171,839,634**		**$80,313,597**	**$16,324,764**	**$1,031,038**	**$62,957,795**

Source: Montana Department of Revenue 2009b.

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I-3.8 AIR QUALITY AND NOISE

Section 3.12 of the main body of the EIS provides information about the affected environment and potential impacts of proposed Project implementation for air quality and noise, including information for Montana. This section of the appendix provides supplemental information about those topics specific to Montana and in accordance with the provisions of MEPA and MFSA.

I-3.8.1 AIR QUALITY

The Clean Air Act (CAA) and its implementing regulations (42 USC 7401 et seq., as amended in 1977 and 1990) are the basic federal statutes and regulations governing air pollution in the United States. The requirements applicable to the proposed Project in Montana are described in detail in Section 3.12.1.2 of the EIS.

I-3.8.1.1 Affected Environment

Regional climate and meteorological conditions can influence the transport and dispersion of air pollutants that affect air quality. The existing climate and ambient air quality in the vicinity of the proposed Project in Montana are described below.

Montana Climate

Montana is in the humid continental climate zone, an area noted for its variable weather patterns and large temperature ranges. Summer high temperatures average over 89 ˚F, while winter low temperatures average 12 to 20 ˚F. Many different types of air masses occur over the state, principally polar and tropical air masses. Where polar air masses collide with tropical air masses, there is an uplift of the less dense and moister tropical air that results in precipitation. Representative climate data for Circle, which is about 2.2 miles from the proposed route, are presented in Table 3.12.1-1 of the EIS.

Ambient Air Quality

Ambient air quality is regulated by federal, state, and local agencies. State air quality standards cannot be less stringent than the national ambient air quality standards (NAAQS). The Montana ambient air quality standards (MAAQS) and the NAAQS are listed in Table I-3.8-1.

The U.S. Environmental Protection Agency (EPA) uses four categories to classify the air quality of all areas of the United States: attainment, unclassifiable, maintenance, or nonattainment. The proposed Project would not pass through any nonattainment areas in Montana.

EPA and state and local agencies have established a network of ambient air quality monitoring stations to measure and track the background concentrations of criteria pollutants across the country, and to assist in the designation of nonattainment areas. To characterize the background air quality in Montana, data from air quality monitoring stations were obtained. A summary of the available regional background air quality concentrations for 2008 is presented in Table 3.12.1-3 of the EIS.

TABLE I-3.8-1 National and Montana Ambient Air Quality Standards				
Pollutant	**Time Period**	**Federal (NAAQS)**	**Montana (MAAQS)**	**Standard Type**
Carbon Monoxide	Hourly Average 8-Hour Average	35 ppm[a] 9 ppm[a]	23 ppm[b] 9 ppm[b]	Primary Primary
Fluoride in Forage	Monthly Average Grazing Season	- - - -	50 μg/g[c] 35 μg/g[c]	- - - -
Hydrogen Sulfide	Hourly Average	- -	0.05 ppm[b]	- -
Lead	90-Day Average Quarterly Average Rolling 3-Month Average	- - 1.5 μg/m^3 0.15 μg/m^3 [c]	1.5 μg/m^3 [c] - - --	- - Primary & Secondary Primary & Secondary
Nitrogen Dioxide	Hourly Average Annual Average	0.100 ppm[d] 0.053 ppm[e]	0.30 ppm[b] 0.05 ppm[f]	Primary Primary & Secondary
Ozone	Hourly Average 8-Hour Average	0.12 ppm[g] 0.075 ppm[h]	0.10 ppm[b] - -	Primary & Secondary Primary & Secondary
Particulate matter less than 10 microns in diameter	24-Hour Average Annual Average	150 μg/m^3 [i] - -	150 μg/m^3 [j] 50 μg/m^3 [k]	Primary & Secondary Primary & Secondary
Particulate matter less than 2.5 microns in diameter	24-Hour Average Annual Average	35 μg/m^3 [l] 15 μg/m^3 [m]	- - - -	Primary & Secondary Primary & Secondary
Settleable Particulate	30-Day Average	- -	10 g/m^2 [c]	- -
Sulfur Dioxide	Hourly Average 3-Hour Average 24-Hour Average Annual Average	- - 0.50 ppm[a] 0.14 ppm[a] 0.030 ppm[e]	0.50 ppm[i] - - 0.10 ppm[b] 0.02 ppm[f]	- - Secondary Primary Primary
Visibility	Annual Average	- -	3 x 10 -5/m[f]	- -

Sources: U.S. Environmental Protection Agency 2009 and Montana Department of Environmental Quality 2009.

Notes:

Mg = Microgram(s).

m^3 = Cubic meter(s).

ppm = Part(s) per million.

[a] Federal violation when exceeded more than once per calendar year.

[b] State violation when exceeded more than once over any 12 consecutive months.

[c] Not to be exceeded (ever) for the averaging time period as described in state or federal regulation.

[d] Federal violation when the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area that exceeds 0.100 ppm (effective January 22, 2010).

[e] Federal violation when the annual arithmetic mean concentration for a calendar year exceeds the standard.

[f] State violation when the arithmetic average over any four consecutive quarters exceeds the standard.

[g] Applies only to nonattainment areas designated before the 8-hour standard was approved in July, 1997; Montana has none.

[h] Federal violation when 3-year average of the annual 4th-highest daily maximum 8-hour concentration exceeds standard.

[i] State violation when exceeded more than eighteen times in any 12 consecutive months.

[j] State and federal violation when more than one expected exceedance per calendar year, averaged over 3-years.

[k] State violation when the 3-year average of the arithmetic means over a calendar year at each monitoring site exceed the standard.

[l] Federal violation when 3-year average of the 98th percentile values at each monitoring site exceed the standard.

[m] Federal violation when 3-year average of the annual mean at each monitoring site exceeds the standard.

I-3.8.1.2 Potential Impacts and Mitigation

Two types of impacts on air quality were considered for this analysis:

- Temporary impacts resulting from emissions associated with construction activities; and
- Long-term or permanent (i.e., lasting the life of the proposed Project) impacts resulting from emissions generated from operation of a stationary source.

Construction

As noted in the Section 3.12.1.3 of the EIS, air quality impacts associated with construction of the proposed Project would include emissions from fugitive dust, fossil-fueled construction equipment, open burning, and temporary fuel transfer systems and associated storage tanks. Because pipeline construction would move through an area relatively quickly, air emissions typically would be localized, intermittent, and short term. Emissions from fugitive dust, construction equipment combustion, open burning, and temporary fuel transfer systems and associated tanks would be controlled to the extent required by state and local agencies and in accordance with the procedures in the Keystone CMR Plan (presented in Appendix B of the EIS) and the MDEQ Environmental Specifications (presented as Attachment 1 to this appendix). In addition, Keystone would establish work camps in Montana to house construction workers and to provide key services to the workers. The camps might require preconstruction permitting unless exemptions existed and were met for temporary nonroad engines. By complying with applicable regulations and implementing the procedures in the CMR Plan (Appendix B) and the MDEQ Environmental Specifications (Attachment 1), emissions from construction-related activities would not significantly affect local or regional air quality. Construction of the proposed Project would have a minor, short-term adverse impact on the air quality in the area.

Operation

As noted in the Section 3.12.1.3 of the EIS, air quality impacts associated with operation of the proposed Project would include minimal fugitive emissions from crude oil pipeline connections and pumping equipment at the pump stations, and minimal emissions from mobile sources using fossil fuel. Keystone would comply with applicable regulations that would address emissions during operation. As a result, emissions from operation of the proposed Project would not significantly affect local or regional air quality. The impact on air quality would be minor and would last for the life of the proposed Project.

I-3.8.2 NOISE

The noise requirements applicable to the proposed Project in Montana are described in Section 3.12.2.2 of the EIS.

I-3.8.2.1 Affected Environment

The proposed Project would be constructed in primarily rural agricultural areas of Montana. It is estimated that the existing sound level in the vicinity of the proposed route ranges from 40 dBA (rural residential) to 45 dBA (agricultural cropland). Sound in the area is generated by roadway traffic, farm machinery on a seasonal basis, pets, and various household noises. EPA (1978) reported that areas along major highways and interstates might have higher ambient sound levels, ranging from approximately 68 to 80 dBA.

In Montana, there no residences would be within 25 feet of the proposed ROW and only six residences would be within 500 feet of the ROW (Keystone 2009). Based on Keystone (2009) and data in the Montana Basemap Service Center (2010), there no residences would be within 0.5 mile of the pump stations, and four residences and one commercial structure would be more than 0.5 mile and less than 1 mile from the pump stations. Prior to construction, Keystone would verify the proximity of structures to the pump stations and determine whether they were occupied by residences or businesses.

I-3.8.2.2 Potential Impacts and Mitigation

Noise impacts for the proposed Project would generally fall into two categories:

- Temporary impacts resulting from construction activities (e.g., operation of construction equipment); and
- Long-term or permanent impacts (i.e., lasting the life of the proposed Project) resulting from operation of proposed Project facilities.

Construction

As noted in Section 3.12.2.3 of the EIS, construction of the proposed Project would be similar to other pipeline system projects in terms of schedule, equipment used, and types of activities. Construction would increase sound levels in the vicinity of proposed Project activities, and the sound levels would vary during the construction period, depending on the construction phase. Construction sound levels would rarely be steady, but instead would fluctuate depending on the number and types of equipment in use at any given time. Construction-related sound levels experienced by a noise sensitive receptor in the vicinity of construction activity would be a function of distance. Residential, agricultural, and commercial areas within 500 feet of the construction ROW would experience short-term inconvenience from the construction equipment noise. Keystone would implement the applicable procedures in its CMR Plan (Appendix B) and the MDEQ Environmental Specifications (Attachment 1) to minimize the effects of construction noise on individuals, sensitive areas, and livestock. As a result, construction of the proposed Project would have a minor and temporary impact on sound levels in the vicinity of the construction ROW.

Operation

As described in Section 3.12.2.3 of the EIS, operation of the electrically driven pump stations would result in an increase in sound levels. However, this increase would be limited to the area in close proximity to the pump stations. Sound levels would likely attenuate nearly to existing ambient levels (40 to 45 dBA) within about 2,300 feet of each pump station, and no structures would be within 0.5 mile (2,640 feet) of the pump stations. Although noise impacts from the electrically powered pump stations would likely be minor, Keystone would perform a noise assessment survey during operation in locations where residents expressed concerns about pump station noise. Those surveys would indicate the sound levels at that residence and would be used to determine what noise abatement measures would be required to reduce the sound levels at that residence. Mitigation measures could include construction of berms around the pump station or planting vegetation screens.

As a result, operation of the proposed Project would not result in a significant increase in sound levels. The impact on sound levels would be minor and would last for the life of the proposed Project.

I-3.8.3 REFERENCES CITED

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I-4.0 UNAVOIDABLE ADVERSE IMPACTS

The proposed Project would incorporate various types of measures to avoid or reduce environmental impacts, including the following:

- Measures committed to by Keystone in its CMR Plan (Appendix B);
- Measures required by regulation at the federal, state, or local level;
- Measures included within the MDEQ Environmental Specifications (Attachment 1); and
- Additional discretionary mitigation measures required by Montana and other cooperating agencies.

Nonetheless, construction and operation of the proposed Project would result in some adverse impacts that could not be fully avoided, as summarized in this section. More detailed discussions about the potential impacts that could not be avoided are presented in Sections 3.1 through 3.12 of the EIS and in Sections I-3.1 through I-3.8 of this Appendix. Those discussions include the effects on specific species where appropriate. Most of the unavoidable adverse impacts would result from construction of the proposed Project and would be minor and either temporary or short term. None of the unavoidable adverse impacts would be significant.

I-4.1 GEOLOGY

- Potential for a temporary increase in landslide risk during excavation activities in steep areas and at water crossings from vegetation clearing and alteration of surface drainage patterns.
- Damage or destruction of paleontological resources from grading and trench excavation.
- Potential that paleontological resources would not be accessible beneath the ROW during operation for the duration of the proposed Project.
- Lost access to potential sand, gravel, clay, and stone resources within the ROW for the duration of the proposed Project.

I-4.2 SOILS AND SEDIMENTS

- Potential temporary to short-term increase in soil erosion where vegetation was cleared.
- Existing structure of some farmland soils might be altered by construction activities.
- Localized soil compaction in construction areas might lead to slower or less vegetation reestablishment following construction.
- Construction activities conducted during precipitation events or wet weather conditions might cause soil rutting and displacement and surface water pooling or water diversion which would increase localized soil erosion.
- Spills or leakage of fuels, lubricants, and/or coolants from construction equipment or vehicles could adversely affect soils.
- Construction in areas where drain tile systems were present would necessitate temporary disruption of those systems.
- Differential settling of soils in the ROW might occur after construction of the pipeline was completed.

- Pipeline operating temperatures might cause a minor and localized increase in soil temperature and a decrease in soil moisture content.

I-4.3 WATER RESOURCES

- Disturbance of soils and vegetation in or near waterbody crossings during construction might result in temporary adverse impacts on water quality and turbidity.
- Water bodies might be adversely affected where erosion occurred and hazardous substances (such as pesticides or herbicides) were present in eroded material.
- Potential minor loss of floodplain area because of placement of proposed Project infrastructure within a floodplain.
- Temporary changes in surface water drainage patterns during construction.
- Minor long-term changes in surface water drainage patterns during operation where aboveground facilities were present and where minor topographic changes were made.

I-4.4 WETLANDS

- Wetland hydrology might be altered such that wetland functions were reduced, or at some locations, eliminated.
- Alterations of wetland vegetation community composition and structure would occur and primarily be temporary, but in some instances permanent, due to clearing during construction and maintenance activities within the permanent ROW during operation.
- Removal of forested and scrub-shrub wetland habitats during construction would result in a permanent conversion of forested and scrub-shrub wetlands to herbaceous wetlands along the permanent ROW.
- During construction across depressional wetlands, disturbance to supporting clay layers or small scale disturbances to topography and drainage might alter the retention capacity.
- Pipeline operating temperatures might result in slight increases in water temperatures where the proposed pipeline crossed through small wetlands. Small ponded wetlands crossed by the alignment might remain unfrozen a few days longer than surrounding wetlands and might thaw a few days sooner than surrounding wetlands. These temperature changes could have either positive or adverse effects on wildlife, depending on the species.

I-4.5 TERRESTRIAL VEGETATION

- Clearing and grading sagebrush shrublands and forest communities would result in long-term to permanent changes in species composition and community structure (height and density) within the construction ROW.
- Maintenance of the permanent ROW would result in permanent impacts to forest and sagebrush communities, except for sagebrush up to 2 feet tall within the ROW.
- Installation of aboveground facilities would result in a permanent loss of vegetation at the facility sites where revegetation was not possible (e.g., concrete pads at pump stations and mainline valves).
- Some sensitive plants and their habitats might be lost during construction.

- Removal of vegetation from the ROW would increase the potential for noxious weeds and other invasive plants to colonize and might result in a small decrease of vegetation community diversity.

I-4.6 WILDLIFE

- Construction would degrade or fragment wildlife habitats in and near the proposed construction ROW. The duration of the impact would range from temporary to long term and would include effects on known habitat for mule deer, white-tailed deer, and pronghorn winter ranges; greater sage-grouse and sharp-tailed grouse lek buffer zones; two prairie dog towns; and 49 raptor nests.
- Increased noise and human activity during construction might displace some wildlife in the vicinity of construction. This might interfere with foraging, breeding, and movements, depending on the construction schedule.
- Clearing, grading, and trenching would result in direct mortality of animals having limited mobility.
- Direct mortalities might occur as a result of collisions of animals with construction vehicles and equipment, maintenance and monitoring vehicles, and when birds collided with the electrical transmission lines associated with the pump stations.
- Indirect mortality and/or reduced reproduction might result from increased predation on grassland and shrubland nesting birds and small mammals by raptors using transmission line poles for perches.
- For wildlife that use trees and shrubs for cover, forage, and nesting, losses of these habitats would be long term or permanent because the permanent ROW would be maintained free of trees and large shrubs.
- Aerial surveillance and other traffic from routine construction and maintenance might cause a short-term alteration of behavior of individual animals.

I-4.7 FISHERIES RESOURCES

- Temporary and localized obstructions to fish movement would occur during construction of some stream crossings.
- Trenching activities could result in displacement or mortalities to fish, macroinvertebrates, and amphibians.
- If scouring occurred from changes in bed conditions, it could affect species associated with stream bottom spawning, rearing, or feeding, or could temporarily affect fish movements during low flow periods.
- Open trench dry cuts would loosen sediments, making them more prone to suspension during initial post-construction streamflows and could result in a minor and temporary to short-term decrease in primary production.
- Elevated turbidity in and near dredging, wet trenching, and wet backfilling sites would result in temporary downstream deposition of fine sediments. That sedimentation could result in a temporary to short-term decrease in primary production.
- If contaminants were present in stream beds being crossed using the wet trenching method, contaminants might be released and could affect aquatic organisms. The likelihood of

encountering contamination would be low and dilution in the waterbody would likely result in a minor impact that would be temporary to short term.

- Impacts from an accidental release of bentonite would be limited to a short-term reduction in feeding success or the temporary suspension of migratory behavior or habitat used by foraging fish.
- Large volumes of water withdrawn for hydrostatic testing would reduce the amount of water available for use by fish and could temporarily result in decreased mobility, increased susceptibility to predation, increased stress-related energy expenditures of fish, habitat abandonment, and deterioration or temporary loss of habitat.

I-4.8 THREATENED AND ENDANGERED SPECIES

- Construction would result in the disturbance or removal of native prairie, wetland, and woodland habitats in the construction ROW that might include suitable habitat for sensitive species.
- Surface disturbances during construction could result in the loss or alteration of potential breeding and/or foraging habitats for sensitive species and short-term fragmentation of those habitats until native vegetation became reestablished.
- Direct mortality of less mobile sensitive species could occur from collisions with construction vehicles and construction equipment, and the potential abandonment of a nest site or territory, including the loss of eggs or young.
- More mobile sensitive species might experience a temporary to short-term displacement from areas within and near the ROW during construction as a result of increased noise, activity, and human presence.

I-4.9 LAND USE, VISUAL RESOURCES, AND RECREATION

- Existing land uses within the active construction zone along the construction ROW would be stopped for the duration of construction.
- Some developed land uses in close proximity to the construction ROW might experience indirect effects from dust, noise, and activity in the construction zone.
- Most land uses along the construction ROW would be returned to pre-construction uses after construction was completed. However, aboveground facilities would permanently convert existing uses to an industrial use.
- Land in the construction ROW that is currently enrolled in the Conservation Reserve Program (CRP) in Montana would be temporarily affected. Keystone would compensate landowners for any loss of CRP payments resulting from Project-related activities.
- From the start of construction on cropland until the next crop was planted, there would be an impact on agricultural use of the construction ROW. However, Keystone would compensate farmers for crop losses resulting from construction.
- Placement of pump stations and mainline valves in cropland would result in the loss of that land for agricultural purposes for the life of the proposed Project. However, Keystone would reach compensation agreements with landowners for crop losses and would avoid or provide the least hindrance to adjacent agricultural operations.

- Construction would alter the existing visual quality in the vicinity of the proposed route from the presence of construction equipment and activity, the loss of vegetation, and the presence of aboveground facilities under construction.
- Although no recreation facilities would be affected in Montana, construction activities along the construction ROW and noise from construction might temporarily affect recreation experiences in the vicinity of the active construction area.
- During operation, the aboveground industrial facilities would alter the visual quality of the rural areas along the proposed route.

I-4.10 SOCIOECONOMICS

- Some land would be affected in the long term along the proposed ROW. Land values and uses along the proposed ROW could be affected.
- Construction and operation of the proposed Project would not have unavoidable adverse impacts on population, housing, economic activity, tax revenues, fiscal resources, or public services.

I-4.11 CULTURAL RESOURCES

- Mitigation measures are being developed for any significant unavoidable adverse impacts to cultural resources that are identified during the EIS process from construction and operation of the proposed Project, and a Memorandum of Agreement (MOA) that codifies those mitigations will be prepared. It might not be possible to identify all unavoidable adverse impacts to cultural resources associated with the construction of the proposed Project prior to initiation of grading and excavation. To address those potential impacts, DOS and the consulting parties under Section 106 of NHPA are negotiating a Programmatic Agreement that would provide a method for development of mitigation measures for unanticipated potential impacts to cultural resources identified during the construction and operation of the proposed Project.

I-4.12 AIR QUALITY AND NOISE

I-4.12.1 AIR QUALITY

- Temporary and localized air quality impacts would occur during construction as a result of emissions of fugitive dust and emissions from fossil-fueled construction equipment, open burning, and temporary fuel transfer systems and associated storage tanks.
- Impacts associated with operation would include minimal fugitive emissions from pipeline connections and pumping equipment at the pump stations, and minimal emissions from fossil fuel mobile sources used during maintenance and monitoring activities.

I-4.12.2 NOISE

- During construction, sound levels would increase in the vicinity of the proposed construction ROW resulting in temporary impacts to agricultural, residential, and commercial areas within 500 feet of the proposed construction ROW.
- During operation, sound levels would increase up to 2,300 feet from each pump station. However, no structures would be within 0.5 mile (2,640 feet) of the pump stations.

I-5.0 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

MEPA requires that the EIS describe any irreversible and irretrievable commitments of resources that would be involved in the proposed action if it is implemented. An irreversible resource commitment is defined as the loss of future options and the effect that use of the resource would have on future generations. It applies primarily to non-renewable resources, such as minerals, and to those resources that are renewable only over long time spans, such as soil productivity. An irretrievable commitment of resources results from the loss of production or harvest, or the use of renewable resources. Opportunities for other uses of those resources during the period of the proposed action are not possible. The decision to use the resource can be reversed (e.g., after the life of a project), but the forgone use opportunities are irretrievable.

For the proposed Project, most resource commitments would neither irreversible nor irretrievable. As described in Sections 3.1 through 3.12 of the EIS, most impacts would be short term and temporary. There would not be any irretrievable or irreversible commitments of threatened and endangered species, transportation, recreation, or public services associated with construction and normal operation of the proposed Project within Montana. The following sections provide summaries of the irreversible and irretrievable commitments of resources that would result from implementation of the proposed Project.

I-5.1 ENERGY, MATERIALS, AND LABOR

The use of materials for construction of the proposed Project, such as steel, concrete, aluminum, plastics, and glass, would be both an irretrievable and irreversible commitment of resources if the materials were not recycled at the end of the proposed Project. Fossil fuel used for energy during construction and operation of the proposed Project would be an irreversible commitment of that resource. Electrical energy consumed by the pump stations that was not renewable would also be irreversible, but the use of renewable energy would be an irretrievable commitment of energy. Labor required for construction and operation of the proposed Project would also be an irretrievable commitment of resources.

Construction materials, energy, and labor are not in short supply, and their use for the proposed Project would not have an adverse impact on their future availability for other uses.

I-5.2 OTHER RESOURCES

Table I-5.2-1 lists the irreversible and irretrievable commitments of resources that would occur from implementation of the proposed Project.

TABLE I-5.2-1
Summary of Irreversible and Irretrievable Commitments of Resources from Implementation of the Proposed Project in Montana

Resource	Irreversible Commitment	Irretrievable Commitment	Explanation
Geology	Yes	Yes	Use of gravel, sand, and rock during construction would be irreversible. Loss of access to mineral resources within the permanent ROW would be an irretrievable commitment of resources.
Soils and Sediments	No	Yes	Soils would be eroded from disturbed areas, but would not be irreversibly lost. Soil compaction may occur in some areas and could be an irretrievable commitment until the soil is loosened mechanically or naturally.
Water Quality and Quantity	No	Yes	Water obtained for hydrostatic testing would be tested and discharged to stable upland areas. A small portion of streamflow would be lost irretrievably due to water withdrawal during hydrostatic testing.
Wetlands	Yes	Yes	Construction across wetlands would result in a temporary irretrievable loss of wetland function and in some areas may result in a permanent irreversible loss of wetland function.
Terrestrial Vegetation	No	Yes	Vegetation would be irretrievably removed from the sites of aboveground facilities. Forest, sagebrush, and other woody vegetation would be irretrievably removed from the construction ROW and except for sagebrush up to 2 feet in height, would not be allowed to reestablish within 15 feet of either side of the pipeline centerline or under electrical transmission lines.
Terrestrial Wildlife	Yes	Yes	Mortality of relatively non-mobile individual animals would be an irreversible commitment. Removal or alteration of wildlife habitat would be an irretrievable commitment.
Fisheries	No	Yes	There would be no irreversible commitments of fisheries resources. A small portion of streamflow and the associated fisheries habitat would be irretrievably lost due to water withdrawal during hydrostatic testing.
Land Use, Recreation, and Visual Resources	No	Yes	Agricultural crops and timber may be lost irretrievably along the construction ROW during the active construction period, and forestland would not be allowed within 15 feet of the pipeline centerline during operation. Land used for aboveground facilities, access roads, and the permanent ROW would be an irretrievable commitment. Alterations of visual quality due to the presence of the permanent ROW and Project-related facilities would be an irretrievable commitment.
Socioeconomics	Yes	Yes	Funds expended on the proposed Project would be an irreversible commitment. Labor and resources expended on construction of the proposed Project would be an irretrievable commitment. Energy used during construction and operation would be an irretrievable commitment. Increases in the property-tax basis of land dedicated to the proposed Project would be an irreversible commitment.
Cultural Resources	No	No	Implementation of the cultural resources Programmatic Agreement would result in mitigation of cultural resources impacts, and therefore there would not be an irreversible or irretrievable commitment of those resources.
Air Resources	No	Yes	There would be minor, short-term irretrievable commitments of air resources during construction and possibly minor irretrievable commitments of air resources during operations.

I-6.0 RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

This section addresses the tradeoffs between short-term uses of the environment and maintenance and enhancement of long-term productivity of resources; it does not repeat the analyses provided in the main body of the EIS and in Section I-3.0 of this appendix. Short-term uses of resources associated with the proposed Project in Montana are defined as uses during the life of the proposed Project. Long-term productivity involves sustaining the interrelationships of each resource in a condition sufficient to support ecological, social, and economic health during and after the life of the proposed Project.

Implementation of the proposed Project would result in primarily temporary impacts (lasting only for the duration of construction) or short-term impacts (lasting up to 3 years after construction), including impacts to wetlands, some vegetation (some vegetation would require more than 3 years to recover), terrestrial wildlife, most land use (exceptions would be the pump stations which would remain through the life of the proposed Project), air quality, and noise levels. Keystone would minimize the impacts through incorporation of the procedures described in its CMR Plan (Appendix B), in Section 2.0 of the EIS, and throughout Sections 3.1 through 3.12 of the EIS, and the procedures required in MDEQ's Environmental Specifications (Attachment 1).

Construction and operation of the proposed Project would be accomplished in accordance with the applicable regulatory standards for water quality, biological resources, cultural resources, and air quality. After termination of the proposed Project, all affected resources are expected to be able to return to conditions that are identical or similar to those that existed prior to implementation of the proposed Project. Therefore, long-term productivity of the resources affected by the proposed Project would be maintained.

Economic activity in the vicinity of the proposed Project in Montana would be aided in the short term by the economic benefit of wages earned by local construction workers, by local construction purchases made by Keystone, and by local purchases made by construction workers. Longer-term benefits to economic activity would include any purchases made by Keystone during proposed Project operation, four to eight permanent jobs, and property taxes generated for the duration of the proposed Project.

I-7.0 REGULATORY RESTRICTIONS

In 1995, the Montana Legislature amended MEPA to require Montana state agencies to evaluate in their environmental documents any regulatory restrictions proposed to be imposed on the use of private property (Section 75-1-201(1)(b)(iv)(D), MCA). The cost of mitigation measures designed to make a project meet minimum environmental standards with implementation methods specifically required by federal or state laws and regulations does not need to be evaluated under the implementing guidelines for the requirement. The procedures presented in Keystone's CMR Plan (Appendix B) are Keystone's proposal and, therefore, not subject to the economic evaluation requirement. The remainder of this section addresses the estimated cost of discretionary mitigation measures recommended by the cooperating agencies in the EIS or that MDEQ has legal discretion to require.

I-7.1 MITIGATION MEASURES

Table I-7.1-1 lists the mitigation measures recommended for the proposed Project in Montana, along with an indication of what the impacts would be with and without the mitigation measures, and a cost estimate for each mitigation measure.

TABLE I-7.1-1
Estimated Costs of Mitigation Measures Recommended by Montana Agencies for the Proposed Project

Recommended Mitigation Measure	Intent of Mitigation Measure	Anticipated Result of Implementation of Mitigation Measures	Comments and Cost Estimate
Mitigate potential impacts to greater sage-grouse and sharp-tail grouse.	Enhance and preserve sagebrush communities for greater sage-grouse and other sagebrush-obligate species in eastern Montana at designated mileposts.	Fragmentation and loss of sagebrush communities has contributed to the decline of greater sage-grouse and other sagebrush-dependant wildlife species. A compensatory mitigation fund could help secure protection for quality sagebrush habitat and rehabilitate damaged habitat.	Establish a compensatory mitigation fund of $600 per acre to be used by MDEQ, BLM, and MFWP.
Mitigate potential impacts to greater sage-grouse and sharp-tail grouse.	Determine whether the presence of proposed Project facilities have affected sage-grouse numbers based on the peak number of males in attendance at leks within 3 miles of facilities.	Human activities, such as the construction and operation of pipelines, can affect sage-grouse behavior and possibly lead to declines in local populations. A study of lek attendance can help to determine if pipeline-related activities do affect sage-grouse, and what those effects might be.	Under the direction of MDEQ, MFWP, and BLM, fund a study for four years.
Avoid crossing water ponds and/or reservoirs.	Avoid impacts to water ponds and/or reservoirs.	The proposed route does not cross any reservoirs and crosses only one stock water pond. The impact to the stock pond could be avoided by rerouting the pipeline to avoid the pond. Other impacts associated with routing the pipeline around the pond have not been identified since Keystone has not been given permission by the landowner to enter the property.	The estimated cost of rerouting the pipeline around the stock water pond is approximately $30,000.
Avoid wet crossings (such as the flowing open-cut method) of any stream, lake, reservoir, or pond.	Avoid impacts to streams, lakes, reservoirs, or ponds.	The proposed route does not cross any lakes or reservoirs in Montana and only one stock water pond. The waterbody crossing procedures in the Keystone Construction Mitigation and Reclamation (CMR) Plan are designed to address specific resource issues. With implementation of those procedures, impacts to streams crossed would be minor and temporary to short term. With implementation of the recommended mitigation measure (such as the dam and pump, dry flume, or horizontal directional drilling methods), impacts would be reduced to minor and temporary.	To cross all flowing streams with one of the dry crossing methods described in Keystone's CMR Plan would add $19.7 million to the proposed Project costs. However, some streams are too wide to use the dry crossing method and would require the HDD method; those sites have been identified and are included in proposed Project cost estimates. If additional sites are identified that require HDD to avoid wet crossings, the proposed Project costs would increase; these costs would be dependent on the subsoil conditions encountered and the length of the crossing and cannot be estimated with certainty.

TABLE I-7.1-1
Estimated Costs of Mitigation Measures Recommended by Montana Agencies for the Proposed Project

Recommended Mitigation Measure	Intent of Mitigation Measure	Anticipated Result of Implementation of Mitigation Measures	Comments and Cost Estimate
Construction equipment and construction-related vehicles crossing a water body should use a crossing location that is within the dewatered reach created by the selected dry crossing construction method.	Avoid impacts to waterbodies due to use of equipment bridges.	With incorporation of the waterbody crossing procedures in the Keystone CMR Plan, Keystone would use methods to cross streams that are designed to minimize impacts. The impact to streams due to the use of equipment bridges is expected to be minor and temporary to short term. Implementation of the mitigation measure would reduce the impacts of some equipment crossings, but would increase the duration of the presence of stream flow control devices (e.g., dams and flumes). The impact to stream habitats may increase at some locations where the stream flow control devices remain in place and may be reduced at some stream locations.	The costs to cross streams are included in the costs described above. Implementation of this mitigation method would require that the bridge crossing be established over the dewatered area in the beginning of construction and be maintained through the entire construction season to allow crews to move through the area

Exhibit D

Montana Department of Environmental Quality's Final Environmental Impact Statement for Southern Montana Electric Generation and Transmission Cooperative, Inc.'s Highwood Generating Station (Jan. 2007)

FINAL
ENVIRONMENTAL IMPACT STATEMENT
(VOLUME I – MAIN REPORT)
Highwood Generating Station

Southern Montana Electric Generation & Transmission Cooperative, Inc.

United States Department of Agriculture – Rural Utilities Service

USDA Rural Development

Montana Department of Environmental Quality

Montana Department of Environmental Quality

January 2007

FINAL ENVIRONMENTAL IMPACT STATEMENT (FEIS)
HIGHWOOD GENERATING STATION
Great Falls, Montana

USDA Rural Utilities Service
Washington, D.C.

Montana Department of Environmental Quality
Helena, Montana

January 2007

Abstract

Southern Montana Electric Generation and Transmission Cooperative, Inc. (SME) proposes to build a 250-megawatt (MW) coal-fired power plant – the Highwood Generating Station (HGS) – and 6 MW of wind generation at a site near Great Falls, Montana. SME has applied for a loan guarantee to construct the HGS from the Rural Development Utilities Program (RD) of the U.S. Department of Agriculture (USDA). SME has also applied for an air quality permit and other environmental permits and licenses from the Montana Department of Environmental Quality (DEQ). In order to fulfill their respective obligations under the National Environmental Policy Act (NEPA) and the Montana Environmental Policy Act (MEPA), RD and DEQ have jointly prepared an Environmental Impact Statement (EIS). The Proposed Action includes the construction and operation of a 250-MW (net), circulating fluidized bed (CFB), coal-fired generating plant and four 1.5-MW wind turbines. The EIS analyzes the potential environmental effects of SME's Proposed Action and alternatives to that action.

The draft EIS was released in June 2006 and public hearings were held at two locations in July and August; the comment period on the draft EIS closed on August 30, 2006. In response to public and agency comments, a number of changes were made to the EIS text itself – including new alternatives and revised significance findings – and the location of the preferred alternative was shifted to reduce cultural and visual impacts on the Great Falls Portage National Historic Landmark.

More than 20 alternatives are evaluated in Chapter Two of the FEIS but eliminated from more detailed consideration because they fail to meet the purpose and need of the Proposed Action – providing 250 MW of base load generation – on the grounds of cost, reliability, or other technical or environmental shortcomings. Alternatives eliminated include: power purchase agreements; energy conservation and efficiency; renewable non-combustible energy sources (wind energy, solar energy, hydroelectricity, geothermal energy); renewable combustible energy sources (biomass, biogas, municipal solid waste); non-renewable combustible energy sources (natural gas combined cycle, microturbines, pulverized coal, integrated gasification combined cycle coal, oil); nuclear power; two alternatives consisting of combinations of renewable resources; and three alternative sites. Several alternative site-specific components also eliminated include: different railroad spur alignments, alternate methods of obtaining potable water, discharging wastewater into the Missouri River, and disposing ash at local landfills. In the FEIS, USDA and DEQ have selected the Proposed Action as their preferred alternative.

Alternatives assessed in detail include the: 1) No Action Alternative; 2) Proposed Action (construction/operation of the HGS and wind turbines at the Salem site eight miles from Great Falls), and 3) Industrial Park Site (construction/ operation of the power plant, but no wind generation, at an alternate site in a designated industrial park just north of Great Falls). The No Action Alternative avoids most direct adverse environmental effects, but potentially entails a number of indirect and cumulative impacts associated with other generation sources from which SME would have to purchase power if unable to generate its own. In most respects, with the exception of cultural resources, impacts from the Proposed Action (2) and Alternative Site (3) are similar, though the proximity of the Alternative Site to greater numbers of residents intensifies some of these impacts, such as traffic, noise, and air quality; nonetheless, impacts would not likely be significant. Potential air quality impacts at both locations would be reduced to non-significant levels through the application of CFB technology and other pollution controls. SME's plant would be subject to Montana air quality permit limits as well as any Montana mercury rule that may be adopted, and EPA's new federal mercury rule. The main potentially significant adverse impacts would be on cultural and visual resources, because constructing the HGS at the Salem site would adversely affect the Great Falls Portage National Historic Landmark (NHL) commemorating the 1805 portage the Lewis and Clark Expedition made around the Great Falls of the Missouri River. Repositioning the HGS and wind turbines reduces but does not eliminate significant impacts on the NHL. Other impacts rated as significant in the final, but not the draft EIS, are temporary impacts on traffic and Level of Service, and long-term impacts to the acoustical environment of the NHL.

To comment on this final EIS, please contact:

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Comments must be received by March 12, 2007.

EXECUTIVE SUMMARY

Introduction

The Southern Montana Electric Generation and Transmission Cooperative, Inc. (SME) proposes to build a 250-megawatt (MW), Circulating Fluidized Bed (CFB), coal-fired power plant – called the Highwood Generating Station (HGS) – and 6 MW of wind generation at a site near Great Falls, MT. This final Environmental Impact Statement (FEIS) discusses this Proposed Action and analyzes its potential effects on the environment.

SME is based in Billings, Montana. As an electric generation and transmission cooperative, it is a non-profit utility owned by its members. As such, it provides wholesale electricity and related services to five electric distribution cooperatives and one municipal utility. The SME member systems are:

- Beartooth Electric Cooperative, Inc., headquartered in Red Lodge, Montana.
- Fergus Electric Cooperative, Inc., headquartered in Lewiston, Montana.
- Mid-Yellowstone Electric Cooperative, Inc., headquartered in Hysham, Montana.
- Tongue River Electric Cooperative, Inc., headquartered in Ashland, Montana.
- Yellowstone Valley Electric Cooperative, Inc., with headquarters at Huntley, Montana.
- Electric City Power, Great Falls, Montana.

SME's 58,000-square mile (150,220-square kilometer) service area encompasses 22 counties in two states – Montana and a very small area of Wyoming. Under its charter, SME is required to meet the electric power needs of the cooperative member systems it serves. SME does not have the capacity to meet all of its members' power needs beyond roughly 2010. After considering various ways to meet those future needs, SME identified the construction of a new coal-fired power plant near Great Falls – the proposed Highwood Generating Station (HGS) – supplemented with four wind turbines on the same site, as its best course of action to meet the electric energy and related service needs of approximately 120,000 Montanans.

SME has applied for a loan guarantee to construct the HGS from the Rural Utilities Service (RUS), an agency which administers the U. S. Department of Agriculture's Rural Development Utilities Programs (USDA Rural Development). The RUS application covers the financing needs of the five cooperative members of SME, representing approximately 75 percent or 185 MW of the total projected load needs of SME. The remaining 25 percent or approximately 65 MW of projected load is planned to be financed separately by Electric City Power. SME has also applied for an air quality permit and other environmental permits and licenses from the Montana Department of Environmental Quality (DEQ). In order to fulfill their respective obligations under the National Environmental Policy Act (NEPA) and the Montana Environmental Policy Act (MEPA), RUS and DEQ have jointly prepared this Environmental Impact Statement (EIS). The Proposed Action includes the construction and operation of a 250-MW (net), CFB coal-fired generating plant and four 1.5-MW wind turbines. The FEIS analyzes the potential environmental effects of the Proposed Action and alternatives to that action.

RUS has established procedures for determining if a proposed project for which a loan or loan guarantee is sought is feasible both from an engineering and financial perspective. Following RUS procedures, SME prepared several proposal development documents, including a System Load Forecast, Alternative Evaluation Study and a Site Selection Study. These studies were subject to RUS's review and approval. Their information and analyses are incorporated into this EIS; they are also available to the public on RUS's website at: http://www.usda.gov/rus/water/ees/eis.htm .

The draft EIS (DEIS) on the HGS was released in June 2006 and public hearings were held in Great Falls and Havre, in July and August respectively. Upon request by an interested party, the comment period on the DEIS was extended by two weeks; it closed on August 30, 2006. Subsequently, in response to public and agency comments and concerns, a number of changes were made to the DEIS text itself – including new alternatives and revised significance findings – and the location of the preferred alternative was shifted to reduce cultural and visual impacts on the Great Falls Portage National Historic Landmark (NHL). The FEIS reflects those changes, which are shown in double-underlining. Also included in the appendices of the FEIS are the comments and agencies' responses to comments, a draft Memorandum of Agreement (MOA) on the NHL, and the final draft Biological Assessment (BA) prepared in compliance with Sec. 7(c) of the Endangered Species Act.

Purpose, Need for, and Benefit of the Proposed Action

Presently, SME meets all of the power requirements for its cooperative member systems by purchasing power from two Federal power suppliers – the Bonneville Power Administration (BPA) and the Western Area Power Administration (WAPA). However, its major supplier (BPA) will end its sales of power to SME by 2011. Thus, SME will need to close the large projected gap between the amount of power it can provide to its cooperative member systems and the amount of power those cooperative member systems need to supply their residential, commercial and industrial customers.

Currently, approximately 20 percent or 20 MW of the cooperative member systems' wholesale supply requirements are met through a power purchase agreement with WAPA. The remaining 80 percent or about 100 MW is met by purchase from BPA under an "all supplemental requirements" contract effective from 2000-2017. The wholesale power requirements of Electric City Power are met with purchases from PPL Montana that will expire in 2011.

A provision of SME's power purchase agreement with BPA allows "recall" of a portion of SME's purchase rights beginning in 2008, and the remaining power purchase rights of the contract by 2011. BPA has now exercised this provision because it has determined that the load requirements of the region which it has a statutory requirement to serve will have needs in excess of its current generating capacity. Under the laws governing BPA, SME is an "extra-regional" customer because it is located east of the continental divide. SME thus faces an imminent wholesale power supply shortfall of major proportions.

Based on SME's existing and projected capacity and energy requirements, in 2009 it will have a resource requirement or deficit of approximately 116 MW. By 2012 this deficit will grow to approximately 160 MW as the BPA power purchase agreement is phased out. Given the price

volatility of natural gas and the lack of viable wholesale power purchase options, SME needs to seriously consider developing an alternate wholesale power supply resource. In addition, Electric City Power has projected resource requirements of approximately 65 MW.
In demonstrating to RUS how to best meet its power supply obligations in the face of a looming phase-out of its main existing power source, SME concluded that owning its own source of electric generation would be in the best interest of its cooperative member systems. SME proposes to construct a 250 MW, CFB coal-fired power plant near Great Falls, Montana. The Proposed Action would also include four 1.5 MW wind turbines, construction of approximately 14 miles (23 km) of transmission lines, substation facilities, pipelines for raw water, potable water and wastewater, and about six miles of railroad tracks for delivery of coal to the plant, in addition to other components.

In addition to providing a reliable supply of electricity at an affordable price, the Proposed Action would furnish local employment in the Great Falls area during construction and operation. It would also provide tax benefits for Cascade County and the City of Great Falls, as well as other associated socioeconomic benefits.

Alternatives Eliminated from Detailed Consideration

The Alternative Evaluation Study and FEIS examined a total of 29 alternative means of responding to the identified purpose and need for the project. These alternatives were evaluated in terms of cost-effectiveness, technical feasibility, and environmental soundness. Twenty-six alternatives were considered but dismissed from more detailed analysis on one or more grounds:

- Power Purchase Agreements – Eliminated because of higher cost and no probable environmental advantage; SME would contribute indirectly to impacts from other generation sources.

- Renewable Non-Combustible Energy Sources –
  Wind Energy – Incapable of providing approximately 250 MW of base load due to its intermittency.
  Solar Energy (photovoltaic and thermal) – Much higher overall cost and inability to serve as base load due to intermittency.
  Hydroelectricity – Scarcity of remaining undeveloped hydro resources in Montana and generally unacceptable environmental impacts.
  Geothermal Energy – Unavailability of sufficient geothermal resources to generate electricity on a commercial scale in Montana.

- Renewable Combustible Energy Sources –
  Biomass – Infeasible due to distance to and uncertainties associated with wood waste supply.
  Biogas – Infeasible due to dispersed locations and insufficient quantities of fuel sources in Montana such as digester gas from organic material and landfill gas.
  Municipal Solid Waste – Unavailability of municipal solid waste in Montana in sufficient quantities to generate 250 MW plus generally high emissions and other environmental problems such as toxic ash and residues.

- Non-Renewable Combustible Energy Sources –

  Natural Gas Combined Cycle – Price volatility and likelihood of significantly higher future costs as a result of rising demand and limited supplies.

  Microturbines – Infeasible due to dispersed locations and insufficient quantities of fuel sources in Montana such as digester gas from organic material and landfill gas.

  Pulverized Coal – Somewhat higher emissions of air pollutants and somewhat higher capital cost than CFB.

  Integrated Gasification Combined Cycle – Not currently cost-effective and requires further research to achieve an acceptable level of reliability; except for still undemonstrated potential to sequester carbon dioxide, does not enjoy significant emissions advantages over CFB.

  Oil – High prices and price volatility, with prospect for even higher prices and volatility in the foreseeable future.

- Nuclear Power – Permitting and construction of nuclear power plants takes considerably longer than for PC or CFB plants and a new plant would face stiff public opposition; moreover, nuclear power is not cost-effective at the scale needed by SME.

- Combinations of Energy Sources –

  Smaller CFB Plant and Renewable Energy Sources – This combination alternative only partially meets the purpose and need of this project in the short-term. It would not provide reliable, cost effective, and consistent energy generation for the predicted long-term load; in addition, transmission constraints and impacts were a key factor in this alternative not being viable.

  Combination of Renewable Energy Sources – This combination alternative would not meet the purpose and need of this project. It would not provide long-term term reliable, cost effective, and consistent energy generation for the predicted load; in addition, transmission constraints and impacts were a key factor in this alternative not being viable.

- Other Coal-Fired Power Plant Sites –

  Decker – More expensive than Great Falls sites; also has a higher degree of risk associated with environmental permitting and approvals; subject to water disruption and the lack of available water rights.

  Hysham – More expensive than either of the Great Falls sites; also has a higher degree of risk associated with environmental permitting and approvals and available water supply and water rights.

  Nelson Creek – More expensive than either of the Great Falls sites; also has a higher degree of risk associated with environmental permitting and approvals and available water supply and water rights.

- Salem Site-Specific Alternative Components –

  Obtaining Potable Water From Other Sources –

  - *Importing bottled water* – Bottled water would not be cost effective in large quantities for site-wide use for anything other than drinking water.

- *Drinking water wells drilled onsite* – Rejected in part because of the 300-450-foot depth to the water-bearing Madison limestone formation.
- *Additional river diversion* – The water treatment facility would be classified as a public water supply and would be subject to state and county regulations; no environmental advantage over connection to and use of City of Great Falls water system.

Directly Discharging Wastewater into the Missouri River – Rejected in favor of discharging into the City of Great Falls' wastewater treatment system on the grounds of environmental benefits and the cost to construct, operate, maintain, and monitor the facility.

Disposing of Sanitary Wastewater in Septic System – Offers no environmental benefits over SME's proposed connection and use of the City of Great Falls wastewater treatment

Alternate Railroad Spur Alignments –

- *Routed south of power plant to abandoned railroad grade* – Rejected because of disadvantages including need for replacing sections of existing, abandoned railroad grade, conversion of privately owned croplands, and routing of coal train traffic through City of Great Falls.
- *Routed north of power plant to City of Great Falls along property lines* – Rejected because of difficult and expensive installation due to rougher terrain, greater environmental impacts at crossings of coulees and watercourses, and the highest estimated cost from the bridges or trestles that would be needed.

Hauling Ash to High Plains Landfill – Rejected because of greater cost and the need to haul 10-12 trucks per day carrying ash through City of Great Falls.

Alternatives Assessed in Detail

No Action Alternative

Under the No Action Alternative, the HGS would not be constructed or operated to meet the projected 250-MW base load needs of SME. There would be no facilities constructed at either the Salem or Industrial Park sites to meet the purpose and need.

However, it is unreasonable to assume that no alternative source of electricity would be provided for SME customers once the current power purchase agreement with the Bonneville Power Administration begins to expire. Therefore, the primary assumption for the No Action Alternative is that the need for a reliable energy supply for the SME service area would still be met by some means, mostly likely the purchase of power from other sources of generation in the West, including those already online and those currently being developed. While no specific generation sources have been identified, it is assumed that power would likely be provided by some mixture of coal, natural gas, oil, hydro, nuclear fission, and renewable electricity sources.

Proposed Action: Highwood Generating Station – Salem Site

Under this alternative, the HGS would be built and operated approximately eight miles east of Great Falls. The Salem site is located in Sections 24 and 25, Township 21 North, Range 5 East at about 3,300 feet (1,006 m) above sea level. It is east and north of the intersection of Salem Road and an abandoned railroad bed. In addition, four 1.5-MW wind turbines would be constructed and operated on the same site.

In response to public concern about visual and cultural resources impacts on the NHL, SME has moved the locations of the footprints of the HGS itself and the four wind turbines. The footprint of the power plant has shifted about one-half mile south to a location just outside the eastern NHL boundary. However, due to property constraints and the necessity of keeping the wind turbines upwind of the power plant, it was not possible to move the wind turbines outside the NHL; they have been relocated toward the north, and still remain within the NHL.

Construction is estimated to take approximately four years and three months (51 months) from ground breaking to commercial operation of the plant. Construction would begin with site preparation, foundations, and underground utilities, while design of the above-ground mechanical, piping, buildings, structures, and electrical systems is being developed. Site grading and preparation has a planned duration of approximately two months and would be followed by foundation construction, with a planned duration of approximately a year. Using a phased process, boiler and baghouse construction would commence approximately five months after the beginning of the foundation construction and would be completed in approximately two years.

Construction of the four 1.5-MW wind turbines would take place concurrently with power plant construction. The towers are anticipated to have a height of 262 feet (80 m) at the rotor. The wind turbine is expected to have three blades, with an overall diameter of 250-270 feet (77-82.5 m) or radius of 125-135 feet (38-41 m).

In addition to construction of the HGS and wind turbines on the Salem site itself, construction of the following utility facilities and infrastructure would take place in the vicinity: a rail spur, raw water intake at the Morony Reservoir on the Missouri River, raw water pipeline, two 230 kV transmission lines, a new switchyard, potable and wastewater lines, and access roads.

Once construction was completed, plant start-up activities would be initiated with a planned duration of eight months and must be completed before commercial operation of the plant could begin. Plant operation would employ approximately 65 permanent workers. The plant design consists of a CFB boiler, single re-heat tandem compound steam turbine, seven stages of feedwater heating, water-cooled condenser, wet cooling tower, hydrated ash reinjection or equivalent flue gas desulfurization (FGD) system, baghouse, and material handling system. The plant would withdraw and use for cooling approximately 3,200 gallons per minute of water from the Missouri River.

The HGS would purchase sub-bituminous coal from either the Spring Creek or Decker mines in Montana's Powder River Basin (PRB), or other suitable supply from which comparable PRB coal supplies are produced. Coal consumption is estimated to be 300,000 lb/hr or 1,314,000 tons/yr. Coal would be delivered approximately twice a week in 110-car bottom-dump unit trains. Fly ash from the coal combustion process would be disposed of onsite in an engineered monofill, lined with clay.

Limestone and ammonia would be purchased and utilized to reduce air pollutants. Limestone would be consumed at a rate of approximately 5,780 lb/hr or 25,300 tons/yr. Limestone would be delivered to the plant by truck or train from the Graymont Lime Plant and limestone quarry near Townsend, Montana. Ammonia would be consumed at a rate of 239 lb/hr (1,047 tons/yr). Anhydrous ammonia would be purchased and delivered to the plant by rail or by truck.

Electricity from the operation of the proposed HGS would furnish the base load component of SME's proposed integrated power supply portfolio. However, under the Proposed Action, SME and its member cooperatives would continue to purchase power from WAPA as well as continue to invest in energy conservation and efficiency, as mandated since 1997 by the State of Montana in Senate Bill 390. In addition, SME proposes to purchase and/or generate an environmentally preferred product, probably wind energy.

SME has applied for an air quality permit under the Montana Clean Air Act and would comply with the conditions and limits in the final permit. The preliminary determination or draft permit is included in the FEIS. The on-site ash monofill would comply with all requirements of Montana's Solid Waste Management Act; SME intends to apply for a solid waste license once appropriate zoning changes were made even though this facility is exempt under the law.

Alternative Site – Industrial Park Site

The Industrial Park site is located in the southern half of Section 30, Township 21 North, Range 4 East. It is just east of Highway 87, about ¾ mile (1.2 km) north of the Missouri River and ½ mile (0.8 km) east of a mobile home park. The City of Great Falls has designated this site as the Central Montana Agricultural and Technology Park, that is, as an industrial park. Construction and operation of the 250-MW, CFB coal-fired power plant at the Industrial Park site would be very similar to that described for the Salem site, except for the differences described below.

Eight miles (13 km) of new track and railroad bed would be needed, slightly more than the distance for the Salem site. The rail spur would start north of the Missouri River and travel north and west to the plant site. A 4.5-mile (7.2-km) long pipeline (compared to less than three miles for the Salem site) would be needed to transport make-up water from an intake structure on the Missouri River to the plant. Precise locations of transmission line corridors have not yet been determined, though it is likely that one transmission line would go to the Great Falls Switchyard, which is about 5.5 miles east of the Industrial Park site. A second line of 18 miles in length would likely be built to a switchyard installed on the Great Falls to Ovando line. The specific rights-of-way for potable water and wastewater lines have been selected, and are 1.5 and two miles in length, respectively, which are shorter than for the Salem site.

Construction at the Industrial Park site would take the same length of time as at the Salem site, approximately three and a half years, and the workforce would be about the same size – averaging between 300 and 400 workers at any one time with an estimated peak construction workforce approaching 550.

The proposed generating station at the Industrial Park site would include the same equipment and component parts, would be operated identically and would consume the same quantities of raw materials as in the Proposed Action. Disposal of fly and bed ash would not take place onsite at

the Industrial Park site, because of the smaller area. Instead, ash would be shipped away for disposal in an approved landfill or for reuse as an industrial byproduct, or both.
Unlike the Salem site, the Industrial Park site would not include four wind turbines due to space constraints on the site.

As with the Salem site, SME would comply with its air quality limit, but would not apply for a solid waste license as there would be no ash monofill at the Industrial Park site.

Impact Analysis

No Action Alternative

In general, the No Action Alternative would result in no impacts or negligible effects on the environment at either the Salem or Industrial Park sites. The only impacts that would occur at these sites under the No Action Alternative would result from the continuation of existing unrelated actions and trends, such as agricultural activities, the physical expansion of the City of Great Falls, and the movement of traffic. However, since SME would have to purchase electricity from other generation sources in the West in order to supply its members and customers, the No Action Alternative would contribute indirectly and incrementally to cumulative environmental impacts associated with these fuels and forms of generation. While these impacts cannot be specified at this time, they can be reasonably assumed to correspond to the various impacts known to result from different methods of power generation.

The No Action Alternative would entail no impacts on the topography or the geology of the Salem or Industrial Park sites. Negligible to minor, long-term adverse impacts on soils (e.g. erosion, gradual loss of fertility) would occur from existing land use practices (dryland farming).

This alternative would not adversely affect water resources at or near the Salem site or the Industrial Park, though negligible to minor, long-term adverse impacts on water resources would continue from existing agricultural land uses.

The No Action Alternative would not result in any direct air quality impacts on either the Salem or Industrial Park sites. However, it would contribute indirectly and cumulatively to air quality impacts at those power plants from which SME would purchase electricity, although these impacts cannot be specified or quantified.

This alternative would produce no direct impacts on biological resources at either the Salem or Industrial Park sites. It would likely contribute indirectly and cumulatively to impacts on flora and fauna from those power plants from which SME would purchase electricity, although these impacts cannot be specified or quantified.

No direct noise impacts on either the Salem or Industrial Park sites would result from the No Action Alternative. Likewise, neither would it have direct impacts on recreation, cultural resources, visual resources, transportation, farmland and land use, waste management, or human health and safety.

The No Action Alternative would have potential adverse effects on two resource topics covered in the EIS – socioeconomics and environmental justice. Due to the higher electric rates it would likely lead to for SME's members and consumers, the socioeconomic impacts from the No Action Alternative would be potentially significant and adverse. While there would be no direct impact or effect from a power plant on persons living in poverty or children at either the Salem or Industrial Park sites, higher electricity prices could disproportionately affect low-income residential consumers at any of SME's member cooperatives. These adverse impacts are expected to be of moderate magnitude, intermittent-term duration, and small extent, and have a possible likelihood of occurring.

Proposed Action: Highwood Generating Station – Salem Site

Overall impacts of the Proposed Action on **soils** at the Salem site would be adverse and most likely non-significant. The Proposed Action would have negligible to minor impacts on **topography and geology**. Soils impacts from construction activities would have a moderate magnitude, medium-term duration, and medium extent, and have a probable likelihood of occurring. The overall rating from construction impacts would be adverse and non-significant. Impacts from operation of the waste monofill would be adverse but non-significant, and of minor magnitude, long-term duration, and small extent, and have a probable likelihood of occurring.

The overall rating for impacts on **water resources** from the operation phase of the power plant would be adverse and non-significant. Construction of the HGS would likely entail increased stormwater runoff, carrying sediment and contamination loads into surface waters, with the potential for contamination from construction equipment and activities infiltrating area soils and percolating down into the groundwater. Impacts to water quality would be mitigated – reduced but not entirely eliminated – through Best Management Practices (BMPs). Impacts on wetlands and floodplains would be negligible to minor. Water withdrawals from the Missouri River for HGS operation would reduce flows by 0.31% in a worst-case scenario. Effluent would be discharged to the City of Great Falls sewage treatment system rather than directly into the Missouri River, in compliance with applicable pre-treatment requirements of the city. Impacts from power plant operation would be of minor magnitude, long term duration, and medium extent, and have a probable likelihood of occurring.

Overall **air quality** impacts from the Proposed Action would be adverse and most likely non-significant. Heavy equipment tailpipe emissions and fugitive dust would probably entail short-term, minor to moderate degradation of local air quality during construction of the HGS and wind turbines. HGS operations would result in long-term minor to moderate degradation of local air quality. There would be long-term minor impacts on sensitive species from criteria pollutant emissions and/or trace element deposition. Off-site impacts on PSD Class I increments and Air Quality Related Values (AQRVs) – regional haze and acid deposition – would likely range from negligible to moderate in intensity. Annual mercury emissions from the HGS would be approximately 36.4 lbs. (16.5 kg) initially, constituting a minor incremental contribution to cumulative state, national, and global mercury emissions. State and national mercury emissions are declining due to new rules and controls; global emissions are still rising. HGS's mercury emissions are unlikely to present unacceptable health risks to humans or wildlife locally or in the state. The HGS would also result in a minor, incremental contribution to the accumulation of atmospheric greenhouse gases, which scientists believe is forcing climate change.

Overall **biological resources** impacts would be adverse and non-significant. The Proposed Action would temporarily displace terrestrial wildlife due to removal of vegetation and disturbance from construction equipment. It would also eliminate potential habitats, but it would be unlikely to adversely affect state-listed species of concern from permanent removal of vegetation. There would be minor short-term harm to wildlife and vegetation by degrading air quality, as well as minor, localized short-term harm to aquatic biota from degraded water quality. The HGS would result in a long-term increase in mortality of terrestrial mammals by rail strikes and increased traffic on the access road(s). There is some potential for increased mortality to birds and bats from blade strikes on the four proposed wind turbines at the Salem site. The Proposed Action may also temporarily disturb habitats along water pipeline routes during construction activities, as well as temporarily disturb wetland habitats over a small area along Morony Reservoir for installation of the raw water intake. In sum, impacts on biological resources would be of minor magnitude, long-term duration, and small extent, and have a probable likelihood of occurring.

Overall **noise** impacts from the Proposed Action would be minor, localized and long-term; while impacts on Great Falls and Salem area residents would most likely be non-significant, there would be a significant adverse impact on the acoustical environment of the Great Falls Portage National Historic Landmark. Noise levels from the operation of the HGS, including intermittent noise sources, would be audible for several miles from the site. Predicted noise levels are equal to or less than the EPA guideline at the receptor locations around the Salem site. Noise levels are predicted to be approximately equal to the existing ambient noise levels during quiet periods at approximately 3.1 miles (5 km) from the Salem site. At all receptor locations, the power plant noise levels are predicted to be less than the 50 dBA nighttime noise limit of the Great Falls Municipal Code for residences, and less than or equal to the EPA Ldn 55 dBA guideline. Noise from operation of the proposed wind turbines on the Salem site would not appreciably increase overall noise levels at that site; the dominant the dominant noise source(s) associated with the project would be the power plant equipment, not the wind turbines.

Overall **recreation** impacts from the Proposed Action would be adverse and non-significant. Construction and operation of the HGS would entail negligible to at most minor impacts on recreation in the immediate project vicinity and wider Great Falls area. The Lewis and Clark staging area historic site would be impacted by the Proposed Action.

Overall impact of the Proposed Action on **cultural resources** would be adverse and significant; the significance of these impacts could be reduced but not eliminated by mitigation. The HGS, wind turbines, and related facilities and infrastructure would have an adverse visual effect on the Great Falls Portage National Historic Landmark (NHL). Other cultural properties within the Area of Potential Effect would not be affected by the Proposed Action. It also appears that no Traditional Cultural Properties would be affected. However, constructing transmission lines, water supply and wastewater lines could potentially affect undiscovered cultural resources. In sum, cultural resources impact would be of major magnitude, long-term duration, and medium or localized extent, and have a probable likelihood of occurring. Moving the HGS outside the NHL boundary, but not the wind turbines, would reduce but not eliminate the significance of the Proposed Action's adverse impact. As a result of Section 106 consultation, SME has also offered to implement a number of off-site mitigations, such as acquiring key properties and assisting the Lewis and Clark Interpretive Center in Great Falls.

The overall rating for **visual impacts** from the Proposed Action would be adverse and significant. The HGS and wind turbines would have scenic impacts of major magnitude, long-term duration, and small extent, and have a high probability of occurring. While the HGS and wind turbines would clearly diminish scenic values within the Great Falls Portage NHL, they would not eliminate them; certain views would remain unaffected. Proposed mitigation measures, such as landscaping and compatible earth-tone color schemes, as well as shifting the HGS to a site just outside the NHL boundary, could reduce the significance of the visual impacts somewhat, but not to a level of non-significance.

The overall rating for impacts on long-term **traffic** congestion from the Proposed Action would be non-significant and adverse. Construction-related impacts on traffic would be of moderate magnitude, medium-term duration, and small extent, and have a probable likelihood of occurring. According to Montana Department of Transportation criteria, short-term construction-related impacts would be significantly adverse; a mitigation plan will be developed to minimize these impacts. Over the long term, during operation of the proposed HGS and wind turbines, impacts on road, rail and air transportation would be generally negligible.

Overall rating for impacts on **farmland and land use** at the Salem site would be adverse and while impacts would most likely be non-significant, there is some potential for impacts to become significant. Construction of a power plant at the Salem site would involve the direct conversion of agricultural lands to an industrialized facility with supporting infrastructure. No homesteads or residences would be displaced. In the context of the amount of quality farmland in other areas of Cascade County, the impact of converting farmland to developed land required for the plant would be of minor magnitude, long-term (permanent) duration, and medium extent, and have a probable likelihood of occurring. Overall rating for impacts on land use from the construction phase of the power plant would be adverse and non-significant. Operation of the power plant at the Salem site would cause no additional direct impacts to land use or farmland. However, the power plant and its associated support facilities could indirectly influence land uses on adjoining or nearby properties in the vicinity of the site. Development of the Salem site may reduce market values of nearby rural, agricultural land, affecting sales of those lands. Property values are less likely to be affected, but if they are reduced then there would be repercussions on land assessments and property taxes.

The overall rating for impacts on **waste management** from the operational phase of the power plant at the Salem site would be adverse; impacts would likely be non-significant. Construction-related impacts on waste management would be of minor magnitude, medium-term duration, and small extent, and have a probable likelihood of occurring. Ash and water treatment system byproducts would be disposed of in an onsite monofill, which would be managed with appropriate environmental controls, including groundwater monitoring. Operation-related impacts would be of moderate magnitude, long-term duration, and medium extent, and have a probable likelihood of occurring.

Overall **health and safety** impacts of the plant would be adverse but non-significant. Construction-related impacts at the Salem site would be of minor magnitude, medium-term duration, and small extent, and have a probable likelihood of occurring. Operation-related impacts on human health and safety for the Salem site would be of minor magnitude, long-term duration, and medium extent, and have a probable likelihood of occurring.

Construction of the HGS would have a moderately beneficial effect on the **socioeconomic environment** of the local and regional area, including increases in employment opportunities, total purchases of goods and services, and an increase in the tax base. During the long term operation of the HGS, it would yield beneficial and potentially significant socio-economic impacts on aggregate income, employment, and population in Great Falls and Cascade County. The HGS would also provide reliable electricity at reduced rates for SME's customer base.

The Proposed Action would have a negligible effect on children or persons living in poverty, as these population groups are not generally present at or near the Salem site.

Alternative Site – Industrial Park Site

Overall impacts of constructing and operating the proposed power plant at the alternative Industrial Park site would in many respects be comparable to those of the Proposed Action at the Salem site, with some important exceptions, as noted below. In general, the closer proximity of the Industrial Park site to residential areas on the northern edge of Great Falls is a disadvantage of this alternative.

The impacts of plant operation on **soils** at the Industrial Park site would be adverse and non-significant. Nevertheless, since the amount of ash waste would not change, an alternative disposal site would have to be located. Impacts to soils at a new location are unknown and site-dependent. The alternative site, like the Proposed Action, would have negligible to minor impacts on **topography and geology**. Soils impacts from construction activities would have a moderate magnitude, medium-term duration, and medium extent, and have a probable likelihood of occurring. The overall rating from construction impacts would be adverse and non-significant. Operation-related impacts on soil resources would be adverse but non-significant, and of minor magnitude, short-term duration, and small extent, and have a possible likelihood of occurring.

The overall rating for impacts on **water resources** from the operation phase of the power plant at the alternative site would be adverse and non-significant. Construction of the HGS would likely entail increased stormwater runoff, carrying sediment and contamination loads into surface waters, with the potential for contamination from construction equipment and activities infiltrating area soils and percolating down into the groundwater. Impacts to water quality would be mitigated – reduced but not entirely eliminated – through Best Management Practices (BMPs). Impacts on wetlands and floodplains would be negligible to minor. Water withdrawals from the Missouri River for HGS operation would reduce flows by 0.31% in a worst-case scenario. Effluent would be discharged to the City of Great Falls sewage treatment system rather than directly into the Missouri River, in compliance with applicable pre-treatment requirements of the city. Impacts from power plant operation at the alternative site would be of minor magnitude, long term duration, and medium extent, and have a probable likelihood of occurring, the same as they would be at the Salem site.

Overall **air quality** impacts from the power plant at the alternative site would be adverse and most likely non-significant, but with the potential to become significant. Heavy equipment tailpipe emissions and fugitive dust would probably entail short-term, minor to moderate degradation of local air quality during construction of the HGS and wind turbines. HGS operations would result in long-term minor to moderate degradation of local air quality. There would be long-term minor impacts on sensitive species from criteria pollutant emissions and/or trace element deposition. Off-site impacts on PSD Class I increments and Air Quality Related Values (AQRVs) – regional haze and acid deposition – would likely range from negligible to moderate in intensity. Annual mercury emissions from the HGS would be approximately 36.4 lbs. (16.5 kg) initially, constituting a minor incremental contribution to cumulative state, national, and global mercury emissions. State and national mercury emissions are declining due to new rules and controls while global emissions are still rising. HGS's mercury emissions are unlikely to present unacceptable health risks to humans or wildlife locally or in the state. The HGS would also result in a minor, incremental contribution to the accumulation of atmospheric greenhouse gases, which scientists believe is forcing climate change.

Overall **biological resources** impacts from developing the alternative site would be adverse and non-significant. The Proposed Action would temporarily displace terrestrial wildlife due to removal of vegetation and disturbance from construction equipment. It would also eliminate potential habitats, but it would be unlikely to adversely affect state-listed species of concern from permanent removal of vegetation. There would be minor short-term harm to wildlife and vegetation by degrading air quality, as well as minor, localized short-term harm to aquatic biota from degraded water quality. The HGS would result in a long-term increase in mortality of terrestrial mammals by rail strikes and increased traffic on the access road(s). The Proposed Action may also temporarily disturb habitats along water pipeline routes during construction activities, as well as temporarily or disturb wetland habitats over a small area on the Missouri River for installation of the raw water intake. In sum, impacts on biological resources would be of minor magnitude, long-term duration, and small extent, and have a probable likelihood of occurring.

Overall **noise** impacts at the alternative site would be minor, localized and long-term; while these impacts would most likely be non-significant, there is some potential for them to become significant, especially if nearby residential development continues. Noise levels from the operation of the power plant, including intermittent noise sources, would be audible for several miles from the site. Predicted noise levels are equal to or less than the EPA guideline at the receptor locations around the Salem site. Noise levels are predicted to be approximately equal to the existing ambient noise levels during quiet periods at approximately 1.2 miles (1.9 km) from the Industrial Park site. At all receptor locations, the power plant noise levels are predicted to be less than the 50 dBA nighttime noise limit of the Great Falls Municipal Code for residences, and less than or equal to the EPA Ldn 55 dBA guideline.

Overall **recreation** impacts from the alternative Industrial Park site would be adverse and non-significant. Construction and operation of the SME power plant at the alternate Industrial Park site would entail negligible to at most minor impacts on recreation in the immediate project vicinity and wider Great Falls area. Upper portions of the proposed generating station would be visible to park users and recreationists along the Missouri River in Great Falls.

The overall impact on **cultural resources** of developing the power plant at the alternative site is likely to be negligible to minor. It would likely have no effect on cultural resources at the site proper due to their apparent absence from the Industrial Park site. It also appears that no Traditional Cultural Properties would be affected at the site proper. However, constructing transmission lines, water supply and wastewater lines could potentially affect undiscovered cultural resources.

The overall rating for **visual impacts** from the alternative Industrial Park site would be adverse and non-significant. It would have scenic impacts of moderate magnitude, long-term duration, and medium or localized extent, and have a high probability of occurring.

The overall rating for impacts on long-term **traffic** congestion from the alternative site would be non-significant and adverse. Construction-related impacts on traffic would be of moderate magnitude, medium-term duration, and small extent, and have a probable likelihood of occurring. According to Montana Department of Transportation criteria, short-term construction-related impacts would be significantly adverse; a mitigation plan would be developed to minimize these impacts. Over the long term, during operation of the proposed SME power plant, impacts on road, rail and air transportation would be generally negligible.

Overall rating for impacts on **farmland and land use** at the Industrial Park site would be adverse and non-significant, but with some potential for the impacts to become significant. Construction of a power plant at this site would involve the direct conversion of agricultural lands to an industrialized facility with supporting infrastructure. No homesteads or residences would be moved. In the context of the amount of quality farmland in other areas of Cascade County, the impact of converting farmland to developed land required for the plant would be of minor magnitude, long-term (permanent) duration, and medium extent, and have a probable likelihood of occurring. Overall rating for impacts on land use from the construction phase of the power plant would be adverse and non-significant. Operation of the power plant at the alternative site would cause no additional direct impacts to land use or farmland. Indirectly, however, the greater proximity of residential areas and other businesses to the Industrial Park site could potentially create more land use conflicts than at the Salem site. Development of the Industrial Park site may reduce market values of nearby agricultural or residential land, affecting sales of those lands. Property values are less likely to be affected, but if they are reduced then there would be repercussions on land assessments and property taxes.

The overall rating for impacts on **waste management** from the operational phase of the power plant at the alternative site would be adverse; while impacts might likely be non-significant, there is some potential for impacts to become significant. Construction-related impacts on waste management would be of minor magnitude, medium-term duration, and small extent, and have a probable likelihood of occurring. All non-hazardous waste generated during operation of the power plant, including ash, would be disposed of at the High Plains Sanitary Landfill and Recycle Center north of Great Falls. Operation-related impacts on waste management for the Industrial Park site would be of minor to moderate magnitude, long-term duration, and small extent, and have a probable likelihood of occurring.

Overall **health and safety** impacts of building and operating the power plant at the alternative site would be adverse most likely non-significant. Construction-related impacts at the Industrial

Park site would be of minor magnitude, medium-term duration, and small extent, and have a probable likelihood of occurring. Operation-related impacts on human health and safety for this site would be of minor magnitude, long-term duration, and medium extent, and have a probable likelihood of occurring.

Construction of the SME power plant at the Industrial Park site would have a moderately beneficial effect on the **socioeconomic environment** of the local and regional area, including increases in employment opportunities, total purchases of goods and services, and an increase in the tax base. During the long term operation of the power plant, it would yield beneficial and potentially significant socio-economic impacts on aggregate income, employment, and population in Great Falls and Cascade County. The power plant would also provide reliable electricity at reduced rates for SME's customer base.

This alternative's overall impacts related to **environmental justice and protection of children** would be adverse but non-significant. There is some potential of a slightly increased risk of impacting children and persons living in poverty from this site, due to the fact that it is located in closer proximity to higher population areas and additional industrial sites. These impacts are judged to be of minor magnitude, long-term duration, and medium extent, and have an improbable likelihood of occurring.

Agencies' Preferred Alternative

USDA Rural Development's and DEQ's preferred alternative is the Proposed Action – the Highwood Generating Station at the Salem site.

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HIGHWOOD GENERATING STATION
Final Environmental Impact Statement

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Volume II – Appendices (under separate cover)

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1.0 INTRODUCTION

This chapter explains what this document is, who prepared it, and why. This chapter also explains the need for electrical power that Southern Montana Electric seeks to satisfy by building a coal-fired power plant and installing four wind turbines. Chapter 2 describes that proposed action along with alternative courses of action considered for meeting the identified purpose and need. Chapter 3 then describes the affected environment of the proposed action and two alternatives. Chapter 4 assesses the potential environmental impacts of the proposed action and alternatives while Chapter 5 considers possible cumulative impacts. This Environmental Impact Statement (EIS) also includes several appendices.

In response to public comments, RUS and DEQ have made several minor changes in Chapter 1 summarized in the italicized bullets below. Any additions or changed text in the Final EIS (FEIS) from the Draft EIS (DEIS) as a result of public comments are shown in double underlining. Deletions are not shown. The main changes in Chapter 1 are:

- *Montana Department of Transportation has been added to Section 1.2, Key Agency Roles, Responsibilities, and Decisions.*
- *A description of public participation during the DEIS comment period and a summary of changes made to the FEIS as a result of this participation has been added.*
- *A description of forthcoming opportunities for public participation has been updated.*

1.1 THE PROPOSED ACTION

The Southern Montana Electric Generation and Transmission Cooperative, Inc. (SME) proposes to build a 250-megawatt (MW) coal-fired power plant and 6 MW of wind generation at a site near Great Falls, MT. This EIS discusses this Proposed Action and analyzes the potential effects that SME's action could have on the environment.

SME is based in Billings, Montana. As an Electric Generation and Transmission Cooperative, it is a non-profit utility owned by its members. As such, it provides wholesale electricity and related services to five electric distribution cooperatives and one municipal utility. The SME member systems are:

- Beartooth Electric Cooperative, Inc., headquartered in Red Lodge, Montana.
- Fergus Electric Cooperative, Inc., headquartered in Lewistown, Montana.
- Mid-Yellowstone Electric Cooperative, Inc., headquartered in Hysham, Montana.
- Tongue River Electric Cooperative, Inc., headquartered in Ashland, Montana.
- Yellowstone Valley Electric Cooperative, Inc., with headquarters at Huntley, Montana.
- Electric City Power, Great Falls, Montana.

SME's 58,000-square mile (150,220-square kilometer) service area encompasses 22 counties in two states – Montana (Figure 1-1) and a very small area of Wyoming. SME's total electric load requirement consists of the combined system needs of the five electric distribution cooperative members and one municipal utility. Under its charter, SME is required to meet the electric power needs of the member systems it serves. As the next section discusses, SME does not have the capacity to meet all of its members' power needs beyond roughly 2010. After considering various ways to meet those future needs (see Section 1.2), SME identified the construction of a new coal-fired power plant supplemented with four wind turbines as its best course of action to meet the electric energy and related service needs of up to approximately 120,000 Montanans upon completion.

1.2 KEY AGENCY ROLES, RESPONSIBILITIES AND DECISIONS

1.2.1 USDA RURAL DEVELOPMENT, UTILITIES PROGRAMS

SME has applied for a loan guarantee for generation and transmission (G & T) borrowers' lending to construct this facility from the Rural Utilities Service (RUS). The Federal Financing Bank (FFB) provides the actual loan dollars and RUS guarantees the repayment of the money to FFB. RUS is an agency which administers the U.S. Department of Agriculture's Rural Development Utilities Programs (USDA Rural Development (RD)).

Under the authority of the Rural Electrification Act of 1936, RD Electric Programs makes direct loans and loan guarantees to electric utilities to serve customers in rural areas. Among other things, these loans and loan guarantees finance the construction of electric distribution, transmission, and generation facilities, as well as demand side management, energy conservation programs, and on-grid and off-grid renewable energy systems. Loans are made to corporations, states, territories and subdivisions and agencies such as municipalities, citizen utility districts, and cooperatives, nonprofit, limited-dividend, or mutual associations that provide retail electric service needs to rural areas or supply the power needs of distribution borrowers in rural areas.

RD has established procedures for determining if proposed projects for which loans are sought are feasible both from an engineering and financial perspective. As part of the loan application process and prior to preparing this EIS, SME was required to prepare three studies: an Alternative Evaluation Study, a Siting Study, and a Macro-Corridor Study (7 CFR 1794.51(c)). These studies were available to the public prior to the scoping meetings held in Great Falls.

Subject to the completion of all environmental review requirements and loan requirements, RD's decision on this proposal is whether to finance the proposal.

1.2.2 U.S. ARMY CORPS OF ENGINEERS

SME's proposal to install an intake structure and pipe in Morony Pool in the Missouri River will require a permit under Section 10 of the Rivers and Harbors Act. The Corps is the permitting authority for the installation of any structure or work on, over, under or affecting navigable waters. SME has submitted a Section 10 permit application to the Corps for its Proposed Action.

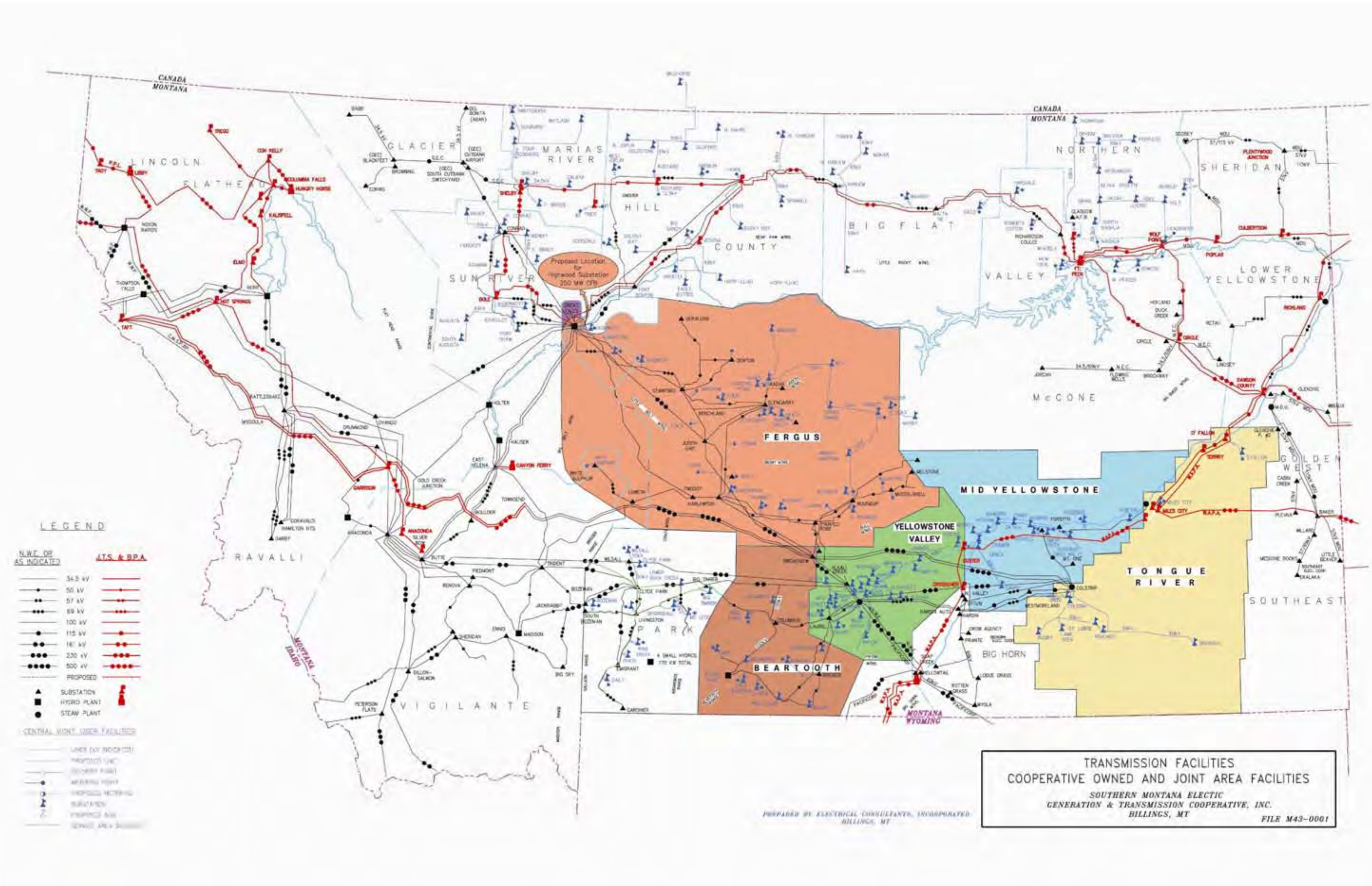


Figure 1-1. Southern Montana Electric (SME) Generation and Transmission Cooperative Service Area in Montana

1.2.3 NATIONAL PARK SERVICE (NPS)

NPS administers the National Historic Landmark (NHL) program and the Lewis and Clark National Historic Trail. The proposed site is in the vicinity of the Great Falls Portage NHL.

1.2.4 MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ)

The Montana legislature has passed statutes defining the requirements for construction and operation of a transmission line, discharge of process and storm waters, discharge of emissions, storage of hazardous and solid wastes, and development and operation of public water supply and sewer systems. The DEQ is required to evaluate the permit, certificate, and license applications submitted by SME under the following major laws and regulations:

- The **Montana Environmental Policy Act (MEPA)** (75-1-101 *et seq.*, MCA and ARM 17.4.601 *et seq.*) requires an environmental review when making decisions or planning activities that may impact the environment. The MEPA and regulations define the process to be followed when preparing an environmental assessment (EA) and an EIS.

- The **Montana Clean Air Act** (75-2-101 *et seq.*, MCA) requires a permit for the construction, installation, and operation of equipment or facilities that may cause or contribute to air pollution.

- The **Montana Water Quality Act** (75-5-101 *et seq.*, MCA) regulates the discharge of pollutants into state waters through the adoption of water quality standards and the permit application process. Water quality standards specify what changes in water quality are allowed during the use of state waters and establish a basis for wastewater and storm water discharge permitting. This act also includes the provisions for short-term waivers for turbidity during construction and Section 401 Certification.

- The **Montana Solid Waste Management Act** (75-10-201 *et seq.*, MCA) regulates the disposal of solid wastes. A license is required to construct a landfill. On-site disposal of fly ash from power plants is excluded from this requirement; however, SME has voluntarily agreed to meeet landfill standards for the proposed on-site fly ash monofill.

1.2.5 MONTANA DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION (DNRC)

The Montana Department of Natural Resources and Conservation (DNRC) administers several statutes and regulations that may pertain to SME's proposed HGS and related facilities, such as the electrical transmission and raw water lines:

- The Montana Water Use Act (85-2-101 *et seq.*, MCA) regulates the issuance of new appropriations of water and changes to existing water rights.

- The Montana Floodplain and Floodway Management Act (76-5-401 through 406, MCA) requires a permit for new construction within a designated l00-year floodplain.

- The Conservation Districts Bureau of DNRC administers the Montana Natural Streambed and Land Preservation Act (75-7-101 *et seq.,* MCA). Any non-governmental entity that proposes to work in or near a perennially flowing stream on public or private land in which any activity may physically alter or modify the bed or banks requires a 310 permit.

- A Montana land-use license or easement on navigable waters is required for any project on lands below the low water mark of navigable waters.

The DNRC will decide on authorizing a change in point of diversion and place of use for the existing water reservation of the City of Great Falls. DNRC may deny an application to change a water right if the applicant does not meet the criteria under 85-2-402, MCA. Other DNRC or delegated agency decisions include need for a Floodplain Development Permit and a decision on a 310 Permit.

1.2.6 MONTANA STATE HISTORIC PRESERVATION OFFICE

The State Historic Preservation Office (SHPO) cooperates with and advises federal and state agencies when a proposed project could affect potentially significant historical, archaeological, or other cultural resources. The SHPO provides federal agencies with site value recommendations for cultural resources eligible for the National Register for Historic Places. If approved, the lead agencies would oversee compliance with historic preservation and monitoring plans.

1.2.7 MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS

The Montana Department of Fish, Wildlife and Parks (FWP) is responsible for the use, enjoyment, and scientific study of the fish in the Missouri River and other project area watercourses. FWP also administers the Stream Protection Act, and cooperates with the DEQ in water quality protection.

1.2.8 MONTANA DEPARTMENT OF TRANSPORTATION

The Montana Department of Transportation (MDT) has jurisdictional authority for issuing encroachment and occupancy permits for pipelines, rail lines or utilities (overhead and underground) within State Highway right of way. In addition, MDT has authority for issuing approach permits for roads and approaches that directly access State maintained right of way. Finally, MDT must review and approve any proposed modifications to the Federal-aid eligible highway system. As per MCA 60-2-111, the Montana Transportation Commission must let all contracts on the Federal-aid eligible highway system, or delegate authority to let contracts on this system to MDT or a local government agency.

SME has initiated discussions with MDT regarding permit requirements and development of a traffic mitigation plan. MDT would require that the necessary permits and mitigation plan be completed prior to any construction.

1.3 NEPA AND MEPA PROCESSES

USDA must comply with the National Environmental Policy Act (NEPA) of 1969 (42 United States Code (USC) 4321 et seq.) and its implementing regulations from the Council on Environmental Quality (40 Code of Federal Regulations (CFR) 1500-1508), and from USDA's Rural Utilities Service's Environmental Policies and Procedures (7CFR 1794).

In cases such as this, NEPA requires that the responsible agency:

- identify the purpose and need to be met;
- identify the available courses of action to meet that need, including no action;
- identify, evaluate and compare the impacts on the environment that could arise from each of the reasonable alternatives;
- publish this information in an EIS for review by the public and other agencies;
- consider the impacts, ways to lessen or avoid them, and public and agency comments, before making its decision on the proposal.

Under Montana's MEPA (Title 75, Chapter 1, MCA), a state law very similar to NEPA, DEQ must conduct an environmental impact analysis before deciding about issuing the discharge and emissions permits SME's power plant would need. In addition to the above NEPA requirements, MEPA requires DEQ to:

- list and describe the responsibilities of federal, state, and local agencies that have jurisdiction over some aspect of the Proposed Action;
- describe potential growth-inducing or growth-inhibiting impacts;
- describe the economic and environmental benefits and costs of the Proposed Action;
- describe the relationship between local short-term uses of man's environment and the effect on maintenance and enhancement of the long-term productivity of the environment;
- evaluate the effects of regulatory restrictions on private property.

Because of the similarity of NEPA and MEPA and their joint need to prepare EISs, USDA and DEQ have decided to jointly prepare and issue this EIS to meet the needs of both agencies and the requirements of both NEPA and MEPA. USDA and DEQ selected an independent contractor with no ties to Southern Montana Electric, and directed the contractor's preparation of this EIS, in accordance with RD regulations.

ABOUT ENVIRONMENTAL IMPACT STATEMENTS

An EIS is intended to help agencies make environmentally well-informed decisions about major actions. It focuses on providing the specific information – on the proposed action, alternatives, and impacts – that is relevant to the agency's decision making.

The EIS answers major questions such as:

- What is the need to be met?
- In what ways could the need be addressed?
- How would these courses of action affect the environment?
- What could be done about those effects?
- What do others think about these alternatives and their impacts?

Preparing an EIS involves several steps, including a "scoping" process at the outset. In scoping, the responsible agency asks other agencies, organizations and the public for input concerning the planned EIS. Later, when the EIS is published as a draft, the agency again invites outside comments, which are reflected in the final EIS, which is published prior to the agency's making a decision. The public may again comment on the final EIS under NEPA.

1.4 PURPOSE, NEED FOR, AND BENEFIT OF THE ACTION

At present, SME meets all of its requirements to provide power to its member systems by purchasing power from two Federal power suppliers. However, its major supplier will end its sales of power to SME by 2011. This forces SME to seek a way to close the large projected gap between the amount of power it can provide to its member systems and the amount of power those member systems need to supply their residential, commercial and industrial customers.

It should be noted that the RD application covers the financing needs of the five cooperative members of SME, representing approximately 75 percent or 185 MW of the total projected load needs of only SME (Table 1-1). Electric City Power (a Montana non-profit corporation formed by the City of Great Falls to provide electric service to its customers), representing approximately 25 percent or 65 MW of the load needs of SME, is financing its share of the facility through issuance of revenue bonds (RW Beck, 2004). While the RD loan will cover approximately 75 percent of the cost of the facility, this joint EIS evaluates the purpose and need and environmental impacts associated with the entire 250-MW facility, particularly since NEPA and MEPA require evaluation of the entire project.

Currently, approximately 20 percent or 20 MW of the cooperative member systems' wholesale supply requirements are met through a power purchase agreement with the Federal Western Area Power Administration (WAPA). The remaining 80 percent or about 100 MW is met by purchase from the Bonneville Power Administration (BPA) under an "all supplemental requirements" contract effective from 2000-2017. The wholesale power requirements of Electric City Power are met with purchases from PPL Montana that will expire in 2011.

A provision of SME's power purchase agreement with BPA allows "recall" of a portion of SME's purchase rights beginning in 2008, and the remaining power purchase rights of the contract by 2011. BPA has now exercised this provision because it has determined that the load requirements of the region which it has a statutory requirement to serve will have needs in excess of its current generating capacity. Under the laws governing BPA, SME is an "extra-regional" customer because it is located east of the continental divide.

SME has unsuccessfully sought to persuade BPA to reconsider its decision. SME will experience an approximate 50 MW reduction in its power purchase rights with BPA in 2008 (SME, 2004a). After 2011, when SME's power purchase rights with BPA will fully expire, SME will lose approximately 160 MW of power supply.

ELECTRICAL UNITS

Watt: A watt is a measure of power, or the rate at which work is done. One watt equals one joule (a unit of energy) per second. Another measure of power is horsepower, with 1 horsepower theoretically equal to 746 watts.

Kilowatt (KW): 1 thousand watts

Megawatt (MW): 1 million watts

Megawatt-hour (MWh): A megawatt-hour is a measure of the total amount of energy delivered, or used. One megawatt hour is a power of one megawatt used for one hour.

Table 1-1. SME's Cooperative Member Systems Requirements: Peak Demand in MW, 2004-2018[8]

Year	Estimated System Peak[1]	WAPA[2]	Wind or EPP[3]	Option 1 less WAPA[4]	System Peak 2003 L.F.[5]	Option 2 less WAPA[6]	BPA Residual	Max. Required[7]
2004	106	20	1	85	110	89		0
2005	132	20	1	111	136	115		0
2006	136	20	1	115	140	119		0
2007	145	20	1	124	149	128		0
2008	154	20	1	133	159	138	93	45
2009	165	20	1	144	170	149	33	116
2010	168	20	1	147	174	153	31	122
2011	172	20	1	151	177	156	29	127
2012	175	20	1	154	181	160	0	160
2013	179	20	1	158	185	164	0	164
2014	183	20	1	162	189	168	0	168
2015	187	20	1	166	193	172	0	172
2016	191	20	1	170	197	176	0	176
2017	195	20	1	174	201	180	0	180
2018	199	20	1	178	205	184	0	184

Source: SME, 2004d

[1] Estimated System Peak calculated by using the estimated usage in kWh and the Average System Load Factor for the period 2001 through 2004

[2] Unadjusted

[3] Environmentally Preferred Product

[4] Peak demand projection based on average system load factor for period 2001-2004 less Western Area Power Administration (WAPA) and EPP. Option 1 represents the estimated peak demand for the cooperative member systems calculated by using the average system load factor for the period 2001 through 2004 less the residual power purchase rights from the WAPA.

[5] Annual system load factor for 2003. This column shows the estimated peak system requirements prior to subtracting the residual power purchase rights from the WAPA. As was stated in the Load Forecast, SME's ability to make purchases from the WAPA has been (and will continue to be) reduced from time to time unilaterally by WAPA. Based on this demonstrated pattern – in fact SME's purchase rights were reduced slightly beginning January 2006 – SME needs to keep in mind it could lose entirely its right to make purchases from WAPA. This column represents an estimate of SME's peak demand requirements if WAPA was to completely remove SME's purchase rights. SME also needs to recognize that there have been efforts in the past to sell the Power Management Authorities and that it could happen again.

[6] Peak demand projection based on annual system load factor for 2003 less WAPA and EPP. Option 2 represents the estimated peak demand calculated by using only the system load factor for the year 2003 less the residual purchase right from WAPA.

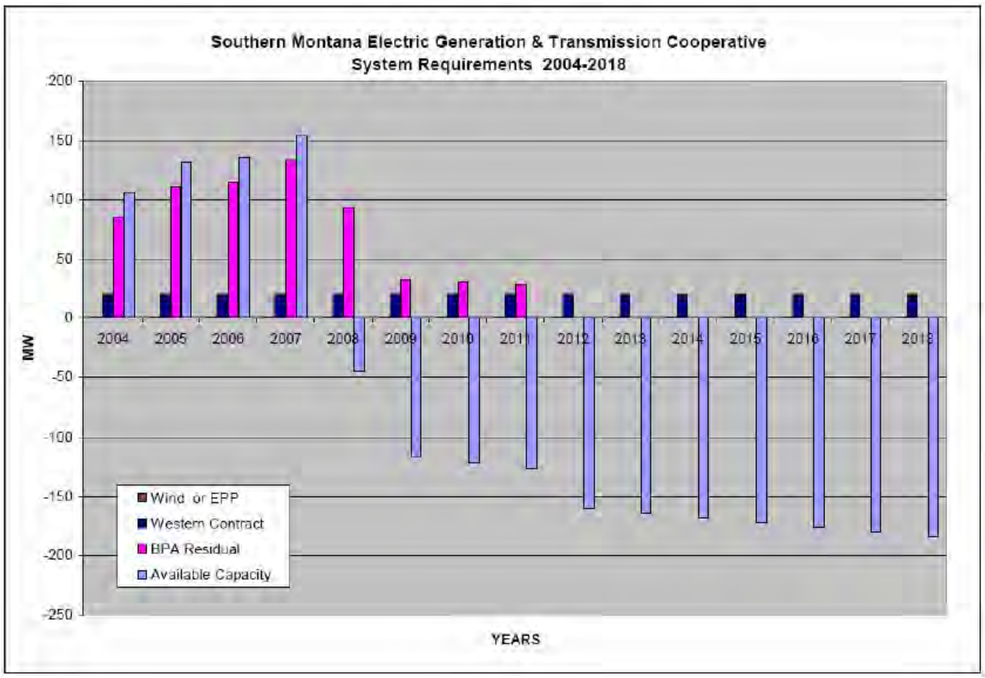
[7] Maximum requirement represents total demand requirement less residual BPA purchase rights

[8] Options 1 and 2 were developed to demonstrate an improvement in member system load factor and the impact that effort had on projected capacity requirements. Option 2 was ultimately selected as the preferred option because it was believed to more accurately represent the anticipated load factor over an acceptable planning horizon as manifested in peak demand for SME. Their member systems have focused on improving their load factors and it was determined that the load factor for 2003 would more accurately represent an anticipated load factor for planning purposes. Option 1 was left in to simply demonstrate that more than one option was considered in the context of the planning process.

The demand for power from SME is projected to increase over the course of the next several years. SME's cooperative member systems project an increase in electric power demand to approximately 180 MW by 2017 (Table 1-1). Therefore, the160 MW that will no longer be available from BPA will clearly cause a major shortfall, as will the expiration of SME's contracts with PPL Montana on behalf of Electric City Power for approximately 65 MW. Moreover, SME's only other power supplier, WAPA, also has the contractual right to reduce its supply to SME, and has made reductions in the past.

SME faces an imminent wholesale power supply shortfall of major proportions. Figure 1-2 depicts this deficit graphically. While this deficit will have to be made up in the next few years by purchasing power from other sources, SME seeks a lower cost solution for the long term that will ensure its ability to provide affordable, reliable, quality electric energy and related services to its six member systems.

Figure 1-2. Upcoming Capacity Deficit Faced by SME's Cooperative Member Systems



Source: SME, 2004a

1.4.1 ESTIMATED ELECTRIC LOADS OF COOPERATIVE MEMBER SYSTEMS

This section explains how much electric power SME projects it will need to provide to its member customers, and shows that the demand will be increasing at the same time that SME's power supply will be decreasing.

SME must provide power to its member cooperatives, which have no power supplies other than what they obtain from SME. In the next several decades, SME projects that its electric load will in fact increase. This will be primarily due to increases in residential customers (which includes both urban and farm customers), and in commercial and industrial customers. There are also several minor contributors to system load, including irrigation, water treatment facilities, street and highway lighting, public schools and municipal buildings. SME used historic usage served as the primary tool for load forecasting (SME, 2004a).

1.4.1.1 Residential

The demand for electricity for residential customers is expected to increase for several reasons: increasing population and increasing use of electricity per household.

Historically, residential loads have accounted for approximately 67 percent of projected total sales made by SME to its member cooperatives. The number of residential customers served by the member systems of SME has been increasing at an annual rate of approximately 1.75 percent over the last 10 years, with most of this growth due to residential subdivisions being developed on the peripheral edges of Billings, Montana in Yellowstone Valley Electric Cooperative's service territory. The annual growth rate in the number of residential customers ranges widely among SME's member cooperatives – from less than 0.5 percent in Mid-Yellowstone Electric Cooperative's service territory to approximately 4 percent in Yellowstone Valley Electric Cooperative's service territory (SME, 2004a).

SME projects a system increase in residential customers of approximately 2.5 percent annually over the next 20 years. The main factor behind this increase will be the continued expansion of the City of Billings into the area served by Yellowstone Valley Electric Cooperative. SME also anticipates additional growth in the residential customer segment of the member systems it serves in some of the more attractive rural locations in close proximity to areas known to offer recreational and "quality" lifestyle opportunities. As a general rule where there is a combination of "trees, scenery and water" there will be population growth in Montana and the Rocky Mountain West generally. If these qualities are absent there is little or no growth (SME, 2004a).

The average amount of electricity used per residential customer is expected to remain relatively constant to increasing slightly over the course of the next 20 years. Factors influencing individual residential customer use of electricity are the following:

- Steady to a moderate decrease in electricity use for household heating, due to more efficient heating appliances.
- Increased use of air conditioning
- Steady to a moderate decrease in electricity use for water heating due to more efficient water heaters.
- More efficient refrigerators and freezers
- More efficient lighting
- Increased electricity use by "farm customers," resulting from an increase in farm size and enhanced mechanization.

In addition to traditional load growth, SME anticipates a continued increase in the use of air conditioning and a reduction in the number of homes selecting natural gas as a home heating fuel. Recent and expected future increases in the price of natural gas have seriously undercut the economic advantage natural gas previously enjoyed as the fuel of choice for home heating purposes. In fact, if the rapid increase in the price of natural gas continues, while electric prices remain stable or increase at a more gradual pace, there may be an increase in the number of homes using electric heat. This increase in the use of electric heat would most likely come in the form of high-efficiency, electric heat pumps, which offer the added advantage of air conditioning (SME, 2004a).

Taking into account the above projected changes in the total number of residential customers and the mean electricity consumption per customer, total electricity sales to SME's residential customers are projected to increase 3.3 percent per year over the next 10 years. Once the already planned developments in the Billings, Montana and Clark, Wyoming areas are built, SME anticipates the surge in growth will subside. Future load growth is expected to return to more traditional levels (SME, 2004d).

Due to increased industrial activity currently underway in Fergus Electric's service territory and planned methane gas development in Tongue River Electric's service territory, the residential customer load is expected to decline from 67 percent to approximately 56 percent of SME's service obligation for the period 2003-2018. The bulk of that shift is expected in the period 2003-2008.

1.4.1.2 Commercial and Industrial

SME partitions its commercial and industrial customers into "small commercial" and "large commercial" classifications. The small commercial customer classification includes restaurants, retail stores, "cottage industries," and small manufacturing facilities. Large commercial customers are mostly larger manufacturing facilities, industrial sites and facilities with sizable motor loads such as compressor stations. The number of small commercial and industrial customers is projected to increase by 1.5 percent per year over the next 20 years. For the period 2003-2018, SME anticipates a 1.7 percent annual increase in the wholesale energy requirements of the member systems' small commercial loads (restaurants, retail stores, "cottage industries," and small manufacturing facilities). This increase would be in line with projected growth in the region for petroleum product extraction and the continued growth in the development of the methane gas wells in southeastern Montana in Tongue River's service area.

If the efforts now being undertaken by local governmental agencies like the City of Great Falls are successful in encouraging industrial development and strong regional economic growth, the projected increases in the load requirements of the member systems for small commercial and industrial customers would need to be adjusted upward accordingly. For the purpose of this needs analysis, a more conservative approach has been taken in projecting the future load requirements of the small commercial and industrial customer sector. In order for a load to be considered in the context of this analysis, there must be considerable assurance that the load is likely to develop.

Although SME does not expect a dramatic increase in the consumption rates of small commercial and industrial users of electricity on a per customer basis, it does anticipate a significant increase in the overall requirements of these customer classes. This increase has been the result of two large pumping stations on Fergus Electric's system and the expected growth in the coal bed methane gas industry in Tongue River Electric's service area located in close proximity to the Powder River Basin (PRB) coal fields. Fergus Electric received a deposit to construct these two pumping stations, which serve approximately 16,000 horsepower of new load. The impact of the installation of this large pumping load, in conjunction with ongoing methane gas development, represents a projected increase in sales to the large commercial segment of SME's load base of approximately 40 percent over the 2003-2008 time frame.

Tongue River Electric Cooperative projects the development of the methane gas industry to result in an additional large commercial load requirement of 3,000 horsepower in 2007, 3,000 horsepower in 2008 and 4,000 horsepower in 2009. This methane gas load development in Montana reflects the established trend in other nearby regions such as northern Wyoming. The near future is likely to bring further natural gas development in the Rocky Mountain States. Based on assessments conducted between 1987 and 1999 by the U.S. Department of Energy (DOE) and the U.S. Geological Survey (USGS), DOE concludes that the Rocky Mountain States in general possess "enormous" volumes of natural gas, almost 7,000 trillion cubic feet (Tcf), although only a small fraction is technically recoverable (DOE, 2003a). One Tcf is enough natural gas to heat 15 million homes for one year. Five Rocky Mountain States (Colorado, New Mexico, Utah, Wyoming and Montana) now account for 27 percent of proved natural gas reserves; in 2001, Montana accounted for 1 Tcf of the 5-state total of 65 Tcf proved reserves (combined total dry gas/coal bed natural gas) (DOE, 2003a).

SME estimates the total increase in the load requirements of Tongue River's large industrial class to be approximately 10,000 horsepower, or an increase to SME of approximately 25 percent over 2004 requirements. This projection was rather conservative when compared to the actual growth and future projections made by neighboring utilities experiencing similar industrial activity. At one point, Powder River Energy just across the border in Wyoming was predicting its methane gas load at approximately 300 MW, 30 times greater than Tongue River's projection.

These projected increases in the load requirements of large industrial consumers will contribute substantially to the increase in SME's wholesale power requirements up to 2013. Large industrial customer load ("large commercial" in Figure 1-3) is expected to increase on average approximately 15 percent annually up to 2016. For the period 2013-2018 projected load growth will have almost leveled off to a rate of less than one percent annually. Without the increased load associated with the above two predicted activities, SME would have anticipated a more modest growth rate of approximately 3 percent over the 2003-2009 period.

LOAD FACTOR

Figure 1-3 is a graph depicting projected growth in SME's member systems' electrical energy requirements by sector. It includes minor sectors such as irrigation, street lighting, and public authorities, which are projected to remain relatively stable or flat over the coming two decades. The units in Figure 1-3 are Megawatt-hours (MWh). A problem inherent to developing a load forecast is making the transition back and forth between MWh and MW. Electric generation capacity is expressed in terms of megawatts. The relationship between megawatt-hours and megawatts of capacity is a variable dependency known as "load factor." Thus, there is not a direct correlation between generation capacity and total energy consumption over a prescribed number of hours because loads are cyclical in nature.

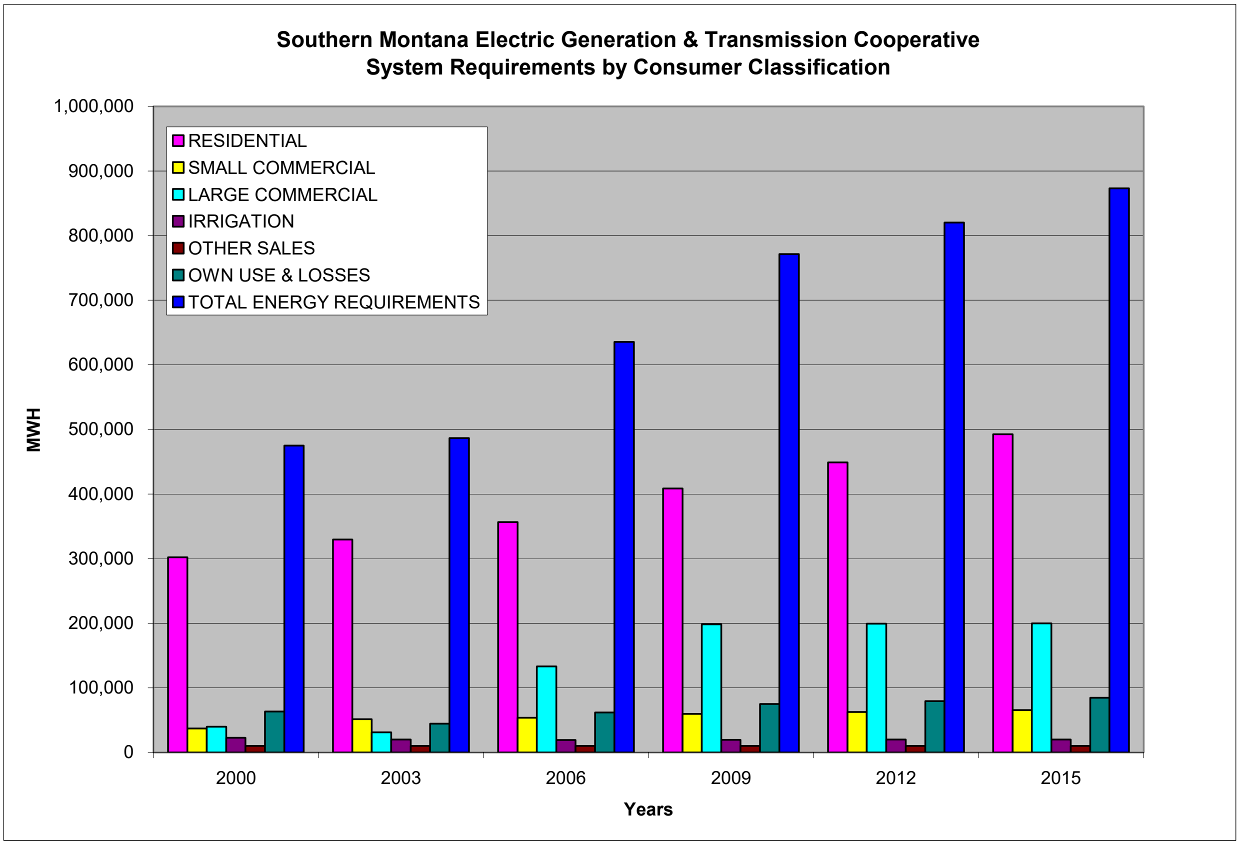
1.4.2 POWER SUPPLY

1.4.2.1 Generating-Capacity Mix

The most economical means of supplying the cyclical load on an electric power system is to have three basic types of generating capacity available:

a. Base load capacity
b. Intermediate load range capacity
c. Peaking capacity

Figure 1-3. SME Cooperative Member System Requirements by Customer Classification Through 2015



Base load capacity operates near its full rating continuously, day and night, all year long. It is economical to design these units with a maximum of fuel-economizing features, highest practical steam temperatures and pressures, extensive use of regenerative boiler-feed water heaters, reheat and double-reheat boiler-turbine arrangements, and large condensers with minimum-temperature cooling water. These items increase the cost of the plant but are justifiable because the fuel-cost saving is large due to the large amount of power produced by having the unit run continuously.

The design of the plant is optimized to obtain the balance between high first cost and low fuel cost that will give the lowest overall power cost under the assumption that the unit will be heavily loaded for many years. The best design will vary depending on the unit size, money costs, and fuel type and cost. Base load units are generally the newest, largest, and most efficient of the three types of units (EIA, 2005b).

Peaking capacity is operated only during daily peak-load periods during the seasonal peak times of the year and during emergencies. Because the total annual output is low, high efficiency is not as necessary as for base load units. Low first cost is of prime importance. Combustion turbines and pumped-storage hydro units are the typical peaking units (SME, 2004a).

Intermediate load range capacity fits between the base load capacity and peaking capacity in both first cost and fuel cost. It generally is designed to be "cycled", that is, turned off regularly at night or on weekends and loaded up and down rapidly during the time it is on the line to accommodate the load swings on the system. In other words, intermediate-load units are used during the transition between base load and peak load requirements. Some additional cost is required to allow for repeated starts and stops without equipment damage or the need for larger operating staffs. However, owing to the lower annual production, some reduction in efficiency is justified. Older small base load units and hydro units with restrictions on water use are sometimes used for intermediate and peaking service (SME, 2004a).

As earlier indicated in Section 1.4 above (Purpose, Need for, and Benefit of the Action), SME does not own base load generation and currently meets approximately 80 percent of its cooperative members' wholesale electric energy supply requirements with a power purchase agreement with BPA and the remaining 20 percent through a power purchase agreement with WAPA. By 2011, SME's power purchase rights with BPA will fully terminate, leaving SME with an approximate shortfall of 160 MW. At that time SME will still have residual power purchase rights with WAPA of approximately 20 MW. As noted, WAPA could reduce this power purchase right for a number of reasons. If the WAPA power purchase agreement were to be completely withdrawn, SME would have a projected requirement of approximately 160 MW in 2008, escalating to approximately 180 MW by 2012. Further, Electric City Power of the City of Great Falls, an SME member, will have projected requirements of about 65 MW after 2011.

On the basis of the results of repeated efforts to secure affordable power purchase agreements, SME does not believe that continuing to rely solely on traditional power supply agreements is acting in the best interest of the member systems it serves. Power purchases face market volatility, transmission capacity issues, and the unwillingness of current owners of existing generation to sell the electrical output of their facilities at prices less than "what the market will bear." These represent a compelling reason for SME to seek a supply option that provides a higher level of control over its existing and future supply needs.

1.4.2.2 Natural Gas Supply, Demand and Pricing

SME conducted an extensive search in the power supply market place for a suitable source of electrical energy to meet its member system requirements with a power purchase agreement secured from an existing source of generation within the Western System Coordination Council

(WSCC). The lack of affordable generation capacity in the WSCC, combined with ever-increasing transmission constraints, has cast doubt on the future viability of purchasing capacity from existing sources of wholesale supply. The WSCC, of which SME is a member, has relied completely on very expensive natural gas-fired generation to meet future regional supply requirements. The forward price of a power purchase agreement would closely track the forward price of natural gas, which has been rising sharply in recent years (API, 2005a). With the price volatility of natural gas, plus the fact that the increasing cost of natural gas-fired generation constitutes the future marginal cost for wholesale electric energy and related supply services, the price SME would pay for power supply might be nearly double its current costs. Given this much greater cost, plus difficult or intractable related transmissions issues, negotiating an acceptable power purchase agreement does not appear to be a viable option.

As in much of the country, consumption of natural gas in the Northwestern U.S. has increased markedly since the 1970's. Not only has gas continued its traditional role as the fuel of choice for residential and commercial heating, but it also became the premier fuel for new electricity generation. Virtually all new generation built in the region was combined or simple cycle gas turbines, which were easy to locate, economical, and "environmentally friendly."

Western System Coordination Council (WSCC)

The U.S. bulk power system has evolved into three major networks or power grids. The WSCC is one of these networks. The major networks consist of extra-high-voltage connections between individual utilities designed to permit the transfer of electrical energy from one part of the network to another. These transfers may be restricted by a lack of contractual arrangements or by inadequate transmission capability. The three networks are:

- the Eastern Interconnected System,
- the Western Interconnected System (WSCC), and
- the Texas Interconnected System.

Virtually all U.S. utilities in the contiguous 48 states are interconnected with at least one other utility by these three major grids. The inter-connected utilities within each power grid coordinate operations and buy and sell power among themselves. The bulk power system makes it possible for utilities to engage in wholesale (for resale) electric power trade. Wholesale trade has historically played an important role, allowing utilities to reduce power costs, increase power supply options, and improve reliability.

– *Energy Information Administration, U.S. Department of Energy (EIA, 2005a)*

Rather than develop a more comprehensive, balanced and diversified supply portfolio, the region decided that the benefits of gas fired generation outweighed the risk associated with the inherent volatility in the price of natural gas. As the region has begun to experience in recent winters, the increased supply burden placed on natural gas has produced an unintended consequence. The price of natural gas is increasing at a troublesome rate, affecting not only the price of electricity produced by gas-fired generation, but also the cost to heat homes and businesses. This unintended consequence is most likely to have the greatest adverse affect on those that can afford it least – fixed and low-income families.

In general terms, rising natural gas prices are due to a number of factors, including:

- Strong growth in demand.
- Competing government policies that encourage use of natural gas on one hand but discourage new supplies by restricting access and development of domestic natural gas resources on the other.
- Lack of infrastructure needed to transport more natural gas to market.
- Declining productivity of older fields (API, 2005a; 2005b). Natural gas well productivity peaked at 435 thousand cubic feet (Mcf) per day in 1971 and by 2004 had declined to 126 Mcf per day (EIA, 2005c).

By 2025, nationwide demand for natural gas is expected to increase by about 40 percent (API, 2005a). Prices are expected to continue to climb and stay volatile. Current data from DOE show that the average residential price of natural gas rose from $7.38 per thousand cubic feet (mcf) in January 2002 to $14.94/mcf in January 2006 (EIA, 2005c; EIA, 2007).

1.4.3 Load and Generating Capability

1.4.3.1 Growth in Generation to Serve Load Base

At present, SME owns no base load generation and meets its wholesale power requirements through the use of power purchase agreements with BPA and WAPA. As stated above, the BPA contract begins to expire in 2008 and by 2012 the cooperative member systems will face a supply deficit of approximately 160 MW, which includes the WAPA component. Table 1-2 is a summary of SME's cooperative member systems' projected capacity requirements for the period 2004-2018. Given the unfavorable conditions of the power purchase option this table may also represent SME's need for a generation resource suitable to meet this requirement. The following information is based on the assumption that SME will continue to have the opportunity to purchase approximately 20 MW from WAPA. If the power purchase rights in WAPA's power purchase agreement were reduced, the following projections would need to be increased accordingly. If the WAPA power purchase agreement were to be completely withdrawn, SME's cooperative member systems would have a projected requirement of approximately 160 MW in 2008, escalating to approximately 180 MW by 2012.

1.4.3.2 Combined Base Load Generation and Power Purchase Option

Over the course of the past 60 years the member systems of SME have met their total wholesale power supply requirements through the use of traditional power purchase agreements. Prior to June 22, 2000, the member system supply needs were met through a combination of purchases from the former Montana Power Company (MPC) and WAPA. The member systems had a defined allocation from WAPA that satisfied approximately 20 percent of the supply requirement, with MPC meeting the remaining need under the terms and conditions of an "all supplemental power requirements contract" that expired on June 22, 2000. Since the expiration of the MPC contract, the portion of the member system requirements previously supplied by MPC has been met with purchases from BPA. As explained earlier, the BPA purchase opportunity will begin to expire in 2008 and disappear completely in 2011 (SME, 2004a).

In the wake of the Energy Policy Act passed by Congress in 1992 and the Electric Utility Industry Restructuring and Customer Choice Act passed by the Montana Legislature in 1997, MPC embarked on a process to divest itself of its generation assets. MPC's generation assets were purchased by Pennsylvania Power and Light (PPL) in 1999, removing from the regulatory process wholesale power transactions involving energy produced by these assets. With the exception of wholesale power purchases made from non-Federal Energy Regulatory Commission (FERC) regulated federal power marketing agencies such as BPA and WAPA, all wholesale power transactions in Montana today are consummated at market rates. Montana ratepayers, at both the retail and wholesale level, no longer have access to electric energy at a regulated rate for service. Except for limited purchases from BPA and WAPA, electric energy prices in Montana are "market based."

Prior to broadening its list of options to include the concept of securing an equity position in a yet to be constructed generating facility, SME made several attempts to engage in meaningful discussions with owners of existing generation facilities to secure an affordable replacement for the expiring BPA contract. The most recent effort to secure a power purchase agreement was through a Request for Proposal (RFP) issued in November 2003. Clearly, the ideal situation would have been for SME to continue meeting approximately 80 percent of its needs with purchases from BPA, but that is no longer an option.

SME and its member systems have evaluated whether to embark on a plan to build their own generation resources. Included in those deliberations is the concept of continuing to meet a portion of its energy requirements with traditional power purchase agreements. As shown in Table 1-1 above, in 2009 SME's member cooperatives would meet approximately 20 percent of their wholesale power needs with continued use of SME's allocation from WAPA and purchases from regional suppliers of an Environmentally Preferred Product (EPP) that will include wind. Based on a review of existing alternatives, it would appear that SME's best option for the near term would be to meet its wholesale power requirements with a combination of purchases from WAPA, EPP, and its portion of the production from a new source of generation. Alternatives for post-2016 requirements would remain open, allowing for the timely evaluation of newly emerging resources that would complement SME's contemplated diverse supply portfolio.

The following calculations reflect the estimated cost of a new resource that would utilize "clean coal" technology and how the cost of that resource would be priced to the members of SME. The member system rates would fully cover the cost of developing that resource through member purchases, making allowances for "off peak" sales, and reflecting revenue from the interim sale of capacity secured for future SME loads. Options 1 and 2 reflect scenarios wherein SME would meet its needs above WAPA and EPP purchases with its own base load resource. Options 3 and 4 represent the increase in cost if SME were to purchase an additional 40 MW on the market at $45 per MWh.

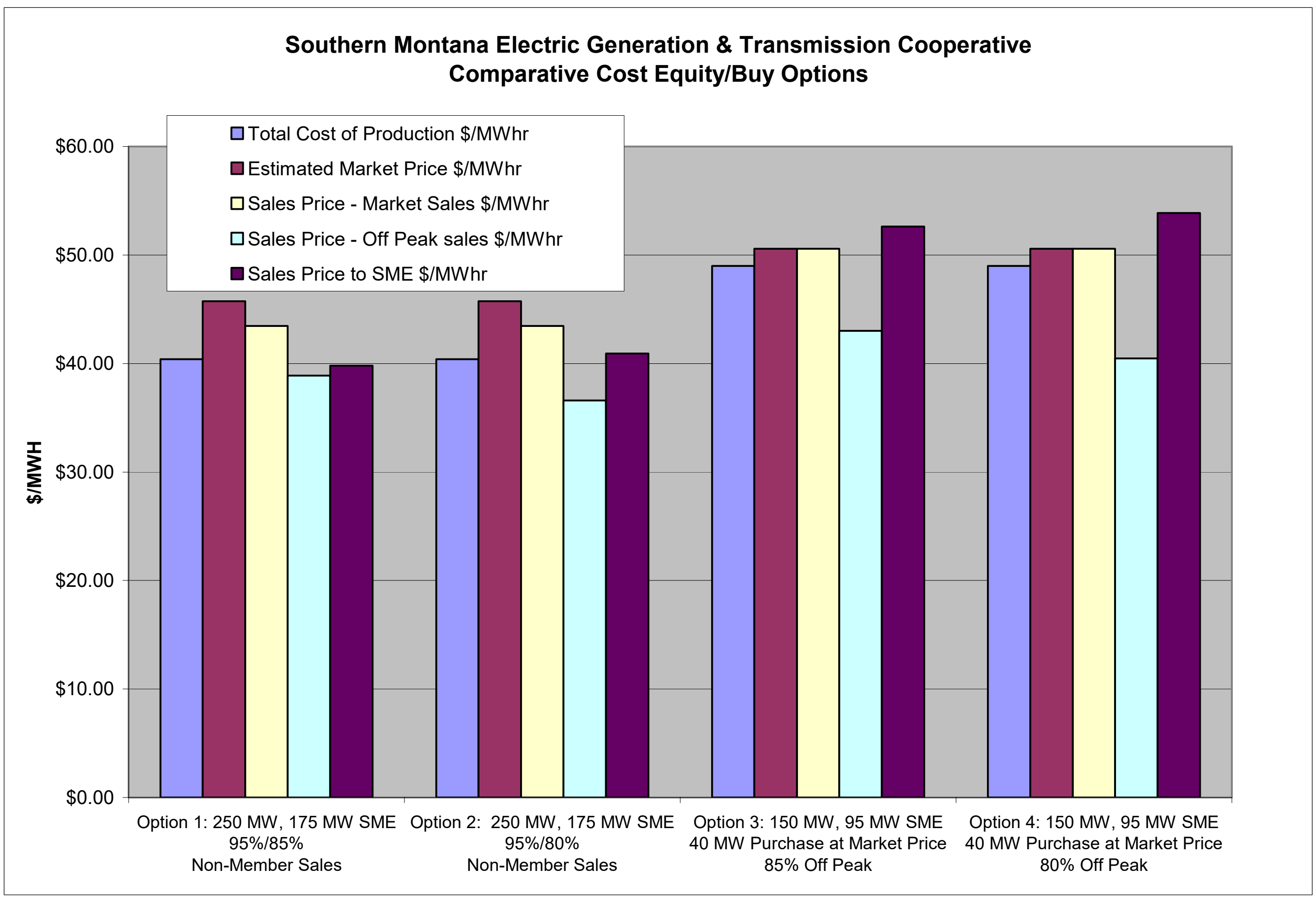
Table 1-2. SME Cooperative Member System Energy Requirements by Consumer Classification (MWH)

Southern Montana G&T	YEAR	RESIDEN-TIAL	SMALL COM-MERCIAL	LARGE COM-MERCIAL	IRRIGA-TION	OTHER SALES	TOTAL SALES	OWN USE & LOSSES	TOTAL ENERGY REQUIRE-MENTS
HI	1971	109,356	16,564	9,765	4,413	14,880	154,978	16,425	171,403
ST	1993	276,505	33,779	39,590	12,700	9,858	372,432	34,611	407,043
ORY	1998	287,688	36,349	39,471	20,577	9,957	394,042	38,435	432,477
	2003	329,497	51,270	31,077	19,944	10,001	441,789	44,737	486,526
	2004	338,229	52,105	31,600	19,294	10,042	451,268	47,749	499,018
P	2005	347,265	53,030	127,123	19,366	10,043	556,827	60,188	617,015
R	2006	356,669	53,882	133,180	19,426	10,043	573,201	61,988	635,190
O	2007	371,884	55,658	154,017	19,486	10,043	611,088	66,046	677,133
J	2008	387,576	57,475	174,864	19,548	10,043	649,508	70,149	719,657
E	2009	408,731	59,514	198,354	19,611	10,043	696,252	75,156	771,409
C	2010	421,723	60,506	198,605	19,674	10,043	710,551	76,613	787,164
T	2011	435,101	58,518	198,859	19,738	10,043	722,259	78,113	800,372
E	2012	448,876	62,550	199,117	19,804	10,043	740,389	79,653	820,042
D	2013	463,062	63,603	199,376	19,870	10,043	755,953	81,237	837,190
	2014	477,671	64,677	199,637	19,937	10,043	771,965	82,864	854,828
	2015	492,718	65,771	199,901	20,005	10,043	788,438	84,537	872,975
	2016	508,215	66,880	200,169	20,075	10,043	805,382	86,258	891,640
	2017	524,191	68,016	200,439	20,145	10,043	822,834	88,028	910,861
	2018	540,625	69,174	200,710	20,217	10,043	840,769	89,848	930,617
	YEAR	RESID.	SM COMM.	L. COMM.	IRRIG.	OTHER	T. SALES	USE & LOSS	T. REQ.
Growth Rate	1971-2003	3.72%	3.59%	3.68%	4.83%	-1.23%	3.33%	3.18%	3.31%
Historic	1993-2003	1.76%	2.10%	-1.20%	2.28%	0.07%	0.83%	1.51%	0.90%
	1998-2003	2.75%	7.12%	-4.67%	-0.62%	0.09%	2.31%	3.08%	2.38%
Growth Rate	2003-2008	3.30%	2.30%	41.27%	-0.40%	0.00%	8.01%	9.41%	8.14%
Projected	2003-2016	3.39%	2.06%	15.40%	0.05%	0.00%	4.72%	5.18%	4.77%
	2008-2013	3.62%	3.15%	2.66%	0.33%	0.00%	3.08%	2.98%	3.16%
	2013-2018	3.15%	1.69%	0.13%	0.35%	0.00%	2.15%	2.04%	2.14%
Historical									
% of Total	1971-2003	66.98%	9.21%	8.01%	3.85%	2.98%	91.04%	8.96%	100.00%
Projected									
% of Total	2004-2018	56.11%	7.84%	22.50%	2.55%	1.30%	90.29%	9.71%	100.00%

Figure 1-4 presents an analysis of the level at which the member purchases of wholesale power and related services would need to be priced in order to cover the embedded cost of developing a new generation facility. Option 1 describes a scenario in which SME would secure an equity position in a new 250-MW facility commensurate with 175 MW of the unit's total 250 MW. SME would utilize 135 MW of its entitlement to meet load, sell 40 MW of its capacity under the terms of a contract that would contemplate receiving 95 percent of a market price of $45 per MWh, and sell "off peak" energy at 85 percent of the market price of $45. In order to fully cover debt service, operation & maintenance (O&M), and related costs of ownership, under this scenario the cost for this portion of the members' requirement would need to be minimally priced at $39.79 per MWh.

Option 2 describes a scenario in which SME would secure an equity position in a new 250-MW facility commensurate with 175 MW of the unit's total 250 MW. SME would utilize 135 MW of its entitlement to meet load, sell 40 MW of its capacity under the terms of a contract that would contemplate receiving 95 percent of a market price of $45 per MWh, and sell "off-peak" energy at 80 percent of the market price of $45. In order to fully cover debt service, O&M, and related costs of ownership, under this scenario the cost for this portion of the members' requirement would need to be minimally priced at $40.92 per MWh.

Figure 1-4. Comparative Cost/Equity Buy Options



Option 3 analysis describes a scenario in which SME would secure an equity position in a new 150-MW facility commensurate with 95 MW of the unit's total 150 MW. SME would utilize 95 MW of its entitlement to meet load, purchase 40 MW of its capacity under the terms of a contract that would contemplate a market price of $45 per MWh, and sell "off peak" energy at 85 percent of the market price of $45. In order to fully cover debt service, O&M, related costs of ownership and the difference in cost for the energy purchase under this scenario the cost for this portion of the members' requirement would need to be minimally priced at $52.62 per MWh.

Option 4 describes a scenario in which SME would secure an equity position in a new 150-MW facility commensurate with 95 MW of the unit's total 150 MW. SME would utilize 95 MW of its entitlement to meet load, purchase 40 MW of its capacity under the terms of a contract that would contemplate a market price of $45 per MWh, and sell "off peak" energy at 80 percent of the market price of $45. In order to fully cover debt service, O&M, related costs of ownership and the difference in cost for the energy purchase under this scenario the cost for this portion of the members' requirement would need to be minimally priced at $53.87 per MWh.

The foregoing economic analysis demonstrates that SME's best option is to build generation capacity capable of meeting peak member system requirements, as expressed in either Option 1 or Option 2.

1.4.4 SUMMARY AND CONCLUSION

Based on SME's existing and projected capacity and energy requirements, in 2009 it will have a resource requirement or deficit of approximately 116 MW. By 2012 this deficit will grow to approximately 160 MW as the BPA power purchase agreement is phased out. Given the price volatility of natural gas and the lack of viable wholesale power purchase options, SME believes it needs to develop an alternate wholesale power supply resource. This alternate wholesale power supply resource could take the form of participating in the development of a variety of generation options to complement its ability to make limited purchases from WAPA and purveyors of an EPP like wind-generated power.

Acknowledging the difference between base load production and peak requirements, SME has concluded it would best serve the interest of its members by integrating base load capacity into its resource portfolio. Given the volatility of the regional supply market and the high cost of resorting to the open market to meet peak requirements, the likelihood of being able to offer affordable, reliable, and stable wholesale electric energy and related services is much greater if SME owns generation capacity capable of covering system peak requirements as specified in the load forecast. SME believes that the forecasted prices for market power justify resource ownership that will, at a minimum, cover member system peak requirements (PowerLytix, 2006).

Several important issues must be addressed in detail to gain a clear understanding of the total cost of resource development. Those issues include, but are not limited to, debt service, cost of operation and maintenance including fuel, operating reserves, spinning reserves, load control area services and facility dispatch. SME must ensure service in the event the proposed project ceases production on a scheduled or unscheduled basis. To that end, SME has engaged in discussions with large regional hydroelectric-based generators which have expressed significant interest in working with SME to ensure that the total output of a contemplated facility would be economically dispatched, with the participating generators sharing risk and benefits. The estimated costs in the models shown in Figure 1-4 reflect the cost of this service.

The member systems of SME have had a long history of meeting the wholesale electric service requirements of the consumers they serve with affordable electric energy and related services. However, the wholesale supply industry in this region and the country has changed, requiring the members of SME to view possible participation in this proposed project as a way for SME to serve its members with a much higher level of confidence than can be afforded by a traditional power purchase agreement – particularly in a restructured wholesale electric supply market place.

In demonstrating to RD how to best meet its power supply obligations in the face of a looming phase-out of its main existing power source, SME concluded that owning its own source of electric generation would be in the best interest of its member systems. SME proposes to construct a 250 MW coal-fired power plant near Great Falls, Montana. The Proposed Action also includes four 1.5 MW wind turbines, construction of approximately 14 miles (23 km) of transmission lines, substation facilities, raw water, potable water and wastewater pipelines, and about six miles of railroad tracks for delivery of coal to the plant, in addition to other components.

In addition to the intention to provide a reliable supply of electricity at an affordable price, the Proposed Action would furnish local employment in the Great Falls area during construction and operation. It would also provide tax benefits for Cascade County and the City of Great Falls, as well as other associated socioeconomic benefits, which are discussed in the socioeconomics section of Chapter 4.

1.5 PUBLIC PARTICIPATION

1.5.1 SCOPING PROCESS

NEPA and MEPA require agencies to invite public involvement prior to decision-making on proposed actions that may affect the environment. "Scoping" is the process of soliciting input from "stakeholders" – including Tribes, the public (both private citizens and non-governmental organizations or NGO's), and other agencies – at the outset of a NEPA/MEPA analysis. Not only may the information obtained from interested and knowledgeable parties be of value in and of itself, but the perspectives and opinions as to which issues matter the most, and how, indeed whether, the agency should proceed with a given proposed action are equally important. Input from scoping thus helps shape the direction that analysis takes helping analysts decide which issues merit consideration. Public input also helps in the development of alternatives to the proposed action, which is an integral part of NEPA and MEPA.

Figure 1-5. Open House Scoping Meeting in Great Falls Civic Center on October 13, 2004

1.5.1.1 RD Scoping

RD and DEQ conducted two separate scoping processes to solicit public input on SME's proposed power plant. Scoping by RD came first, and was carried out in the fall of 2004. RD published a Notice of Intent (NOI) to hold a public scoping meeting and prepare an EIS in the *Federal Register* on September 24, 2004. A public scoping meeting was held on October 13, 2004 at the City Civic Center in Great Falls, Montana. The public was notified of the meeting by advertisements in the local newspapers, including the *Billings Gazette* and the *Great Falls Tribune*. The scoping meeting was arranged in an open house format, featuring a series of information stations. Each station was staffed by SME representatives or their consultants; RD, DEQ, and DNRC representatives were also present. Fact sheets and other informational handouts were available, as was a comment form for attendees to complete. Based on sign-in sheets, a minimum of 74 people attended the public scoping meeting.

A total of 13 written responses containing 40 comments were received during the RD scoping comment period that ended November 15, 2004. Public comments were received in the form of direct letters mailed to SME and RD, emails, verbal comments, and completed comment forms. All written comments were entered into a spreadsheet for analysis and summary.

In addition to the public meeting, two agency scoping meetings were held, the first at DEQ offices in Helena on the afternoon of August 12, 2004, and the second at the Civic Center in Great Falls on the morning of October 12, 2004, with a site visit afterwards. Also, on October 5, 2004, RD sent a letter containing a brief project description to various federal and state agencies, followed on October 22, 2004 by copies of the Alternative Evaluation Study and Site Screening Study provided by Stanley Consultants. Agencies that responded included the federal Natural Resources Conservation Service (NRCS), U.S. Environmental Protection Agency, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, Federal Aviation Administration, Montana Department of Transportation, Montana Historical Society (Montana's SHPO), and the Lewistown Water Resources Office.

SME also held 20 or more meetings with the Great Falls City Commission, school districts, environmental groups, and individual cooperative memberships. The proposed power plant was discussed in 27 articles in local newspapers. These meetings and this media coverage occurred before, during and after the formal public scoping period.

RD issued a scoping report that summarizes the process as well as input received from the public. This summary is available at the RD website at: http://www.usda.gov/RD/water/ees/pdf/sme_RDscopingcomments.pdf .

1.5.1.2 DEQ Scoping

Supplemental to the scoping carried out by RD in the fall of 2004, DEQ conducted additional scoping in the spring of 2005 to comply with Montana procedures. The DEQ public scoping meeting was held on April 18, 2005 at the Great Falls Civic Center and the 30-day public scoping period lasted from April 6 to May 6, 2005. The public was notified of the scoping meeting and comment period by advertisements in the local newspapers, via State websites and through specific invitations. There were 45 people registered on the attendees' list at the April 18 meeting; others were present who did not sign the attendance list.

A total of 38 written responses containing 137 comments were received from the public and agencies during the scoping comment period. Comments were received in the form of direct letters mailed to DEQ, emails, and completed comment forms. All written comments were entered into a spreadsheet for analysis and summary.

DEQ also issued a report summarizing its scoping process as well as input received from the public and agencies. This summary is available at the DEQ website at: http://deq.mt.gov/eis/SME_Scoping/MDEQScopingRprtFinal.pdf .

Subsequent to both the RUS and DEQ scopings, SME has continued to meet with the Great Falls City Commission and other groups. There have also been numerous articles in local newspapers.

1.5.2 DEIS PUBLIC REVIEW AND COMMENT

The original 45-day DEIS comment period began on June 29, 2006 and was to close on August 15. However, upon request, the agencies agreed to extend the comment period by two weeks to August 30, 2006. An open house and public hearing was held in Great Falls on June 27, 2006. Again upon request, an additional hearing was held in Havre on August 7. Approximately 150 people attended the Great Falls open house and hearing and approximately 70 individuals presented testimony at the hearing. Approximately 70 people attended the Havre open house and pubic hearing, while about 40 people presented testimony.

Public comment on the DEIS took several forms: oral testimony at the public hearings, written comment in the form of emails, letters, postcards and a petition. Counting all of these forms, more than 5,000 people commented on the DEIS, though most of these consisted of signatures on postcards and petitions. More than 200 comment letters were received by RUS and DEQ. Appendix L of the FEIS contains a summary of comments and the agencies' responses.

The main changes resulting from public comments are summarized in the bullet points under each chapter below.

Chapter 2.

- *Additional information has been included on Integrated Gasification Combined Cycle (IGCC) technology.*

- *Nuclear fission has been added to the list of non-renewable alternatives considered but eliminated.*

- *Two combinations of energy sources have been added to the list of alternatives considered but eliminated.*

- *The explanation of the methodologies used in the site screening and site selection studies is further elaborated.*

- *A new section (2.1.7.4) is added which describes four additional sites in the Great Falls area that were considered and rejected during the site selection process.*

- *The description of the Proposed Action (Highwood Generating Station at the Salem site) is modified to reflect a shift in the location of the HGS in response to concerns about its potential impact on the Great Falls Portage National Historic Landmark.*

- *Certain conclusions in the impacts comparison matrix (Table 2-14) have been modified to reflect changes in the way certain impacts are characterized.*

Chapter 3.

- *Numerous minor text edits have been made.*

- *A number of maps have been modified to reflect the shift in the location of the HGS at the Salem site.*

Chapter 4.

- *Numerous minor text edits have been made.*

- *A number of maps have been modified to reflect the shift in the location of the HGS at the Salem site.*

- *Various impact ratings have been reconsidered and modified as to level of significance, in particular under the topics of Noise and Transportation, where certain impacts have now been rated as significant.*

Chapter 5.

- *Several minor text edits have been made.*

1.5.3 FORTHCOMING OPPORTUNITIES FOR PUBLIC PARTICIPATION

Upon release of the FEIS to the public for review and comment, RD will publish a notice in the *Federal Register*, and DEQ will send news releases to print and broadcast media in Great Falls, Havre, and Billings, Montana and the State website informing the public of its availability. In addition, notices will be sent via U.S. mail to individuals, NGOs and agencies which previously expressed interest in continuing to participate in public review of the proposed power plant.

The day the U.S. Environmental Protection Agency (EPA) publishes a Notice of Availability in the *Federal Register* marks the beginning of a 30-day federal comment period on the FEIS. Written comments may be submitted to RD. While agencies are not required to request comments on FEISs [40 CFR 1503.1(b)], RD will solicit comments on the FEIS, but does not intend to formally respond to these comments. However, a summary of the comments received, and any responses if warranted, will be included in the Record of Decision. DEQ does not have a comment period on FEISs.

The agencies will issue their records of decisions (RODs) either jointly or separately after RD's public comment period on the FEIS. RD will issue its decision regarding funding for 75 percent of the cost of the power plant. DEQ will issue decisions regarding SME's air quality and solid waste permit applications. The public will have the right to appeal DEQ's permit decisions to the Board of Environmental Review. Any challenges regarding the adequacy of the FEIS under NEPA or MEPA would have to be made through the federal or state court systems, respectively.

1.6 ISSUES DEVELOPMENT

1.6.1 KEY ISSUES

Significant or key issues are intended to form the basis of the NEPA/MEPA analysis. In other words, they define the scope of the analysis. Once the scope has been defined, the project benefits, purpose, and need and key issues govern the range of reasonable alternatives that will be considered in the environmental analysis. Alternatives must at least partially meet the project benefits, purpose, and need and address one or more of the key or significant issues. This section presents the key issues identified during scoping. These issues defined the scope of the NEPA/MEPA analysis and the alternatives considered. The italicized text indicates how RD and DEQ evaluated and estimated effects relative to those issues.

Issue 1: Soils and Topography

Construction would involve excavation and disturbance of soils as well as certain permanent changes to topography on whatever site is selected to build the power plant. In addition, waste management could potentially impact soils. *Effects are predicted by evaluating the extent to which the proposed action and connected actions may contribute to soil erosion and contamination.*

Issue 2: Water Resources

The proposed action would both use raw water and discharge waste water. In addition, during construction there would be potential for erosion, turbidity and sedimentation from runoff during storm events. In addition, comments from the public on water issues were received during scoping. Some of these comments expressed concern regarding pollution of water resources resulting from power plant emissions or discharges, while others related to water rights and usage, specifically the use of Great Falls water rights for the project and the usage of water in a drought condition. *Effects on water quality in the Missouri River are predicted by comparing the existing water quality conditions with characteristics of the projected discharge. Effects on water quantity/resources in the Missouri River are predicted by comparing projected withdrawals with flows in the river.* [Note that, as currently planned, the Proposed Action would not discharge waste water directly to the Missouri River, but into the City of Great Falls' waste water treatment system.]

Issue 3: Air Quality

Even though it would utilize the latest Best Available Control Technology (BACT) and be considered a state-of-the art, "clean coal" facility, and be permitted by the State of Montana, the proposed plant would emit a variety of pollutants to the air, as do all fossil fuel thermal electric generating stations. During scoping, numerous commenters expressed concerns about the potential impacts of emissions from the coal-fired plant, including mercury. *Effects on air quality are predicted using the most recent technical models such as CALPUFF developed and applied by specialists in the field and by a review of the published scientific literature on mercury emissions, transport, deposition, uptake, and toxicity.*

Issue 4: Biological Resources

During scoping, the U.S. Fish and Wildlife Service identified two federally-listed species that may potentially occur in the project area – the threatened bald eagle and the threatened Canada lynx. The Service requested RD to determine possible impacts to species of federal concern. In addition, species of concern within the State of Montana could potentially be present on the project site. *Effects on biological resources, including federal and state-listed species, are predicted, first, by conducting field surveys of the subject locations, including right-of-way corridors for pipelines or transmission lines to inventory which habitats occur and which species may potentially occur; and second, by considering the various elements of the proposed action which may lead to changes in habitat (including direct conversion and fragmentation), and thus, changes in wildlife populations, or that may directly induce mortality.*

Issue 5: Noise

Construction and operation of a coal-burning power plant near Great Falls could add to noise levels in the area from construction equipment, truck traffic, trains, the vehicles of commuting workers, and operation of the various components of the industrial facility. One commenter during scoping expressed concern about noise generation by the proposal. *Effects on the acoustic environment are predicted by a two-step process: 1) characterizing existing ambient* *noise levels (i.e. a noise profile) and 2) introducing known noise levels of equipment likely to be used in construction and operation. Using the Cadna-A Version 3.5 noise prediction software from DataKustik, noise level contours for the combined typical power plant equipment and train operations have been developed.*

Issue 6: Recreation

Construction and operation of a major new industrial facility in the Great Falls area could hypothetically generate direct and/or indirect impacts on recreational facilities and opportunities in the area, in particular those related to the Missouri River and the Great Falls Portage National Historic Landmark. While no comments were received during scoping expressing concern about potential impacts specifically on outdoor recreation, concern was expressed about related issues, such as air, water, visual impacts, and wildlife. *Effects on recreation are predicted by characterizing existing facilities and opportunities in relation to proposed project sites, characterizing the key elements and processes of the proposed action that might affect recreation, and estimating qualitatively the extent to which these elements or processes may enhance or detract from the recreational experience.*

Issue 7: Cultural Resources

The Great Falls area contains important historic/cultural resources, such as the Great Falls Portage National Historic Landmark commemorating the Corps of Discovery (Lewis and Clark Expedition). Construction of a power plant could conceivably impact cultural resources in a variety of ways. During scoping, the Montana State Historical Society (which is the State Historic Preservation Office or SHPO in Montana) stated that the project may have the potential to impact cultural properties and recommended that a cultural resources inventory be conducted. *Effects on cultural resources are predicted by conducting an inventory of cultural resources, including traditional cultural properties, using established methodologies, and evaluating the likely impact of specific components of the proposed action and alternatives on these resources.*

Issue 8: Visual Resources

Construction of a large power plant and related facilities such as transmission lines in an undeveloped area could potentially affect scenic quality and visual resources. Several comments expressing concern about possible visual impacts were received by members of the public during scoping. *Effects on visual resources and scenery are predicted by using a methodology developed by the Bureau of Land Management (BLM) called the Visual Resource Management (VRM). VRM consists first of a visual resource inventory to determine the quality of existing scenic values at affected sites followed by an analysis using a visual contrast rating process, which involves comparing the project features with the major features in the existing landscape using the basic design elements of form, line, color, and texture. (Visual impacts on federal mandatory Class I areas are addressed under Air Quality.)*

Issue 9: Transportation

Both construction and operational phases of the proposed action could potentially affect transportation in the Great Falls area – including road, rail, and air transport. One commenter raised the issue of traffic impacts during public scoping. Also during scoping, the Federal Aviation Administration (FAA) advised RD that a form (7460) would need to be completed for the proposed power plant that would enable FAA to prepare a study of possible impacts on air traffic at Great Falls International Airport. *Effects on transportation are predicted by first establishing the proximity of transportation infrastructure and current use patterns, particularly Average Daily Traffic (ADT) (if available) on nearby roads and streets, and then estimating traffic generated by phases of the proposed action using procedures developed by the Transportation Research Board.*

Issue 10: Farmland and Land Use

Construction of a power plant on an undeveloped site in the Great Falls area could entail the permanent conversion of farmland to industrial land use. During scoping, the Natural Resources Conservation Service (NRCS) requested RD to document any such loss of farmland according to the procedures of the Federal Farmland Protection Act, which applies to actions of all federal agencies that may directly or indirectly lead to the irreversible conversion of agricultural lands to non-agricultural land uses. There was some public concern about farmland conversion as well. *Effects on farmland and land use are predicted by documenting the type and quality of farmland present on proposed building sites and evaluating any loss of farmland according to federal and state criteria.*

Issue 11: Waste Management

Operation of a power plant would generate considerable quantities of solid waste, particularly ash, which is a residual of coal combustion. Disposal of ash was the subject of some public concern during scoping. *Effects from waste management are predicted by characterizing both the quantity and quality of the waste stream and examining how proposed waste management practices will dispose of wastes.*

Issue 12: Human Health and Safety

Construction and operation of any large industrial facility involves certain risks to human health and safety. A coal-fired power plant in particular raises questions about possible effects on human health and safety from air emissions. During scoping, members of the public expressed concern about air pollution-related diseases such as cancer, asthma, and autism (the latter from mercury emissions in particular). *Effects on human health and safety are predicted by examining whether or not the proposed facility would comply with the National and Montana Ambient Air Quality Standards (for "criteria" pollutants) as well as with BACT requirements, and in the case of mercury, by reviewing what science knows and does not know about mercury emissions, deposition, biological uptake, bioaccumulation/biomagnification, and toxicity, and by reviewing applicable federal and state standards for emissions from power plants.*

Issue 13: Socioeconomics

Construction and operation of the proposed power plant would entail impacts on employment, income, taxes, property values, and population in the Great Falls area. Several people commented on these possible effects during public scoping. *Effects on socioeconomics are predicted by characterizing the existing socioeconomic environment of the Great Falls/Cascade County area, quantifying projected direct employment associated with construction and operation of the power plant, and using an employment multiplier for Cascade County from the Montana Governor's Office of Economic Opportunity to estimate direct and induced employment.*

Issue 14: Environmental Justice/Protection of Children

Two Executive Orders issued by the president of the United States require all federal agencies to examine possible disproportionate impacts of the proposed action on minority and low-income populations and children. *Effects on environmental justice and protection of children are predicted by establishing the proportion of minorities and low-income populations in the affected area and determining whether some facet of the proposed action would lead to disproportionate, adverse impacts on them.*

1.6.2 ISSUES CONSIDERED BUT DISMISSED

RD and DEQ reviewed the issues raised during scoping and concluded that some issues raised by the public were outside the scope of this EIS, were items that are addressed by law or regulation, were items that are unrealistic or unreasonable to implement, or were insignificant issues that are covered by larger and significant issues. The rationale for eliminating these issues is provided in the descriptions below.

- Wetlands – Wetlands are not dismissed entirely from the EIS but are not considered a key issue because of their virtual absence from the proposed project sites. Where pipeline or power line corridors cross wetlands or other "waters of the United States" under the jurisdiction of the U.S. Army Corps of Engineers and protected by Section 404 of the Clean Water Act, no permanent fill would be placed into these waters and at most there may be temporary disturbance at stream crossings.

- Burning fuels other than coal in the proposed power plant – Based on recent experience with at least one other Montana generating station, some concern was expressed that SME's power plant, once operational, may attempt to burn fuels other than coal. However, the Air Quality Permit issued by DEQ is based on coal combustion in the Circulating Fluidized Bed (CFB) boiler to produce steam and generate electricity, except when fuel oil is used during start-up and shutdown of the CFB boiler.

- Reclamation/Remediation – The EIS does not discuss potential future reclamation or remediation for the plant site were it to be decommissioned or shut down at some point in the future. Given the projected 30-50 year life of a coal-fired generating station, decommissioning and cleanup were deemed beyond the time frame of the EIS.

Furthermore, the plant and surrounding property on which ash may be disposed would be managed in such a way that when the facility closes, it would not leave behind contamination and pollution problems. However, closure of the solid waste cells in which the fly ash would be stored is addressed in the solid waste license. Coal-fired power plants are not like nuclear power plants, for which decommissioning and removal of materials and components contaminated by radioactivity are major issues.

- State solid waste exclusion for on-site disposal of ash – The EIS does not consider possible changes to law.

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

In response to public comments, RD and DEQ have made a number of changes to Chapter 2. These changes are summarized in the italicized bullets below. Any additions or changed text in the FEIS from the DEIS as a result of public comments are shown in double underlining. Deletions are not shown. The main changes in Chapter 2 are:

- *Section 2.1.5.4 on Integrated Gasification Combined Cycle (IGCC) technology has been expanded with new information.*
- *Nuclear fission has been added to the list of non-renewable alternatives considered but eliminated (Section 2.1.5.6).*
- *Two combinations of energy sources have been added to the list of alternatives considered but eliminated (Section 2.1.6). These include one combination alternative consisting of a smaller CFB plant and energy efficiency/conservation with renewable energy sources (Section 2.1.6.1) and another combination alternative consisting entirely of energy efficiency/conservation and renewable energy sources (Section 2.1.6.2).*
- *The explanation of the methodologies used in the site screening and site selection studies is further elaborated in Section 2.1.7.*
- *A new section (2.1.7.4) is added which describes four additional sites in the Great Falls area that were considered and rejected during the site selection process. These include the Sun River site, Manchester area, a site north of Malmstrom Air Force Base, and the Section 36 site. A rationale is included for why each of these sites was deemed inadequate.*
- *The description of the Proposed Action (Highwood Generating Station at the Salem site) is modified to reflect a shift in the location of the HGS in response to concerns about its potential impact on the Great Falls Portage National Historic Landmark. The original proposed location of the HGS would have been within the NHL; the new location is just outside the NHL.*
- *Certain conclusions in the impacts comparison matrix (Table 2-14) have been modified to reflect changes in the way certain impacts are characterized.*
- *Several new figures have been added, captions of several existing figures have been changed, and throughout the chapter, text edits and corrections have been made in response to comments.*

To determine how best to procure needed power and meet obligations to its member utilities in the face of a looming phase-out of its main existing source – and following the guidance set forth by RD to prospective loan recipients – SME conducted an alternatives analysis and an electric load analysis. Based on these analyses, SME concluded that owning its own source of electric generation is in the best interests of its members. SME then conducted a site selection analysis for a proposed facility. This analysis consisted of a broad-scale, site-screening study initiated early in 2004 (SME, 2004d). This study was a state-wide constraints and opportunities analysis, from which emerged four potential power plant areas. Next, SME conducted a more detailed site-selection study, which further analyzed the areas by identifying and comparing specific sites at the four general areas. SME also conducted an evaluation of sites in the Great Falls area as described in this chapter. As a result of these analyses, SME proposes to construct a 250 net MW coal-fired power plant at a site near Great Falls, Montana. This proposed action would also include construction of approximately 13 miles (21 km) of 230-kV transmission lines and about six miles (10 km) of railroad tracks for delivery of coal and limestone to the plant, in addition to several other connected actions, among them the construction and operation of four 1.5-MW wind turbines.

SME evaluated alternatives to the proposed power plant in terms of cost-effectiveness, technical feasibility, and environmental soundness. RD and DEQ reviewed SME's evaluations of these alternatives in this EIS. RD and DEQ added the oil and nuclear generation alternatives to the original list, as well as the combination alternatives. The alternatives considered were:

1. Power Purchase Agreements – Power purchases from existing regional suppliers of wholesale electric energy and related services.

2. Energy conservation and efficiency – Demand side management and the ability of increased energy efficiency to offset the projected increases in energy demand.

3. Noncombustible renewable energy sources – Renewable energy technologies considered included wind, photo voltaic (solar), hydroelectric and geothermal.

4. Combustible renewable energy sources – Renewable combustible technologies considered included biomass, biogas, landfill gas, and municipal solid waste.

5. Nonrenewable combustible and nuclear energy sources – Traditional combustible and nuclear technologies considered included:
   - oil
   - nuclear
   - natural gas-fired boilers and combustion turbines - both simple and combined cycle configurations
   - other carbon-based fuel burning technologies including fluid-bed combustion and integrated gasification combined cycle (IGCC) technology.

6. Combinations of energy sources:
   - A reduced 150-MW CFB coal-fired power plant in conjunction with a combination of conservation, efficiency improvements, and renewable energy sources

- A combination of lower-emission, non-renewable fuels like natural gas with a combination of conservation, efficiency improvements, and renewable energy sources

RD and DEQ considered these and other alternatives in this EIS and evaluated them according to the purpose and need and issues identified in Chapter 1. Reasonable alternatives are fully evaluated and presented in comparative form along with the proposed action. Other alternatives were identified during scoping but were eliminated from detailed study in the EIS. The reasons for not fully evaluating these alternatives are explained in this Chapter.

This chapter describes alternative approaches to meeting the benefits, purpose and need and addressing the issues discussed in Chapter 1. The purpose of the proposal is to meet a forecasted deficit in SME's wholesale power supply. For the alternatives described in the following sections to be considered reasonable for further consideration, they must fully meet the projected electric power needs for the SME service area.

Alternatives were evaluated in terms of their cost-effectiveness, technical feasibility, and environmental issues (consequences and constraints). The cost-effectiveness of each alternative was addressed by evaluating the initial capital costs as well as the long-term cost of operation and maintenance, including the cost of fuel over the projected life of the project. The technical feasibility of each generation option was evaluated on the basis of the alternative's ability to provide a highly reliable source of generation compatible with the energy needs as defined above. To be reasonable, an alternative must also be commercially available and capable of providing 250 MW of base load capacity by 2012 for the SME service area.

Section 2.1 describes alternatives that were considered but were eliminated from detailed evaluation in the EIS because they did not satisfy the criteria of cost-effectiveness, technical feasibility, or environmental acceptability.

Section 2.2 describes the three alternatives evaluated in detail in the EIS.

2.1 ALTERNATIVES ELIMINATED FROM DETAILED CONSIDERATION

This section includes alternatives that were investigated, but found to not fully meet the stated requirements for detailed analysis. The rationale for their elimination is also provided.

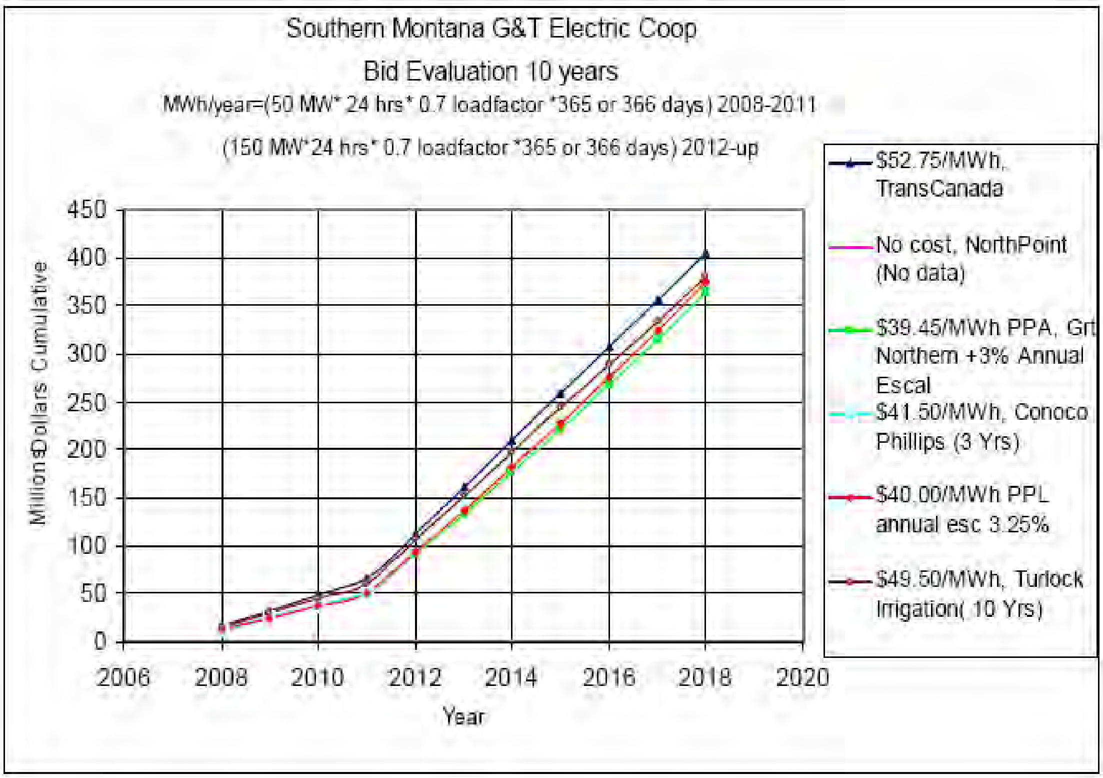
2.1.1 POWER PURCHASE AGREEMENTS

In order for a power purchase proposal to receive serious consideration, a suitable transmission path must be available from the generation source to the load control area in which SME's member systems are located. There are a number of transmission constraint points in Montana through which additional firm deliveries are not possible without considerable investments in transmission infrastructure. Non-firm transmission paths are not a viable option.

As explained in Chapter 1, the member cooperatives of SME currently meet their wholesale electric energy and related services obligations through the use of power purchase agreements with BPA and WAPA. In 2011, when the inherent power purchase rights in the BPA contract fully expire, the member cooperatives of SME will have a projected load of approximately 180 MW. At that time the member cooperatives of SME will have residual power purchase rights with WAPA of approximately 20 MW. If the WAPA power purchase agreement were to be completely withdrawn, the member cooperatives of SME would have a projected requirement of approximately 160 MW in 2008, escalating to approximately 180 MW by 2012 (SME, 2004a). (As noted in Chapter 1, Electric City Power of Great Falls, MT will have a load requirement of approximately 65 MW when its purchase contract with PPL expires in 2011.)

With RD's oversight and guidance, SME conducted an extensive search in the regional wholesale power supply marketplace for a suitable source of energy to meet its member system requirements with a power purchase agreement secured from an existing source of generation within the Western System Coordination Council (WSCC), of which SME is a member. Figure 2-1 shows the results of SME's November 2003 Request for Proposal (RFP) on the basis of the cumulative cost of the proposal for a 10-year period from 2009-2018.

Figure 2-1. Summary of the Results of SME's November 2003 RFP 10-year Evaluation



In January 2006, the weighted price of wholesale electricity through the Western Electricity Coordinating Council (WECC, successor to the WSCC) fluctuated between approximately $60 and $62 per MWh, or $15 per MWh – about 30 percent – more than the approximately $44-47 per MWh SME expects to pay to produce its own power (PowerLytix, 2006).

In early December 2006, SME engaged in discussions with a regional provider of wholesale electric energy and related services for the purpose of securing varying blocks of power to meet the needs of additional retail customers seeking service from the City of Great Falls; and a portion of the post July 2008 supply needs of the Cooperative member systems. SME has a number of contracts with this entity that has traditionally responded to similar RFPs with a price that is below market and far less than other respondents.

The results of this RFP indicate that the price regional suppliers are requesting for a long-term "firm" supply reflects the upward trend in natural gas prices and a decreasing supply of "firm" generation capacity not already subject to long-term contract. The indicative prices contained in the proposal were in excess of $56 per MWh less the cost of transmission. When adjusted to reflect the cost of transmission the price would be approximately $64 per MWh if the energy were delivered to NWE's transmission system, and approximately $66 per MWh if delivered to the Mid Columbia/BPA transmission system. This price would be for modestly shaped blocks of power for the periods February 2007 through August 2011, and July 2008 through August 2011.

A review of the published price NWE intends to pay to meet its default supply obligation post-2007, and the forecasted price for "market purchases" at the Mid Columbia, is consistent with the aforementioned offer. These prices represent an approximate 20 percent increase in the price of wholesale power proposals since SME entered into a several power purchase contracts in June 2006.

The lack of affordable generation capacity in the WECC, combined with ever-increasing transmission constraints, limits the future viability of purchasing capacity from existing sources of wholesale supply. As discussed in Chapter 1, the WECC has relied almost exclusively on natural gas fired generation to meet future regional supply requirements. With the cost of natural gas fired generation constituting the future marginal cost for wholesale electric energy and related supply services, the price SME would pay for power supply could be nearly double its current costs for this service commodity because of the price volatility of natural gas. Based on a search in the power supply marketplace for a suitable supply of energy, and analysis of related transmission issues, SME concluded that negotiating an acceptable power purchase agreement to meet future energy needs does not appear to be a viable option (SME, 2004a). RD concurs with this assessment.

2.1.2 Energy Conservation and Efficiency

Energy efficiency means doing the same work with less energy. Energy efficiency improvements can free up existing energy supply. Energy efficiency incentive programs have been found to be cost-effective in terms of reducing load growth. Energy efficiency in buildings means using less energy for heating, cooling, and lighting. It also means buying energy-saving appliances and equipment for use in a building. Promotion and use of energy efficiency programs generally have neutral or beneficial effects on the environment by slowing down or eliminating the need for additional power sources.

Around the country, a number of electrical utilities sponsor programs that encourage customers to invest in energy efficiency products and energy-efficient appliances that lower consumer energy bills, delay the need for new electrical generation capacity, and reduce the emission of greenhouse gases and other pollutants. Technologies that maximize the efficient generation, transmission, and storage of energy are central to such programs (DOE, 2005a). Demand Side Management (DSM) is one example of a promising form of energy efficiency promotion; it refers to utility-facilitated actions undertaken by customers to reduce the amount or alter the timing of energy consumption (DOE, 2005b). Utility DSM programs furnish an array of measures that can lower both energy consumption and consumer energy expenses. Electricity DSM strategies aim to maximize end-use efficiency to avoid or postpone the construction of new generating plants. Means of accomplishing this include load reduction, load leveling, energy storage devices, and rate schedule/structuring such as time-of-use rates that charge consumers higher prices for peak electricity and lower prices for off-peak electricity (DOE, 2005b).

In 1997, the Montana Legislature passed Senate Bill 390, which required electric utilities and cooperatives in the state to invest a minimum of 2.4 percent of their annual retail sales in a universal systems benefits program focused on the acquisition and support of renewable energy and conservation related activities (69-8-402, *et seq.*, MCA). According to SME, since 1997, SME's member cooperatives have complied with this state mandate to invest a portion of their total revenues in a conservation program. Conservation measures include rebates on ground source heat pumps and the installation of energy efficient appliances and retrofit lighting. The installation of equipment is almost universally replacement in kind or is located on the end user's property, thus resulting in little to no additional land use (footprint) issues. Permits that may be required are typically obtained at the local agency level through the residential or commercial / industrial building permit process. Table 2-1 documents SME expenditures in 2004 on conservation.

Energy conservation is a key component of a program managed by DEQ called Energize Montana (DEQ, 2005b). Figure 2-2 is a graphic from the Energize Montana website. The website provides information for citizens, schools, businesses and government on a variety of energy-related topics, including energy conservation and efficiency. DEQ publishes the *Montana Energy Savers Guidebook* and has staffed programs in the areas of Energy Planning & Technical Assistance, Public Buildings & Renewable Energy, and Business & Community Assistance.

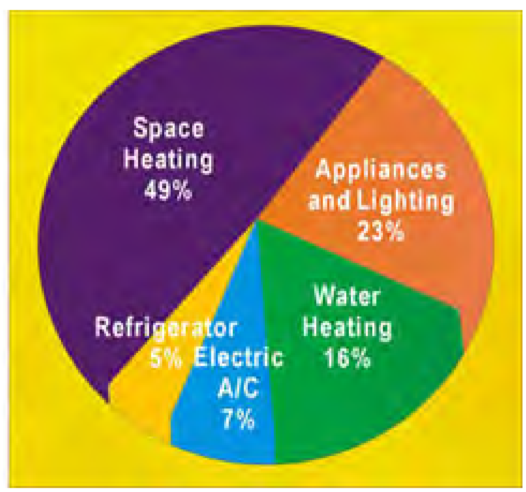


Figure 2-2. "How We Use Energy in Our Homes" – Educational Pie Chart on the *Energize Montana* Website

Energy efficiency programs will aid in reducing the needed capacity of future additional generation facilities. However, conservation and increased efficiency alone will not eliminate the need for additional generation capacity within the SME service area by 2009. Conservation and efficiency do not generate electricity; they make better use of the electricity that is available. Based on studies conducted around the country, as well as some estimates in Montana, it is reasonable to assume potential reductions in electricity use from conservation and efficiency improvements are in the 10 percent range without causing economic privation (DEQ, 2004a). This may represent the low end of the potential for conservation/efficiency. However, SME needs to replace approximately 80 percent of its existing supply by 2012; it is not technically feasible that the remaining 20 percent of its supply from WAPA could be stretched widely enough to fully supply all members and customers at a reasonable cost.

Table 2-1. SME System Investments in Energy Conservation in 2004

Investment Type	Beartooth	Fergus	Mid-Yellowstone	Tongue River	Yellowstone Valley	SME Total
Energy audits					$4,595	$4,595
Water heater program					$34,715	$34,715
Conservation education			$1,561		$6,393	$7,954
Demand Side Management			$9,719		$26,991	$36,710
Ground source heating					$11,737	$11,737
Energy-efficient street lighting			$449	$26	$10,263	$10,739
Distribution sys. design > min.[1]		$66,222			$63,441	$129,663
Conservation invest. in power purch. [1]	$100,897	$108,168	$46,020	$147,663	$276,530	$679,278
Totals	$100,897	$174,390	$57,750	$147,689	$434,665	$915,391

Source: SME, 2005b

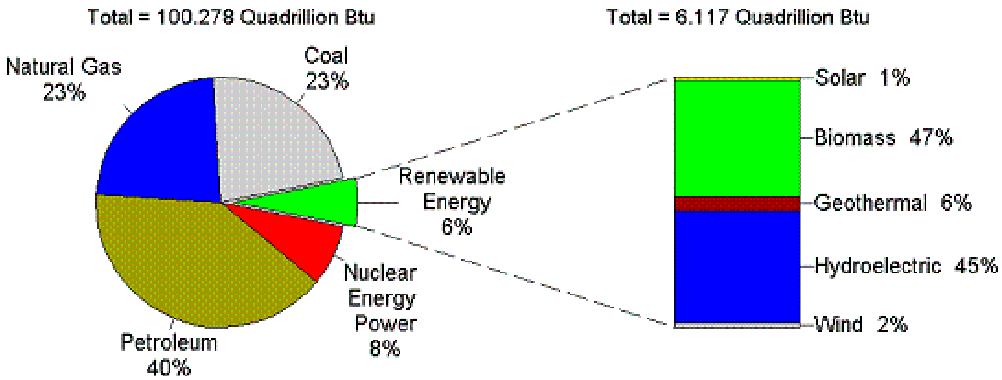
[1] The last two items in Table 2-1 represent the investments SME's member systems have made on the conservation front through wholesale power purchases. For a number of years (1980s and early 1990s) electric consumers were able to apply for low and no interest loans for the purpose of investing in conservation measures such as home weatherization, installation of energy-efficient heating and cooling systems, efficient motors, etc. These loans were provided by entities such as the BPA, Montana Power Company and others with the cost being passed on to the distribution systems through the wholesale supplier. The members of SME are now repaying costs associated with this regional program. The total investment of $915,391 in 2004 amounts to approximately 4.5 percent of SME's annual wholesale power expense.

Energy conservation and efficiency programs should be pursued by SME as parallel activities alongside securing additional generation to meet projected demand.

2.1.3 Renewable Non-Combustible Energy Resources

The renewable, non-combustible energy resources evaluated in this section are wind, hydroelectric, solar (photovoltaic [PV] and thermal), and geothermal energy. The role of renewable energy sources in the USA's total primary energy supply in 2004 is quantified in Figure 2-3. In total, renewable energy sources supplied 6.1 quadrillion Btu's (quads), or about six percent, of the nation's total energy consumption of 100.3 quads in 2004 (EIA, 2005d). The electric power cost projections for these energy technologies are shown in Table 2-2.

Figure 2-3. The Role of Renewable Energy Consumption in the Nation's Energy Supply, 2004



Source: EIA, 2005d

Table 2-2: Electric Power Cost ($/MWh) Projections for Renewable, Non-Combustible Energy Resources*

Cost component	Wind	Solar		Hydroelectric	Geothermal[1]
		Photovoltaic	Thermal		
Capital	35.9	N/A	N/A	17.0	N/A
Fixed O & M	7.7	N/A	N/A	2.6	N/A
Variable/Fuel	7.0	N/A	N/A	4.0	N/A
Total Busbar Cost[2]	50.6	350	105	23.6	65

Source: SME, 2004a
**Levelized Costs ($/MWh) for New Utility Generating Plants in Northwest Power Pool (NWPP) Region)*

Levelized cost is the present value of the total cost of building and operating a generating plant over its economic life, converted to equal annual payments; costs are levelized in real dollars, i.e., adjusted to remove the impact of inflation.
Source for Wind Costs: U.S. Department of Energy (DOE) Energy Information Administration (EIA) *Annual Energy Outlook 2004 with Projections to 2025*. Based on the National Energy Modeling System.
Source for Photovoltaic Costs: U.S. DOE Energy Efficiency and Renewable Energy (EERE) State Energy Information – Photovoltaic Technology website: (http:/lwww.eere.energy.gov/state_energy/technology_overview.cfm?techid=1).
Source for Thermal Solar Costs: U.S. DOE Energy Efficiency and Renewable Energy (EERE) State Energy Information – Concentrating Solar Power Technology website: (http:/lwww.eere.energy.gov/state_energy/technology_overview.cfm?techid=4).
Source for Hydroelectric Costs: U.S. DOE Idaho National Engineering and Environmental Laboratory (INEEL) Hydropower Program website: (http:/hydropower.inel.aov/facts/costs-graphs.htm).
Source for Geothermal Costs: U.S. DOE Energy Efficiency and Renewable Energy (EERE) State Energy Information - Geothermal Technology website: (http:/lwww.eere.energy.gov/state_energy/technology_overview.cfm?techid=5).

Notes:
[1] Commercial geothermal resources are not available in the SME service area.
[2] Busbar Cost - wholesale cost to generate power at the plant.
$/MWh - dollars per megawatt hour; O&M - operations and maintenance

2.1.3.1 Wind Energy

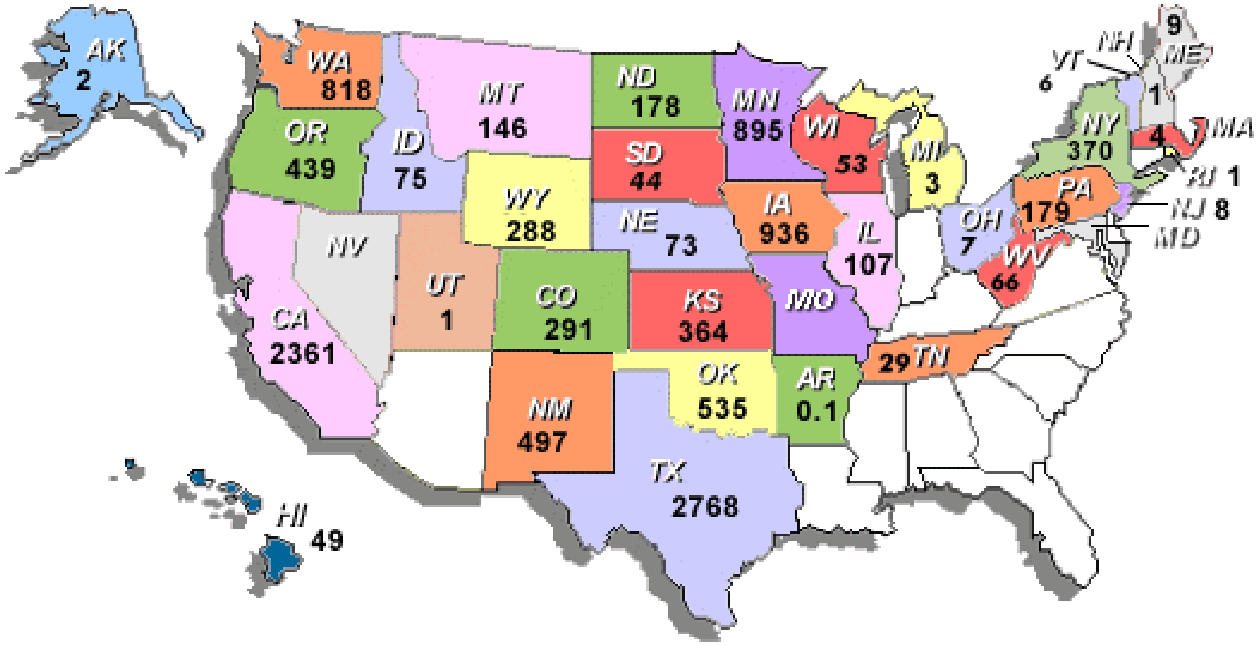
Wind energy offers many advantages and is the fastest-growing renewable energy source in the world, although it still accounts for just 0.25 percent of U.S. power output. Spurred by declining costs and a growing body of local, state, and national "buy-green laws," global wind capacity quadrupled between 1998 and 2003 (Anon., 2003). The development of wind power is increasing in many regions of the United States, including Montana (Figure 2-4). As of 2004, total installed wind electric generating capacity nationwide was 6,374 MW and was expected to generate approximately 16.7 billion kWh (SME, 2004a). See Figure 2-5. Stimulated by the federal Production Tax Credit, which provides wind farm owners with a 1.9-cent credit per kilowatt-hour generated for the first 10 years of operation, installed wind energy capacity in the United States jumped by approximately 2,500 MW in 2005 alone, including two projects in Montana (AWEA, 2005). An additional financial incentive – this one for landowners – is the potential for income from leasing land to wind generators (NWCC, 2005; UCS, 2005). The industry's trade group – the American Wind Energy Association (AWEA) – estimated that by the end of 2005 the USA's wind power capacity was about 9,200 MW, enough to power roughly 2.5 million homes (Halperin, 2005), and 11,600 MW by the end of 2006 (AWEA, 2007). Figure 2-5 shows installed capacity as of December 31, 2006.

Figure 2-4. Modern Wind Turbine at Judith Gap, Montana, Installed in 2005

Wind is a clean energy source that does not pollute the air or produce greenhouse gases like carbon dioxide or atmospheric emissions that can cause acid rain or visibility reduction. Although wind power plants have relatively little impact on the environment compared to conventional power plants, there is some concern over the noise produced by the rotor blades and aesthetic (visual) impacts; furthermore, birds have been killed by flying into the rotors (DOE, 2005c). Avian deaths have become a concern at Altamont Pass in California, which is an area of extensive wind development and also high year-round raptor use. Detailed studies and monitoring following construction at other wind development areas indicate that this may be a site-specific issue. Areas that are commonly used by threatened or endangered bird species may be unsuitable for wind development. Wind energy can also negatively impact birds and other wildlife by fragmenting habitat, both through installation and operation of wind turbines themselves and through the roads and power lines that may be needed (AWEA, 2004).

A 2001 review for the National Wind Coordinating Committee (a collaborative effort of the wind industry, environmental groups, and other stakeholders) of existing studies of avian collisions with wind turbines concluded that avian collision mortality was much lower than other sources of avian collision mortality in the United States (WEST, 2001). This study predicted that even if wind plants became much more numerous and widespread, they would still likely cause no more

Figure 2-5. Total Installed U.S. Wind Power-Generating Capacity by State (2006), in MW



Total installed U.S. wind energy capacity: 11,603 MW as of December 31, 2006
Source: AWEA, 2007

than a few percent of all bird deaths from collision with manmade structures. However, there is not yet a consensus among wildlife biologists more generally as to wind energy's long-term impacts.

A 2005 review of available research by the U.S. Government Accountability Office (GAO, formerly called the General Accounting Office) found that the impact of wind power installations on wildlife generally varies by region and by species. Specifically, studies have shown that wind power facilities in northern California and in Pennsylvania and West Virginia have killed large numbers of raptors and bats, respectively. Studies in other parts of the country have shown comparatively lower levels of mortality, although most facilities have killed at least some birds. However, numerous wind power facilities in the U.S. have not been studied to date, and therefore scientists are unable to reach definitive conclusions about the risk that wind power poses to wildlife in general. Uncertainties remain. Moreover, much is still unknown about migratory bird flyways and overall species population levels, impeding the analysis of the cumulative impact that wind power may have on wildlife species. This field of research is still in its infancy, as is large-scale wind power itself. To date, few studies exist on how to reduce wildlife fatalities at wind power facilities. Overall, based on what is known so far, it does not appear that existing wind power development accounts for a significant amount of bird mortality. Nevertheless, it is premature to conclude that the potential cumulative impact on birds and bats of any widespread expansion of wind power in the country would be insignificant (GAO, 2005).

For its part, the U.S. Fish and Wildlife Service, in its interim guidance on avoiding and minimizing wildlife impacts from wind turbines, states: "…wind energy facilities can adversely impact wildlife, especially birds and bats, and their habitats. As more facilities with larger turbines are built, the cumulative effects of this rapidly growing industry may initiate or contribute to the decline of some wildlife populations" (USFWS, 2003).

Another issue with some early wind turbine designs was noise, but it has been largely eliminated as a problem through improved engineering and through appropriate use of setbacks from nearby residences. Aerodynamic noise has been reduced by changing the thickness of the blades' trailing edges and by positioning machines "upwind" rather than "downwind" so that the wind hits the rotor blades first, then the tower. (On downwind designs, where the wind hits the tower first, its "shadow" can cause a thumping noise each time a blade passes behind the tower.) A small amount of noise is generated by the mechanical components of the turbine. To put this into perspective, a wind turbine 300 meters away is no noisier than the reading room of a library (AWEA, 2004).

Scenic coastal areas and mountain ridges (Figure 2-6) are often characterized by high wind intensity and good to excellent wind energy potential (DOE, 2005c; Anon., 2001). Thus, certain proposed wind developments have been opposed on the basis of aesthetic or visual resource concerns, most notably in recent years the Cape Wind Project in Nantucket Sound, Massachusetts, which would be the USA's first offshore wind farm (Cape Wind, no date; ACE, 2004). This proposed 130-turbine project would generate approximately 450 MW of clean, renewable energy, yet has split public opinion and environmentalists, drawn bipartisan opposition and support, and even became an issue in Massachusetts' 2006 gubernatorial race (Dennehy, 2005).

Figure 2-6. Wind Farm on West Virginia's Backbone Mountain, Visible from Blackwater Falls State Park

Wind power must compete with conventional generation sources on a cost basis. Wind energy is one of the lowest-priced renewable energy technologies available today. State-of-the-art wind power plants can generate electricity for less than 5 cents/kWh with the Production Tax Credit in many parts of the U.S. (AWEA, 2004). Technological advances have improved the performance of wind turbines and driven down their cost. In locations where the wind blows steadily, the cost of wind power has been shown to compete favorably with coal and natural gas fired power plants, if the full cost including "firming" (see Section 2.2.2.3) is not considered. Even though the cost of wind power has decreased dramatically in the past 10 years, the technology requires a higher initial investment than fossil-fueled generation. Fixed, investment-related costs are the largest component of wind-based electricity costs. Improved designs with greater capacity per turbine have reduced investment costs to approximately $750-to-$1,000/kW. Wind power plants incur no fuel costs, however, and their maintenance costs have also declined with improved designs. Not including the cost of firming, the Energy Information Administration (EIA) projects the levelized cost of wind power to be approximately $50.6/mWh (refer to Table 2-2).

The big challenge to using wind for electrical power is that it is intermittent and the electricity generated cannot be stored effectively. Thus it is not considered a “firm” resource. Not all winds can be harnessed to meet the timing of electricity demands. Due to the intermittent nature of wind, a wind power plant's economic feasibility strongly depends on the amount of energy it produces. Capacity factor serves as the most common measure of a wind turbine's productivity. Capacity factor is the ratio of the net electricity generated, for the time considered, to the energy that could have been generated at continuous full-power operation during the same period. The capacity factor for wind plants is normally in the 25 to 40 percent range (AWEA, 2004).

Another major issue regarding wind intermittence is that wind power can provide energy, but not on-demand capacity. Even at the best sites, there are times when the wind does not blow sufficiently and no electricity is generated. Related to intermittence is wind's unpredictable nature. Weather forecasting has improved over the past several decades, so wind power plant operators can predict, to some extent, what their output will be by the hour. However, that ability is imperfect at best. Therefore, wind power cannot always be reliably dispatched at the time it is needed. If wind is generating more than about 20 percent of the electricity that a system is delivering in a given hour, the system operator begins to incur significant additional expense because of the need to procure additional equipment that is solely related to the system's increased variability (AWEA, 2004).

Furthermore, wind farms have experienced "quality" issues due to harmonic frequencies (other than 60 cycles) that occur as a result of integrating large amounts of wind into the grid (Muljadi et al., 2004). Power electronics may introduce harmonic distortion of the alternating current in the electrical grid, thereby reducing power quality (DWIA, 2003). In recent testimony at a legislative committee meeting in Helena, a representative of NorthWestern Energy stated they have experienced issues with integration of the large wind farm located at Judith Gap.

Good wind resource areas with accessibility to nearby existing transmission lines do exist; however, it is more common that wind resources are located some distance from adequate transmission lines. Larger wind developments (several hundred megawatts) are more likely to invest in new transmission infrastructure.

Wind turbines can be used in off-grid applications, or they can be connected to a utility power grid. For utility-scale sources of wind energy, a large number of turbines are usually built close together to form a wind farm. In open, flat terrain, a utility-scale wind plant will require about 60 acres (24 hectares) per MW of installed capacity. However, only five percent or less of this area is actually occupied by turbines, access roads, and other equipment, while 95 percent remains free for other compatible uses such as farming or ranching (AWEA, 2004).

Wind is classified according to wind power class, which is based on typical wind speeds. These classes range from class 1 (lowest) to class 7 (highest). In general, a wind power class 4 or higher can be useful for generating power with large (utility-scale) turbines, and small turbines can be used at any wind speed. Class 4 and above are considered good resources. Montana has wind resources consistent with utility-scale production (DOE, 2005i). Good-to-excellent wind resource areas are distributed throughout the eastern two-thirds of Montana (Figure 2-7). The region east of the Rockies in northern Montana has excellent-to-superb wind resource, with other outstanding resource areas being located on the hills and ridges between Great Falls and Havre. The region between Billings and Bozeman also has excellent wind resource areas. Ridge crest locations have the highest resource in the western third of the state (DOE, 2005i).

Although most of SME's service area is rated at class 3 (fair wind resources), areas with a wind power class of 4 or higher are present within the SME service territory. This portion of the SME service area has the potential to support large-scale wind farm facilities with an estimated annual capacity factor of approximately 30 percent. Therefore, it is technically feasible to develop wind farms within the general SME service area (DOE, 2005i).

A 250-MW wind farm would require approximately 18.6 square miles (11,880 acres or 4,752 hectares) of area based on an average power output of 13.47 MW/square mile for wind power class 4 resources (DOE, 2006e). Because of the intermittent nature of wind power and the large land requirements, wind power alone cannot realistically fulfill the need for 250 MW of highly reliable base load capacity. As explained in more depth in Section 2.2.2.3, wind power is uncertain, variable and cannot be dispatched. Wind power facilities generate electricity only when the wind is blowing, with production facility output entirely dependent on variable and inherently unpredictable wind speed. Thus, utilities that use wind power must ensure that they have a backup, or reserve, source of generation capacity to meet loads when wind speed is less than that needed to produce the maximum, or rated, output of the wind power facility. The cost associated with this is called the "firming cost."

"Firming" wind power for sale into the market, or to base load dispatch wind power directly into the system grid in a predetermined load control area, requires a dedicated source of operating and spinning reserve capacity equal to the production ability of the wind resource. Without this, wind power does not meet the fundamental requirements of a dispatchable source of generation, and simply ignoring the associated cost of "firming" renders any economic comparison of wind power to traditional base load generation fundamentally flawed.

Table 2-13 in Section 2.2.2.3, based on price data from the Mid-Columbia energy market, shows that the $35/MWh (after production tax credit) cost of wind power is highly competitive with fossil fuel energy sources. However, the "penalty" of wind's intermittency is a higher overall price ($66.24/MWh) due to having to purchase costly spinning reserve and power (i.e. firming cost) to fill in when the wind is not blowing. Overall, then, this cost, which would be passed onto SME's cooperatives and customers, would be about fifty percent higher than the cost of electricity from the proposed HGS.

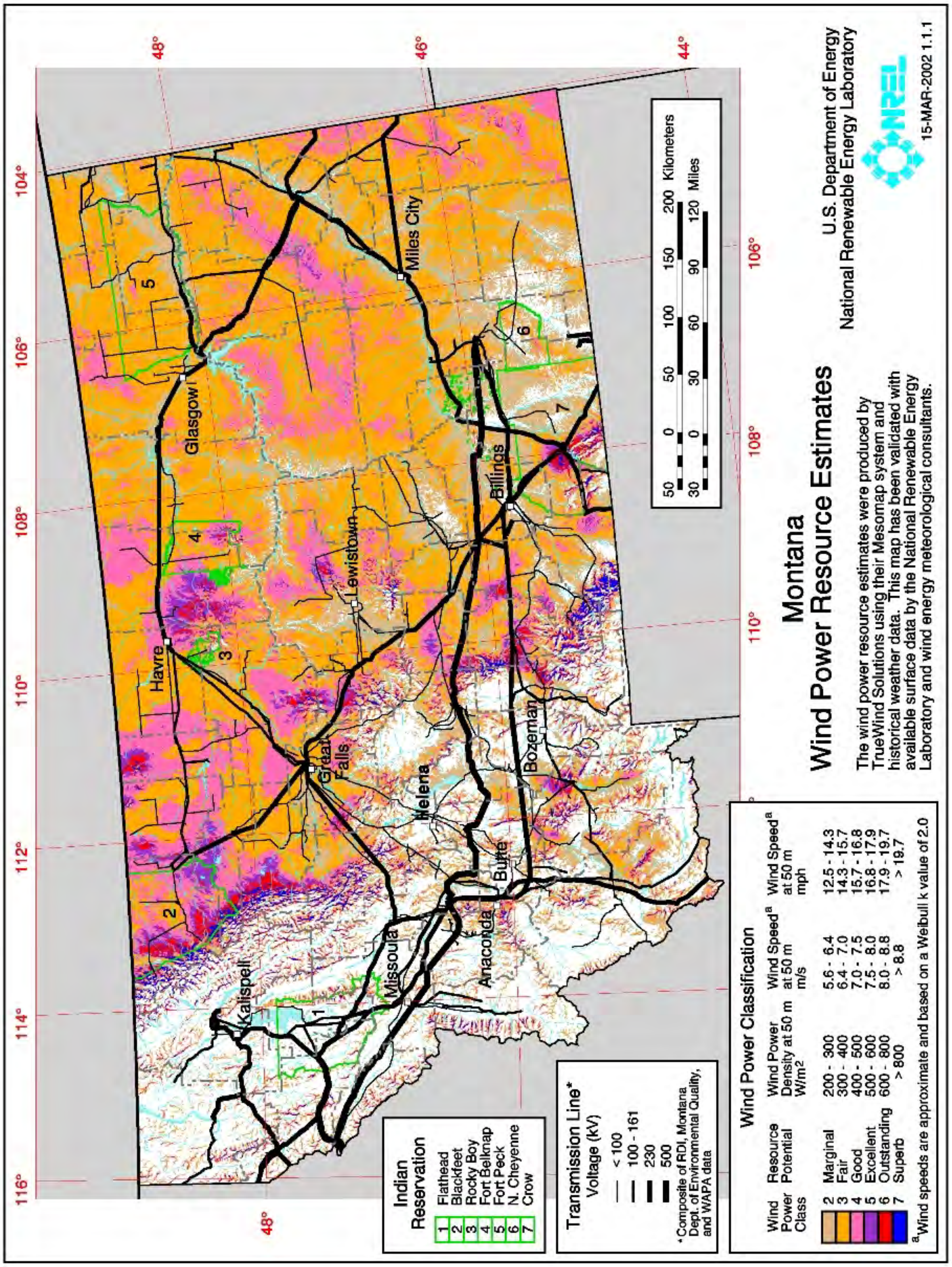


Figure 2-7. Montana Wind Resources (*Source: DOE, 2005i*)

2.1.3.2 Solar Energy

Figure 2-8. Solar Photovoltaic System

Renewable energy technologies can convert solar energy into electricity (Figure 2-8). Solar resources are expressed in watt-hours per square meter per day. This is roughly a measure of how much solar radiation strikes a square meter over the course of an average day.

Flat-plate solar systems are flat panels that collect sunlight and convert it to either electricity or heat. These technologies include photovoltaic (PV) systems, which include a flat-plate collector installed in a tilted position. A flat-plate collector generally obtains the most available solar energy if it is tilted toward the south at an angle equal to the latitude of the location. Because of their simplicity, flat-plate collectors are often used for residential and commercial building applications. They can also be used in large arrays for utility applications.

Concentrating solar power technologies use reflective materials such as mirrors to concentrate the sun's energy (Figure 2-9). This concentrated heat energy is then converted into electricity. Concentrating solar power is the least expensive solar electricity for large-scale power generation (DOE, 2005d). Solar concentrators usually are mounted on tracking systems in order to face the sun continuously. This allows the collectors to capture the maximum amount of direct solar rays. Because these systems usually require tracking mechanisms, solar concentrators are generally used for large-scale applications such as utility or industrial use.

The Western Governors Association (WGA) estimates that, with a longer-term federal investment tax credit and state-based incentives, the western United States could install as much as eight gigawatts (8,000 MW) of solar electric generating capacity by 2015, enough to power four million homes (REA, 2005). According to the WGA, deployment on this scale could also reduce solar costs to a point where they are competitive with power produced from fossil fuels. A WGA task force in 2005 envisioned half of solar deployment developed in central concentrating solar power plants and half developed in distributed PV generation. According to the U.S. DOE however, Montana's climate and northern latitude render it a marginal resource for solar concentrators (DOE, 2005d). The most promising role for solar energy in Montana may not be in centralized, utility-operated power plants, but rather in distributed applications such as hot water and space heating, as well as electricity generation in residences, commercial buildings, farms, and ranches.

Figure 2-9. Concentrating Solar Power (solar thermal trough) System in California's Mojave Desert

Utilizing solar energy generally produces environmental benefits (NCAT, no date). It is both renewable and sustainable. There are no major water discharge issues and no major direct air emissions related to the installation of a solar facility. Carbon emissions are avoided, as are SO_2 and NOx emissions. There could be minor sources of air emissions resulting from the installation of miscellaneous support equipment such as diesel/natural gas emergency generators. The fact that the structures associated with solar energy installations are generally not nearly as tall as modern wind turbines means that they have not generated the same concern and controversy over aesthetic impacts as have wind farms. Likewise, solar energy facilities have not been implicated in bird and bat kills, as have some wind facilities. However, within the confined footprint of development, centralized solar energy facilities virtually eliminate native habitat.

A 250-MW PV solar farm located in the best area of Montana for solar power would require approximately 310 acres (125 hectares), or less than 0.5 square mile (1.3 sq. km) (SME, 2004a). The aesthetic effects of a facility of this relatively small size would be unlikely to generate public concern and controversy.

Fixed, investment-related charges are the largest component of solar-based electricity costs. The DOE Energy Information Administration projects the capital cost component of the levelized cost of solar power to be approximately $350/mWh for PV and $105/mWh for thermal solar (SME, 2004a). Solar power units incur no fuel costs. Maintenance costs are low for PV systems but are high for thermal solar applications.

Due to the intermittent nature of solar power, economic feasibility strongly depends on the amount of energy it produces. Capacity factor serves as the most common measure of solar power productivity. Estimates of capacity factors range from 20 to 35 percent. Because solar power is dependent on the weather, it is unpredictable and cannot offer on-demand capacity.

Solar power alone could not reasonably fulfill the need for 250 MW of a reliable base load capacity within the SME service area for the reasons discussed above. In particular, Montana has a marginal solar resource, and solar power production in the SME service area would be intermittent.

2.1.3.3 Hydroelectricity

The most common type of hydroelectric power plant uses either a dam on a river to store water in a reservoir or a run of the river approach, which does not result in the construction of a large reservoir (Figure 2-10) (DOE, 2001). Water released from the reservoir flows through a turbine, which in turn activates a generator to produce electricity. Another type of hydroelectric power plant is referred to as a pumped storage plant. The plant turbines turn

Figure 2-10. Bureau of Reclamation's Hungry Horse Dam & Reservoir on the South Fork of the Flathead River near Kalispell, Montana

backward to pump water from a river or lower reservoir to an upper reservoir, where the potential energy is stored. To use the energy, the water is released from the upper reservoir back down into the river or lower reservoir. This turns the turbines forward, activating the generators to produce electricity (DOE, 2005e).

To have a usable hydropower resource, there must be both a large volume of flowing water and a change in elevation. Due to the seasonal nature of hydropower, the average annual capacity factor for most facilities is approximately 40 to 50 percent. Another major issue regarding hydropower is its year-to-year unpredictable output due to annual rainfall variability.

There are no major direct air emissions related to the utilization of hydroelectric resources. There could be minor sources of air emissions resulting from the installation of miscellaneous support equipment such as diesel/ natural gas emergency generators. The major impacts would likely be to the aquatic environment, alteration of river flows, and land use alterations. The construction of an impoundment or reservoir could have various adverse impacts on water quality, wetlands, flooding of bottomland and upland habitats or agricultural areas, and aquatic biota (EPA, 2005a). Fish populations can be impacted if adults cannot migrate upstream past impoundment dams to spawning grounds or if juveniles cannot migrate downstream. (This is much more of an issue west of the continental divide, where Pacific salmon stocks occur.) Fish injury and mortality can also result from passage through turbines. Advanced turbine technology reduces fish mortality resulting from turbine passage to less than two percent, in comparison with turbine-passage mortalities of 5 to 10 percent for the best existing turbines and 30 percent or greater from other turbines (INL, 2005a). Advanced turbine technology also can maintain downstream dissolved oxygen levels to help ensure compliance with water quality standards.

Fixed, investment-related charges are the largest component of hydroelectric power plant costs. The DOE's Idaho National Engineering and Environmental Laboratory (INEEL) reports hydropower capital costs to be $1,700 to $2,300/kW. Operating and maintenance costs are low for hydropower. The total levelized cost of hydropower is projected to be approximately $24/MWh (refer to Table 2-2).

Figure 2-11. One of PPL Montana's Great Falls Dams that Generate Hydroelectricity along the Missouri River (Rainbow Dam at Rainbow Falls)

One of the principal issues facing hydropower is the extent to which additional expansion of capacity is even possible or realistic, due to opposition by environmental groups to further development of U.S. rivers. A 1998 study by the INEEL for the U.S. DOE modeled undeveloped hydropower capacity on a national basis, for the first time taking into account environmental, legal, and institutional constraints (Connor et al., 1998). Whereas past efforts to quantify undeveloped U.S. hydropower capacity ranged across an order of magnitude, from approximately 50,000 MW to almost 600,000 MW, the more realistic 1998 assessment identified 5,677 sites with a total undeveloped capacity of approximately 30,000 MW. According to this study, 158 hydroelectric projects with an adjusted, undeveloped capacity of 1,014 MW could be developed in Montana (Table 2-3). The projects include:

- expansions of existing power projects;
- developing hydropower projects at existing dams; and
- projects at undeveloped sites.

There are five small, historic run of the river hydroelectric dams along the series of waterfalls that constitute the Great Falls of the Missouri River: Black Eagle (21 MW), Cochran (60 MW), Morony (48 MW), Ryan (60 MW), and Rainbow (36 MW). These are owned by Pennsylvania Power and Light-Montana (PPL Montana) and have a combined generation capacity of 225 MW (PPL Montana, 2006). The power generated by these facilities is sold under contract and the entire amount needed to meet SME's requirements is not available at any time in the foreseeable future to SME. In recent decades, the generating facilities in several of these dams were upgraded, increasing their capacity, but further expansion of hydropower generation at these facilities by either enlarging dams/reservoirs or turbine generators is probably not realistic.

Because of the lack of significant precipitation, runoff, and topographic relief in south-central and southwestern Montana, the region lacks the undeveloped hydroelectric resources capable of providing 250 MW of generation from a single power plant. Attempting to provide 250 MW in a timely fashion by constructing multiple facilities would likely be rendered infeasible by the lengthy Federal Energy Regulatory Commission (FERC) licensing process and possible delays resulting from opposition by environmental groups (FERC, 2005).

Table 2-3. Unadjusted and Adjusted Undeveloped Hydropower Capacity in Montana

Category	Number of Projects	Unadjusted, undeveloped capacity (MW)	Adjusted, undeveloped capacity (MW)
Developed sites with existing power	7	470	235
Developed (dammed) sites without existing power	72	1,129	502
Undeveloped sites	79	2,073	277
State total	158	3,672	1,014

Source: Connor et al., 1998
"Unadjusted, undeveloped capacity" refers to downward adjustments to hypothetical capacity unadjusted for environmental, legal, and institutional constraints

2.1.3.4 Geothermal Energy

Around the world, geothermal energy – "heat from the earth" – is a proven resource both for direct heat and power generation (World Bank, no date). This energy source is contained in underground reservoirs of steam, hot water, and hot dry rocks. Two types of geothermal

Figure 2-12. CalEnergy Navy I Flash Power Plant at the Coso Geothermal Field in California (85 MW net capacity)

resources are being tapped commercially: hydrothermal fluid resources and earth energy. Hydrothermal fluid resources, which are reservoirs of steam or very hot water, are well suited for electricity generation. Due to the remote locations of many geothermal resources, the cost of transmission may make development of these energy sources more expensive than a facility that is closer to an identified interconnection point. Earth energy, the heat contained in soil and rocks at shallow depths, is excellent for direct use and geothermal heat pumps but not as a source of electric power generation.

Producing electricity from geothermal resources involves a mature technology. Approximately 8,000 MW of geothermal electric capacity are currently in service around the world, including approximately 2,200 MW of capacity in the United States. All of the geothermal power in the U.S. is generated in California, Nevada, Utah, and Hawaii, with California accounting for over 90 percent of installed capacity. A considerable amount of this – 1,137 MW – is generated at one northern California facility, the Geysers. This site is an ideal and fairly unusual resource because its wells produce virtually all steam with little water carry over.

In general, geothermal reservoirs are classified as either low temperature (<150° C) or high temperature (>150° C). The high temperature reservoirs are most suited for commercial production of electricity. Three types of geothermal plants have been developed: dry steam, flash steam, and binary. Dry steam power plants, the first kind to be developed, use the steam from the geothermal reservoir as it comes from wells, routing it directly through turbine/generator units to produce electricity. In flash steam plants, the most prevalent type of geothermal electric plant in operation today, water at temperatures greater than 360° F (182° C) is pumped under high pressure to the generation equipment at the ground surface. Upon reaching this equipment the pressure is suddenly reduced, allowing some of the hot water to convert or “flash” into steam. This steam is then used to power the turbine/generator units and produce electricity. The remaining hot water not flashed into steam, and the water condensed from the steam, are generally pumped back into the reservoir (INL, 2005b).

Binary cycle power plants differ from dry steam and flash steam systems in that the water or steam from the geothermal reservoir never comes into contact with the turbine/generator units. Rather, the water from the geothermal reservoir is used to heat another “working fluid,” which is vaporized and used to turn the turbine/generator units. The geothermal water and the “working fluid” are each confined in separate circulating systems or “closed loops.” The advantage of the binary cycle system is that it can operate with lower temperature waters (225° F - 360° F), by using working fluids that have an even lower boiling point than water. Binary cycle power plants also produce no air emissions (INL, 2005b).

Geothermal energy is generally one of the cleaner forms of energy available for commercial applications. Small direct heat resources have minimal air and water emissions. Large geothermal resources utilized for electrical generation have air emissions consisting primarily of hydrogen sulfide (H_2S), ammonia (NH_3), and methane (CH_4). These developed projects also have water discharges, and would need additional controls to minimize emissions. New designs are able to minimize emissions within the process and with the use of add-on emissions control equipment. The high flow rates of steam and water from geothermal wells can result in the precipitation of various compounds on the steam generating and turbine equipment. These precipitates are primarily silica. Frequent cleaning of the equipment would result in land disposal of the precipitates. Land use for geothermal resources is normally small compared to fossil energy resources. A 20- MW geothermal power plant would require approximately three acres (1.2 hectares). Therefore, 13 of these plants having a total output of 250 MW would require a total area of approximately 39 acres (16 hectares).

Montana has low to moderate temperature resources that could be tapped for direct heat or for geothermal heat pumps. However, electric generation is not possible with these resources because the temperature is too low to be suitable for commercial generation. Therefore, geothermal electric power cannot fulfill the need for 250 MW of highly reliable base load capacity within the SME service area because commercial geothermal resources for the generation of electric power are not available in the state (DOE, 2004b).

2.1.4 RENEWABLE COMBUSTIBLE ENERGY RESOURCES

The renewable combustible energy resources evaluated in this section are biomass, biogas, and municipal solid waste (MSW). The electric power cost projections for these energy technologies are shown in Table 2-4.

Table 2-4. Electric Power Cost ($/MWh) Projections for Renewable, Combustible Energy Resources*

Cost Component	Biomass	Biogas	Municipal Solid Waste
Capital	N/A	37.0	32.8
Fixed O&M	N/A	6.6	38.9
Variable/Fuel	N/A	3.0	13.0
Total	90.0	46.5	84.8

Source: SME, 2004a
*Levelized Costs ($/MWh) for New Utility Generating Plants in NWPP Region

Source for Biomass Costs: U.S. Department of Energy (DOE) Energy Efficiency and Renewable Energy (EERE) State Energy Information - Biomass Power Technology website:(http://www.eere.energy.gov/state_energyttechnology_overview.cfm?techid=3)

Source for Biogas Costs: U.S. DOE Energy Information Administration (EIA) *Annual Energy 2003 Outlook* Reference Case. Based on the National Energy Modeling System (NEMS).
$/MWh - dollars per megawatt hour

A significant environmental issue for these renewable, combustible technologies is air emissions. Table 2-5 documents projected emissions of key air pollutants from a hypothetical 250-MW power plant using biomass and municipal solid waste as fuel.

2.1.4.1 Biomass

The term "biomass" means any plant-derived organic matter available on a renewable basis, including dedicated energy crops and trees, agricultural food and feed crops, agricultural crop wastes and residues, wood wastes and residues, aquatic plants, animal wastes, municipal wastes, and other waste materials. Biomass can be used to provide heat, make fuels, chemicals and other products, and generate electricity. Bio-energy ranks second (to hydropower) in renewable U.S. primary energy production and accounts for three percent of the primary energy production in the United States (DOE, 2005f). However, on an equivalent heat basis, biomass actually ranks first among renewable energy sources. (Refer to Figure 2-3.)

Table 2-5. Estimated Annual Air Emissions (tons/year) for a 250-MW Generating Station Using Biomass or Municipal Solid Waste[1]

Technology	Sulfur dioxide (SO_2)	Nitrogen oxides (NOx)	Carbon monoxide (CO)	Particular Matter (PM_{10})	Hazardous Air Pollutants (HAPs)	Mercury (Hg)	GHGs[2]
Biomass	274	2,409	6,570	810	427	0.038	342[3]
Municipal Solid Waste	439	4,886	1,911	132	54	0.29	2,668,000

Source: SME, 2004a; EPA, 2003l; EPA, 1996

[1]For biomass, based on 250-MW wood-fired boiler with low-NO_X burners and fabric filter; average fuel heating value of 6,500 British thermal units (Btu) per pound (lb). For municipal solid waste, based on mass burn water well combustor, 4,500 Btu/lb; 2,443,000 tons refuse derived fuel per year (RDF/yr); Lime Spray Dryer, Fabric Filter, and Selective Catalytic Reduction (at 80 percent control); AP-42, Section 2.1 emission factors.

[2]Greenhouse Gases

[3] CO_2 emitted from this source is generally not counted as greenhouse gas emissions because it is considered part of the short-term CO_2 cycle of the biosphere (USEPA, 2003l).

Heat can be used to chemically convert biomass into a fuel oil, which can be burned like petroleum to generate electricity. Biomass can also be burned directly to produce steam for electricity production or manufacturing processes. In a power plant, a turbine utilizes the steam to turn a generator that converts the energy into electricity. Some coal-fired power plants use biomass as a supplemental energy source in high-efficiency boilers to significantly reduce emissions (DOE, 2005f).

Biomass can also produce gas for generating electricity. Gasification systems use high temperatures to convert biomass into a gaseous mixture of hydrogen, carbon monoxide, and methane. The gas then fuels a combustion turbine, which is very much like a jet engine, except that it turns an electric generator instead of propelling a jet. The decay of biomass in landfills also produces a gas – methane (CH_4) – that can be burned in a boiler to produce steam for electricity generation or for industrial processes (DOE, 2005f).

Wood is the most commonly used biomass fuel for heat and power and is an available biomass resource in Montana. The most economic sources of wood fuels are usually urban residues and mill residues. Urban residues used for power generation consist mainly of chips and grindings of clean, non-hazardous wood from construction activities, woody yard and right-of-way trimmings, and discarded wood products such as waste pallets and crates. Mill residues, such as sawdust, bark, wood scraps, and sludge from paper, lumber, and furniture manufacturing operations are typically very clean and can be used as fuel by a wide range of biomass energy systems. These forest industries exist in Montana, and offer potential fuel sources for power generation. However, these waste materials are often burned in boilers at the plants themselves to produce thermal and/or electric power used to run the mills.

Biopower technologies are proven electricity generation options in the United States, with 10 gigawatts (10,000 MW) of installed capacity. All of today's capacity is based on mature, direct-combustion technology. Direct combustion involves the burning of biomass with excess air, producing hot flue gases that are used to produce steam in the heat exchange sections of boilers. The steam is used to produce electricity in steam turbine generators (DOE, 2005f).

The primary pollution issue in utilizing biomass to generate electricity is the control of air emissions. Co-firing of biomass fuels in a coal-fired boiler is advantageous from a renewable energy point of view as well as an alternative to land disposal of biomass as a solid waste. Biomass used as 5-15 percent of the fuel input in the co-firing of a coal-fired boiler would have similar air emissions and control requirements as those for a conventional pulverized coal or circulating fluidized bed boiler discussed later in this chapter. A 250 MW biomass-only fired boiler would have estimated air emissions shown in Table 2-5. While a biomass-fired boiler would have relatively low emissions of sulfur dioxide (SO_2), emissions of nitrogen oxides (NOx), carbon monoxide (CO), particulate matter (PM), and hazardous air pollutants (HAPs) would typically be higher than conventional coal-fired boilers or natural gas-fired combustion turbines.

The cost to generate electricity from biomass varies depending on the type of technology used, the size of the power plant, and the cost of the biomass fuel supply. In today's direct-fired biomass power plants, generation costs are approximately $90/MWh. Co-firing is an emerging technology that has been evaluated for a variety of boiler technologies, including pulverized coal, cyclone, fluidized bed and spreader stokers. Co-firing refers to the practice of introducing biomass in high-efficiency, coal-fired boilers as a supplemental energy source. For utilities and power generating companies with coal-fired capacity, co-firing with biomass may represent one of the least-cost renewable energy options (DOE, 2005g). For biomass to be economical as a fuel for electricity, the source of biomass must be located near the power generation facility to reduce transportation costs.

SME examined the possibility of a 20-MW biomass facility utilizing wood waste from pulp mills in Montana and concluded it was not feasible due to the location and uncertainties associated with the wood waste supply. For biomass to be economical as a fuel to generate electricity, the source of biomass must be located close to the power plant. This reduces transportation costs; the preferred system has transportation distances below 100 miles (approx. 260 sq. km). The most economical conditions exist when the energy use is located at the site where biomass residues are generated (i.e., at a paper mill or sawmill). These conditions do not exist in the SME service area. Thus, SME concluded that a 250-MW biomass facility would not be cost-effective compared to a conventional, pulverized coal-fired or circulating fluidized bed power plant (SME 2004a). RD and DEQ concur with this conclusion.

2.1.4.2 Biogas

Biomass gasification for power production involves heating biomass in an oxygen-starved environment to produce a medium or low calorific gas. This biogas is then used as fuel in a combined cycle power generation plant that includes a gas turbine topping cycle and a steam turbine bottoming cycle (DOE, 2005g).

Anaerobic digestion by anaerobic bacteria (whose survival requires an environment devoid of oxygen) is a naturally-occurring process (CanREN, 2003). “Swamp gas,” which contains methane, is produced by the anaerobic decomposition of wetland vegetation that has settled to the bottom of a marsh, swamp or other wetland. Environmental concerns and rising energy costs for energy and for wastewater treatment have led to a resurgence of interest in anaerobic treatment and new interest in using biogas produced during this treatment of organic wastes.

The same types of anaerobic bacteria that produce natural gas also produce methane-rich biogas today. Anaerobic bacteria break down or "digest" organic material in a two-step process. The first step is to break down the volatile solids in a waste stream to fatty acids. The second stage of the process is environmentally sensitive to changes in temperature and pH and must be free of oxygen to produce biogas as a waste product. The anaerobic processes can be managed in a "digester" (an airtight tank) or a covered lagoon (a pond used to store manure) for waste treatment. The primary benefits of anaerobic digestion are nutrient recycling, waste treatment, and odor control. Except in very large systems, biogas production is considered a secondary benefit.

In most cases, the methane produced by the digester is well-concentrated. Because methane is the principal component of natural gas, it is an excellent source of energy for use either in cogeneration on the electrical grid or simply for fueling boilers at the wastewater treatment plant. The methane captured from an anaerobic digester will naturally contain some impurities, chiefly sulfur, which should be scrubbed prior to pressurization and combustion. Anaerobic digesters are used in municipal wastewater treatment plants and on large farm, dairy, and ranch operations for disposal of animal waste.

Landfill biogas (LFG) is created when organic waste in a landfill naturally decomposes. This gas consists of about 50 percent methane, about 50 percent carbon dioxide, and a small amount of non-methane organic compounds. Instead of allowing LFG to escape into the air, it can be captured, converted, and used as an energy source. Using LFG helps to reduce odors and other hazards associated with LFG emissions, and it helps prevent methane from migrating into the atmosphere and contributing to local smog and global climate change.

The various types of biogas can be collected and used as a fuel source to generate electricity using conventional generating technology. Production of electric power from both digester gas and landfill gas has been demonstrated commercially for many years. The DOE Energy Information Administration projects the capital cost component of the levelized cost of biogas power to be approximately $37/MWh in 2009. The total levelized cost of biogas power is projected to be approximately $46/MWh (refer to Table 2-4).

Using digester or landfill gas as a fuel in a turbine is environmentally beneficial because biogas is a renewable resource. Pretreatment of the digester or landfill gas is very important to the long-term viability of the engines or turbines. The gas is typically treated to remove hydrogen sulfide, siloxanes, moisture, and particulates prior to combustion. The primary environmental compatibility issue is the air emissions produced by combustion. Air emissions for a turbine firing digester or landfill gas are similar to those of a natural gas-fired combustion turbine. The use of Selective Catalytic Reduction (SCR) for nitrogen oxide (NOx) control and catalytic oxidation for carbon monoxide (CO) control may be required. There are no major issues with biogas concerning water discharge or solid waste/hazardous waste generation. A 20-MW biogas facility would require approximately three acres (1.2 ha). Therefore, 13 of these plants having a total output of 250 MW would require a total area of approximately 39 acres (16 ha).

The current U.S. Environmental Protection Agency (EPA) Landfill Methane Outreach Program landfill and project database lists four landfill sites in Montana that have the potential for a landfill gas to electric power project. Two of the landfills are located within or near the SME service territory. One is located in Bozeman (owned and operated by the City of Bozeman), which is near the service territory and the other is located in Great Falls (owned and operated by Montana Waste Systems) which is within the service territory. The other two landfill locations are located at Missoula and Kalispell which are considerable distances to the SME service area. There are no landfills in Montana currently using landfill gas for energy production. The ability of a landfill to use the LFG for power generation is based on the rate of gas production. Gas production is dependent on the volume of waste in place, the age of the waste, and the moisture content of the waste. Landfills in Montana are dry and produce less gas than landfills in other parts of the country. Because of its low population, the total volume of waste produced in Montana is less than about 43 other states.

For SME or other Montana electric generation utilities, the key issues for biogas facilities are the dispersed locations and insufficient quantities of the fuel source. The City of Great Falls is currently developing a small-scale biogas generating facility in conjunction with its wastewater treatment plant. The amounts of digester gas and landfill gas resources are too limited within the SME service area for biogas power to fulfill the need for 250 MW of highly reliable base load capacity.

2.1.4.3 Municipal Solid Waste

The municipal solid waste industry includes four components: recycling, composting, landfilling, and waste-to-energy via incineration. Municipal Solid Waste (MSW) is total waste excluding industrial waste, agricultural waste, and sewage sludge. Medical wastes from hospitals and items that can be recycled are also generally excluded from MSW used to generate electricity. As defined by the U.S. EPA, MSW includes durable goods, non-durable goods, containers and packaging, food wastes, yard wastes, and miscellaneous inorganic wastes from residential, commercial, institutional, and industrial sources. Examples from these categories include: appliances, newspapers, clothing, food scraps, boxes, disposable tableware, office and classroom paper, wood pallets, rubber tires, and cafeteria wastes. Waste-to-energy combustion and landfill gas are byproducts of municipal solid waste (EIA, 2005e).

MSW can be directly combusted in waste-to-energy facilities to generate electricity. Because no new fuel sources are used other than the waste that would otherwise be sent to landfills, MSW is often considered a renewable power source. Although MSW consists mainly of renewable resources such as food, paper, and wood products, it also includes nonrenewable materials derived from fossil fuels, such as tires and plastics (EPA, 2005b).

At the power plant, MSW would be unloaded from collection trucks and shredded or processed to ease handling. Recyclable materials would be set aside, and the remaining waste would be fed into a combustion chamber to be burned. The heat released from burning the MSW would be utilized to produce steam, which turns a steam turbine to generate electricity.

Burning MSW produces nitrogen oxides, CO_2, and SO_2 as well as trace amounts of toxic pollutants, such as mercury compounds and dioxins. Variability in the composition of MSW affects the emissions produced. For example, if MSW containing batteries and tires is burned, toxic materials can be released into the air. A variety of air pollution control technologies are used to reduce toxic air pollutants from MSW power plants (EPA, 2005b). Estimated emissions of criteria air pollutants from a 250-MW MSW electric-generation facility are comparable or lower than a coal-fired resource, however, the emissions of hazardous air pollutants including mercury, cadmium, and toxic organics are considerably higher.

Power plants that burn MSW are normally smaller than fossil fuel power plants but typically require a similar amount of water per unit of electricity generated. Similar to fossil fuel power plants, MSW power plants discharge used water. Pollutants build up in the water used in the power plant boiler and cooling system. In addition, the cooling water is considerably warmer when it is discharged than when it was taken. This discharge would require a permit and would have to be monitored (EPA, 2005b).

MSW power plants reduce the need for landfill capacity because disposal of ash created by MSW combustion requires less volume and land area as compared to unprocessed MSW. However, because ash and other residues from MSW operations may contain toxic materials, the power plant wastes must be disposed of in an environmentally safe manner to prevent toxic substances from migrating (leaching) into groundwater supplies. Current regulations require MSW ash sampling on a regular basis to determine its hazardous status. Hazardous ash must be managed and disposed of as hazardous waste. Depending on state and local restrictions, non-hazardous ash may be disposed of in a MSW landfill or recycled for use in roads, parking lots, or daily covering for sanitary landfills (EPA, 2005b).

The United States has approximately 90 operational MSW-fired power generation plants, generating approximately 2,500 megawatts, or about 0.3 percent of total national power generation. However, because construction costs of new plants have increased, economic factors have limited new construction (EPA, 2005b). The capital cost of an MSW power project is approximately $3,500 to $4,000/kW. The total levelized cost of MSW power is projected to be approximately $85/mWh (refer to Table 2-4). Typically, MSW power plants become economical only when landfills for MSW disposal are not available near the collection area and hauling costs become excessive. The MSW power plants can command a tipping fee to offset the high cost of power production, but these need to be in the $50 to $60/ton range in order for the plant to be competitive. These conditions exist in populous areas such as New York City.

Except for small, localized areas, the potential for economical power to be generated in Montana from MSW does not exist. SME serves rural areas and does not have a municipal customer base large enough to support a municipal solid waste-to-energy project (SME, 2004a). There are currently no MSW incinerators operating in the State of Montana.

2.1.5 Non-Renewable Combustible Energy Resources

The non-renewable combustible energy resources evaluated in this section are Natural Gas Combined Cycle (NGCC), microturbines, Pulverized Coal (PC), Integrated Gasification Combined Cycle (IGCC) coal, oil, and nuclear. The electric power cost projections for the first five of these energy technologies are documented in Table 2-6 below.

As with the renewable, combustible technologies discussed above, a significant environmental issue for the non-renewable, combustible technologies is air emissions. Table 2-7 documents projected emissions of key air pollutants from a hypothetical 250-MW power plant from non-renewable, combustible energy sources.

Table 2-6. Electric Power Cost Projections for Non-Renewable, Combustible Energy Resources*

Cost Component	Levelized Costs ($/MWh)				
	Natural Gas Combined Cycle (NGCC)	Microtubines	Subcritical Pulverized Coal (PC) Powder River Basin (PRB) Coal	Circulating Fluidized Bed (CFB) Powder River Basin (PRB) Coal	Integrated Gasification Combined Cycle (IGCC) Bituminous Coal
Capital	19.0	49.1	33.8	25.2	42.8
Fixed O&M	2.3	8.4	4.6	4.6	3.3
Variable / Fuel	41.0	55.7	11.7	12.8	19.8
Total Bus-bar Cost[1]	62.3	113.2	50.1[2]	42.6	65.9

Source: SME 2004a
**Levelized Costs for New 250 MW Power Plant (Microturbines @ 30 kW), 90 Percent Capacity Factor*
[1] Busbar Cost-wholesale cost to generate power at the plant.
[2] EIA, 2004a: Table 21 for Advanced Coal plant.
$/mWh dollars per megawatt hour
O&M operations and maintenance

Table 2-7. Estimated Annual Air Emissions (tons/year) for a Gross 250 MW Generating Station, from Non-Renewable, Combustible Energy Sources[1]

Technology	Sulfur dioxide (SO_2)	Nitrogen oxides (NOx)	Carbon monoxide (CO)	Particulate Matter (PM_{10})	Hazardous Air Pollutants (HAPs)	Mercury (Hg)	GHGs[2]
NGCC[3]	30	87	131	58	9	---	963,000
Microturbines	83	83	1,250	83	---	---	1,691,666
Pulverized coal	1,330[6]	887[6]	1,330[6]	166	33	0.05	1,941,000
CFB[4] coal	142[7]	887[7]	710[7]	89[7]	18[7]	0.05[8]	1,941,000[9]
CFB (HGS)[10]	437	805	1,150	299	43.7	0.02	2,100,000
IGCC[5] coal	1,242	790	364	133	NA	0.05	1,553,000

Source: SME, 2004a (updated April 2005) and Supplemental Draft Air Quality Permit #3423-00

[1]For natural gas combined cycle, based on 250-MW Combined Cycle Turbine; 8,000 Btu/gross kWh heat rate; 90% NOx removal with selective catalytic reduction (SCR); AP-42 Section 3.1 emissions factors. For microturbines, based on summed emissions of 8,333 microturbines, each 30 kW in size; 0.437 MMBtu/hr heat input; 80% capacity factor; Dry Low NOx combustion; emission factors based on AP-42 Section 3.1 and EPA paper, *Technology Characterization: Microturbines,* March 2002. For pulverized coal, based on pulverized coal boiler, Powder River Basin (PRB) coal 8,000 British thermal units (Btu)/pound; 9,000 Btu/gross kilowatt hours (kWh) heat rate; 1,108,700 tons/yr coal; lime spray dryer, fabric filter and selective catalytic reduction; AP 42 emissions factors; U.S. Department of Energy (DOE) Energy Information Agency (EIA) Carbon Dioxide (CO_2) factor of 1,970 lb/megawatt hours (MWh). For circulating fluidized bed coal, based on circulating fluidized bed boiler; Powder River Basin (PRB) coal 8,000 British thermal units (Btu)/pound (lb); 9,000 Btu/gross kilowatt hours (kWh) heat rate; 1,108,700 tons/yr coal; limestone flash dryer absorber desulphurization, fabric filter and selective non-catalytic reduction. For integrated gasification combined cycle coal, emissions are based on Tampa Electric Polk Power Station IGCC Project. HAPs emissions were not reported but are expected to be lower than a conventional pulverized coal boiler but higher than a conventional natural gas combined cycle turbine. Carbon dioxide emissions are estimated to be 20% less than conventional pulverized coal boiler.
[2]Greenhouse Gases
[3]Natural Gas Combined Cycle
[4]Circulating Fluidized Bed
[5]Integrated Gasification Combined Cycle, testing eastern coals with higher sulfur content.
[6]These emissions values were extracted from recent air permits issued in the state of Montana and were found to be comparable with the AP42 emissions factors.
[7] Information obtained from CFB boiler suppliers.
[8]AP42 Emissions Factors.
[9]U.S. DOE EIA carbon dioxide factor of 1970 lb/megawatt hours (MWh).
[10] Proposed permit limits from Supplemental HGS Draft Air Quality Permit #3423-00, 270 gross MW.

2.1.5.1 Natural Gas Combined Cycle

Natural gas combined cycle power plants generate electricity using two cycles – the steam cycle and the gas cycle (PF, 2005). In the steam cycle, fuel is burned to boil water and create steam which turns a steam turbine, driving a generator to create electricity. In the gas cycle, gas is burned in a gas turbine which directly turns a generator to create electricity (refer to Figure 2-13). Combined cycle power plants operate by combining these two cycles for higher efficiency; that is, a higher percentage of the innate chemical energy of the fuels is converted into heat and kinetic energy. The hot exhaust gases exiting the gas turbine are routed to the steam cycle and are used to heat or boil water. These exhaust gases typically carry away up to 70 percent of the energy in the fuel before it was burned, so capturing what otherwise would be wasted can double overall efficiency from 30 percent for a gas cycle only plant to 60 percent using the newest combined cycle technology (PF, 2005).

Gas turbines for electric utility services generally range from a minimum of 20 MW for peaking service up to the largest machines for use in combined cycle mode. In the early 1990's natural gas played a major role as a heating fuel of choice for homes and commercial and business establishments, and also became the premier fuel for new electric generation. Natural gas was easy to locate, economical, and more environmentally friendly than coal or oil. During this

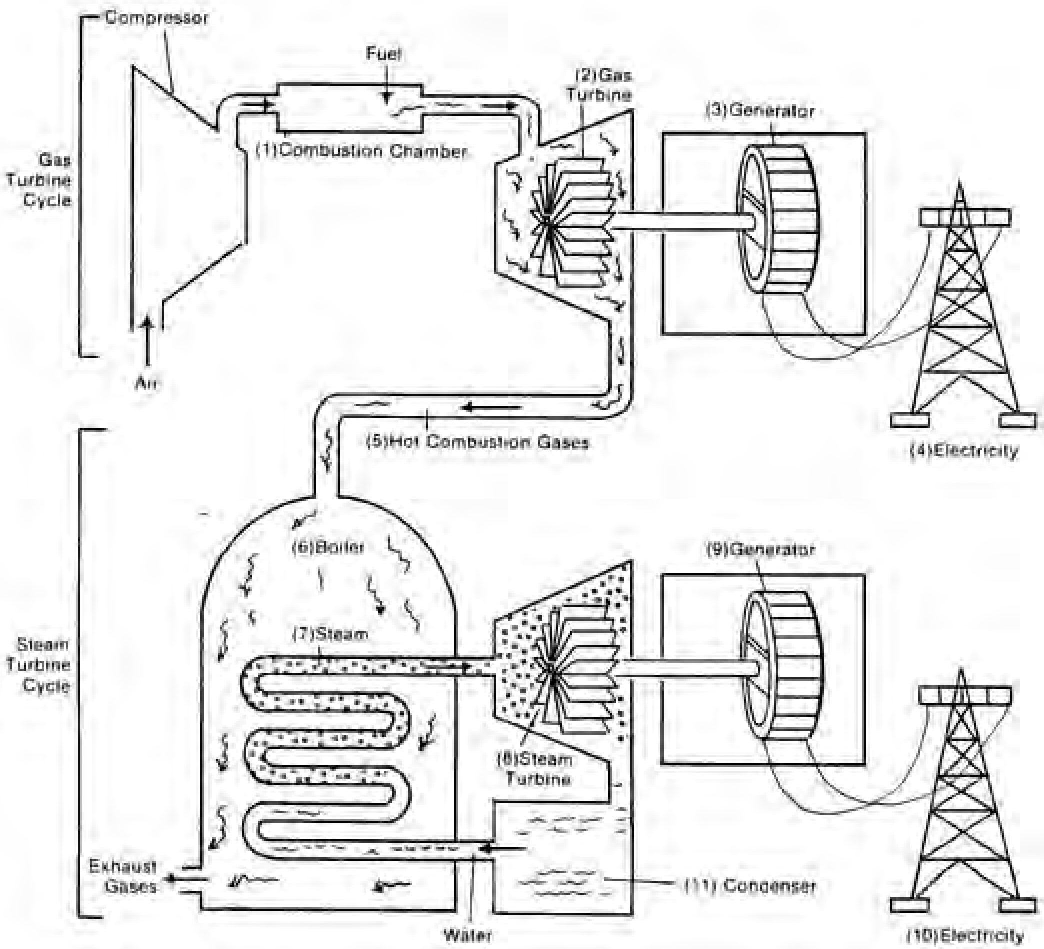


Figure 2-13. Major Elements of Natural Gas Combined Cycle System

period, virtually all new generation built in the region was in the form of combined or simple cycle gas turbines. Most new base load power plant facilities built in the United States in the past 10 years have used NGCC technology. NGCC plants have demonstrated high reliability and low maintenance costs.

Environmentally, as documented in the air emissions rates in Table 2-7, NGCC is clearly superior to other non-renewable energy resources. Assessing the entire life cycle, one of NGCC's drawbacks is the loss of potent greenhouse gas methane during extraction and distribution (Spath and Mann, 2000). Even though air pollution concerns are much lower with gas-fired plants than oil or coal-fired plants, there are other environmental concerns, including water use and water pollution. Combined cycle plants use about 10 million gallons of water per day, consuming seven million and discharging three million gallons back into nearby water bodies (PF, 2005).

More recently, because of the increased supply burden placed on natural gas, its price is increasing significantly, which affects not only the price of electricity produced by gas-fired generation but also the cost to heat homes and businesses. Because of highly variable and volatile natural gas fuel costs, as well as the likelihood of significant future price rises as domestic production crests and demand continues to intensify, NGCC is not a reliable, cost-effective option to meet the long-term energy needs of the SME service area.

2.1.5.2 Microturbines

Microturbines are small combustion turbines, approximately the size of a refrigerator, with outputs of 25-500 kW. They evolved from automotive and truck turbochargers, auxiliary power units for airplanes, and small jet engines and are composed of a compressor, a combustor, a turbine, an alternator, a recuperator, and a generator. Microturbines offer a number of potential advantages over other technologies for small-scale power generation. These include their small number of moving parts, compact size, light weight, greater efficiency, lower emissions, lower electricity costs, and ability to use waste fuels. They can be located on sites with space limitations for the production of power, and waste heat recovery can be used to achieve efficiencies of more than 80 percent (DOE, 2005h).

Because of their compact size, relatively low capital costs, low operations and maintenance costs, and automatic electronic control, microturbines are expected to capture a significant share of the distributed generation market (DOE, 2005h). Types of applications include stand-alone primary power, backup/standby power, peak shaving and primary power (grid parallel), primary power with the grid as backup, resource recovery and cogeneration. Target customers include financial services, data processing, telecommunications, office buildings and other commercial sectors that may experience costly downtime when electric service is lost from the grid (SME, 2004a).

In general, microturbine power plants are not currently cost competitive with conventional power-generation technologies. The capital cost of a microturbine unit is approximately $2,500/kW. The total levelized cost of microturbine power is projected to be approximately $113/MWh. Typically, microturbine units become economical for remote locations, where grid power is not available, and when low cost waste fuel is available (SME, 2004a). The U.S. Department of Energy's Office of Power Technologies is currently leading a national effort to design, develop, test, and demonstrate a new generation of microturbine systems for distributed energy resource applications. The goal is to develop advanced microturbines that will be cleaner, more fuel efficient and fuel-flexible, more reliable and durable, and lower in cost than the first-generation products entering the market today (DOE, 2005f).

Currently, microturbine units alone cannot fulfill the need for 250 MW of long-term, cost-effective, and competitive generation of base load capacity for the SME service area. This power generation technology pollutes more and costs more per unit of power generated than conventional power generation technologies; they are intended primarily for remote locations and as backup units rather than for base load supply.

2.1.5.3 Pulverized Coal

Modern pulverized coal plants generally vary widely in size from 80 MW to 1,300 MW and can use coal from various sources. Coal is most often delivered by unit train to the site, although barges or trucks are also used. Many plants are situated adjacent to the coal source where delivery can be by conveyor. Coal can have various characteristics with varying Btu heating values, sulfur content, and ash constituents. The source of coal and coal characteristics can have a significant effect on the plant design in terms of coal-handling facilities and types of pollution control equipment required.

Regardless of the source, the plant coal-handling system unloads and stacks out the coal, reclaims the coal as required, and crushes the coal for storage in silos. Then the coal is fed from the silos to the pulverizers and blown into the steam generator (Figure 2-14). The steam generator mixes the pulverized coal with air, which is combusted, and in the process produces heat to generate steam. Steam is conveyed to the steam turbine generator, which converts the steam thermal energy into mechanical energy. The turbine then drives the generator to produce electricity.

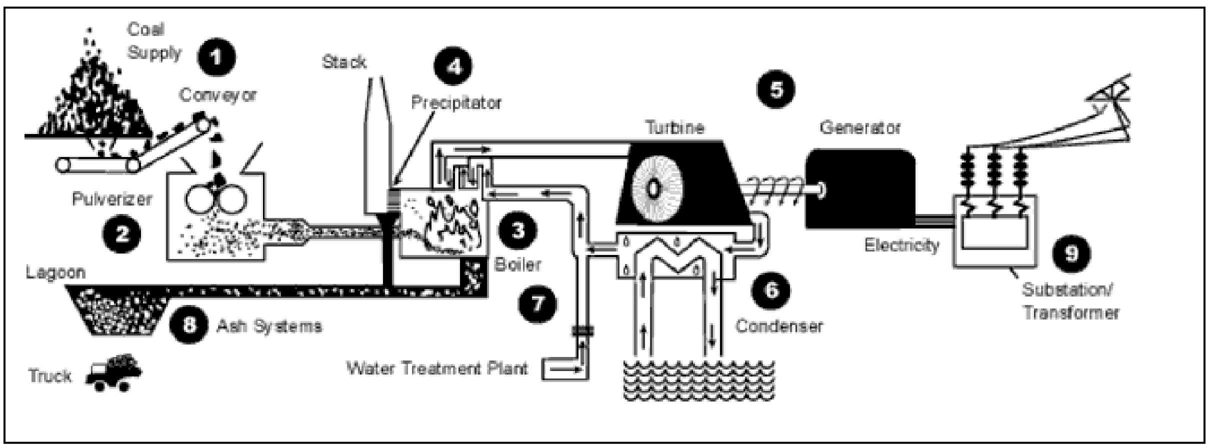


Figure 2-14. Diagram Depicting Components of a “Generic” Pulverized Coal Power Plant

Estimated air emissions for a 250 MW pulverized coal plant are documented in Table 2-7. Pollution control equipment would include either a fabric filter (bag house) or an electrostatic precipitator for particulate control (fly ash), selective catalytic reduction for removal of NOx, and a flue gas desulfurization system for removal of SO_2. Limestone is required as the reagent for the most common wet FGD process, limestone forced oxidation desulphurization. A limestone storage and handling system is a required design consideration with this system.

Pulverized coal plants represent the majority of coal-fired electric generating stations in the country, and coal-fired thermal plants generate more electricity than any other type in the United States. Because of the widespread use of PC plants, their air emissions are major contributors to a wide array of significant and cumulative environmental problems, including acid rain, visibility reduction, mercury emission, deposition and accumulation, and global warming (Applied Geochemistry Group, 2001; Eilperin, 2004; EPRI, 1998; IPCC, 2004; Kenworthy, 2004; Malm, 1999; EPA, 2005a; EPA., 2005b; EPA, 2004a; EPA, 2004b; EPA, 2003a; EPA, 2003b; EPA, 2003c; EPA, 2003d; EPA, 2003e; EPA, 2003f; EPA, 2003g; EPA, 2003h; EPA, 2003i; EPA, 2003j; EPA, 2003k; EPA, 2002c; EPA, 2000c; EPA, 1998c; EPA, 1997; USGS, 2000a; Suplee, 2000).

Pulverized coal plants produce several forms of liquid and solid waste. Liquid wastes include cooling tower blowdown, coal pile runoff, chemicals associated with water treatment, ash-conveying water, and FGD wastewater. Solid wastes include bottom and fly ash and FGD solid wastes. Disposal of these wastes is a major factor in plant design and cost considerations.

PC plants, although having a high capital cost relative to some alternatives, have an advantage over other non-renewable combustible energy source technologies due to the relatively low and stable cost of coal. New conventional pulverized coal plants achieve above 40 percent efficiency. Advanced modern plants use specially developed high strength alloys, which enable the use of the supercritical and ultra-supercritical steam (high pressures and temperatures) necessary to achieve the higher cycle efficiencies and can achieve, depending on location, close to 45 percent efficiency (CURC, 2005).

Constructing and operating a PC plant typically requires numerous permits and approvals from federal and state regulatory agencies. A major source Prevention of Significant Deterioration (PSD) air construction permit may be required from DEQ. The permit application, agency review, and public comment process can be extensive for a new coal-fired resource.

A PC generating station would have the benefit of relatively low cost and high reliability for base load generation for SME. However, these advantages are offset by the somewhat greater emissions of PC plants than CFB plants (Table 2-7). Typical PC plants use more water and generate more solid waste than CFB plants. In addition, at this scale, the total busbar cost is about 25 percent higher for a PC than a CFB plant (Table 2-6), as a result of higher operating and maintenance expenses. For these reasons, this alternative is eliminated from more detailed consideration in this EIS.

Busbar Cost

The busbar cost is the wholesale cost to generate power at a plant. The busbar itself is a copper or aluminum bar or bars to which the external transmission lines connect. The busbar is located inside the switchyard at the power plant.

2.1.5.4 Integrated Gasification Combined Cycle Coal

IGCC Overview

IGCC is a power generation process that integrates a gasification system with a conventional combustion turbine combined cycle power block. Rather than burning coal (or other feedstock) directly, the gasification system breaks it down to its basic chemical constituents. Coal is exposed to hot steam and carefully controlled amounts of oxygen under high temperatures and pressures. Carbon molecules in the coal then rupture, initiating chemical reactions that produce a synthetic gas or syngas consisting of carbon monoxide, hydrogen and other compounds (DOE, 2006a). This combustible syngas is then used to fuel a combustion turbine to generate electricity, and the exhaust heat from the combustion turbine is used to produce steam for a second generation cycle and provide steam to the gasification process (Rosenberg et al., 2005).

Minerals in the fuel such as rocks, dirt and other impurities separate and leave the bottom of the gasifier either as an inert glass-like slag or other marketable solid products. Only a small fraction of the mineral matter is blown out of the gasifier as fly ash and requires removal downstream. Sulfur impurities in the feedstock form hydrogen sulfide, from which sulfur can be easily extracted, typically as elemental sulfur or sulfuric acid, both of which are valuable byproducts. Nitrogen oxides, another potential pollutant, are not formed in the oxygen-deficient (reducing) environment of the gasifier. Instead, ammonia is created by nitrogen-hydrogen reactions; ammonia can be readily stripped out of the gas stream (DOE, 2006b).
.
The use of these two types of turbines in combination – a combustion turbine and a steam turbine – known as a "combined cycle," is one reason why gasification-based power systems can achieve unprecedented power generation efficiencies (refer to Figure 2-15). Currently, gasification-based systems can operate at around 45 percent efficiencies; in the future, these systems may be able to achieve efficiencies approaching 60 percent. In contrast, a conventional coal-based boiler plant, employing only a steam turbine-generator, is typically limited to 33-40 percent efficiencies (DOE, 2006b).

Potential Environmental Benefits

IGCC is an emerging, advanced technology with great promise for generating electricity with coal that can substantially reduce some air emissions, water consumption, and solid waste production (if gasification byproducts can be sold) as compared to conventional coal-fired power plants (EPA, 2006g). IGCC offers the potential for using coal in electricity generation with improved environmental performance, particularly reduced air emissions, through gasification and removal of impurities prior to combustion in the combustion turbine. This emissions control method is very different from conventional coal-fired power plants, which achieve virtually all emissions control through combustion and post-combustion controls that treat exhaust gases. Because the syngas produced in the gasification process has a greater concentration of pollutants, lower mass flow rate, and higher pressure than stack exhaust gas, emissions control through syngas cleanup is generally more cost-effective than post-combustion treatment to achieve the same or greater emissions reductions (Rosenberg et al., 2005). Overall environmental impacts from emissions of an IGCC plant would be expected to range somewhere between those of a natural gas combined cycle plant and a pulverized coal plant (Table 2-7). In Table 2-7, air emissions from IGCC and CFB plants are similar (taking into account higher sulfur coal used in Polk Power tests) with the exception of particulate matter and CO emissions, which are lower for an IGCC plant. A recent EPA report (EPA, 2006g) cites the overall potential for a reduced environmental footprint of IGCC in comparison with conventional coal-fired technologies with regard to reduced emissions of criteria pollutants and mercury.

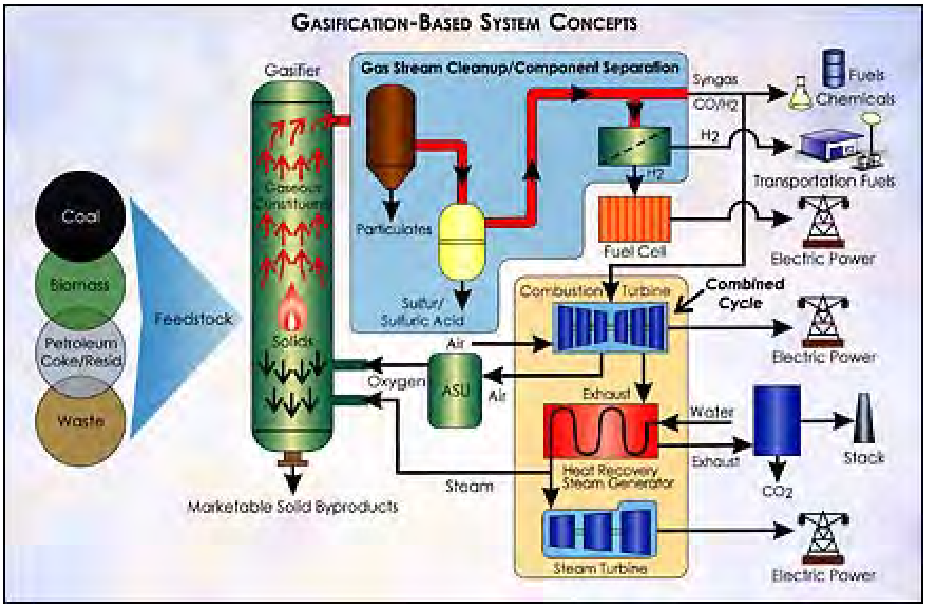


Figure 2-15. Gasification-based System Concepts (DOE, 2006b)

DOE also believes coal gasification may be one of the best ways to produce clean-burning hydrogen for automobiles and power-generating fuel cells. It might also offer greater potential for removing carbon dioxide at a lower cost for potential sequestration, thereby reducing emissions of this greenhouse gas (DOE, 2006b). However, no existing IGCC facility anywhere in the world removes or sequesters carbon dioxide.

DOE is currently spearheading "FutureGen," a $1 billion public-private partnership to build the world's first coal-fueled, "zero emissions" power production plant (FutureGen, 2006a). Partners in the "FutureGen Industrial Alliance" include seven American coal companies and utilities and one Chinese utility, coordinated by the non-profit Batelle research and industrial firm. A prototype, consisting of a 275-MW FutureGen plant, is slated to begin operations in 2013. It will produce electricity for about 150,000 homes using the IGCC process, as well as hydrogen and a concentrated stream of carbon dioxide. The hydrogen will be used as a clean fuel in applications such as electricity generation in turbines or fuel cells, or hybrid combinations of these technologies. Captured CO_2 will be separated from the hydrogen and permanently stored in deep saline formations, unmineable coal seams, depleted oil and gas formations, or other geologic formations. Ninety percent of the total carbon dioxide produced by the plant is expected to be captured initially, and with advanced technologies, this type of plant may eventually be able to capture up to 100 percent of carbon dioxide emissions (FutureGen, 2006a; DOE, 2006d).

Reliability and Cost

Although recognizing the potential benefits mentioned above, at the present time, the U.S. utility industry lacks extensive operating experience with IGCC technology. Each major component – gasification and combined cycle – of IGCC has been broadly used in industrial and power generation applications. However, the industry lacks experience at integrating these two complex processes. The integration of coal gasification with a combined cycle power block to produce commercial electricity as a primary output has been demonstrated at only a handful of facilities around the world, including two in the United States (DOE, 2006c). As time goes on, the industry is gaining valuable experience, which has been and continues to be demonstrated at the Polk and Wabash stations over the last several years. This growing experience is leading to increased confidence within the industry that reliability problems encountered to date can be overcome eventually. As a result, a number of new commercial-scale plants have been proposed by large utilities in recent years, including several plants announced in Colorado, Texas, Illinois, Indiana, and Florida.

Excluding the cost of financing, the cost of designing and building a power plant for IGCC is estimated to be about 20 percent higher than for PC systems (Rosenberg et al., 2005). The combined cycle portion of the process is attractive from a capital cost perspective compared to a conventional coal plant, but the addition of gasification, coal feed equipment, gas cooling, gas cleanup, and the installation of an oxygen plant result in an overall cost that is higher than a conventional coal plant. The resulting higher efficiency as compared to a conventional coal plant cannot offset the higher capital costs. In 2004, the capital cost was about 30 percent higher and the efficiency approximately five percent better than a conventional coal plant. This cost and performance comparison does not result in a cost of electricity that is lower than a conventional coal plant (Dalton, 2004).

IGCC plants are very complex and are often down for repairs, resulting in a reliability factor of 80-85 percent in the two existing U.S. plants (Amick, 2006; Black, 2003), which is significantly lower than the reliability of a CFB plant (over 95 percent). During the period of down-time, it would be necessary for SME to procure power from the open market, resulting in higher energy costs as well as potentially increased air pollution, since the energy might be purchased from older, coal-fired plants with less efficient pollution controls. Thus, in addition to higher capital costs, the overall operating cost of an IGCC plant would be higher than that of a CFB plant and it could possibly lead to increased emissions during the periods of down-time, which would likely occur more frequently than for a CFB plant.

Investments to design and build commercial IGCC power plants on a large scale in the U.S. have been slow to materialize due to cost and risk concerns. A 2004 survey by DOE indicates that the three leading risk factors perceived by industry to be associated with IGCC investments are high capital costs, excessive down time, and difficulty with financing (Rosenberg et al., 2005). The U.S. Department of Energy is continuing to fund research and development of IGCC, focusing on improvements in efficiency, fuel flexibility, and economics (DOE, 2005j).

Conclusion

Because IGCC technology is currently more costly and requires further demonstration to achieve the industry standard of 90 percent reliability for baseload generation, an IGCC facility is not a reasonable alternative for meeting SME's projected energy needs. While acknowledging IGCC's potential environmental benefits, it cannot meet SME's near-term energy generation needs.

2.1.5.5 Oil

In the United States as a whole, electricity generated by oil or petroleum (including distillate fuel oil, residential fuel oil, petroleum coke, jet fuel, kerosene, other petroleum and waste oil) has declined substantially in recent decades. From a peak of 365 million MWh in 1978 (17 percent of total U.S. net electricity generation in that year), petroleum accounted for just 118 million MWh – three percent – of net electricity generated in 2004 (EIA, 2005f). With the peak of domestic petroleum production in 1970, rising imports since then, increasing global prices over the last few years and the prospect for more of the same, plus competition for this valuable fuel commodity not only from the transport sector but also from the petrochemical industry, it is virtually certain that the downward trend for using petroleum to generate electricity will continue.

Three technologies are used to generate electricity from oil:

- *Conventional steam* - Oil is burned to heat water and create steam to generate electricity;
- *Combustion turbine* - Oil is burned under pressure to produce hot exhaust gases which spin a turbine to generate electricity;
- *Combined-cycle technology* - Oil is first combusted in a combustion turbine, using the heated exhaust gases to generate electricity. After these exhaust gases are recovered, they heat water in a boiler, creating steam to drive a second turbine (this is the NGCC process described in Section 2.1.5.1) (PowerScorecard, 2005).

Oil, like coal, is a fossil fuel, and burning it emits most of the same air pollutants as burning coal, though in different quantities. Oil combustion for electricity generation produces air pollutants such as nitrogen oxides, volatile organic compounds, and particulates, as well as, depending on the sulfur content of the oil, sulfur dioxide. Generating electricity from oil also results in emissions of the greenhouse gases carbon dioxide and methane and heavy metals such as mercury (PowerScorecard, 2005).

The looming peak of global oil production – whether in the current or an upcoming decade – presents the United States and the entire world with an unprecedented challenge in risk management. As the peak is approached – at the same time that global demand for oil is still increasing steadily in developed countries like the U.S. but now also increasing sharply to fuel the industrial development of rapidly growing, heavily populated countries like China and India – liquid fuel prices and price volatility will increase dramatically. Without timely mitigation, the economic, social, and political costs could be unprecedented (Hirsch et al., 2005). Skyrocketing gas prices and price volatility are much on the minds of Americans consumers and motorists even today each time they pull up to a gasoline station.

Important observations and conclusions from a 2005 U.S. Department of Energy-funded study (Hirsch et al., 2005) on the implications of "peak oil" include:

1. When the peak of world oil production will occur is not known with certainty. A fundamental problem in predicting oil peaking is the poor quality of and possible political biases inherent in world oil reserves data. (In the 1980s many member states of the

Organization of Petroleum Exporting Countries (OPEC) cartel arbitrarily boosted their stated reserves in order to capture higher production quotas. These stated "political" reserves must be regarded with skepticism.) Some experts believe peaking may occur soon. The 2005 DOE study indicates that "soon" is within 20 years, while some authorities believe peaking may even occur before 2010.

2. The problems associated with world oil production peaking will not be temporary but rather, long-lived. Therefore, past "energy crisis" experiences, which were temporary (e.g., 1974-75 during the Arab Oil Embargo and 1979-80 due to the Iranian Revolution), will provide limited guidance. The challenge of peak oil deserves immediate, serious attention, if risks are to be fully understood and mitigation initiated on a timely basis.
3. Oil peaking will create a severe liquid fuels problem for the transportation sector, not an "energy crisis" in the usual sense that term has been used.
4. Peaking will result in dramatically higher oil prices, which will cause protracted economic hardship in the United States as well as the world. However, the problems are not insoluble. Timely, aggressive mitigation initiatives addressing both the supply and the demand sides of the issue will be required.
5. In the developed nations, the problems will be especially serious. In the developing, less affluent nations, peaking problems have the potential to be even worse.
6. While greater end-use efficiency in the use of oil is essential, increased efficiency alone will be neither sufficient nor timely enough to solve the problem. Production of large amounts of substitute liquid fuels will be required. Various commercial or near-commercial substitute fuel production technologies are currently available for deployment, so the production of vast amounts of substitute liquid fuels is feasible with existing technology.
7. Intervention by governments will be required, because the socioeconomic implications of peak oil and the post-peak oil period would otherwise be chaotic. The experiences of the 1970s and 1980s offer some guidance as to government actions that are desirable and those that are undesirable, but the process will not be easy (Hirsch et al., 2005).

In conclusion, no one has built or is contemplating building oil-fired plants in recent years because of their high and increasing operating cost and, as compared to natural gas, greater air emissions, thereby requiring additional air pollution controls. In terms of SME's need to generate affordable electricity for its members and customers, oil would not be a cost-effective alternative, and thus is not evaluated any further in this EIS.

2.1.6 NUCLEAR POWER

First commercialized in the late 1950's, nuclear power now accounts for approximately one-fifth of the total electricity generated in the United States. In a nuclear fission reactor, uranium atoms are fissioned or split, which generates considerable heat energy. The fission process for a uranium atom yields two smaller atoms of lighter elements, one to three free neutrons, plus a large amount of energy in the form of heat. This heat then boils water to make the steam that turns the turbine-generator, just as in a fossil fuel plant. The part of the plant where the heat is produced is called the reactor core (EIA, no date-a).

"Free" neutrons means the neutrons are free of any atomic nuclei, in which neutrons are normally found closely bound with protons. Because more free neutrons are released from a uranium fission event than are required to initiate the event, the reaction can become self sustaining – a chain reaction – thus producing an enormous amount of energy (EIA, no date-b).

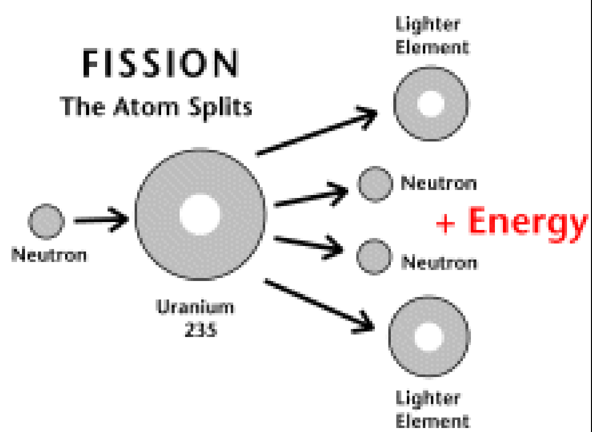


Figure 2-16. Nuclear Fission

In the most of the world's nuclear power plants, so-called light-water reactors, fission heats ordinary water, or "light water," as opposed to "heavy water," which contains the heavy hydrogen isotope deuterium. The heated water is carried away from the reactor's core either as steam in boiling water reactors, or as superheated water in pressurized-water reactors. In either a boiling-water or pressurized-water facility, steam under high pressure is the medium used to transfer the nuclear reactor's heat energy to a turbine that mechanically turns an electric generator.

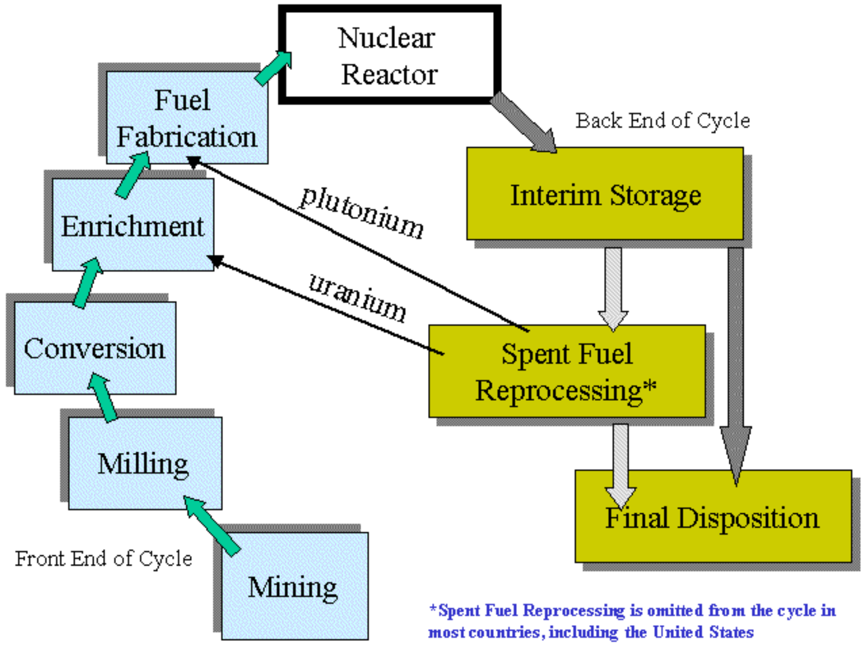
The fuel core for a light-water nuclear power reactor may contain up to 3,000 fuel assemblies. The fuel core is essentially a reservoir from which heat energy can be extracted through the nuclear chain reaction process. During the operation of the reactor, the concentration of U-235 (the reactive or fissile isotope of uranium) in the fuel declines as those atoms undergo nuclear fission. Some U-238 (the most common isotope of uranium in nature) atoms are converted to atoms of a plutonium isotope – fissile Pu-239 – some of which also undergo fission and produce energy. The products created by the nuclear fission reactions are retained within the fuel pellets and these become neutron-absorbing products (called "poisons") that act to slow the rate of nuclear fission and heat production. As the reactor operation is continued, a point is reached at which the decreasing concentration of fissile nuclei in the fuel and the increasing concentration of poisons result in lower than optimal heat energy generation, and the reactor must be shut down temporarily and refueled (EIA, no date-b).

The nuclear fuel cycle is illustrated in Figure 2-17. This complex cycle consists of "front end" and "back end" steps. The former lead to the preparation of uranium for use as fuel in reactor operation while the latter are necessary to safely manage and dispose of the highly radioactive spent nuclear fuel. It is technically feasible to chemically process the spent fuel material to recover the remaining fractions of fissionable products, U-235 and Pu-239, for use in fresh fuel assemblies. However, reprocessing of spent commercial-reactor nuclear fuel is not permitted in the United States at this time (EIA, no date-b).

The front end of the nuclear fuel cycle starts with exploration and mining. Using geophysical techniques, geologists discover, evaluate and sample a deposit of uranium to determine the amounts that are extractable at specified costs. Uranium reserves are the amounts of ore that are estimated to be recoverable at stated costs (EIA, no date-b).

Uranium ore can be mined in either open pits or underground, or by using *in situ* leach mining, in which uranium is leached from the in-place ore. Uranium ores in the United States range from about 0.05 to 0.3 percent uranium oxide (U_3O_8). Certain uranium deposits developed in other countries are of higher grade and are also larger than deposits mined in the United States.

Figure 2-17. Nuclear Fuel Cycle



Mined uranium ores are normally milled by grinding the ore to a uniform particle size and then treating it to extract the uranium by chemical leaching. Milling typically yields a dry powder called "yellowcake," which is high-concentration U_3O_8. U_3O_8 must be converted to uranium hexafluoride, UF_6, which is the form required by most commercial uranium enrichment facilities. UF_6 is a solid at room temperature but can be changed to a gas at moderately higher temperatures. The UF_6 conversion product contains only natural, not enriched, uranium.

The concentration of the fissionable or fissile uranium isotope, U-235 (only 0.71 percent in natural uranium) is less than that required to sustain a nuclear chain reaction in light-water reactor cores. Thus, natural UF_6 must be "enriched" by increasing the concentration of U-235 to about four percent. Gaseous diffusion and gas centrifuge are the commonly used uranium enrichment technologies. The gaseous diffusion process consists of passing the natural UF_6 gas feed under high pressure through a series of diffusion barriers (semiporous membranes) that permit passage of the lighter U-235F_6 atoms at a faster rate than the heavier U-238F_6 atoms. Because this technology requires a large capital outlay for facilities and it consumes large amounts of electrical energy, it is relatively cost intensive. In the gas centrifuge process, the natural UF_6 gas is spun at high speed in a series of cylinders. This acts to separate the U-235F6 and U-238F6 atoms based on their slightly different atomic masses. Gas centrifuge technology involves relatively high capital costs for the specialized equipment required, but its power costs are less than those for the gaseous diffusion technology. New enrichment technologies currently under development include the atomic vapor laser isotope separation and the molecular laser isotope separation (EIA, no date-b).

For use as nuclear fuel, enriched UF_6 is converted into uranium dioxide (UO_2) powder which is then processed into pellet form. The pellets are stacked, according to each nuclear core's design specifications, into tubes of corrosion-resistant metal alloy. The tubes, called fuel rods, are sealed to contain the fuel pellets. The finished fuel rods are grouped in special fuel assemblies that are then used to build up the nuclear fuel core of a power reactor.

The first step of the back end of the nuclear fuel cycle is interim storage. After its operating cycle, the reactor is shut down for refueling. Its spent fuel is stored either at the reactor site or, potentially, in a common facility away from reactor sites. If on-site pool storage capacity is exceeded, it may be desirable to store aged fuel in modular dry storage facilities known as Independent Spent Fuel Storage Installations (ISFSI) at the reactor site or at a facility away from the site. The spent fuel rods are usually stored in water, which provides both cooling (the spent fuel continues to generate heat as a result of residual radioactive decay) and shielding (to protect the environment from residual ionizing radiation) (EIA, no date-b).

Spent fuel discharged from light-water reactors contains fissile U-235 and Pu-239, as well as “fertile” U-238 and other radioactive materials. These fissile and fertile materials can be chemically separated and recovered, and then, if economic and institutional conditions permit, recycled for use as nuclear fuel. Currently, plants in Europe are reprocessing spent fuel from utilities in Europe and Japan. At this time, however, such recycling is not carried out in the United States.

The final step in the nuclear fuel cycle is final disposition of radioactive nuclear wastes. The safe disposal and isolation of either spent fuel from reactors or, if the reprocessing option is used, wastes from reprocessing plants, is a major concern in the nuclear field and with the public. These waste products must be isolated from the biosphere until the radioactivity contained in them has diminished to a safe level. Under the Nuclear Waste Policy Act of 1982, as amended, the Department of Energy has responsibility for developing a permanent waste disposal system for spent nuclear fuel and high-level radioactive waste. Current plans call for the ultimate disposal of the wastes in solid form in licensed deep, stable geologic structures (EIA, no date-b). DOE has been studying Yucca Mountain in Nevada for this purpose.

Environmental concerns about nuclear power arise from several phases of the nuclear fuel cycle, especially mining, reactor safety, and interim and permanent waste disposal. Uranium mining has been cited by some scientists and activists as an occupational health hazard to miners, while improper disposal of tailings is alleged to have left active and former mine sites with an enduring source of radioactive contamination. The public’s faith in the operational safety of nuclear power reactors was badly shaken by a partial core meltdown during the 1979 accident at Three Mile Island in Pennsylvania and a 1986 full core meltdown at Chernobyl in the former Soviet Union. In addition, the possibility of terrorist attacks on nuclear power plants and proliferation issues – especially the potential for fissile or radioactive materials falling into the hands of terrorists – have also fueled rising public anxiety. A 2003 study by the Massachusetts Institute of Technology concluded that the current international safeguards regime is inadequate to meet security challenges (MIT, 2003). Finally, both the interim and final disposal of nuclear wastes have become highly contentious and politicized as a result of doubts about the ability of the methods being used and proposed to ensure public safety and environmental protection.

These continuing concerns, as well as delays and cost overruns in constructing nuclear power plants, led to the cancellation of every plant ordered in the U.S. after 1974; no plants have been ordered since 1977. In recent years however, many Americans have expressed renewed interest in nuclear power as a result of concerns about fossil fuel depletion and global climate change (MIT, 2003). As fossil fuels, especially natural gas, have become costlier, the operating cost of nuclear power has held relatively constant. Among major U.S. investor-owned electric utilities, the average total operating expenses for fossil steam power plants increased from 21.8 to 27.7 mills per kilowatt-hour between 1994 and 2005; over the same period, the total operating expenses for nuclear power declined from 20.9 to 18.2 mills per kilowatt-hour (EIA, 2006a). In addition, newer reactor designs emphasize operational safety features.

There are currently 104 commercial nuclear generating units fully licensed by the U.S. Nuclear Regulatory Commission (NRC) to operate in the United States. Of these 104 reactors, 69 are pressurized water reactors totaling 65,100 net megawatts while 35 units are boiling water reactors totaling 32,300 net megawatts. Although the United States has more nuclear capacity than any other nation, no new commercial reactor has come on line since May 1996. The current administration has been supportive of nuclear energy, emphasizing its importance in maintaining a diverse energy supply. Nevertheless, as of October 31, 2006, no U.S. company had yet applied for a new construction permit (EIA, 2006b). In the meantime, older reactors that are nearing the end of their operating permits and lifetimes have begun to be decommissioned and shut down. In some cases, issuance of new operating permits has necessitated the installation of upgrades to systems, equipment and materials for the existing facilities.

SME did not actively pursue nuclear as an energy source for several reasons. Permitting and construction of nuclear power plants takes considerably longer than for PC or CFB plants. Given SME's urgent need to bring a new base load generating source on line as soon as possible, or face serious financial consequences, this is a distinct disadvantage. Furthermore, even with renewed emphasis on nuclear power as a component of a national energy strategy, building a new nuclear power plant would still face the daunting prospect of stiff public opposition and permitting uncertainty. Furthermore, nuclear power plants are built on a large scale that far exceeds SME's 250 MW need, so nuclear power would therefore not be an appropriate or cost-effective technology at this size.

2.1.7 COMBINATIONS OF ENERGY SOURCES

In response to concerns expressed by the public in commenting on the DEIS, the agencies have added two alternatives, each consisting of combinations of energy sources considered independently in this chapter. Section 2.1.2 on energy conservation and efficiency indicated that load reductions on the order of 10 percent could reasonably be achieved through a concerted effort on this front. Thus, the combinations below each assume a 10 percent contribution from conservation and efficiency.

As discussed in Section 2.1.3.4, geothermal energy is not considered to be a viable commercial generation source in Montana, and is therefore excluded from the discussions below. Use of geothermal energy in a dispersed fashion, such as with ground source heat pumps, is considered as part of conservation and efficiency efforts. Biomass, biogas and municipal solid waste energy resources in the state, as discussed in Sections 2.1.4.1, 2.1.4.2 and 2.1.4.3, are too scarce to make an appreciable contribution to the energy mix, and are therefore excluded. Hydroelectricity, wind, and solar energy have more potential in Montana than these.

2.1.7.1 Combination of CFB and Renewable Energy Sources

This alternative consists of a 150-MW CFB coal-fired power plant in conjunction with a combination of conservation, efficiency improvements, and renewable energy sources. The renewable energy sources would be comprised of a variable and flexible mix of wind, solar, and hydroelectricity. Conservation, efficiency, and renewable sources would therefore have to meet a net 100 MW of capacity. Assuming that conservation and efficiency are able to meet 10 MW (10 percent) of this 100 MW, renewable sources would have to supply the remaining 90 MW. Of the three renewable sources, hydroelectricity has the greatest ability to regulate output, thus meeting dispatchable capacity requirements. In contrast, solar and wind are inherently limited in this respect, due to their intermittency and relative unpredictability, and there is no ability to regulate their output as needed.

Thus, under this combination alternative, two variations have been developed. In the first, wind and solar are assumed to supply the greater share of the needed 90 MW. In the second variant, hydroelectricity is assumed to supply the greater share, with wind and solar making up the difference.

As noted above, each of the variants below would still have a 150-MW CFB facility. The footprint of a facility this size would still be approximately 160 acres, about the size of the full-scale 250-MW HGS, because of diseconomies of scale (that is, a smaller output facility would still need all of the same infrastructure as the larger facility). The sizes of project components such as the stack, raw water line, potable water line, wastewater line, transmission lines, railroad spur, and transportation improvements would not change with the 150-MW CFB plant. Other components such as the ash disposal area within the overall footprint would be proportionately downsized.

Certain direct impacts of the 150-MW facility would be proportionately smaller (by about 40 percent) than the 250-MW HGS, such as air emissions, consumptive water use, coal consumption, wastewater generation, and fly and bed ash generation. In terms of air emissions, overall criteria pollutant, mercury, and carbon dioxide emissions would all be approximately 40 percent less than the HGS. Economic benefits to Great Falls and Cascade County would be somewhat or slightly less. Although some of the facilities that comprise the generating station itself would be somewhat smaller, overall the visual presence and noise signature, and therefore, impacts on visual resources, cultural resources, and the acoustic environment – namely on the Great Falls Portage National Historic Landmark – would be only marginally smaller, and still significant. The number of unit coal trains servicing the plant would likely not be reduced, but the number of coal cars in each train would be smaller.

Wind and Solar Dominant

In this variant, wind would supply 40-60 MW and solar 15-25 MW, leaving 5-35 MW for hydroelectricity. Using the land area requirements described in Sections 2.1.3.1, 2.1.3.2 and 2.1.3.3, first order approximations of the land required for each of these renewable contributions can be derived. To produce 40-60 MW of wind capacity, assuming 13.47 MW/sq. mi. for a Class 4 wind resource area, approximately 3-4.5 square miles (1,920-2,880 acres) of terrain would be used. If large 1.5-MW turbines were used to supply this electricity, that would represent about 25-40 approximately 400-ft. high wind turbines. To supply 15-25 MW of power with solar energy using photovoltaic systems would require up to 31 acres. To supply 5-35 MW of hydroelectricity would require a facility roughly the size of one of the dams and generation facilities along the Great Falls of the Missouri River.

Wind energy on the scale assumed in this variant could entail certain environmental impacts of the sort described in Section 2.1.3.1. Given the presence of the 150-MW CFB plant at the Salem site, for reasons of reducing additional costs associated with additional transmission lines and other infrastructure development, wind development would preferably be located at or near the Salem site. Therefore, the placement of some 25-40, 1.5-MW wind turbines in the vicinity of the Salem site, close to or within the Great Falls Portage NHL, would result in significant visual and cultural resource impacts. Because the area is not a site with concentrated bird populations (e.g. wetland or river) or a known migratory route, impacts on bird mortality from a wind farm of this size would not likely be significant, but this would still require additional study and monitoring. Wind turbine operation does not generate emissions, consume water, or generate solid wastes or waste water.

Developing 31 acres of land for solar power would necessitate purchasing this area for solar collectors or photovoltaic arrays, as well as facilities and infrastructure (e.g. buildings, generator, transformers, roads). Unlike with wind, this acreage would be entirely and permanently transformed; any prior use, for example as farmland, pasture, or wildlife habitat, would be eliminated. Although this acreage is not large in the context of a big state like Montana with ample open space, it could still potentially represent a significant adverse impact. There would be impacts to soils, hydrology, landform, vegetation, habitat, wildlife populations, and visual resources. Socioeconomic impacts, as with most job-creating development, would be somewhat positive, as would other environmental impacts, especially the potential elimination of criteria and hazardous pollutants and greenhouse gases. Water consumption associated with solar generation would be virtually nil. In addition, waste generation (wastewater and solid waste) would be virtually non-existent.

The proximity of these wind and solar facilities to the HGS transmission interconnection lines is an important issue and constraint. Electricity generated by these facilities would have to tie in with the interconnection lines before they reach Northwest Energy's system. If they could not, then the wind and solar components would lose their place in the queue and not be able to tie in with any certainty, without a delay and the possible necessity of constructing additional transmission capacity.

With regard to hydroelectricity, the assumed 5-35 MW would come from either existing, upgraded, or new facilities. If an existing or upgraded source of hydroelectricity could be found, this would clearly be preferable, because it would avoid new environmental impacts. However, competition for existing hydroelectric capacity is increasing, as evidenced by the impending loss of 80 percent of SME's supply from BPA, most of which was hydroelectricity. Moreover, constraints on the fixed hydroelectric resource in the Pacific Northwest and greater demands by the public for competing uses of river flows (e.g., for conserving and restoring salmon runs) are likely to further limit hydropower output. Thus the likelihood is low of obtaining existing hydroelectricity or developing new source(s) to meet the stated 5-35 MW.

If a new hydroelectric source could be found and developed, it would not be in the vicinity of the HGS because of a lack of nearby potential and there would be numerous problems to overcome. Permitting a new hydroelectric facility through the Federal Energy Regulatory Commission requires considerable time and includes the preparation of an EIS. Once permitted, construction of a new facility could take years to complete; the actual time would depend on the location. Transmission lines would have to be installed to two substations and the interconnections would have to be placed in the queue. If the transmission lines were of sufficient length, they would trigger the permitting requirements of the Montana Major Facility Siting Act, which also requires an EIS. Therefore, even if it were possible to build a new hydroelectric facility, it could be a decade before it was online providing the power that SME needs starting in 2008.

Construction of a new hydroelectric facility would impact a number of resources. A run of the river dam would cause fewer impacts but they would still likely be major and potentially significant to some resources. Depending on the size of the stream or river, one dam may or may not be sufficient to provide the entire amount of electricity. The impacts would be greater if more than one dam was needed. A dam which impounded water behind it would create even greater impacts as the stream and land behind the dam were covered by rising water. Dam construction and operation would impact hydrology, river dynamics, sediment transport, vegetation, soils, wildlife, wildlife habitat, fisheries, and possibly agriculture, land use, recreation, residential relocations, and roads. Socioeconomic benefits would include increased employment during construction and long-term employment during operation of the facility. There is potential for recreational benefits such as fishing, boating, and swimming and lakeshore development depending on the type of dam constructed. Flood control may also be a benefit.

Hydroelectric dam operation does not generate emissions, consume water, or generate solid wastes or waste water.

Hydroelectricity Dominant

In this variant, hydroelectricity would supply 50-60 MW and wind 15-25 MW, leaving 5-15 MW for solar. To supply 50 to 60 MW of hydroelectricity would require three to four smaller facilities about the size of the Black Eagle Dam or one larger facility roughly the size of Cochrane Dam on the Great Falls of the Missouri River. Using the land area requirements described in Sections 2.1.3.1 and 2.1.3.2, first order approximations of the land required for wind and solar can be derived. To produce 15-25 MW of wind capacity, assuming 13.47 MW/sq. mi. for a Class 4 wind resource area, approximately 1.1-1.9 square miles (704-1,216 acres) of terrain would be used. If large 1.5-MW turbines were used to supply this electricity, that would represent about 10-17 approximately 400-ft. high wind turbines. To supply 5-15 MW of power with solar energy using photovoltaic systems would require up to 19 acres.

The supply of 50 to 60 MW of hydroelectricity would come from either existing, upgraded, or new facilities. The acquisition of existing or upgraded facilities or the purchase of power from those facilities would be the same as described for the Wind and Solar Dominant variant. Construction of new hydroelectric facilities would be on a larger scale than previously described. This variant would require three to four smaller facilities about the size of the Black Eagle Dam or one larger facility roughly the size of Cochrane Dam on a river the size of the Missouri River or more smaller dams on smaller streams. The problems discussed under the previous variant would be magnified under this variant for hydroelectricity. These problems include not only getting one or more facilities permitted but the associated impacts on environmental resources.

Wind energy on the scale assumed in this variant – 10-17, 1.5-MW wind turbines – could entail certain environmental impacts of the sort described in Section 2.1.3.1 and in the Wind and Solar Dominant variant above. Wind development would preferably be located at or near the Salem site. Therefore, the placement of even a reduced number of wind turbines in the vicinity of the Salem site, close to or within the Great Falls Portage NHL, would still result in significant visual and cultural resource impacts.

Developing 19 acres of land for solar power would necessitate purchasing this area for solar collectors or photovoltaic arrays, as well as facilities and infrastructure (e.g. buildings, generator, transformers, roads). The impacts and benefits would be proportionately smaller than those described for the variant above.

As in the previous variant, the proximity of these wind and solar facilities to the HGS transmission interconnection lines is an important issue and constraint.

Conclusion

Overall, both variants of this combination alternative would be somewhat superior to the Proposed Action because of proportionately smaller air emissions, water consumption and waste generation. An additional benefit of this alternative is that over the long term, it would be more sustainable, although not entirely sustainable due to the continued consumption of coal and release of greenhouse gases. However, this alternative would expand the overall footprint (land used) from that of the Proposed Action. In addition, the use of renewable sources would produce some adverse impacts on land, hydrology, wildlife, fisheries, visual and cultural resources, among others. These impacts would probably be somewhat more dispersed and widespread than in the case of the Proposed Action. There is particular potential for significant impacts to some resources, especially cultural and visual resources and the acoustic environment, due to the proximity of the Great Falls Portage NHL. Cultural and visual impacts of this combination alternative would likely exceed those of the Proposed Action, if the wind turbines and solar facilities were constructed in close proximity to the HGS, and hence the NHL. If these facilities were constructed further away from the NHL, this impact would be reduced or eliminated. However, doing so could impede the ability to connect these generation facilities with the grid.

Several factors affect this alternative's ability to meet the purpose and need for the proposed action. Assuming that wind and solar power could be developed and brought on line more quickly than the CFB plant, these resources could help fill the power deficit that will begin to emerge in 2008, when BPA supply begins to phase out. Because wind and solar are not dispatchable power (always able to meet demand as it occurs), firming power would have to be acquired during this time, at a cost to SME.

When the 150-MW CFB was completed and brought on line, SME's ability to meet its load would improve. However, once BPA sales were entirely phased out, and SME was faced with meeting all of its projected deficit with this alternative, SME would again be faced with the substantial expense of acquiring and maintaining firming power, for the times when either its wind or solar plants were idle or generating below capacity. The example shown in Table 2-13 of the EIS, assumes a 36 percent capacity factor (that is, wind is available about one-third of the time); the firming cost of wind in this example almost doubles its cost to the utility. The actual cost of the purchased power depends on the market at the time, but almost certainly would result in a higher or substantially higher cost than self-generation. The same general situation – the need to purchase expensive firming power – applies with solar power.

Hydroelectricity presents even greater risk and uncertainty at the present time. If new hydroelectricity could be obtained, the lengthy approval process and construction time would mean power would not be available until after the date it was needed by SME to replace lost power. If existing or new hydropower could be obtained, this energy source could reliably provide dispatchable power at either level assumed in these two variants. There would be no need to obtain firming power for a hydroelectric source. However, as discussed above, in the current environment, the probability of being able to obtain existing or new sources of hydropower must be considered low as the magnitude and extent of demand on water resources continues to grow. Thus, it would not be prudent to count on the assumed contribution of hydropower in this combination alternative.

Therefore, this combination alternative only partially meets the purpose and need of this project in the short-term. It does not provide reliable, cost effective, and consistent energy generation for the predicted long-term load.

2.1.7.2 Combination of Renewable Energy Sources

This alternative consists of a combination of conservation, efficiency improvements, and a variable and flexible mix of wind, solar, and hydroelectricity. Conservation, efficiency, and renewable sources would therefore have to meet the entire 250 MW of capacity. Assuming that conservation and efficiency are able to meet 25 MW (10 percent) of this 250 MW, renewable sources would have to supply the remaining 225 MW.

Under this combination alternative, two variations have been developed. In the first, wind and solar are assumed to supply the greater share of the needed 225 MW. In the second, hydroelectricity is assumed to supply the greater share, with wind and solar making up the difference.

Wind and Solar Dominant

In this variant, wind would supply 80-120 MW and solar 25-45 MW, leaving 80-100 MW for hydroelectricity. Using the land area requirements described in Sections 2.1.3.1 and 2.1.3.2, first order approximations of the land required for wind and solar facilities can be derived. To produce 80-120 MW of wind capacity, assuming 13.47 MW/sq. mi. for a Class 4 wind resource area, approximately 6-9 square miles (3,840-5,760 acres) of terrain would be used. If 1.5-MW turbines were used to supply this electricity, that would represent about 54-80 approximately 400-ft. high wind turbines. To supply 15-25 MW of power with solar energy using photovoltaic systems would require up to 56 acres. To supply 80-100 MW of hydroelectricity would require a facility roughly the twice the size of the Cochran Dam, the largest of the dams along the Great Falls of the Missouri River.

Wind energy on the scale assumed in this variant – 54-80, 1.5-MW wind turbines – could entail certain environmental impacts of the sort described in Section 2.1.3.1 and in the Wind and Solar Dominant variant in Section 2.1.7.1 above. Wind development could potentially be located at a number of locations within SME's service area. A site selection study would have to be done to identify locations that best met wind resource facility requirements.

Developing 56 acres of land for solar power would necessitate purchasing this area for solar collectors or photovoltaic arrays, as well as facilities and infrastructure (e.g. buildings, generator, transformers, roads). The impacts and benefits would be proportionately larger than those described for the variants above in Section 2.1.7.1.

An important factor for both wind and solar facilities would be the proximity of and ability to connect to grid transmission facilities. Depending on the location of firming facilities, these could also require additional transmission infrastructure. Because there would be no requirement to locate the wind farm or the solar facilities at or near the Salem site, there would be no impact to the Great Falls Portage NHL.

The supply of 80 to 100 MW of hydroelectricity would come from either existing, upgraded, or new facilities. The acquisition of existing or upgraded facilities or the purchase of power from those facilities would be the same as described for the Wind and Solar Dominant variant in Section 2.1.7.1 above. Construction of new hydroelectric facilities would be on a much larger scale than previously described. This variant would require one larger facility roughly twice the size of Cochrane Dam on a river the size of the Missouri River or several smaller dams on smaller streams. The problems discussed under the previous variants in Section 2.1.7.1 would be magnified under this variant for hydroelectricity. These problems include not only getting one or more facilities permitted but the associated impacts on environmental resources.

Hydroelectricity Dominant

In this variant, hydroelectricity would supply 80-120 MW and wind 80-100 MW, leaving 30-50 MW for solar. To supply 80-120 MW of hydroelectricity would require a facility about 2.5 times the size of the Cochrane Dam on the Great Falls of the Missouri River. Using the land area requirements described in Sections 2.1.3.1 and 2.1.3.2, first order approximations of the land required for wind and solar can be derived. To produce 80-100 MW of wind capacity, assuming 13.47 MW/sq. mi. for a Class 4 wind resource area, approximately 6-7.4 square miles (3,840-4,736 acres) of terrain would be used. If 1.5-MW turbines were used to supply this electricity, that would represent about 54-67 approximately 400-ft. high wind turbines. To supply 30-50 MW of power with solar energy using photovoltaic systems would require up to 62 acres.

The supply of 80 to 120 MW of hydroelectricity would come from either existing, upgraded, or new facilities. The acquisition of existing or upgraded facilities or the purchase of power from those facilities would be the same as described for the Wind and Solar Dominant variant in Section 2.1.7.1 above. Construction of new hydroelectric facilities would be on a much larger scale than previously described. This variant would require one larger facility roughly 2.5 times the size of Cochrane Dam on a river the size of the Missouri River or several smaller dams on smaller streams. The problems discussed under the previous variant would be magnified under this variant for hydroelectricity. These problems include not only getting one or more facilities permitted but the associated impacts on environmental resources.

Wind energy on the scale assumed in this variant—54-67, 1.5-MW wind turbines – could entail certain environmental impacts of the sort described in Section 2.1.3.1 and in Section 2.1.7.1 above. Wind development could potentially be located at a number of locations within SME's service area. A site selection study and a new transmission system impact study would have to be done to identify locations that best met wind resource facility requirements.

Developing 62 acres of land for solar power would necessitate purchasing this area for solar collectors or photovoltaic arrays, as well as facilities and infrastructure (e.g. buildings, generator, transformers, roads). The impacts and benefits would be proportionately larger than those described for the variants above in Section 2.1.7.1. As with the wind system, a site selection study and a new transmission system impact study would have to be done to identify locations that best met wind resource facility requirements.

An important factor for both wind and solar facilities would be the proximity to and ability to transmit the capacity on the grid. Because there would be no requirement to locate the wind farm or the solar facilities at or near the Salem site, there would be no impact to the Great Falls Portage NHL.

Conclusion

Overall, with regard to environmental impacts, both variants of this combination alternative would be superior to the Proposed Action because of the elimination of air emissions, water consumption and waste generation other than minor air quality impacts during construction and storm water impacts. An additional benefit of this alternative is that over the long term, it would be more sustainable, in that it would eliminate the release of greenhouse gases. However, this alternative would substantially expand the overall footprint (land used) from that of the Proposed Action. In addition, the use of renewable sources would produce some adverse impacts on land, hydrology, wildlife, fisheries, visual and cultural resources, among other resources. These impacts would probably be somewhat more dispersed and widespread than in the case of the Proposed Action. Impacts to the Great Falls Portage NHL would be avoided.

Several factors, including timing, affect this alternative's ability to meet the long term purpose and need of the proposed action is doubtful. The various studies required to locate the wind and solar facilities would most likely take about one year. Assuming that none of the interconnection transmission lines triggered MFSA, some of the wind and solar power could be developed and brought on line in time to help fill the power deficit that will begin to emerge in 2008, when BPA supply begins to be phased out. The remaining turbines and solar units would continue to be installed and brought on line as quickly as possible. Because wind and solar are not dispatchable power (always able to meet demand as it occurs), firming power would have to be acquired during this time, at a cost to SME, which may engender additional transmission requirements.

Hydroelectricity presents an even greater risk and uncertainty at the present time. If new hydroelectricity could be obtained, the lengthy approval process and construction time would mean power would not be available until after the date it was needed by SME to replace lost power. If existing or new hydropower could be obtained, this energy source could reliably provide dispatchable power at either level assumed in these two variants. There would be no need to obtain firming power for a hydroelectric source. However, as discussed above, in the current environment, the probability of being able to obtain existing or new sources of hydropower must be considered low. Thus, it would not be prudent to count on the assumed contribution of hydropower in this combination alternative.

This combination alternative does not meet the purpose and need of this project. It does not provide long-term term reliable, cost effective, and consistent energy generation for the predicted load.

2.1.8 OTHER COAL-FIRED POWER PLANT SITES

The Alternative Evaluation Study recommended CFB technology as the preferred generation method for meeting SME's identified need of 250 MW (SME, 2004a). With the selection of this technology and scale, SME then began to look for a suitable location for the proposed generating station. Early in 2004, Stanley Consultants, Inc. initiated a site screening study (SME, 2004d) focusing on the major factors that affect siting a 250-MW CFB power plant, including:

- Environmentally compliant
- Cost-effective
- High level of reliability
- Fuel cost stability
- Deliverability (The new generation source must be connected to the transmission system in a way to ensure delivery of power to the members which Southern Montana Electric serves.)
- Close proximity to Southern Montana Electric territory
- Operational availability by 2009
- Cooling water system must minimize impacts to the environment
- Must meet all applicable air quality standards and permitting requirements
- Preferred minimum site area of 160 acres
- Water source capable of condenser cooling and other makeup requirements

- Site must be in close proximity to at least one rail line and/or barge access for Montana Powder River Basin coal delivery
- Facility must have a competitive Net Present Value as compared to the cost of purchasing power

On behalf of SME, Stanley Consultants initially screened the entire state of Montana, identifying prospective power plant sites that were generally close to water bodies, transmission lines, substations, and railroads while at the same time avoiding Native American lands and Class I airsheds (national parks and national wilderness areas) (SME, 2005d). Risk factors with the potential to impede, delay or prevent development of the plant at a given site were identified. Figure 2-18 reveals a composite screening map of the state of Montana which identified these features.

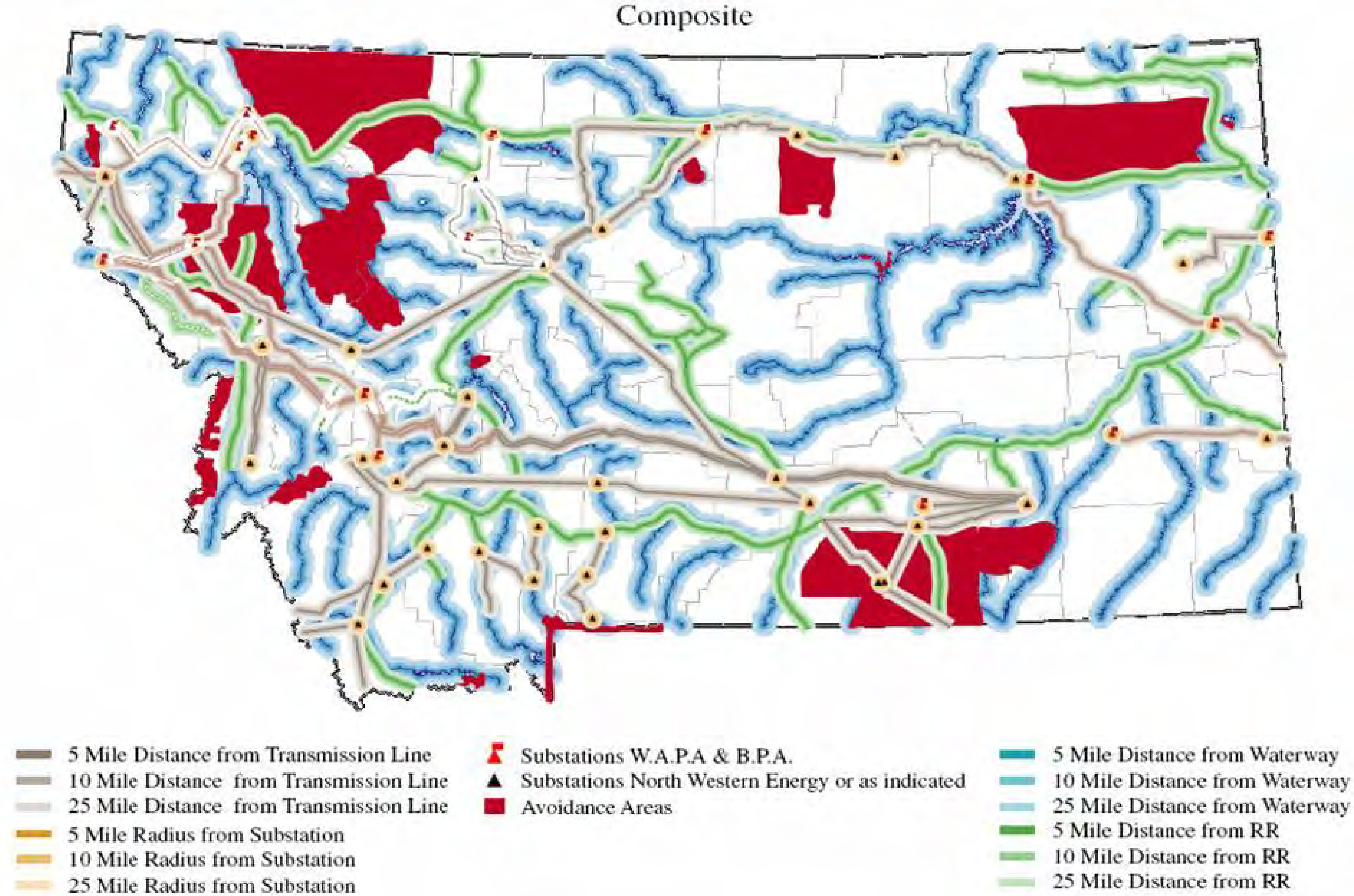
Seven sites in four main areas emerged from the initial screening process: Great Falls (including the sites identified as Salem and Salem Industrial or Industrial Park sites, as well as a site north of Malmstrom AFB), two sites at Decker, Hysham, and Nelson Creek. Their locations are shown in Figure 2-19. An artist's rendering of a power plant at each location is depicted in Figure 2-20.

The following factors were examined in more detail in the Site Selection Study (SME, 2004b):

- Heat rate, which considered the different types of coal and locations at which the coal would be utilized;
- Water consumption and wastewater discharge, including source and discharge points, and associated water rights issues;
- Environmental suitability, which includes the existing land use, air quality concerns, proximity to state or national parks and wildlife areas, existing or planned airports, and Native American lands;
- Site-specific costs for plant development and operation;
- Infrastructure improvements for both construction and operation, which included roads, railroads, water and natural gas pipelines, and transmission; and
- Conceptual cost and schedule benefits and impacts.

Based on the results of the site selection study, the Salem and Industrial Park sites (Sections 2.2.2 and 2.2.3 in this EIS, respectively) are considered reasonable locations for the proposed generating station. The Decker, Hysham, and Nelson Creek sites were unacceptable with respect to one or more of the factors summarized above, and, therefore, they are not analyzed in detail in this EIS. The major activities and components associated with construction of a 250-MW plant at each of these three sites are described in the following sections (2.1.8.1 through 2.1.8.3). Two other Great Falls area sites, not covered in the Site Screening Study, and the Malmstrom AFB site were also unacceptable and are discussed separately in Section 2.1.8.4.

Figure 2-18. Composite Map of Montana Depicting Features Relevant for Power Plant Development



SME, 2005d

Table 2-8 compares key features of five sites evaluated in the Site Selection Study.

Table 2-8. Comparison of Alternative Sites from the 2004 Site Selection Study (SME, 2004b)

Description	Unit	Salem	Industrial Park	Decker	Hysham	Nelson Creek
Fuel (coal) Consumption	Tons/year	1,135,800	1,135,800	1,101,200	1,230,000	1,626,800
Limestone Consumption	Tons/year	25,300	25,300	28,200	58,000	42,700
Ammonia Consumption	Tons/year	220	220	220	220	360
Ash Production	Tons/year	49,100	49,100	45,150	114,000	117,950
Transmission Line Construction	Miles	14	23	130	87	180
Railroad Spur Construction	Miles	6	8	4	2	0 (45 miles upgraded)
Raw Water Pipeline Construction	Miles	3	4.5	11	9	41
Transmission Facilities Cost Estimate	Thousands of dollars ($1,000)	$25,250	$25,250	$86,840	$67,575	$104,950
Total Installed Cost	Thousands of dollars ($1,000)	$469,555	$481,100	$553,096	$545,193	$692,292

Figure 2-19. Locations of Four Potential Areas in the Site Screening Study

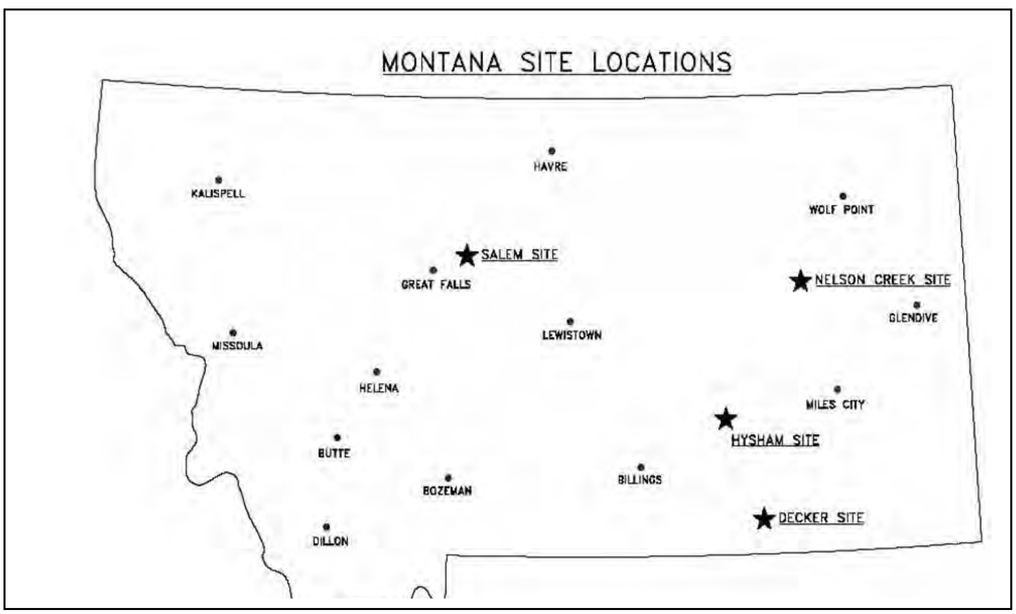
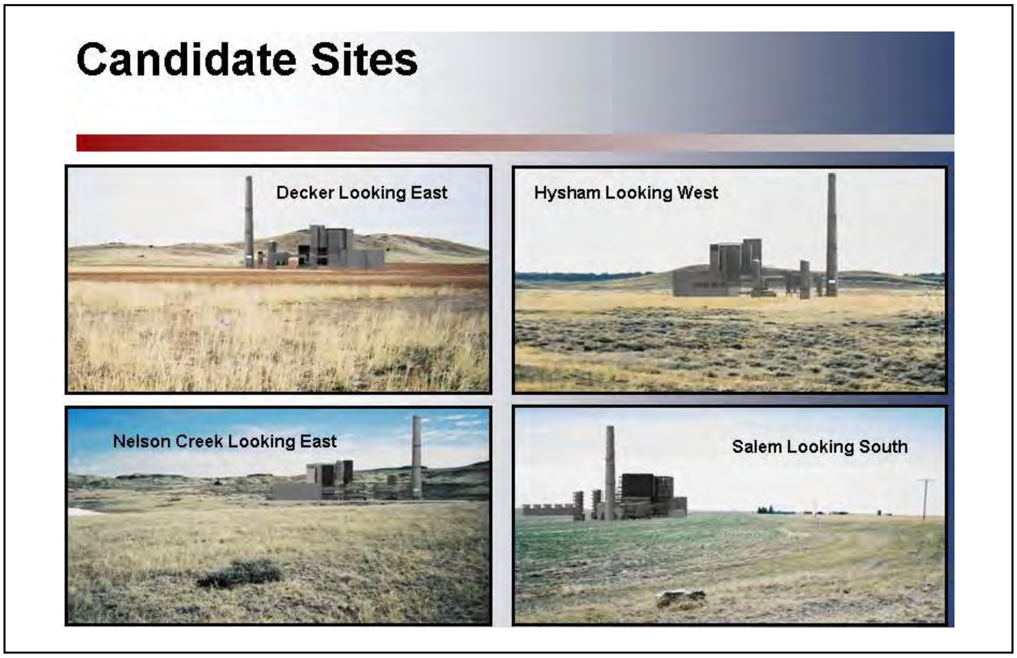


Figure 2-20. Artist's Renderings of a Coal-Fired Power Plant at the Four Candidate Locations



2.1.8.1 Decker

The Decker site is situated at an elevation of approximately 3,881 feet (1,183 m) above sea level, 30 miles (48 km) east of Interstate 90 and east of Highway 314 near the North Fork Monument Creek. The Decker site is in the Southwest ¼ of Section 1, Township 8 South, Range 39 East.

A generating station at the Decker site would consume an estimated 251,400 lb/hr (1,101,200 tons/yr) of sub-bituminous coal supplied by railroad from the Decker Mine. Four miles (6.4 km) of new track and railroad bed would be required from the existing Burlington Northern Santa Fe (BNSF) Railroad main line track system to the plant site.

Make-up water would be pumped from an intake structure on the west bank of the Tongue River Reservoir for a distance of about 11 miles (18 km) to the plant. This location is served by the smallest watershed of any of the sites. This stream appears to be heavily allocated. Average daily flow at the Tongue River dam during 2002 (a dry year) was 136 cubic feet per second. Allocations and claims on file total more than the average daily flow such that many junior users received less water than they wanted or were cut off during that time (SME, 2004b).

No.2 fuel oil would be delivered to the plant by truck for start-up. Limestone and ammonia would be delivered to the facility by railroad. Approximately 6,420 lb/hr (28,200 tons/yr) of limestone and 50 lb/hr (220 tons/yr) of ammonia would be consumed. About 10,300 lb/hr (45,150 tons/yr) of ash waste would be produced and trucked back to the Decker Mine for disposal (SME, 2004b).

Electricity produced at the plant would be transmitted to the existing Rosebud Substation and would require approximately 80 miles (129 km) of new transmission line. The plant at the Decker site would also interconnect with a new Tongue River Substation, which would be located east of the existing Colstrip Power Plant (SME, 2004b).

The Decker site would be more expensive than either of the Salem sites and would have a higher degree of risk associated with environmental permitting and approvals. It would also be subject to water disruption and the lack of available water rights, and was therefore eliminated from further consideration.

2.1.8.2 Hysham

The Hysham site is in the Southwest ¼ of Section 11, Township 6 North, Range 37 East. The site is approximately 2,879 feet (878 m) above sea level and is located about eight miles (13 km) south of the Yellowstone River on the west side of Old Sarpy Road (refer to Figure 2-22). It was formerly a gravel borrow site.

Figure 2-21. Looking West onto the Yellowstone River Near the Hysham Candidate Site

A generating station at the Hysham site would consume about 280,800 lb/hr (1,230,000 tons/yr) of sub-bituminous coal supplied by railroad from the Absaloka Mine (SME, 2004b). About 1.5 miles (2.4 km) of new track and railroad bed would be required from the existing BNSF Railroad main line track system to the plant site.

Make-up water would be pumped from an intake structure on the Yellowstone River, east of the City of Hysham, for about nine miles (6.4 km) to the plant. According to Montana Department of Natural Resources and Conservation (DNRC), much of the available water from the Yellowstone River is already allocated. An off stream storage structure, or arrangement, would most likely be necessary to guarantee the necessary flow (SME, 2004b).

Natural gas would be supplied to the plant for start-up fuel from an existing pipeline. Limestone and ammonia would be delivered to the facility by railroad. About 13,240 lb/hr (58,000 tons/yr) of limestone and 50 lb/hr (220 tons/yr) of ammonia would be consumed. Approximately 26,030 lb/hr (114,000 tons/yr) of ash waste would be produced and trucked to a landfill location on site (SME, 2004b).

Electricity produced at the plant would be transmitted to the existing Rosebud and Custer Substations. Approximately 34 and 53 miles (55 and 85 km) of new transmission line would be required to the Rosebud and Custer Substations respectively (SME, 2004b).

As in the case of the Decker site above, the Hysham site would be more expensive than either of the Salem sites and would also have a higher degree of risk associated with environmental permitting and approvals and available water supply and water rights. Therefore it was eliminated from further consideration.

2.1.8.3 Nelson Creek

The Nelson Creek site is in the Northwest ¼ of Section 36, Township 21 North, Range 43 East. The site is located southeast of Nelson Creek Bay, just east of Highway 24, at approximately 2,322 feet (708 m) above sea level.

A generating station at the Nelson Creek site would consume an estimated 371,400 lb/hr (1,626,800 tons/yr) of lignite coal supplied from a new mine located east of the plant. The coal would be delivered by heavy-haul mine trucks a distance of two miles on existing roads to the plant. It is estimated that over 45 miles (72 km) of existing railroad track from Glendive to Circle would need to be upgraded to accommodate the delivery of major equipment, and about 26 miles (42 km) of road improvements would be needed to transport major equipment by heavy-rigging trucks from the upgraded rail siding at Circle to the site.

Make-up water for the plant would be pumped from an intake structure located on Fort Peck Reservoir. A 41-mile (66-km) pipeline would be needed to supply the water to the plant. However, according to the DNRC, the Corps of Engineers has filed several water right claims for amounts approximating the capacity of the Fort Peck reservoir (SME, 2004b).

No.2 fuel oil would be delivered to the plant by truck for start-up. Limestone and ammonia would be delivered to the facility by trucks. Approximately 9,730 lb/hr (42,700 tons/yr) of limestone and 82 lb/hr (360 tons/yr) of ammonia would be consumed. About 26,930 lb/hr (117,950 tons/yr) of ash waste would be produced and trucked back to the new mine for disposal (SME, 2004b).

Electricity produced at the plant would be transmitted to the existing Rosebud and new Tongue River Substations. Ninety miles (145 km) of new transmission line would be required from the plant to the Rosebud Substation (SME, 2004b).

As with both the Decker and Hysham sites above, the Nelson Creek site would be more expensive than either of the Salem sites and would have a higher degree of risk associated with environmental permitting and approvals and available water supply and water rights. Therefore it was eliminated from further consideration.

2.1.8.4 Great Falls Area Sites

Prior to selecting the Great Falls Industrial Park Site and the Salem Site as the two preferred locations that would be carried forth in the EIS, SME considered a number of other locations in the Great Falls area as "high level" choices for its proposed CFB plant. Additionally, the Site Selection Study identified a preferred site in Section 36, Township 21 North, Range 5 East (termed the "Section 36 Site"), approximately one mile south of the Salem site in Sections 24 and 25. The following is a description of the other sites visited by SME on 17 December 2003 and considered but eliminated early on in the site screening/selection processes for reasons that rendered the sites unsuitable for a base load electric generation facility.

1. **Sun River Site:** This site is on land considered by the City of Great Falls as a location for a future landfill. This site is located on the north side of the Sun River and west of the Missouri River. The site is in close proximity to rail facilities but the spur line to a parcel of land suitable for a base load coal-fired electric generation facility would have required crossing Interstate 15 and would have resulted in transporting coal for the facility through Great Falls, posing a number of transportation problems. The site was also in relatively close proximity to a number of residential locations and had limited access even though it was in close proximity to Interstate 15. In addition to access problems the location was distant from a suitable location to draw upon the City of Great Falls' water reservation that would be used to provide raw water for plant operations. Finally, the parcel under consideration was limited to 160 acres and not adequate for the facility contemplated by SME.

2. **Manchester Area:** Manchester is a small rural community located west of Great Falls where there are a number of light industrial enterprises. On close examination the site posed a number of logistical problems. The site is in close proximity to rail facilities but a potential spur line would have required crossing Interstate 15 and a frontage road used to access local "bedroom communities," and would have resulted in transporting coal for the facility through Great Falls, posing a number of transportation problems. The site was also in relatively close proximity to a number of residential locations and had limited access even though it was in close proximity to Interstate 15. In addition to access problems the location was distant from a suitable location to draw upon the City of Great Falls' water reservation that would be used to provide raw water for plant operations. The closest large water body is the Sun River that has water quality and flooding issues. Finally, even setting aside the other drawbacks, it did not appear that a suitable parcel of land would be available for the facility contemplated by SME.

3. **Site North of Malmstrom Air Force Base:** This site, considered in both the site screening and site selection studies, is on the north boundary of the United States Air Force facility that serves as a hub for the operation and maintenance of the missile system installed in the 1960s and 1970s for the purpose of defending the Untied States from nuclear attack. The site received initial selection because of its proximity to the Missouri River and NorthWestern Energy's (NWE) Great Falls Substation. However, subsequent analysis revealed the following site-eliminating characteristics:

   - The available parcel of land would not be of adequate size for the proposed facility.
   - Malmstrom was in the process of aggressively expanding base housing in the direction of the most suitable location for the facility.
   - Malmstrom is fourth in line as an emergency location to land the Space Shuttle.

- The City of Great Falls was in the process of constructing a very large soccer complex that is heavily used and not compatible with a base load electric generation facility.
- The site is in close proximity to rail facilities but the spur line would have resulted in transporting coal for the facility through Great Falls, posing a number of transportation problems.

4. **Section 36 Site:** The Site Selection Study identified a site in Section 36, Township 21 North, Range 5 East, about one mile south of the Salem site. Field reconnaissance confirmed the site's potential to support a generating station. The site was rural, flat and close to water and rail and accessible to transmission facilities. In addition, it lay outside the boundary of the National Portage Site National Historic Landmark. Repeated efforts were made to contact the property owner regarding possible acquisition of the property, but the property owner was unresponsive. Thereafter, SME became aware of the availability of the adjacent Salem site and after discussions with the site owners, SME entered into option agreements to purchase the site in August and October 2004. Thus, as of Fall, 2004, the current Salem site was identified as one of two potential sites in Great Falls for development of HGS.

2.1.9 Alternative Components at Salem Site

Five other alternative components at the preferred Salem site were considered and dismissed from more detailed consideration in the EIS.

2.1.9.1 Obtaining Potable Water from Other Sources

Potable or drinking water could be provided via imported bottled water, by drilling a groundwater well, or by installing a treatment system in order to use additional diverted Missouri River water as the drinking water source for the plant.

- Importing bottled water is an option to supply drinking water at the site and individual offices and staff may select to have bottled water dispensers available. However, bottled water would not be an option for supplying water for restrooms, outdoor faucets, and other non-industrial water uses. Bottled water would not be cost effective in large quantities for site-wide use for anything other than drinking water.
- Potable water for the HGS power plant could be obtained from one or more drinking water wells drilled on-site. SME rejected this alternative in part because of the 300-450-foot depth to the water-bearing Madison limestone formation (PBSJ, 2005). There are ample groundwater sources in the area of the site although not readily available and requiring a deep well. Some pretreatment of the water may be required in order to meet federal and state drinking water standards. The water treatment facility would be classified as a public water supply and would be subject to state and county regulations. The operator of this facility would have to be licensed by DEQ.
- An additional river diversion could be used to obtain potable water for the HGS or the industrial diversion could be upgraded to handle the additional volume of water. The river water would most likely require some pretreatment in order to meet federal and state

drinking water standards. The water treatment facility would be classified as a public water supply and would be subject to state and county regulations. The operator of this facility would have to be licensed by DEQ.

Construction of a 20 gallons per minute water treatment facility would result in additional disturbance of soils and plants at the facility location. Depending upon the type of water treatment method selected (reverse osmosis, ion exchange, etc.), additional chemicals or reagents may be needed which could in turn result in waste streams that must be selectively handled for disposal, such as the brine generated from a reverse osmosis facility. There would be a slight increase in traffic to the plant from the delivery of the needed chemicals and reagents, and the removal of waste products. The treatment facility may also require large quantities of electricity to operate as these are not passive systems. This alternative could cost anywhere from $250,000 to $750,000 to construct (approximate capital costs) and as much as $20,000 to operate each year, depending upon the treatment method selected. There would be annual operation and maintenance costs in addition to the need to hire licensed operators

Although obtaining potable water from a groundwater well or the Missouri River are feasible alternatives, they offer no environmental benefit over SME's Proposed Action to obtain potable water from the City of Great Falls. Either of these alternative sources would be available to SME as a contingency should it be unable to obtain water from the city. Since the construction and location of the raw water intake and pipeline are already analyzed in this EIS, DEQ would only need to analyze the impacts from the construction and operation of the public water treatment facility as required by state law (75-6-101 *et seq.*, MCA and ARM 17.38.101 and 102).

2.1.9.2 Discharging Wastewater into the Missouri River

This alternative would consist of discharging treated wastewater or effluent directly from the HGS into the Missouri River. SME would need to obtain an MPDES permit with wastewater parameter conditions or criteria from DEQ. SME rejected this alternative in favor of discharging into the City of Great Falls' wastewater treatment system on the grounds of environmental benefits, the cost to construct, operate, maintain, and monitor the facility, and the convenience of hooking into an existing permitted wastewater treatment and disposal facility. This alternative could cost anywhere from approximately $750,000 to $1,000,000 to construct and approximately $100,000 to operate each year depending upon the treatment method selected.

Construction of the plant would result in additional disturbance of soils and plants at the plant location. There may be some impacts to aquatic life downgradient of the discharge, although they would not be significant as long as the discharge complied with MPDES permit limits. In addition to operating costs, the facility must be maintained and effluent inflow and outflow must be monitored to ensure the discharge would comply with the MPDES permit.

Discharging treated industrial wastewater into the Missouri River from the HGS is a feasible and reasonable alternative. However, given the capacity of the City of Great Falls wastewater treatment facility (see Proposed Action description in Section 2.2.2.2 below), there are no additional environmental benefits associated with the construction, operation, maintenance, and monitoring of an on-site wastewater treatment facility and discharge into the river.

2.1.9.3 Disposal of Sanitary Wastewater in Septic System

Disposing of sanitary wastewater in a septic system was reviewed as an alternative to including it in the wastewater stream proposed to be sent to the City of Great Falls wastewater treatment facility. Under state law, this system would qualify as a public sewer system (75-6-101 *et seq.*, MCA and ARM 17.38.101 and 102), and the operator of this facility would have to be licensed by DEQ. SME would be required to submit plans to DEQ or a delegated division of local government for review and approval.

Construction of a sewer system would result in the disturbance of additional soils and vegetation for the treatment facility and the septic field. There would be some limited potential for seepage from the septic field to reach groundwater. Modest annual operation and maintenance costs would be incurred.

Although a public sewer system is a feasible alternative, it offers no environmental benefits over SME's proposed connection and use of the City of Great Falls wastewater treatment for disposal and treatment of sanitary wastes.

2.1.9.4 Alternate Railroad Spur Alignments

Three possible rail spur alignments were evaluated for cost, environmental impacts, impacts to land owners, and impacts to residents of the City of Great Falls. The two alternate routes were eliminated from further consideration.

- The railroad spur could be routed south from the power plant to the abandoned railroad grade, then placed along this railroad grade toward the city of Great Falls and tied into existing track north of Malmstrom Air Force Base. This alternate route would be 8.6 miles (13.9 km) long – 2.3 miles (3.7 km) longer than the proposed alignment. A short portion of the abandoned railroad grade immediately north of Malmstrom Air Force Base has been converted into a construction and demolition waste landfill and is no longer on grade; the spur would have to avoid this landfill. Other disadvantages include: the necessity of reworking and replacing sections of the existing, abandoned railroad grade to comply with modern standards; a route that would divide certain privately owned croplands against the wishes of their owners; and routing HGS-related coal train traffic through the City of Great Falls, where some residents have expressed concerns about wait times at existing at-grade street crossings.
- The railroad spur could be routed north from the power plant and towards the city of Great Falls along property lines. This alternate route would also tie into the existing track north of Malmstrom Air Force Base. This route would be 8.5 miles (13.7 km) long – 2.2 miles (3.5 km) longer than the proposed alignment. Other disadvantages include: difficult and expensive installation due to the rough terrain that would be crossed; greater environmental impacts at crossings of coulees and watercourses; and the highest estimated cost due to the large structures (either bridges or trestles) that would be needed.

These two alternate railroad spur alignments would provide no beneficial advantage over SME's proposed route, and were therefore, eliminated from further consideration.

2.1.9.5 Hauling Ash to the High Plains Landfill

SME investigated hauling ash to the High Plains Landfill (see Figure 2-25) rather than storing the ash in a monofill on site. This alternate method of disposing of this material would require approximately 10-12 trucks per day to be hauled through the City of Great Falls along S-228 and U.S. 87. The hauling of the ash would add to the wear and tear and required maintenance of the city and county roads used en route to and from the HGS at the Salem site. SME would either be required to maintain a fleet of trucks or hire a firm to haul the material resulting in increased costs of approximately $180,000-$220,000 per year to haul the ash to the High Plans landfill. Given that SME and DEQ believe that the bedrock beneath the proposed facility and the compacted clay liner would minimize downward migration of contaminated water into the ground water there would be no beneficial advantage to hauling the ash approximately 25 miles (40 km) one-way to the landfill.

2.1.10 CONCLUSION

The projected levelized costs for new utility power generation plants in the Montana area are documented in Table 2-9. The power-generation technologies presented with their respective competitive costs are wind, solar, hydroelectric, geothermal, biogas, MSW, NGCC, microturbines, PC, CFB and IGCC. Wind, solar, and hydroelectric power have average capacity factors which range from 26 to 50 percent and cannot be considered for base load service.

A comparison of the alternate technologies regarding their capability of meeting the SME purpose and need criteria is documented in Table 2-10. Only the PC and CFB coal technologies are capable of meeting all of the criteria. NGCC offers the average capacity factor SME requires and the capital cost component of the levelized cost of NGCC power is attractive as compared to a CFB or pulverized coal plant. However, the volatility of natural gas prices results in NGCC being a costly option for SME's member cooperatives and customers.

The alternative of using oil as a fuel source, not displayed in Tables 2-8 and 2-9, was rejected on the basis of high current and probable future fuel costs as demand for this commodity continues to increase globally and supplies become more limited or insecure.

CFB has been selected as the preferred technology which would satisfy the projected SME base load needs due to its combination of environmental, economic, and technical advantages over other alternatives. The summary analysis of the Decker, Hysham and Nelson Creek sites above assumed the construction and operation of a CFB coal-fired power plant at each location. These sites advanced through the initial screening process but were rejected in favor of the two Salem sites (Salem and Industrial Park) on the basis of both economic and environmental factors (such as available water). In the following sections, the Salem and Industrial Park sites are described, along with the No Action Alternative.

Two project alternatives at the Salem Site – obtaining potable water from aquifers rather than the City of Great Falls municipal drinking water system, and discharging treated wastewater into the Missouri River rather than the City of Great Falls' municipal wastewater collection and treatment system – were rejected on the basis of greater convenience and environmental advantages as well as lower cost.

Table 2-9. Levelized Costs for New Utility Power Generation Plants in Montana

Type of Power Plant	Levelized Costs ($ MWh)				
	Capital Cost	Fixed O&M Cost	Variable/ Fuel Cost	Total Busbar Cost[1]	Average Capacity Factor
Wind	35.9	7.7	7.0[2]	50.6	26-36%
Solar photovoltaic	N/A	N/A	N/A	350.0	20-35%
Solar thermal	N/A	N/A	N/A	105.0	20-35%
Hydroelectric	17.0	2.6	4.0	23.6	40-50%
Geothermal	N/A	N/A	N/A	65.0	90%
Biomass	N/A	N/A	N/A	90.0	90%
Biogas	37.0	6.6	3.0	46.5	90%
Municipal Solid Waste (MSW)	32.8	38.9	13.0	84.8	90%
Natural Gas Combined Cycle	19.0	2.3	41.0	62.3	90%
Microturbines	49.1	8.4	55.7	113.2	90%
Pulverized Coal (PC)	33.8	4.6	11.7	50.1	90%
Circulating Fluidized Bed Coal (CFB)	25.2	4.6	12.8	42.6	90%
Integrated Gasification Combined Cycle Coal (IGCC)	42.8	3.3	19.8	65.9	<80%

Source: SME, 2004a

Notes:

[1]Busbar Cost – wholesale cost to generate power at the plant

[2]Variable cost for wind power represents transmission costs

$/MWh – dollars per megawatt hour

O&M – operation and maintenance

Table 2-10. Comparison of Alternative Power Generation Technologies in Meeting the Purpose and Need of the Proposed Action

Capable of Meeting Purpose and Need Criteria

Type of Power Plant	250 MW in 2012	Baseload Operation	Environmentally Permitable	Cost Effective	Fuel Cost Stability	High Reliability	Commercially Available	Meets All Criteria
Wind	Yes	No	Yes	Yes	Yes	No	Yes	No
Solar-Photovoltaic	No	No	Yes	No	Yes	No	Yes	No
Solar-Thermal	No	No	Yes	No	Yes	No	Yes	No
Hydroelectric	No	No	Difficult	Yes	Yes	Yes	Yes	No
Renewable Energy Sources Combined	Yes	No	Yes	No	Yes	No	Yes	No
Geothermal	No	Yes	Yes	N/A	Yes	Yes	N/A	No
Biomass	No	Yes	Yes	No	Yes	Yes	Yes	No
Biogas	No	Yes	Yes	Yes	Yes	Yes	Yes	No
Municipal Solid Waste	No	Yes	Difficult	No	Yes	No	Yes	No
Natural Gas Combined Cycle	Yes	Yes	Yes	Yes	No	Yes	Yes	No
Microturbines	No	No	Yes	No	No	Yes	Yes	No
Pulverized Coal	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Oil	Yes	Yes	Yes	Yes	No	Yes	Yes	No
Nuclear	No	Yes	Difficult	Yes	Yes	Yes	Yes	No
CFB Coal	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IGCC Coal	Yes	Yes	Yes	No	Yes	No	Yes	No
CFB and Renewable Sources Combined	Yes	No	Yes	No	Yes	No	Yes	No

Note: Based on alternate power plant options located within or adjacent to the SME system

2.2 ALTERNATIVES TO BE ASSESSED IN DETAIL

This section describes the alternatives that are considered reasonable and are analyzed in detail in this EIS. For an alternative to be judged reasonable, it must meet the purpose and need for proposing a new energy generation source for the SME service area, which is to provide wholesale electric energy and related services for the SME service area. Reasonable alternatives must be affordable, reliable, and stable sources of wholesale electric energy, and they cannot pose unacceptable environmental risks.

Several sites in the SME service area were evaluated in 2004 to determine their suitability for constructing a 250-MW CFB coal-fired power plant. Factors considered in assessing the sites were: relative costs of site development, projected production costs, environmental impacts and the cost of mitigation, the availability of an adequate source of water; movement of electrical power, the load centers for the member cooperatives, proximity to nearby fuel sources, and ability to obtain environmental permits. In addition to the No Action Alternative, this section describes the two sites that meet these criteria and are evaluated in detail in the EIS.

2.2.1 NO ACTION

Under the No Action Alternative, the Highwood Generation Station would not be constructed or operated to meet the projected 250-MW base load needs of SME. There would be no facilities constructed at either the Salem or Industrial Park sites to meet the purpose and need discussed in Chapter 1 of the EIS.

However, it is unreasonable to assume that no alternative source of electricity would be provided for SME customers once the current power purchase agreement with the Bonneville Power Administration begins to expire. Member cooperatives and consumers would not simply “do without.” Therefore, the primary assumption for the No Action Alternative is that the need for a reliable energy supply for the SME service area would still be met by some means. At the same time, the No Action Alternative needs to describe the consequences of taking the minimal action necessary to provide uninterrupted power. In that case, SME would not investigate other cost-effective and potentially reliable energy sources, nor would efforts be made to extend the current power purchase agreements.

At a minimum, however, SME would need to purchase power from existing sources of wholesale supply. As stated in Section 2.1.1, because of projected increased costs, SME estimates the price it would pay under new power purchase agreements could be as much as double its current costs (SME, 2004a). These increased costs would be passed on to SME’s residential, commercial and industrial customers. This action would also promote the continued use of existing generation sources which in many cases are inefficient coal-fired sources with higher emissions than the proposed preferred action.

2.2.2 PROPOSED ACTION: HIGHWOOD GENERATING STATION – SALEM SITE

In response to concerns expressed during the DEIS review and Section 106 consultation processes about its potential impacts on the Great Falls Portage National Historic Landmark, the proposed HGS power plant has been reconfigured and shifted to the south by approximately one-half mile, to a site just outside the NHL boundary. As a result of this modification, the locations of the proposed railroad loop and ash disposal cells within the loop would shift to the southeast. The railroad spur would not entirely avoid the NHL. The wind turbines would be located in a different alignment, but not off the NHL because of constraints on suitable locations for wind turbines on the Salem site. In the vicinity of the plant, the proposed transmission lines and water lines would also be moved accordingly, although these would still cross the NHL. Accordingly, the descriptions in this section now refer to the new locations of these facilities.

The Salem site is located in Sections 24 and 25, Township 21 North, Range 5 East at about 3,300 feet (1,006 m) above sea level (Figures 2-22 and 2-23). It is east and north of the intersection of Salem Road and an abandoned railroad bed. Figure 2-24 depicts the Salem site and the Industrial Park site in relation to each other, the Missouri River, and the City of Great Falls. Figure 2-25 depicts the boundaries of the property SME would purchase for the HGS in comparison with the Great Falls Portage National Historic Landmark boundaries, while Figure 2-26 depicts the preliminary arrangement of key facilities on the Salem site. Figure 2-27 depicts relative and approximate heights, elevations and sizes of the main CFB plant features.

2.2.2.1 Construction

Construction is estimated to take approximately four years and three months (51 months) from breaking ground to commercial operation of the plant. Construction would begin with site preparation, foundations, and underground utilities, while design of the above-ground mechanical, piping, buildings, structures, and electrical systems is being developed.

The existing aggregate roadways currently leading to the site would be used and maintained during construction. After construction, these existing roadways would be regraded and covered with additional aggregate. A 1,800-ft (545-m) long paved access road into the site would be constructed and maintained from the existing Cascade County road, Salem Road. Additionally, 6,600 feet (2,000 m) of paved internal roadways would be constructed to facilitate both the construction and operations phases of the plant. These on-site, paved roads would be aggregate-based during construction and would be paved upon completion of heavy construction.

Site grading and preparation has a planned duration of approximately two months and would be followed by foundation construction, with a planned duration of approximately a year. Using a phased process, boiler and baghouse construction would commence approximately five months after the beginning of the foundation construction and would be completed in approximately two years. Once the foundation is complete, the installation of the turbine generator components would begin and be completed in one year. Construction activity is planned to occur over an approximate four years and three months duration during which employment would average between 300 and 400 workers at any one time with an estimated peak construction workforce approaching 550 (SME, 2005j).

Figure 2-22. View of the Salem Site Looking Toward Highwood Mountains

Figure 2-23. Another View of the Salem Site

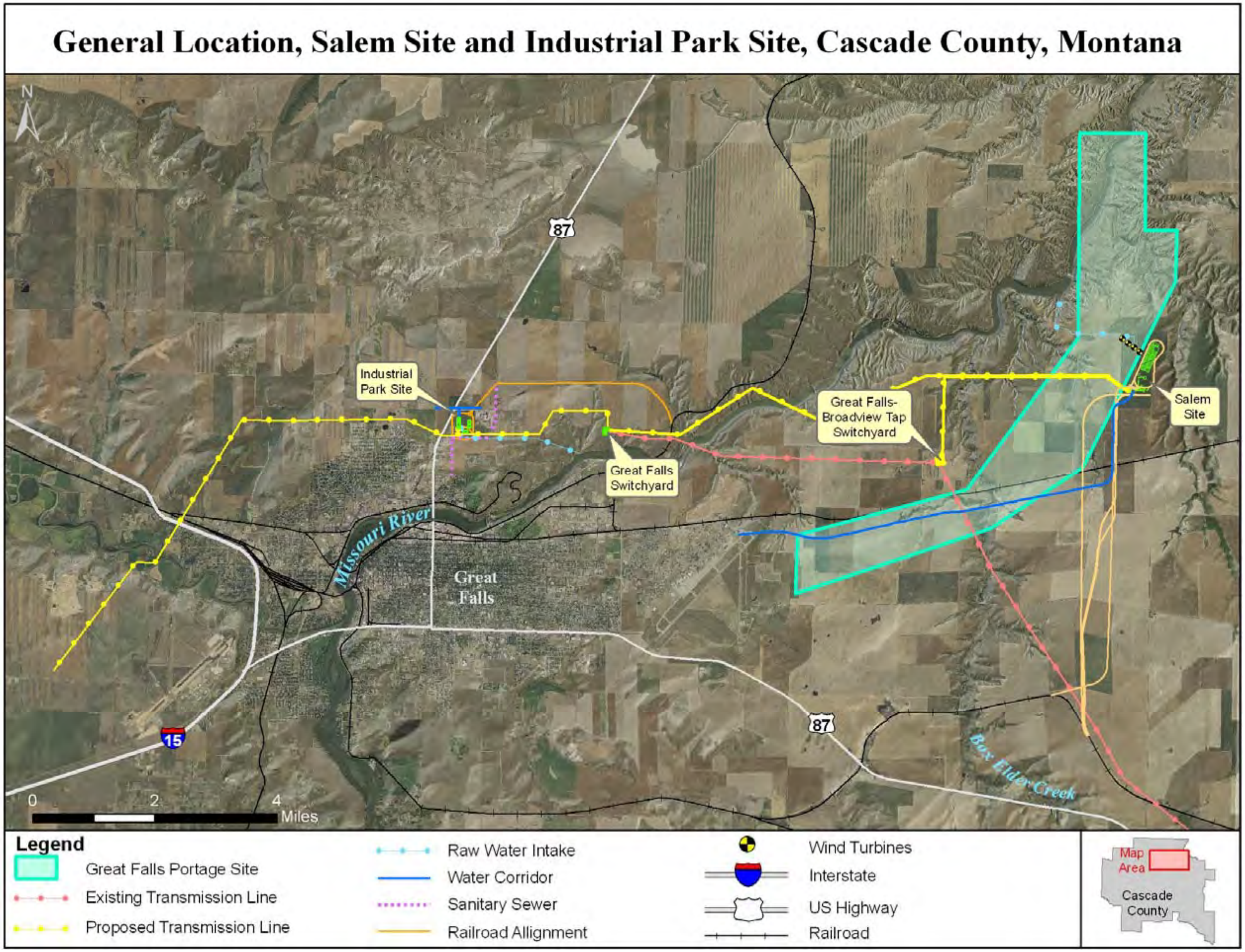


Figure 2-24. Vicinity Map of Highwood Generating Station (Salem and Industrial Park Sites), Great Falls, and Missouri River

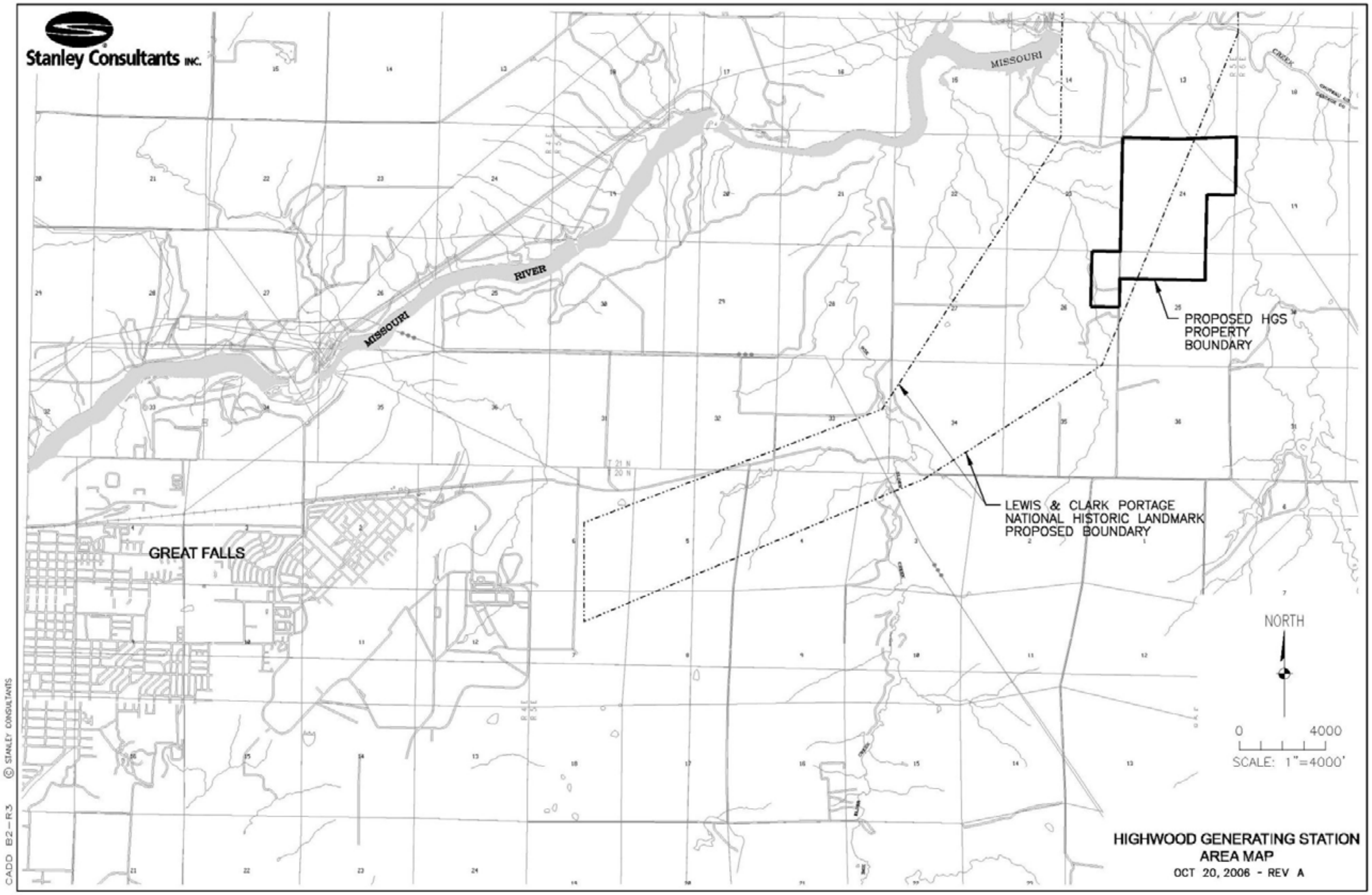


Figure 2-25. Proposed Property Boundary of the Highwood Generating Station in Comparison with the Great Falls Portage National Historic Property Boundary

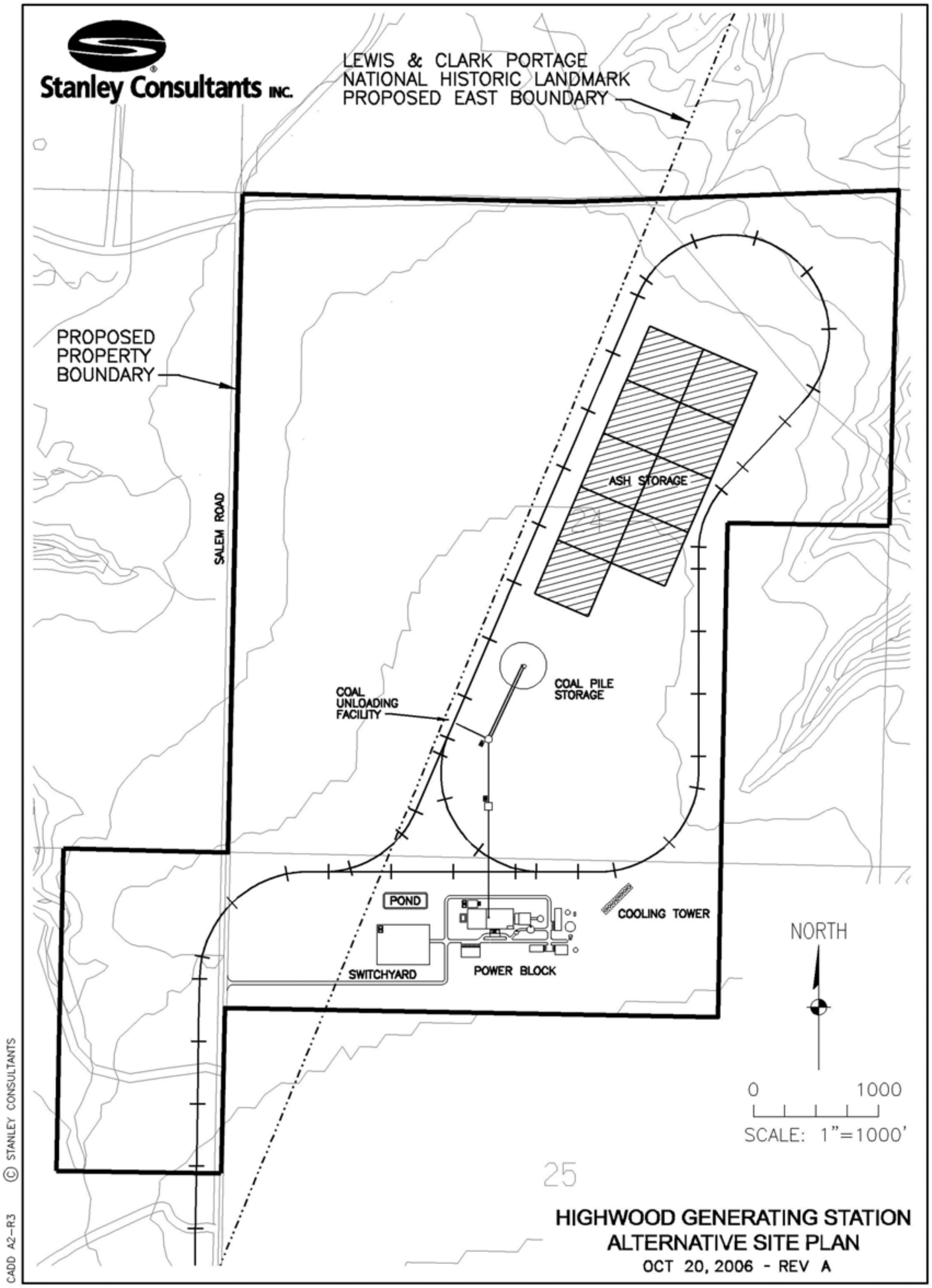


Figure 2-26. Preliminary Site Configuration of the Highwood Generating Station in Comparison with NHL Boundary

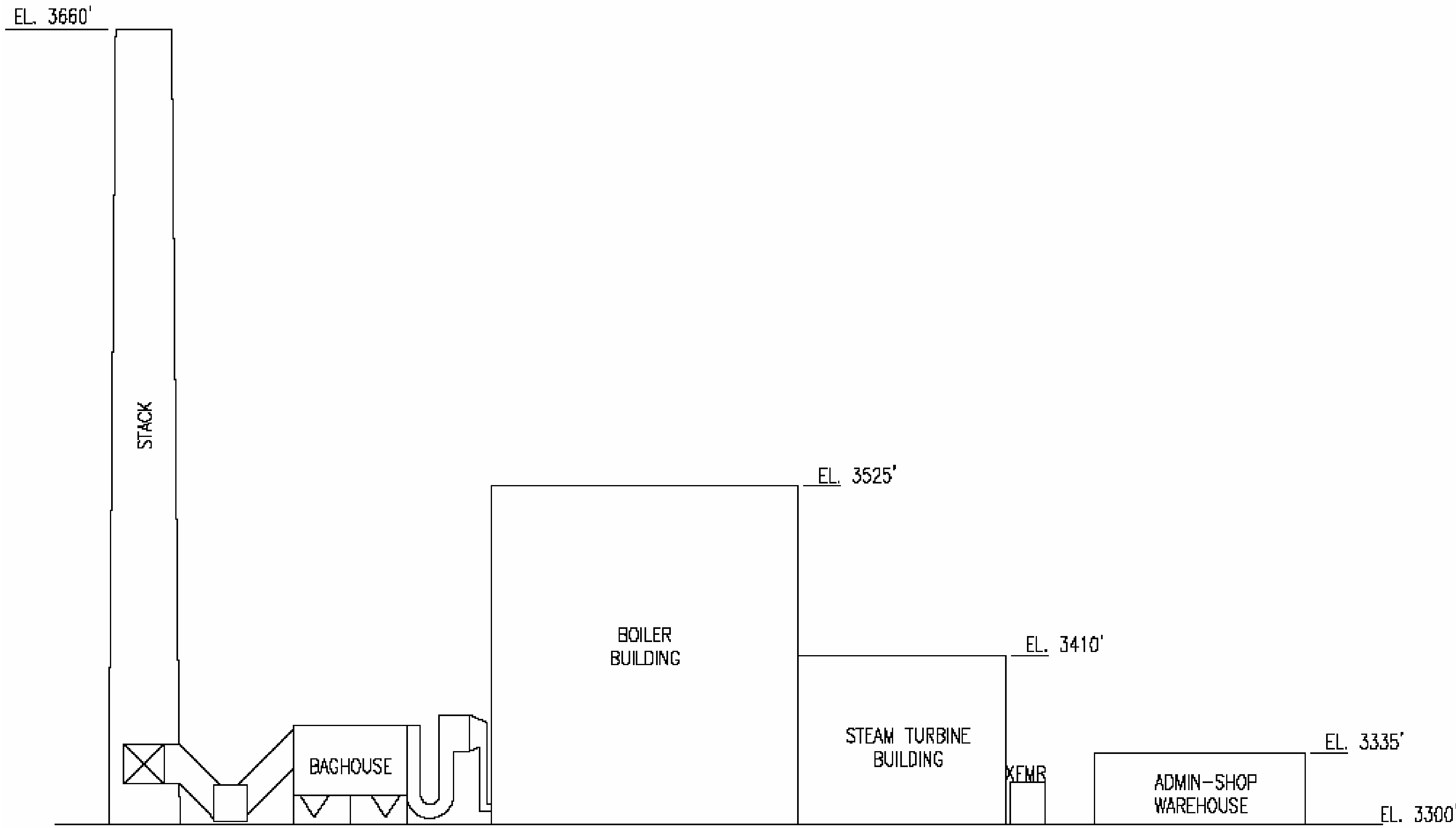


Figure 2-27. Relative and Approximate Heights, Elevations and Sizes of the Main CFB Plant Features (Preliminary)

In order to supply coal to the HGS, it would be necessary to install a railroad spur. The spur would extend from one of the existing rail lines in the area to the plant site. SME selected one of the three possible rail spur corridors evaluated for cost, environmental impacts, impacts to land owners, and impacts to residents of the City of Great Falls. The spur would be routed south from the plant and tie into existing main line track that is located three miles (five kilometers) south of the city of Great Falls. SME is in the process of choosing one of three possible alignments of the spur within the preferred rail corridor (Figure 2-24). The ultimate selection would attempt to minimize landowner and NHL impacts.

SME selected the preferred rail corridor based on cost and minimizing environmental concerns. It has several advantages:

- Shortest alignment at approximately 6.3 miles (10.1 km);
- No watercourse crossings required, which minimizes environmental impacts;
- Coal originates in southern Montana so the coal trains would be switched onto the spur resulting in no increase of train traffic in the City of Great Falls;
- Lowest estimated cost;
- No need to relocate construction and demolition waste landfill.

The two disadvantages of this route versus the other two options studied are that the tracks would cross Montana State Highway S-228, Highwood Road, which would require an expensive highway overpass, and it would cross agricultural land which would need to be reviewed with local property owners (SME, 2005e).

Figure 2-28. Morony Dam and Reservoir at Site of Proposed Water Intake Structure

The HGS would require a reliable source of raw water for operations. The proposed water supply for both the primary and alternate sites is the Missouri River. The water rights for supplying the water would be from an existing water reservation that is owned by the City of Great Falls (City). The City would continue to own the water reservation and would sell the water to HGS through an agreement between the City and SME. However, the current points of diversion and places of use authorized under the existing water reservation do not include those required by the preferred HGS plant site. Therefore, the City has prepared and submitted an application to the Montana Department of Natural Resources and Conservation to add a point of diversion and place of use consistent with the preferred site (SME, 2005f).

Raw water for the preferred Salem HGS plant site would be obtained from the Missouri River approximately 0.4 mile (0.6 km) upstream of Morony Dam. Morony Dam is owned and operated by PPL Montana, a subsidiary of the former Pennsylvania Power & Light Company.

The land directly adjacent to the reservoir is also owned by PPL Montana. Morony Dam is operated as a run-of-the-river generation facility. Therefore, the outflow is maintained essentially equal to the inflow. The Morony Reservoir (Figure 2-29) has a capacity of approximately 13,889 acre-feet and covers an area of approximately 304 acres (123 ha). Presently, there is no public access to the reservoir for recreational purposes.

The raw water supply system would consist of a collector well which would use a passive intake screen installed on the end of a lateral pipe that extends into the Morony Reservoir. The intake screen would be located and designed to prevent sediment and debris from entering the system while also providing protection to aquatic life. The passive intake would be designed according to Section 316(b) of the Clean Water Act which applies to new cooling water facilities that withdraw between two and 10 million gallons per day (MGD). Pursuant to that Act, the maximum throughscreen intake velocity must be less than 0.5 feet per second (fps). The diameter of the intake screen to be installed on the pipe extending into the river would be sized to meet the impingement velocity requirement and address Clean Water Act requirements.

A reinforced, below-grade, concrete caisson or sump (vertical cylinder) would be constructed near the river and would serve as the intake's "wet well." The caisson would be located outside of the floodplain. A fully enclosed pump house would be located on the top of the caisson with a finish floor elevation at approximately grade. The pump house would contain two pumps designed to deliver a maximum of 3,200 gallons per minute (gpm) to the plant site. The pumps would deliver the water to the HGS plant site through a buried pipe approximately 2.3 miles (12,200 ft or 3,720 m) long.

SME has options to obtain the necessary easements for the construction, operation and maintenance of the raw water system from the property owners. SME would also need to obtain permits from county, state, and federal regulators for the construction, operation and maintenance of the raw water system (SME, 2005f). On March 21, 2006 SME submitted a Joint Application to these authorities, including DEQ and the Army Corps of Engineers. On November 20, 2006 the Helena Regulatory Office of the Army Corps of Engineers' Omaha District advised SME that the proposed activity (intake structure and overhead power line crossing of the Missouri River) was covered by Nationwide Permit 12 (Utility Line Activities).

If wastewater were to be discharged into the Missouri River, construction of a second discharge pipeline would be needed. However, the preferred option at present is to discharge wastewater back to the City of Great Falls for disposal at its existing waste water treatment facility. The wastewater would be transported via a 12" newly constructed sanitary force main that would run from the project site to a point near Malmstrom Air Force Base where the line would intersect an existing waste water line owned by the City of Great Falls. The length of the pipeline and main improvements would be approximately 53,000 feet (16,160 m). SME would need to obtain a permit from the City and meet pre-treatment effluent standards.

In order to export electrical power from the HGS it would be necessary to construct two short segments of 230 kV transmission line. The first line segment, approximately 4.1 miles (6.6 km) long, would extend from the plant site to a new 230kV switchyard site proposed for a location south and west of HGS. This terminus point coincides with an existing three pole wood deadend transmission structure on NorthWest Energy's (NWE) Broadview to Great Falls 230kV Transmission Line (ECI, 2005). The proposed switchyard would consist of the following:

- 180 ft. by 240 ft. (55 to 73 m) fenced switchyard
- Standard 230 kV ring bus
- 230 kV switching equipment and related hardware
- Lightning protection
- Control house that would contain relaying and communications equipment.

The second line segment, approximately 9.1 miles (14.6 km) long, would extend slightly north and then west from the plant site, across the Missouri River west (upstream) of Cochrane Dam and terminate at NorthWest Energy's existing Great Falls Switchyard, located north and west of Rainbow Dam.

Both line segments would be constructed in new rights-of-way typically extending 50 feet (15 m) either side of centerline. Single pole weathering (corten) steel pole structures would be utilized for the entire length of both lines except where necessary to cross the Missouri River. Multiple-pole or H-frame structures may be required at this crossing point to maintain proper phase-to-phase and phase-to-ground clearances.

All running angle and deadend structures would be supported by steel-reinforced concrete caisson foundations, eliminating the need for guys and anchors. All tangent structures would be direct embedded utilizing native or engineered soils as backfill. Structures are anticipated to vary in height between 80 and 100 feet (25-30 m) and would be constructed approximately every 500-700 feet (150-215 m) along the rights-of-way depending upon terrain and obstacles. Insulation would be provided by use of composite post and/or suspension insulators depending on the ultimate structure configuration chosen. The single circuit lines would consist of three 1272 kCM phase conductors protected by a single 3/8" (1 cm) EHS shield wire.

2.2.2.2 Operation

Once construction was completed, plant start-up activities would be initiated with a planned duration of eight months and must be completed before commercial operation of the plant could begin. Plant operation would employ approximately 65 permanent workers (SME, 2005j).

The plant design consists of a CFB boiler, single re-heat tandem compound steam turbine, seven stages of feedwater heating, water-cooled condenser, wet cooling tower, hydrated ash reinjection, FGD system, baghouse, and material handling system. Figure 2-27 depicts the general location of equipment including the boiler, turbine building, exhaust stack, coal yard, switch yard, cooling tower, and site roads. Figure 2-29 depicts the main elements of a CFB coal-fired power plant.

The plant would purchase sub-bituminous coal from either the Spring Creek or Decker mines in Montana's Powder River Basin (PRB), or other suitable supply from which comparable PRB coal supplies are produced. Coal consumption is estimated to be 300,000 lb/hr or 1,314,000 tons/yr, based on SME's air permit application. Coal would be delivered approximately twice a

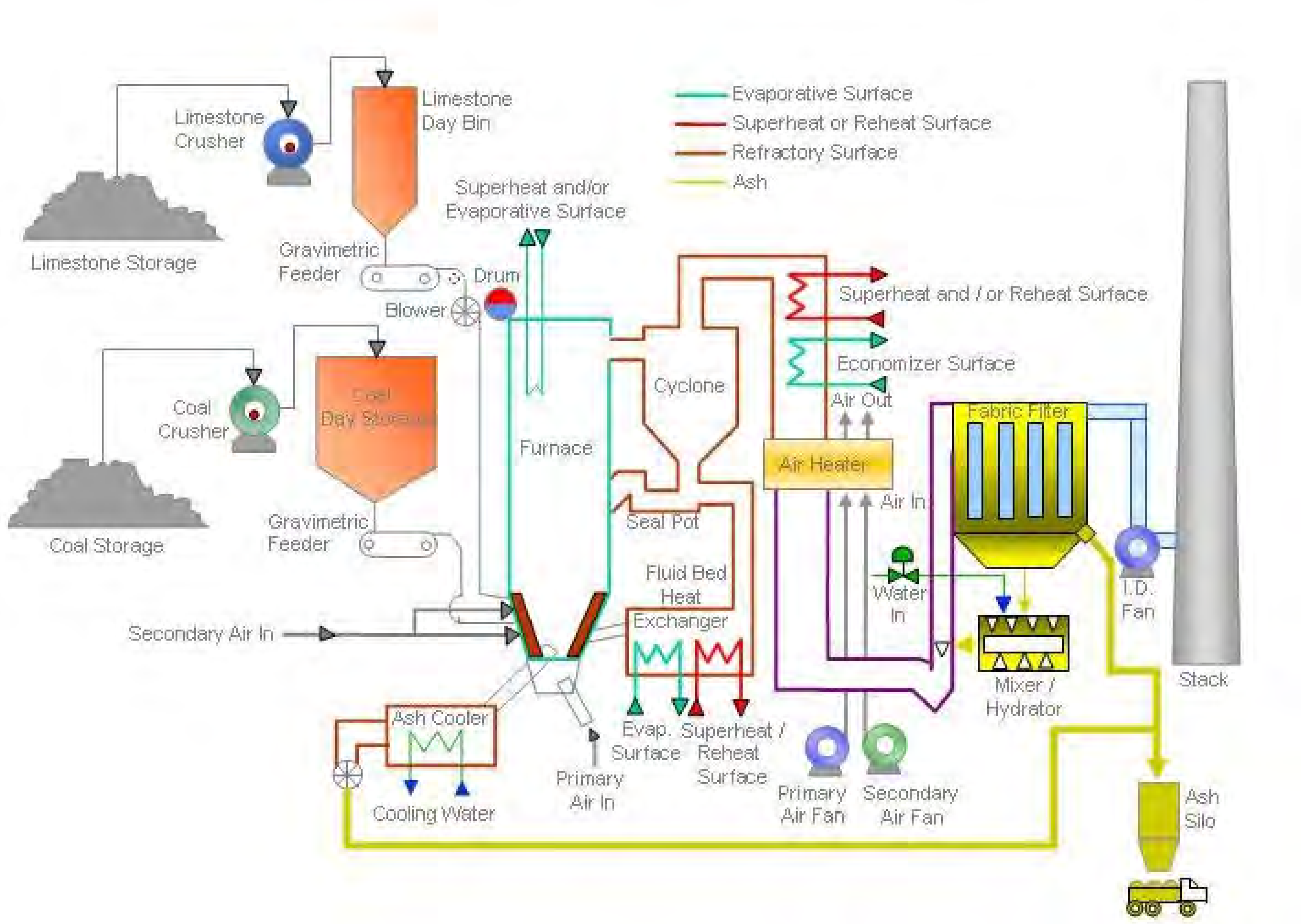


Figure 2-29. Circulating Fluidized Bed (CFB) Process with Hydrated Ash Reinjection*

*This figure represents a generic CFB process schematic. Reference to any individual component's inclusion or exclusion is determined on a project by project basis.

week in 110 bottom-dump rail car trains. The rail cars empty into a track hopper which feeds the coal to a transfer tower. The transfer tower moves the coal to either a coal silo or a storage pile. Feeders direct the coal from storage to the coal crusher building on two belts. The crushed coal is conveyed into one of four coal bunkers.

Limestone and ammonia would be purchased and utilized to reduce air pollutants. Limestone would be consumed at a rate of approximately 5,780 lb/hr or 25,300 tons/yr. Limestone would be delivered to the plant by truck from the Graymont Lime Plant and limestone quarry near Townsend, Montana. The bottom-dump trucks would empty their loads into a hopper, which feeds the limestone to a storage silo. From there the limestone would be crushed to reduce its size. The crushed limestone would then be transported to the CFB boiler to be utilized in the coal burning process.

Ammonia would be consumed at a rate of 239 lb/hr (1047 tons/yr), according to SME's air permit application. Anhydrous ammonia would be purchased and delivered to the plant by rail or by truck. The ammonia would be pumped from a rail unloading station from the rail car or truck to a horizontal storage tank. The ammonia would then be pumped from the storage tank to a vaporizer skid where steam is used to evaporate the liquid ammonia. Vaporized ammonia leaves the vaporizer and mixes with dilution air prior to injection into the boiler as a reagent for reducing NOx. System design safety features include separation distances, leak detection, spray and fogging systems, shower and eyewash stations, and containment barriers.

The facility power output rate is estimated to be a nominal 270 MW gross (250 MW net). It would be a low-emitting facility as a direct result of the application of state-of-the-art air pollution control technologies. The facility has been designed to minimize environmental impacts and environmental systems and equipment have been incorporated into the design of the facility.

The primary source of emissions to the atmosphere from the proposed generating station would be the CFB boiler (Figure 2-30). The CFB boiler itself, a "clean coal" technology, is an integral part of the proposed pollution control systems. By operating at lower temperatures, a CFB boiler generates lower NOx emissions than a comparable pulverized coal boiler. The CFB design also injects limestone into the boiler for control of SO_2 emissions and acid gas emissions (e.g. sulfuric acid or H_2SO_4 mist). Larger particles of unburned boiler bed material (coal and limestone) are separated in a cyclone from the boiler flue gas stream and "circulated" back into the CFB boiler. This circulation of unburned or heavy material provides for complete combustion of the coal and longer limestone residence times for more efficient collection of pollutants.

In addition to emission controls inherent in the CFB boiler design, SME proposes to install a fabric filter baghouse to reduce potential emissions of PM and PM_{10}. Potential NOx emissions would be further reduced using selective non-catalytic reduction (SNCR) technology and additional SO_2 and acid gas polishing would be accomplished using a HAR FGD system (refer to Figure 2-29). The use of best combustion practices would limit emissions of CO and VOC. Table 2-11 provides a summary of the proposed emission control systems and projected emission rates for PSD pollutants from the facility as presented in the draft air quality permit from DEQ

(DEQ, 2006a). The draft air quality permit has been subject to comment from the public, including SME, and may change depending on such comments.

Table 2-11. Best Available Control Technology (BACT) for proposed CFB at HGS

Pollutant	Proposed BACT Emission Limit	Proposed BACT Technology
NOx	0.07 lb./MMBtu	CFB Boiler and Selective Non-Catalytic Reduction
SO_2	0.038 lb./MMBtu	CFB Boiler with Limestone Injection and HAR FGD system
PM_{10} (filterable)	0.012 lb./MMBtu	Fabric Filter Baghouse
PM_{10} (condensable)	Included in the PM_{10} (total) limit	CFB Boiler with Limestone Injection, HAR FGD system, and Fabric Filter Baghouse
PM_{10} (total)	0.026 lb./MMBtu	CFB Boiler with Limestone Injection, HAR FGD system, and Fabric Filter Baghouse
CO	0.10 lb./MMBtu	Proper Boiler Design and Operation
VOC	0.003 lb./MMBtu	Proper Boiler Design and Operation
Sulfuric Acid Mist	0.0054 lb./MMBtu	CFB Boiler with Limestone Injection, HAR FGD system, and Fabric Filter Baghouse
Mercury	1.5 lb./trillion Btu	CFB Boiler with Limestone Injection, HAR, and Fabric Filter Baghouse

Source: DEQ, 2006a; MMBtu = Million British Thermal Units

Other potential sources of air pollution from the generating facility include an auxiliary boiler, cooling tower, materials handling (e.g. coal, ash, and limestone), coal thawing shed heater, emergency coal storage pile, ash landfill, truck traffic, building heaters, fuel oil storage tank, emergency generator, and emergency fire water pump. SME would integrate mist eliminators into the cooling tower design, incorporate conveyor enclosures and baghouse dust collectors into the materials handling system design, use water and/or chemical dust suppression on the facility roadways, and use the emergency coal storage pile.

Overall estimated annual potential emissions of air pollutants of interest from all operations combined (including boiler and baghouse emissions, coal unloading and storage, etc.) at the proposed HGS are documented in Table 2-12.

The plant would require approximately 3,000 to 3,200 gallons per minute (4.32 to 4.61 million gallons per day or 4,850 to 5,170 acre-feet per year) of “make-up water”. The majority of make-up water would be used for cooling tower make-up due to the large evaporation, drift, and blowdown losses. A raw water tank would provide on-site storage for service water and cooling tower make-up usage. A coal burning power plant is a thermoelectric plant, and works by heating water in a boiler until it turns into steam. After the steam is used to spin the turbine-generator that produces electricity, it is sent to the condenser to be cooled back into water. Most of the water used in thermoelectric power generation is used in the condenser to cool the steam back into water. Then the condensed water is pumped back to the steam generator to become steam again while the cooling water is recycled through cooling ponds or towers.

Table 2-12. Estimated Potential Annual Emissions of Key Air Pollutants from Proposed HGS

Pollutant	Emissions in tons
Nitrogen Oxides (NOx)	944
Sulfur Dioxide (SO_2)	443
Carbon Monoxide (CO)	1177
Volatile Organic Compounds (VOCs)	38
Particulate Matter (PM)	376
Particulate Matter smaller than 10 microns (PM_{10})	366
Lead (Pb)	0.3
Mercury (Hg)	0.02

Source: DEQ, 2006a

Up to 811 gal/minute of wastewater would be discharged and would consist of concentrated river water and trace amounts of cooling tower water and boiler water treatment chemicals (DEQ, 2005a). SME plans to discharge this wastewater into the City of Great Falls wastewater treatment plant, thereby avoiding direct discharge of effluent into the Missouri River.

A hydrated ash reinjection or dry FGD system and pulse jet baghouse (fabric filter) would be installed "downstream" of the boiler to further reduce sulfur dioxide levels and remove fly ash in the flue gas stream. The baghouse collects the fly ash for disposal. Flue gas enters the baghouse through an inlet plenum, and the particulate matter is collected on the outside surface of the bags. Pulsating air is used to remove the ash from the filter media and discharge the ash to the baghouse hoppers. The fly ash would be removed from the baghouse and transported to a filter separator and then to a storage silo. Bed ash is removed from the fluidized bed and cooled as it is removed in the water cooled bed ash screw conveyors. Cooled bed ash would be discharged into a storage silo, which is sized for 3-day storage. From the silos, the fly ash and bed ash are mixed with wastewater and wastewater sludge to control dust and then trucked to a dedicated ash landfill, where the damp ash would solidify (SME, 2004b). The solid waste byproduct of the combustion process at the HGS would be approximately 225 tons of fly and bed ash that would require disposal in an environmentally acceptable manner on a daily basis (SME, 2005h).

After consulting with DEQ on solid waste management and examining two disposal options, SME plans to dispose of coal combustion byproduct within the confines of the rail loop adjacent to the generating facility. The area within the rail loop would be laid out in a rectangular grid consisting of nine parcels or cells totaling approximately 53 acres (21 ha). The grid would be two parcels wide and five parcels long. The nine roughly square 450 foot by 450 foot (137 by 137 m) cells could be opened one at a time on an "as needed" basis with an estimated byproduct storage capacity of approximately three years. The monofill facility would have a storage capacity for solid waste byproducts commensurate with the estimated life of the HGS – in excess of 35 years.

The rail loop and waste material landfill cells would be located on land that is relatively flat, as is typical for fuel unloading and related rail activities. Each cell would be excavated to a depth of

36 feet (11 m) and have an estimated combustion byproduct storage capacity of 36 months. The monofill cells would be designed as self-contained units with recompacted clay liners. As each cell was filled, a layer of compacted clay would be placed over the waste material. The final stage in the process, at an above-grade height of 22 feet (7 m), would be an evapo-transpiration cover and vegetation-sustaining layer of topsoil held in reserve from the process of opening an adjacent storage cell. All storage and reclamation materials necessary for this process can be found onsite.

In addition to the fly and bed ash there would be approximately 2.0 tons per day of equivalent solid waste byproduct produced by the raw water treatment facility. This slurry would consist of concentrated sediment naturally occurring in raw water taken from the Missouri River for use at HGS. The sediment concentrate resulting from the raw water treatment process would be injected into the fly ash and bed ash pug mills to control dusting. At this point the sediment concentrate would have a consistency well-suited for injection into the fly ash and bed ash pug mills.

The solid waste byproduct of the raw water treatment process would be deposited in the onsite monofill site where the fly and bed ash would be contained. The mixing of materials (bed or fly ash with the concentrated sediment in the pug mills below each ash storage silo) would result in a mixture which would set up like a light weight concrete material. The concentrated sediments would be encapsulated through this process. This material would be evenly spread throughout the monofill cells. The use of concentrated sediment would result in lower quantities of water needed for dust suppression within the pug mill and in the silo unloading processes.

Electricity from the operation of the proposed HGS would furnish the base load component of SME's proposed integrated power supply portfolio. However, under the Proposed Action, SME and its member cooperatives would continue to purchase power from WAPA as well as continue to invest in energy conservation and efficiency, as mandated since 1997 by the State of Montana in Senate Bill 390. In addition, SME proposes to purchase and/or generate an Environmentally Preferred Product, probably wind energy. As discussed below, SME's Board has expressed its intention to construct four 1.5-MW wind turbines on the Salem site on a gentle ridge within the property that would be acquired for the HGS. In addition to generating a small amount of intermittent power, these proposed turbines would enable SME engineers to gain on-the-ground experience integrating wind as part of the power supply portfolio.

2.2.2.3 Wind Turbines

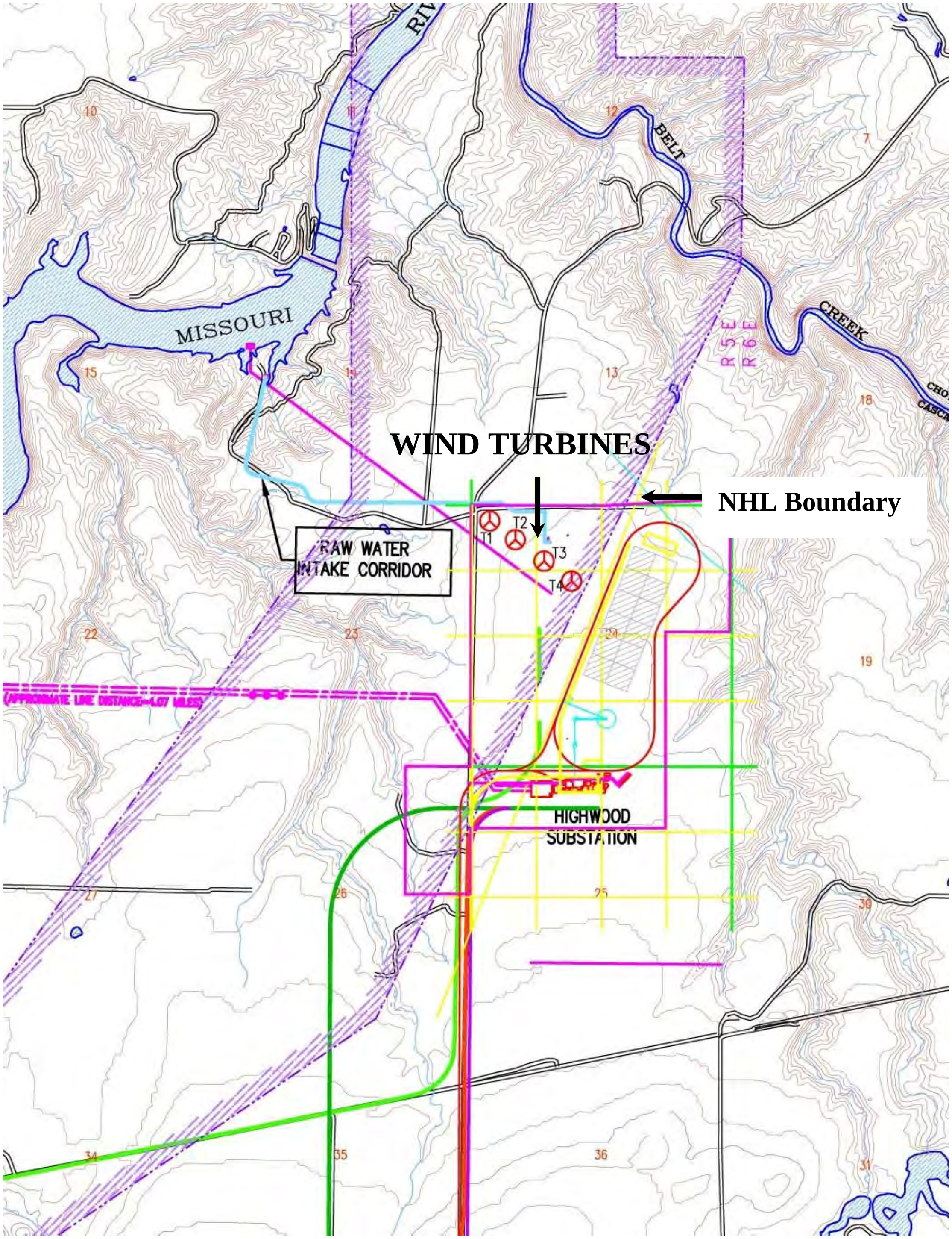
One additional element of the Proposed Action that would take place at the Salem site is the construction and operation of a wind generation project having an aggregate capacity of approximately 6 MW distributed between a maximum of four individual wind turbine generator (WTG) sites. Although SME has received Clean Renewable Energy Bonds (CREBs) funding for the construction of these structures (that is, they are not part of the RD loan application), they are included as a part of the Proposed Action. Wind energy was discussed at some length in Section 2.1.3.1 in the context of why it alone could not meet the entire benefits, purpose and need for the project, and that discussion will not be repeated here. A brief description of the proposed facilities will suffice.

Figure 2-30. 1.5-MW GE Wind Turbines at Judith Gap, Montana

Wind towers would be tubular multi-sectional, having a base diameter of approximately 18 feet (5.5 m) and be erected onsite. Towers are anticipated to have a height of 262 feet (80 m) at the rotor. The wind turbine is expected to have three blades, with an overall diameter of 250-270 feet (77-82.5 m) or radius of 125-135 feet (38-41 m). Thus, when a rotating blade is in the upright position, its tip would rise approximately 387-397 feet (118-121 m) above the ground surface. The tower and turbines would be erected on a spread footing foundation approximately 48 feet (15 m) across and up to four feet (1.2 m) thick; a volume of 240 cubic yards (183 cubic meters) of concrete with 40,000 lbs. (18,000 kg) of reinforcing steel would be needed for each foundation (ECI, 2006). The overall appearance of the wind machines would be very similar to that shown in Figure 2-30 at Judith Gap, MT.

Development of the HGS Wind Project would require approximately 100 acres (40 ha) to be occupied by up to four wind machines. The location of these machines would be generally north -northwest of the HGS Coal-Fired Plant site (Figure 2-31). Elevation above sea level for the wind turbine tower foundations would be approximately 3,280 feet (1,000 m). Wind towers would be upwind from the HGS coal-fired plant facilities, oriented to form a single string of turbines running northwest-southeast in order to capture energy from the prevailing westerly and southwest winds. Spacing between wind turbines would be approximately 800 feet (240 m). Final siting for the WTGs would need to be coordinated with placement of the 230-kV transmission lines, rail spur and HGS main access road (ECI, 2006).

Excavation and grading would be required at each WTG location for foundation placement, as well as a temporary crane pad for tower erection. The total area of site disturbance for each tower is estimated at approximately 1.1 acres (0.4 ha). A portion of the excavated native soil materials would be used to establish natural drainage away from the turbine tower foundation. Additional soils disturbance would occur for installation of high voltage underground cable (collection system), communications cable and the electrical grounding system between the HGS Switchyard and WTG locations. A total of approximately 3,300 feet (1,000 m) of excavated trench, typically three feet (0.9 m) wide by four feet (1.2 m) deep, would be required.



ECI ELECTRICAL CONSULTANTS, INC.

SME Southern Montana Electric Generation & Transmission Cooperative, Inc.

Figure 2-31. Preliminary HGS Wind Turbine Site Plan

Ongoing operation and maintenance would require construction of approximately 2,200 lineal feet (670 m) of access roads. Road construction impacts would be reasonably small considering the relatively minor change in elevation between WTG locations, the HGS plant site and existing county road. Access road construction would be limited to placement of pit run and final road base gradation materials to establish a 25-foot (8 m) wide drivable surface with elevations of 12 inches (0.3 m) or more above natural grade, or as otherwise required to interface with an improved primary plant access road. Culverts to re-establish natural drainage would be utilized where required; in addition, riprap and flow diversion devices would be specified as required for erosion protection. Top soils removed at the start of construction would be spread adjacent to completed roadways and disturbed areas would be reseeded with natural vegetation (ECI, 2006).

Integration of wind generation into a wholesale power supply portfolio requires a proper balance between the operating characteristics of base load generation, power purchase agreement flexibility and cost of service objectives. Purchasing or generating wind power has an associated expense that must be addressed as the wholesale power supplier meets its obligation to supply a reliable, affordable and balanced supply of wholesale electric energy and related services to its member systems. The integration of wind into a power supply portfolio can be challenging and the “all in” costs related to this resource must be objectively considered in order to accurately reflect the contribution this resource will make to supply portfolio pricing (SME, 2005c).

When compared to other generation technologies, wind power has a number of unique operating characteristics that must be included in an objective estimate of the cost of wind generation. Wind generation is uncertain, variable and cannot be dispatched. Wind power facilities generate electricity only when the wind is blowing, with production facility output very dependent on wind speed. Unfortunately, wind speed cannot be predicted with any degree of accuracy over a predetermined period of time. Therefore, to “firm” wind power for sale into the market, or to base load dispatch wind power directly into the system grid in a predetermined load control area, requires a dedicated source of operating and spinning reserve capacity equal to the production ability of the wind resource. Absent a commensurate

“FIRMING” AND “LOAD CONTROL AREA”

The term "**firming**" in this instance describes the process of having a base load generation resource in "spinning reserve" – ready to cover load with no more than a one-hour notice. Firming is necessary in the case of wind generation because the amount of energy produced at these facilities can (and does) vary as a function of the availability of wind. If wind generation has been earmarked to cover a particular load, the entity relying on that resource to cover load must have an alternate source of generation to cover the load when the wind does not blow.

"**Load control area**" is a defined portion of the electrical grid where an entity (generally the predominant owner of the transmission facilities in that area) is responsible for ensuring that for every hour of the year (8,760 hours) they will balance the demand for electricity with supply of electric energy. The task is accomplished by ensuring that the electric energy that is being produced/purchased by load serving entities (such as SME) with load in that particular geographic area, have adequate generation on line or have scheduled energy for delivery into that area adequate to cover the load they serve. In the event there is discrepancy between load and supply, the load control area services provider will go to the open market and purchase the energy requirement shortfall and bill the entity that was short on supply for all costs associated with that transaction. If a load serving entity has more energy delivered than they have load, the load control area services provider will sell the surplus and return the proceeds to the supplier that over delivered the revenue from that transaction – less FERC-approved charges. The concept of load/supply reconciliation is referred to as balancing the system when in energy imbalance.

level of reserve capacity, wind power does not meet the basic requirements of a dispatchable source of generation, and simply ignoring the associated cost of "firming" renders any economic comparison of wind power to traditional base load generation fundamentally flawed.

The uncertainty and variability of wind power also presents operational issues for the system dispatch operator. The system dispatch operator has the responsibility to determine how much generation must be "on line" to meet the forecasted system load requirement on an hourly basis. This scheduling activity typically begins a full day in advance, with anticipated system load and generation capacity being "balanced" on an hourly basis.

In a system comprised of both wind and conventional base load generation, the dispatch operator will determine on an "hour ahead basis" if there is sufficient generation capacity on line to meet the system load requirements – with and without the use of wind generation. If additional generation resources are needed, the system dispatch operator is responsible for acquiring generation capacity necessary to meet system load requirements. Typically, the system dispatcher would attempt to meet these requirements with purchases from available lowest-cost generation resources located within the load control area that the dispatch operator is responsible for keeping in "balance." The process of seeking, purchasing and dispatching supplemental generation on the basis of cost is referred to as "economic dispatch."

Once wind and other generation resources are brought on line, the system dispatch operator would have the responsibility to maintain the "match" between system load requirements and generation supply. If the system is in balance – implying that generation resources have a constant output that matches load control area requirements – the electric system is said to be in "steady state." However, should the wind suddenly or unexpectedly decrease or stop, the contribution wind capacity was making to the system's generation requirements would decrease accordingly and the system operator would have to readjust the mix of generation resources and compensate for this loss of generation capacity.

The need for additional generation may be met with capacity owned by the load control area provider/operator or by making purchases of generation capacity from resources willing to sell capacity at the prevailing market rate. It should be noted that the purchase of generation capacity on short notice could be very costly. There is a significant cost associated with starting additional generators and bringing them on line with short notice to cover the imbalance between system load requirements and on-line generation capacity.

Recently, there has been considerable discussion on the relative cost of wind generation. Based on an analysis of current Mid-Columbia energy market prices, it appears as though the price being quoted for the cost of wind generation may not represent the "all in" cost of this resource. The following calculation (Table 2-13) represents the underlying economics associated with determining the "all in" cost of wind generation on a specific date – including "firming."

Table 2-13 demonstrates that while the $35/MWh (after production tax credit) cost of wind power is highly competitive with fossil fuel energy sources, the "penalty" of its intermittency is a higher overall price ($66.24/MWh) due to having to purchase costly spinning reserve and power to fill in when the wind is not blowing.

Table 2-13. Wind Power Firming Cost

Assume:			
Generation Form	Cost	Unit of Energy	Comments
Wind Power	$35	/MWhr	After production tax credits
Purchased Power	$84	/MWhr	Average cost for firm on and off peak at the Mid-Columbia Electricity Index on October 15, 2005
Assume the wind power is available 36% of the time, which is a one-hour increment, and for each hour the balance of the power will be supplied by the Purchased Power Component.			
Wind Power Component	$12.60		
Purchase Power Component	$53.64		
Total Power Cost	**$66.24 /MWhr**		

Cost-effective generation resource management is a multidimensional task complicated by load variation, generation availability and cost of production. System load requirements can vary greatly by time of the day, day of the week and season. This load requirement dynamic does not match particularly well with the lack of predictability inherent in wind generation capacity. Central station electric power cannot be stored in quantities sufficient in size to cover an appreciable level of fluctuation in system load requirements. Essentially, the electric grid operates as a large synchronous machine whereby electricity must be produced and consumed on an instantaneous basis.

The HGS would be the only dispatchable source of generation in the entire SME system. The HGS unit would have, relatively speaking, limited load following ability. When operating at or above its minimum load level, the HGS is expected to be able to increase load or "ramp up" at approximately 3 MW to 10 MW per minute. For comparison purposes, a similar sized gas-fired combined cycle plant would be able to ramp up at approximately 10 MW to 15 MW per minute to cover system imbalances – but at a much higher cost.

During the time that the unit is ramping up or down to meet a variance in load, the unit's performance (i.e., heat rate) suffers and its emissions rates increase. Variations in a generating unit's operating characteristics are due to the "flywheel" effect of the generating unit as it responds to demands from its operator to alter energy production. As the generating unit's "moment of inertia" must be overcome relative to variations in energy production, unit operating efficiencies decline. When a particular generating unit is called upon to increase energy production output, operating efficiency may decline to the point that additional sources of generation are needed until the primary generating unit is able to respond to contemporary load requirements. The limitations of the flywheel effect and overcoming a moment of inertia are also true of wind power. The period of time when generating units are the most efficient is when they are operating at "steady state" – which means the generating unit no longer needs to overcome the flywheel effect and the system load requirements and generation resources are in balance for a specific load control area.

Likewise, should the wind suddenly or unexpectedly pick up, the wind power production facilities would "cut-in" and begin producing electricity. Under this scenario, the system dispatch operator would reduce the output from the HGS (or some other dispatchable source of base load capacity) in order to allow for the additional energy from the wind power facilities. This rapid curtailment in base load capacity may also create problems in the form of performance degradation and higher emissions rates. Once again, this mild form of system instability is due to the inherent design characteristics of dispatchable base load generation. Throughout the period of base load generation "ramp down," more energy is used at any load point than would be used at that same point under steady state operation. This phenomenon results in increased emissions and performance penalties as compared to the steady state condition where optimum efficiency and lowest emissions are possible.

Typically, natural gas-fired combined cycle facilities are looked to as a source of generation reserves well suited to satisfy system production/load imbalances in a specific load control area. However, recent increases in the price of natural gas have rendered a wind/combined cycle plant combination a very expensive source of base load generation. In fact, when viewed in the context of the added pressure natural gas-fired generation has had on the supply and price of natural gas, an unintended consequence of this arrangement has been an inadvertent increase in the cost of natural gas. With natural gas serving as a primary source for home heating in much of SME's service territory, fixed income and low income consumers are negatively impacted with increased cost for home heating and a higher cost for electricity that would more cost-effectively be met through SME's contemplated supply portfolio.

The challenge of maintaining "steady state" is significantly affected by the introduction of generation resources dispatchable only on a non-firm basis. A base-load, fully dispatchable source of generation will always be needed to serve as the "regulating" energy production facility governing the match between production and system load requirements. The base-load generating unit providing system regulation will utilize its governor control system to determine generation requirements necessary to match load control area energy requirements with generation capacity. This fundamental system operating requirement cannot be satisfied by a wind power source of generation that is not fully dispatchable on a predetermined basis.

There are two distinct load fluctuation patterns realized from the utilization of wind power. The first is the instantaneous fluctuation of power caused by the variability in wind power. These swings occur over fractions of a second. The second fluctuation occurs over a longer period of time, which can be fractions of a minute to fractions of an hour. Added to these fluctuations are the changing system load requirements. In order to limit the impacts of fuel costs, increased emissions and additional system imbalance costs, SME believes that it is in the best interests of its member/owners to limit the percentage of its power generation portfolio from wind generation to a relatively low amount, in a range of 2-3 percent of the system load. This is generally considered to be in the range of the control system response of the boiler, turbine, and generator controls for a coal-fired unit. Under this scenario, the uncertain and/or unplanned startup and shutdown of wind generation will have little effect on the overall performance of the proposed power plant. It may be that, in time, reliance on wind or other sources of renewable generation could be increased, but at this time wind is still not a proven economically dispatchable source of base load generation.

The Montana Legislature has set a goal of 15 percent for the renewable resource portion for power supply portfolios. The requirement to meet this objective will ramp in over time with the ultimate goal of 15 percent beginning in the year 2015. Although not specifically required to do so by the recent action of the Montana Legislature, SME is focused on integrating wind power into its supply portfolio. To ensure the highest level of operating flexibility of the contemplated HGS, SME is installing a modest amount of wind generation (6 MW) to test the value of this resource. SME will also consider power purchase agreements with qualified wind power producers operating in larger load control areas as an additional source of renewable energy. A wind resource-based power purchase agreement would enable SME to structure the integration of wind resources into the supply mix as a "firm" resource – complete with operating and spinning reserves.

SME may eventually decide to expand on its test program to the extent where it would own, operate and maintain additional wind generation. However, to properly place this activity in perspective would require a detailed analysis of the total cost of this resource as experienced by the test program is implemented. This analysis would require extensive, all-inclusive economic modeling of the costs associated with project development, construction, reserves (both operating and spinning), economic dispatch, transmission capacity and other costs associated with the contemplated test facility.

2.2.2.4 Connected Actions

Projects of this scale and scope always entail “connected actions”, that is, other actions, projects, or processes that are linked in some way to or are dependent on the Proposed Action. Connected actions are influenced by the Proposed Action; either they would not occur without the Proposed Action or their magnitude, nature, location or timing are affected by the Proposed Action.

The coal and limestone to be combusted in the CFB boiler at the proposed HGS would be purchased and transported from other existing companies conducting ongoing operations at existing mines and quarries and are therefore not part of the Proposed Action per se. Neither SME nor the suppliers in question would be opening new extractive facilities to supply the raw materials used in the proposed HGS. However, by using raw materials from the facilities in question, SME may contribute to expanded operations and would be contributing incrementally to the impacts associated with mining and quarrying coal and limestone, respectively. In the case of coal, which would be used in much larger quantities than limestone (45 times as much, by weight) these impacts have already been addressed and mitigated in Environmental Impact Statements for the Spring Creek and Decker coal mines (USGS-MDSL, 1977; USGS-MDSL, 1979; MDSL, 1980). These EISs are hereby incorporated by reference into the present EIS.

In 2004, the Spring Creek Mine, operated by the Spring Creek Coal Company in southeastern Montana’s Powder River Basin, was the 13th largest coal mine in the United States, producing approximately 12.1 million tons of coal. The Decker Mine nearby, operated by the Decker Coal Company, was the 18th largest coal mine in the U.S. (by tonnage produced), with 2004 production of 8.2 million tons. They were the second and third largest coal mines in Montana, respectively (EIA, 2004b). Projected coal consumption of 1,314,000 tons per year for the proposed HGS would therefore represent about 9 percent of the Spring Creek Mine’s annual production or about 14 percent of Decker’s.

Figure 2-32. Graymont's Indian Creek Lime Plant near Townsend, MT

SME would purchase approximately 3,888 tons per year of limestone from Graymont's Indian Creek lime plant to be injected in the CFB boiler and used as bed material. The Indian Creek plant (Figure 2-32) is located near Townsend, MT, just north of the Limestone Hills. It produces lime in two coal/coke fired preheater kilns and is equipped with lime sizing and storage facilities as well as a hydrator capable of producing 300 tons of hydrated lime per day (Graymont, 2005). Operation of this facility is regulated by DEQ Operating Permit #00105 and is not addressed here.

The plant's limestone quarry is on the south side of Indian Creek. High quality limestone from the quarry is trucked to a crushing plant where it is sized and conveyed to a large storage pile next to the preheater kilns. Bulk truck loading facilities are provided at the plant site (Graymont, 2005); HGS limestone deliveries from the Indian Creek plant would be made by truck.

As to other actions described previously, including constructing and operating transmission line interconnections, the railroad spur, and water and wastewater pipelines, as well as transporting coal to the HGS in unit trains along the rail spur, while these are integral to the Proposed Action itself, they are not considered connected actions but rather components of the overall Proposed Action.

2.2.3 ALTERNATIVE SITE – INDUSTRIAL PARK SITE

The Industrial Park site is located in the Southern half of Section 30, Township 21 North, Range 4 East. It is just east of Highway 87, about ¾ mile (1.2 km) north of the Missouri River and ½ mile (0.8 km) east of a mobile home park (see Figure 2-24). The City of Great Falls has designated this site as the Central Montana Agricultural and Technology Park, that is, as an industrial park. Construction and operation of the 250-MW, CFB coal-fired power plant at the Industrial Park site would be the same as described in section 2.2.2 for the Salem site, except for the differences described below. Figure 2-33 displays the rough layout of the Industrial Park site and Figures 2-34 and 2-35 depict scenes from the site.

Eight miles (13 km) of new track and railroad bed would be needed, slightly more than the distance for the Salem site. The rail spur would start north of the Missouri River and travel north and west to the plant site. A 4.5-mile (7.2-km) long pipeline (compared to less than three miles for the Salem site) would be needed to transport make-up water from an intake structure on the Missouri River to the plant. Precise locations of transmission line corridors have not yet been determined, though it is likely that one transmission line would go to the Great Falls Switchyard, which is about 5.5 miles east of the Industrial Park site. A second line of 18 miles in length would likely be built to a switchyard installed on the Great Falls to Ovando line. The specific rights-of-way for potable water and wastewater lines have been selected, and are 1.5 and two miles in length, respectively, which are shorter than for the Salem site.

Construction at the Industrial Park site would take the same length of time as at the Salem site, approximately three and a half years, and the workforce would be about the same size – averaging between 300 and 400 workers at any one time with an estimated peak construction workforce approaching 550 (SME, 2005j).

The proposed 250-MW (net) generating station would include the same equipment and component parts, would be operated identically and would consume the same quantities of raw materials as in the Proposed Action.

Disposal of fly and bed ash would not take place onsite at the Industrial Park site, because of the smaller area. Instead, ash would be shipped away for disposal in an approved landfill, for reuse as an industrial byproduct, or both.

SME has not committed to building and operating wind turbines at the Industrial Park site. However, it would continue to purchase power from WAPA, purchase 1 MW of Environmentally Preferred Power, and invest a minimum of 2.4 percent of annual retail sales in energy efficiency and conservation per Montana Senate Bill 390.

The connected actions of mining coal and quarrying limestone would be the same as in the Proposed Action.

2.2.4 AGENCIES' PREFERRED ALTERNATIVE

RD and DEQ's preferred alternative is the Proposed Action – the Highwood Generating Station at the Salem site.

2.2.5 COMPARISON OF ALTERNATIVES

Table 2-14 on the following pages is a matrix comparing the potential impacts by resource topic of each of the alternatives analyzed fully in this EIS.

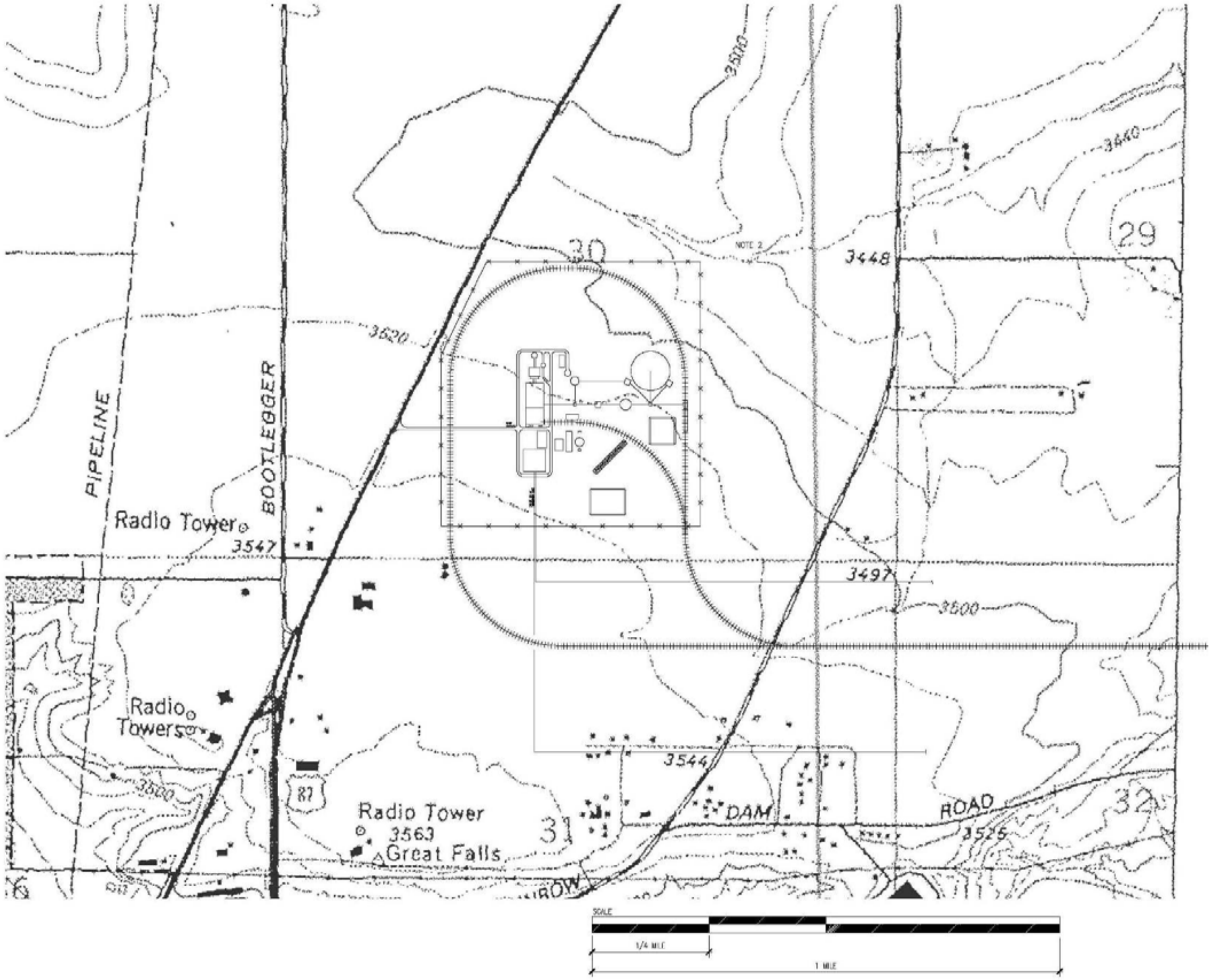


Figure 2-33. Preliminary Layout of the Industrial Park Site (Central Montana Agricultural and Technology Park)

Figure 2-34. September 2005 View of the Industrial Park Site

Figure 2-35. September 2005 View from the Industrial Park Site West Toward Suburban Subdivision North of Great Falls

Table 2-14. Comparison of Direct, Indirect, and Cumulative Environmental Impacts of Alternatives

Affected Resource or Issue	Alternative 1: No Action	Alternative 2: Highwood Generating Station – Salem Site (Proposed Action)	Alternative 3: Industrial Park Site (Generating Station at Alternate Site)
Soils, Topography, and Geology	▪ No impacts on the topography or the geology of the Salem or Industrial sites. ▪ Negligible to minor, long-term adverse impacts on soils would continue from existing land use practices.	▪ Negligible to minor impacts on topography and geology. ▪ Soils impacts from construction activities would have a moderate magnitude, medium-term duration, medium extent, and probable likelihood. ▪ Overall rating from construction impacts adverse and non-significant. ▪ Impacts from operation of the waste monofill would be adverse but non-significant, and of minor magnitude, long-term duration, small extent, and probable likelihood. ▪ Overall impacts on soil at the Salem site would be adverse and most likely non-significant.	▪ Negligible to minor impacts on topography and geology. ▪ Soils impacts from construction activities would have a minor magnitude, medium-term duration, medium extent, and probable likelihood. ▪ Overall rating from construction impacts adverse and non-significant. ▪ Operation-related impacts on soil resources would be adverse but non-significant, and of minor magnitude, short-term duration, small extent, and possible likelihood. ▪ Overall impact on soil at the alternative site would be adverse and non-significant. Impacts at an alternative ash disposal site are unknown and site-dependent.
Water Resources	▪ Would not significantly, adversely affect water resources at or near the Salem Site or the Industrial Park. ▪ Negligible to minor, long-term adverse impacts on water resources would continue from existing agricultural land uses. ▪ Could potentially contribute	▪ Construction of the HGS would likely entail increased storm water runoff carrying sediment and contamination loads into surface water, and the potential for contamination from construction equipment and activities infiltrating area soils and percolating down into	▪ Construction of the HGS would likely entail increased storm water runoff carrying sediment and contamination loads into surface water, and the potential for contamination from construction equipment and activities infiltrating area soils and percolating down into

Affected Resource or Issue	Alternative 1: No Action	Alternative 2: Highwood Generating Station – Salem Site (Proposed Action)	Alternative 3: Industrial Park Site (Generating Station at Alternate Site)
Water Resources (continued)	indirectly and cumulatively to water resource impacts at the sites of other generation sources from which power is purchased.	the groundwater. Impacts to water quality would be mitigated (reduced but not entirely eliminated) through BMPs. ▪ Negligible to minor impact on wetlands and floodplains. ▪ Water withdrawals from the Missouri River for HGS operation would reduce flows by 0.31% in a worst-case scenario. ▪ Effluent would be discharged to City of Great Falls sewage treatment system rather than directly into the Missouri River after on-site treatment. ▪ Impacts from power plant operation would be of minor magnitude, long term duration, medium extent, and probable likelihood. ▪ Overall rating for impacts on water resources from the operation phase of the power plant would be adverse and non-significant.	the groundwater. Impacts to water quality would be mitigated (reduced but not entirely eliminated) through BMPs. ▪ Negligible to minor impact on wetlands and floodplains. ▪ Water withdrawals from the Missouri River for HGS operation would reduce flows by 0.31% in a worst-case scenario. ▪ Effluent would be discharged to City of Great Falls sewage treatment system rather than directly into the Missouri River after on-site treatment. ▪ Impacts from power plant operation would be of minor magnitude, long term duration, medium extent, and probable likelihood. ▪ Overall rating for impacts on water resources from the operation phase of the power plant would be adverse and non-significant.
Air Quality	▪ Would not result in any direct air quality impacts on either the Salem or Industrial Park sites. ▪ Would contribute indirectly and cumulatively to air quality impacts at those power plants from which SME would purchase electricity,	▪ Short-term, minor to moderate degradation of local air quality from construction activities. ▪ Long-term minor to moderate degradation of local air quality from HGS operations. ▪ Long-term minor impacts on	▪ Short-term, minor to moderate degradation of local air quality from construction activities. ▪ Long-term minor to moderate degradation of local air quality from HGS operations. ▪ Long-term minor impacts on

Affected Resource or Issue	Alternative 1: No Action	Alternative 2: Highwood Generating Station – Salem Site (Proposed Action)	Alternative 3: Industrial Park Site (Generating Station at Alternate Site)
Air Quality (continued)	although these impacts cannot be specified.	sensitive species from criteria pollutant emissions and/or trace element deposition. ▪ Off-site impacts on PSD Class I increments and AQRVs (regional haze and acid deposition) ranging from negligible to moderate in intensity. ▪ Annual mercury emissions from the HGS would be approximately 34.5 lbs. (15.7 kg), constituting a minor incremental contribution to cumulative state, national, and global mercury emissions. State and national mercury emissions are declining due to new rules and controls; global emissions are still rising. HGS Hg emissions are unlikely to present unacceptable health risks to humans or wildlife locally or in the state. ▪ Minor, incremental contribution to accumulation of greenhouse gases in the atmosphere, which scientists believe is forcing climate change. ▪ Overall air quality impacts would be adverse and most likely non-significant.	sensitive species from criteria pollutant emissions and/or trace element deposition. ▪ Off-site impacts on PSD Class I increments and AQRVs (regional haze and acid deposition) ranging from negligible to moderate in intensity. ▪ Annual mercury emissions from the HGS would be approximately 34.5 lbs. (15.7 kg), constituting a minor incremental contribution to cumulative state, national, and global mercury emissions. State and national mercury emissions are declining due to new rules and controls; global emissions are still rising. HGS Hg emissions are unlikely present unacceptable health risks to humans or wildlife locally or in the state. ▪ Minor, incremental contribution to accumulation of greenhouse gases in the atmosphere, which scientists believe is forcing climate change. ▪ Overall air quality impacts would be adverse and most likely non-significant.

Affected Resource or Issue	Alternative 1: No Action	Alternative 2: Highwood Generating Station – Salem Site (Proposed Action)	Alternative 3: Industrial Park Site (Generating Station at Alternate Site)
Biological Resources	▪ No direct impacts on biological resources at either the Salem or Industrial Park sites. ▪ Could contribute indirectly and cumulatively to impacts on flora and fauna from those power plants from which SME would purchase electricity, although these impacts cannot be specified.	▪ Temporarily displace terrestrial wildlife due to removal of vegetation and disturbance from construction equipment. ▪ Eliminate potential habitats, but unlikely to adversely affect, state-listed species of concern from permanent removal of vegetation. ▪ Short-term harm to wildlife & vegetation by degrading air quality. ▪ Short-term harm to aquatic biota from degraded water quality. ▪ Long-term increase in mortality of terrestrial mammals by rail strikes and increased traffic on access road. ▪ Increased mortality to birds and bats from blade strikes on wind turbines. ▪ Temporarily disturb habitats along water pipeline routes during construction activities. ▪ Temporarily disturb wetland habitats for installation of water intake. ▪ In sum, impacts on biological resources would be of minor magnitude, long-term duration, small extent and probable likelihood. ▪ Overall biological resources impact would be adverse and non-significant.	▪ Temporarily displace terrestrial wildlife due to removal of vegetation and disturbance from construction equipment. ▪ Eliminate potential habitats, but unlikely to adversely affect, state-listed species of concern from permanent removal of vegetation. ▪ Short-term harm to wildlife & vegetation by degrading air quality. ▪ Temporarily disturb habitat along water pipeline routes during construction activities. ▪ Temporarily or permanently disturb wetland habitats for installation of water intake. ▪ In sum, impacts on biological resources would be of minor magnitude, long-term duration, small extent and probable likelihood. ▪ Overall biological resources impact would be adverse and non-significant.

Affected Resource or Issue	Alternative 1: No Action	Alternative 2: Highwood Generating Station – Salem Site (Proposed Action)	Alternative 3: Industrial Park Site (Generating Station at Alternate Site)
Acoustic Environment	▪ No direct noise impacts on either the Salem or Industrial Park sites. ▪ Would contribute indirectly to noise impacts at other plants from which SME would purchase electricity.	▪ Noise levels from the operation of the HGS, including intermittent noise sources, would be audible for several miles from the site. ▪ Predicted noise levels from HGS and wind turbines are equal to or less than the EPA guideline at receptors near the Salem site. ▪ Noise levels are predicted to be approximately equal to the existing ambient noise levels during quiet periods at approximately 3.1 miles (5 km) from the Salem site. ▪ At all receptor locations, the power plant and wind turbine noise levels are predicted to be less than the 50 dBA nighttime noise limit of the Great Falls Municipal Code for residences, and less than or equal to the EPA Ldn 55 dBA guideline. ▪ According to National Park Service policy, noise impacts on the NHL would be significant because of the degradation to natural ambient sounds. ▪ Overall noise impacts would be minor, localized and long-term; while impacts on Great Falls and Salem area residents would most likely be non-significant, there would be a significant adverse	▪ Noise levels from the operation of the HGS, including intermittent noise sources, would be audible for several miles from the site. ▪ Predicted noise levels are equal to or less than the EPA guideline at the receptor locations around the Industrial Park site. ▪ Noise levels are predicted to be approximately equal to the existing ambient noise levels during quiet periods at approx. 1.2 miles (1.9 km) from the Industrial Park site. ▪ At all receptor locations, the power plant noise levels are predicted to be less than the 50 dBA nighttime noise limit of the Great Falls Municipal Code for residences, and less than or equal to the EPA Ldn 55 dBA guideline. ▪ Overall noise impacts would be minor, localized, and long-term; while impacts would most likely be non-significant, there is some potential for the impacts to become significant.

Affected Resource or Issue	Alternative 1: No Action	Alternative 2: Highwood Generating Station – Salem Site (Proposed Action)	Alternative 3: Industrial Park Site (Generating Station at Alternate Site)
Acoustic Environment (continued)		impact on the acoustical environment of the Great Falls Portage National Historic Landmark.	
Recreation	▪ No direct impacts on recreation facilities or opportunities in the area. ▪ Would contribute indirectly to recreation impacts associated with those generating stations from which SME would purchase electricity.	▪ Construction and operation of the HGS would entail negligible to at most minor impacts on recreation in the immediate project vicinity and wider Great Falls area. ▪ The Lewis and Clark staging area historic site would be impacted by the Proposed Action. ▪ Generally, impacts on recreation would be of minor magnitude, long-term duration, small extent, and probable likelihood. ▪ Overall impacts on recreation would be adverse and non-significant.	▪ Construction and operation of the SME power plant at the alternate Industrial Park site would entail negligible to at most minor impacts on recreation in the immediate project vicinity and wider Great Falls area. ▪ Upper portions of the proposed generating station would be visible to park users and recreationists along the Missouri River in Great Falls. ▪ Overall impacts on recreation would be adverse and non-significant.
Cultural Resources	▪ No direct impacts on cultural resources in the area. ▪ Could potentially contribute indirectly to cultural resources impacts associated with those generating stations from which SME would purchase electricity.	▪ Adversely affect Great Falls Portage NHL from site preparation, staging, construction, maintenance, operations, and connected actions associate with power plant, water lines, transmission lines, rail supply lines. ▪ Other cultural properties within the APE would not be affected by the proposed undertaking.	▪ Would likely have no effect on cultural resources due to their apparent absence from the Industrial Park site. ▪ It appears that no TCPs would be affected. ▪ Constructing transmission lines, water supply and wastewater lines could potentially affect undiscovered cultural resources.

Affected Resource or Issue	Alternative 1: No Action	Alternative 2: Highwood Generating Station – Salem Site (Proposed Action)	Alternative 3: Industrial Park Site (Generating Station at Alternate Site)
Cultural Resources (continued)		▪ It appears that no TCPs would be affected. ▪ In sum, cultural resources impact would be of major magnitude, long-term duration, medium or localized extent, and probable likelihood. ▪ Overall impact would be adverse and significant; significance of impacts can be reduced but not eliminated by <u>proposed</u> mitigation, <u>including moving most of the facilities to just outside the NHL.</u>	▪ Overall impact likely to be negligible to minor.
Visual Resources	▪ No direct impacts on visual resources in the area. ▪ Could potentially contribute indirectly and incrementally to visual resources impacts associated with those power sources from which SME would purchase electricity.	▪ The HGS and wind turbines would have scenic impacts of major magnitude, long-term duration, small extent, and high probability. ▪ While the HGS and wind turbines would clearly diminish scenic values within the NHL, they would not eliminate them; certain views would remain unaffected. ▪ Overall rating for visual impacts from the Proposed Action would be adverse and significant; significance of impacts can be reduced but not eliminated by <u>proposed</u> mitigation, <u>including moving most of the facilities to just outside the NHL, landscaping, and compatible earth-tone color schemes.</u>	▪ Would have scenic impacts of moderate magnitude, long-term duration, medium or localized extent, and high probability. ▪ Overall rating for visual impacts from the alternative Industrial Park site would be adverse but non-significant.

Affected Resource or Issue	Alternative 1: No Action	Alternative 2: Highwood Generating Station – Salem Site (Proposed Action)	Alternative 3: Industrial Park Site (Generating Station at Alternate Site)
Transportation	▪ Would not contribute directly to transportation impacts at either the Salem or Industrial Park sites. ▪ Would be contributing indirectly to ongoing transportation impacts at existing generating stations in the region.	▪ Construction-related impacts on traffic would be of moderate magnitude, medium-term duration, small extent, and probable likelihood; according to Montana Department of Transportation criteria, short-term construction-related impacts would be significantly adverse. ▪ Over the long term, during operation of the proposed HGS, impacts on road, rail and air transportation would be generally negligible.	▪ Construction-related impacts on traffic would be of moderate magnitude, medium-term duration, small extent, and probable likelihood; according to Montana Department of Transportation criteria, short-term construction-related impacts would be significantly adverse. ▪ Over the long term, during operation of the proposed Industrial Park facility, impacts on road, rail and air transportation would be generally negligible.
Farmland and Land Use	▪ Would not adversely affect or alter existing land uses at or near the Salem Site or the Industrial Park. ▪ The Salem Site would continue to be maintained in agricultural production and the Industrial Site would continue to be open space. ▪ Could potentially contribute indirectly to impacts on farmland and land use related to other generation sources.	▪ Construction of a power plant at the Salem site would involve the direct conversion of agricultural lands to an industrialized facility with supporting infrastructure. ▪ No homesteads or residences would be displaced. ▪ In the context of the amount of quality farmland in other areas of Cascade County, the conversion of farmland to developed land required for the plant would be a minor magnitude, long-term (permanent) duration, medium extent, and probable likelihood.	▪ Construction of a power plant at the Industrial Park site would involve the direct conversion of agricultural lands to an industrialized facility with supporting infrastructure. ▪ No homesteads or residences would be displaced. ▪ In the context of the amount of quality farmland in other areas of Cascade County, the conversion of farmland to developed land required for the plant would be a minor magnitude, long-term (permanent) duration, medium extent, and probable likelihood.

Affected Resource or Issue	Alternative 1: No Action	Alternative 2: Highwood Generating Station – Salem Site (Proposed Action)	Alternative 3: Industrial Park Site (Generating Station at Alternate Site)
Farmland and Land Use (continued)		▪ Overall rating for impacts on land use from the construction phase of the power plant would be adverse and non-significant ▪ Operation of the power plant at the Salem Site would cause no additional direct impacts to land use or farmland. ▪ However, the influence and impacts of the power plant and its associated support facilities could indirectly influence land uses on adjoining or nearby properties in the vicinity of the site. ▪ Development of the Salem Site may reduce market values of nearby rural, agricultural land, affecting sales of those lands. Property values are less likely to be affected, but if they are reduced then there would be repercussions on land assessments and property taxes. ▪ Overall rating for impacts at Salem would be adverse and non-significant, but with some potential for the impacts to become significant.	▪ Overall rating for impacts on land use from the construction phase of the power plant would be adverse and non-significant. ▪ Operation of the power plant at the Industrial Park site would cause no additional direct impacts to land use or farmland. ▪ Indirectly, however, the greater proximity of residential areas and other businesses to the Industrial Park site could potentially create more land use conflicts than at the Salem Site. ▪ Development of the Industrial Park Site may reduce the market values of nearby agricultural or residential land, affecting sales of those lands. Property values are less likely to be affected, but if they are reduced then there would be repercussions on land assessments and property taxes. ▪ The impacts on land use from the operation of a power plant at the Industrial Park Site would be minor magnitude, long-term duration, medium extent, and possible likelihood. ▪ Overall rating for impacts at the Industrial Park site would be adverse and non-significant, but

Affected Resource or Issue	Alternative 1: No Action	Alternative 2: Highwood Generating Station – Salem Site (Proposed Action)	Alternative 3: Industrial Park Site (Generating Station at Alternate Site)
			with some potential for the impacts to become significant.
Waste Management	▪ Would not create any waste management issues on either the Salem or Industrial Site, as no waste would be generated at the sites. ▪ By purchasing an equivalent amount of power from generation sources elsewhere, SME would be contributing indirectly to waste management impacts associated with existing or new generating stations in or outside the region.	▪ Construction-related impacts on waste management would be of minor magnitude, medium-term duration, small extent, and probable likelihood. ▪ Ash and water treatment system byproducts would be disposed of in an onsite monofill which would be managed with appropriate environmental controls, including groundwater monitoring. ▪ Operation-related impacts would be of moderate magnitude, long-term duration, medium extent, and probable likelihood. ▪ Overall waste management impacts would likely be non-significant, but with some potential to become significant.	▪ Construction-related impacts on waste management would be of minor magnitude, medium-term duration, small extent, and probable likelihood. ▪ All non-hazardous waste generated during operation of the power plant, including ash, would be disposed of at the HPSL. ▪ Operation-related impacts on waste management for the Industrial Site would be of minor to moderate magnitude, long-term duration, small extent, and probable likelihood. ▪ Overall waste management impacts would likely be non-significant, but with some potential to become significant.
Human Health and Safety	▪ Would not create any notable risks to human health and safety at, or because of, the sites. ▪ By purchasing power from other generation sources, SME would be contributing indirectly to ongoing human health and safety impacts at	▪ Construction-related impacts at the Salem site would be of minor magnitude, medium-term duration, small extent, and probable likelihood. ▪ Operation-related impacts on human health and safety for the Salem site	▪ Construction-related impacts at the Industrial Park site would be of minor magnitude, medium-term duration, small extent, and probable likelihood. ▪ Operation-related impacts on human health and safety for the alternative

Affected Resource or Issue	Alternative 1: No Action	Alternative 2: Highwood Generating Station – Salem Site (Proposed Action)	Alternative 3: Industrial Park Site (Generating Station at Alternate Site)
	different generating stations in the region.	would be of minor magnitude, long-term duration, medium extent, and probable likelihood. ▪ Overall health and safety impacts of the plant would be adverse and most likely non-significant.	site would be of minor magnitude, long-term duration, medium extent, and probable likelihood. ▪ Overall health and safety impacts of the plant would be adverse and most likely non-significant.
Socioeconomic Environment	▪ Due to the higher electric rates it would likely lead to for SME's members and consumers, the socioeconomic impacts from the No Action Alternative would be potentially significant and adverse.	▪ Construction of the HGS would have a moderately beneficial effect on the socioeconomic environment of the local and regional area, including increases in employment opportunities, total purchases of goods and services, and an increase in the tax base. ▪ During the long term operation of the HGS, it would yield beneficial and potentially significant socio-economic impacts on aggregate income, employment, and population in Great Falls and Cascade County. ▪ HGS would also provide reliable electricity at reduced rates for SME's customer base.	▪ Construction of the Industrial Park facility would have a moderately beneficial effect on the socioeconomic environment of the local and regional area, including increases in employment opportunities, total purchases of goods and services, and an increase in the tax base. ▪ During the long term operation of the facility at the Industrial Park site, it would yield beneficial and potentially significant socioeconomic impacts on aggregate income, employment, and population in Great Falls and Cascade County. ▪ The Industrial Park facility would also provide reliable electricity at reduced rates for SME's customer base.
Environmental Justice/Protection of Children	▪ No direct impact or effect from a power plant on persons living in poverty or children at either site.	▪ Would have a negligible effect on children or persons living in poverty, as these population groups	▪ Some potential of a slightly increased risk of impacting children and persons living in poverty from

Affected Resource or Issue	Alternative 1: No Action	Alternative 2: Highwood Generating Station – Salem Site (Proposed Action)	Alternative 3: Industrial Park Site (Generating Station at Alternate Site)
Environmental Justice/Protection of Children (continued)	▪ Higher electricity prices could disproportionately affect low-income residential consumers. ▪ Impacts would be moderate magnitude, intermittent-term duration, small extent, and possible likelihood.	are not generally present at or near the Salem Site.	this site, due to the fact that it is located in closer proximity to higher population areas and additional industrial sites. ▪ Impact of minor magnitude, long-term duration, medium extent, and improbable likelihood. ▪ Overall impacts would be adverse but non-significant.

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3.0 AFFECTED ENVIRONMENT

In response to public comments, RD and DEQ have made a number of edits to the text of Chapter 3. Other than updated maps to reflect the modified location of the HGS, there are no large changes. Any additions or changed text in the FEIS from the DEIS as a result of public comments are shown in double underlining. Deletions are not shown.

3.1 SOILS, TOPOGRAPHY, AND GEOLOGY

Great Falls and its surrounding areas lie within the western edge of the northern Great Plains physiographic area, which in its entirety reaches from Mexico far north into Canada and spreads out east of the Rocky Mountains. Specifically, Great Falls is located within the Missouri Plateau region of the Great Plains, which is characterized by several levels of rolling upland surmounted by small mountainous masses and flat-topped buttes and entrenched by streams. The area has been greatly dissected by the Missouri River and its tributaries (Figure 3-1).

The rather limited variety of landforms found on the Missouri Plateau is testimony to their glacial origin and to the great advances of the continental ice sheets. This is a stream-carved terrain that has been modified by continental glaciers and almost completely covered by a thick blanket of glacially transported and deposited till and rock debris, locally hundreds of feet thick but generally less than 50 feet (15 m) thick. Soils surrounding the area have developed from the gently rolling glacial drift and rock debris and are characterized by poorly developed drainage (Trimble, 1980).

Figure 3-1. Landscape of the Missouri River Canyon

The regional topography in the Great Falls vicinity primarily consists of gently rolling northern Great Plains and prairie at relatively high altitudes, with little change in relief. Average elevations in the area range from 3,300 to 3,600 feet (1,000-1,100 m) above mean sea level (MSL). Nearby mountain ranges partially encircle the Great Falls portion of the Missouri River valley. These include the Highwood and Little Belt Mountains, which are about 30 miles (50 km) away to the east and south, respectively. The Big Belt Mountains are 40 miles (65 km) distant to the southwest and the Front Range of the Rocky Mountains varies between 60 and 100 miles (100-160 km) distance to the west and northwest.

A hydrogeologic report was completed for area in September, 2005 (PBSJ, 2005). The deepest rock of consequence identified in this study is the Madison limestone, a thick sequence of dark gray, hard limestone beds deposited during Mississippian Period or epoch, around 300 million years ago. The thickness of the Madison limestone is believed to be at least 1,000 feet (305 m) in this area.

Above the Madison limestone is the Morrison Formation of Jurassic age. Morrison sediments predominantly consist of intercalated sandstone and shale beds that are brown to dark gray, respectively. The Morrison Formation is about 100-200 feet (30-60 m) thick. Locally, below the Morrison Formation, is a separately recognized unit called the Swift Formation.

Overlying the Morrison Formation is the Cretaceous age Kootenai Formation. The upper portion of the Kootenai Formation consists dominantly of mudstone with some claystone and siltstone. This unit is chiefly grayish red to moderate red, with some greenish-gray and dark gray beds. The lower portion of the Kootenai is characterized by sandstone and siltstone. Sandstone color is light gray and weathers yellow-gray. The Kootenai Formation is roughly 200-250 feet (60-76 m) thick in this area (PBSJ, 2005).

3.1.1 SALEM SITE

The preferred location, the Salem Site, is located approximately 3,354 feet (1,022 m) above sea level. This site lies approximately eight miles (13 km) to the east of Great Falls, Montana, and site topography is gently sloping and undulating, sloping downward to the west and north toward the Missouri River.

The geology of the area to the east of Great Falls is characterized by a thick sequence of sedimentary rocks overlain by a mantle of glacial and alluvial deposits. Glacial deposits beneath the Salem Site were identified during a geotechnical investigation that consisted of drilling 67 borings to depths ranging from 11.5 to 60 feet (3.5-18 m) (PBSJ, 2005). Site geology consists of eolian (wind-blown) deposits of Holocene age composed of silty sand, underlain by Pleistocene-age glacial lake bed deposits and glacial till layers. The glacial lake deposits are the end result of Glacial Lake Great Falls, a large lake that formed at the southern margin of the great ice sheets. Beneath the upper fine-grain layers, alluvial silt and sand and gravel deposits of the ancestral Missouri River were observed. The unconsolidated sediments extend 125 to 150 feet (38-46 m) below ground where the Kootenai Formation is found.

At the ground level, the Salem site is located entirely on Pendroy Clay soils, with 2-8 percent slopes. The Pendroy series consists of very deep, well-drained soils formed from clayey parent materials on alluvial fans, floodplains, stream terraces, and lake plains. These soils have a clay content of 60-75 percent through the surface and subsurface horizons

Soils Terminology

Parent Material: The unconsolidated mass from which soil forms. The characteristics of the parent material determine soil characteristics such as thickness and texture of the horizons, mineralogy, color, and reaction.

Soil Series: A group of soils formed from the same parent material under similar conditions and having the same kind and sequence of all major horizons and the same land use properties.

Soil Association: A landscape, named for its major soil series, which has a distinctive proportional pattern of soils, generally consisting of one or more major soils and at least one minor soil series.

(0-40" deep), below which the clay content decreases slightly to 50-65 percent (at 40-70" or 1.0-1.8 m of depth). As a result of these contents, Pendroy soils exhibit very slow permeability (NRCS, no date). Figure 3-2 is a soils map of the Salem site.

Pendroy Clay soils are in hydrologic group D, which consists of soils with high runoff potential. Hydrologic group D soils have very slow rates of water transmission and infiltration. Additionally, Pendroy soils are classified as CH soils according to the Unified system and A-7 soils according to the American Association of State Highway and Transportation Officials (AASHTO) system. The Unified system classifies soils according to properties that affect their use for engineering and construction purposes. The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance, including the particle-size distribution and Atterberg limits (the liquid limit and plasticity-index of the soil). CH soils are at the extreme end of the Unified classification system for fine-grained high content inorganic clay soils which exhibit high plasticity. Similarly, A-7 soils are at the extreme fine-grained particle end of the AASHTO measurement spectrum, and contain minimal to no coarse-grained particles.

3.1.2 Industrial Park Site

The alternate site location, the Industrial Park Site, is located approximately 3,530 feet (1,076 m) above sea level. Figure 3-3 is a soils map of the site.

The great majority of the facilities at the Industrial Park site (96.2 acres or 39 ha) would be located on Ethridge-Kobase (formerly known as Kobar) silty clay loams, with 0-2 percent slopes, and a smaller amount of facilities, including railbed and access roads, (8.1 acres or 3.3 ha) would be located on Linnet-Acel silty clay loams, also with 0-2 percent slopes. Additionally, some short sections of the transmission lines and railroad bed would be located on Kobase (Kobar) silty clay loam and Lothair silty clay loam.

Ethridge-Kobase (Kobar) silty clay loams are very deep, well-drained soils formed in alluvium and glaciofluvial deposits from mixed rock sources, or glaciofluvial or glaciolacustrine deposits. They are found on till and lake plains, stream terraces, alluvial fans, drainage ways, sedimentary plains, and hills. Slopes are 0 to 40 percent. These soils have a clay content of 27-35 percent in the surface horizons (0-20" deep), after which the clay content increases slightly to 35-45 percent (at 10-60" of depth). Ethridge-Kobase soils exhibit slow permeability (NRCS, no date).

Linnet-Acel silty clay loams are also very deep, well-drained soils formed in clayey alluvium, glaciolacustrine, or glaciofluvial deposits. They are located on lake plains, stream terraces, alluvial fans, drainage ways, and till plains. Slopes are 0 to 10 percent. These soils have a clay content of 30 to 40 percent in the surface horizons (0-6" deep), after which the clay content increases to 40-55 percent (at 6-60" of depth). The Linnet-Acel soils exhibit slow permeability (NRCS, unknown date).

Ethridge-Kobase (Kobar) and Linnet-Acel soils are all in hydrologic group C, which consists of soils that have a slow infiltration rate when thoroughly wetted. Hydrologic group C soils have moderately fine to fine texture and exhibit slow rates of water transmission. Additionally,

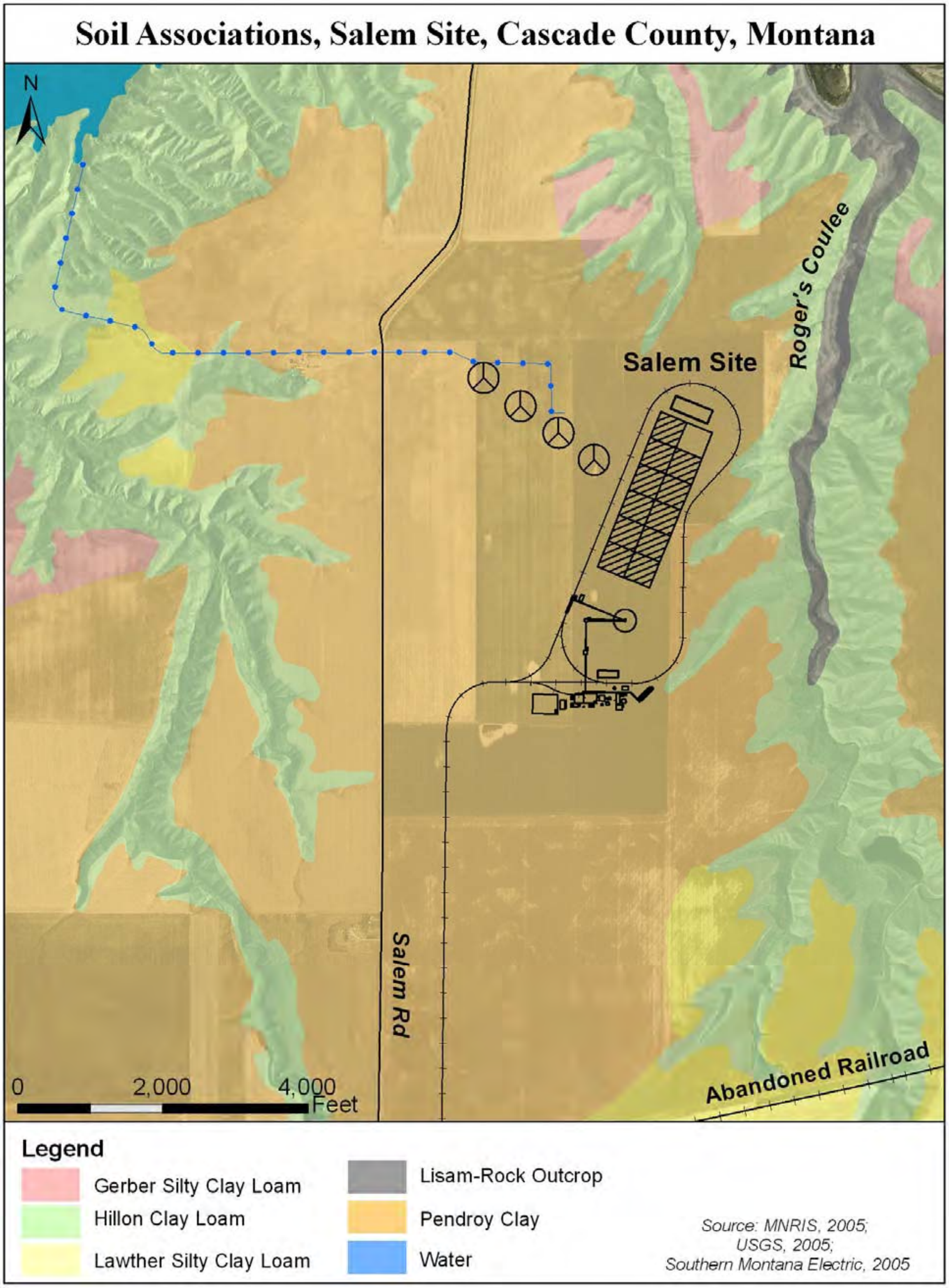


Figure 3-2. Soils Map of the Salem Site

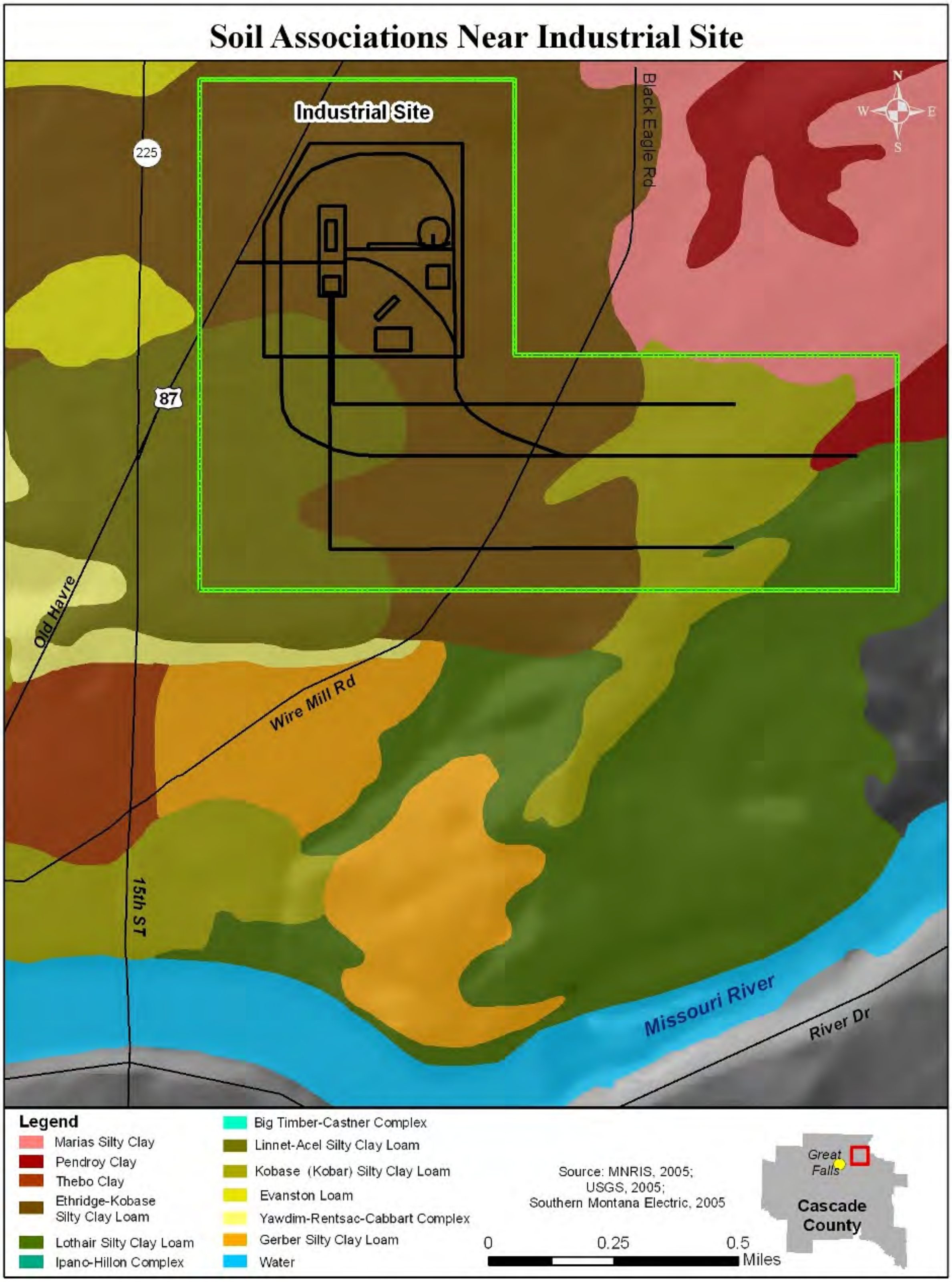


Figure 3-3. Soils Map of the Industrial Park Site

Ethridge-Kobase and Linnet-Acel soils are classified as CL soils according to the Unified system and A-6/A-7 soils according to the AASHTO system. Soils classified as CL by the Unified system are fine grained soils. Specifically, these soils are inorganic clay soils of low to medium plasticity. Similarly, soils classified as AAHSTO A-6/A-7 soils include plastic clay soils which usually have high volume changes between the wet and dry states, meaning that they will compress when wet and shrink and swell with changes in moisture content.

Lothair silty clay loams are located on the southeast edge of the proposed property, where some amount of transmission lines and railroad would potentially be located. Lothair soils consist of very deep, well-drained soils that formed in alluvium and lacustrine deposits. The soils are found on alluvial fans and stream terraces. The clay content throughout the Lothair soil horizons is between 35-45 percent.

3.2 WATER RESOURCES

3.2.1 MISSOURI RIVER

From the junction of the Jefferson, Madison and Gallatin Rivers near Three Forks, Montana, the Missouri River extends approximately 2,384 miles (3,837 km) in a northeasterly then southeasterly direction to its mouth just upstream of St. Louis, Missouri, where it joins the Mississippi River. The Missouri River is the longest river in the U.S., and the river basin has a total drainage area of 529,350 sq. miles (1,371,010 sq. km) (USACE, 2004). The river is considered a navigable U.S. water by both the Army Corps of Engineers and the State of Montana from Three Forks down to the Montana-North Dakota border. The City of Great Falls is located at river mile 2093, just under 300 miles (485 km) north of the river's beginning near Three Forks.

The Missouri River receives additional federal protection 50 miles (80 km) downstream from Great Falls near Fort Benton, where it is designated a Wild and Scenic River. Much further downstream, the river is nicknamed "Big Muddy" for its heavy load of silt and sediment. The Missouri River's brown waters do not readily mix with the gray waters of the Mississippi River until approximately 100 miles (160 km) downstream of their confluence (MRA, no date).

Figure 3-4. Missouri River Downstream of Great Falls

The Missouri's fluctuating flow is now regulated by seven large dams (Fort Peck, Garrison, Oahe, Big Bend, Fort Randall, Gavins Point, and Canyon Ferry) and more than 80 smaller dams on the river and tributary streams. Since the dams have no locks, Sioux City, Iowa, is the head of navigation for the river over the 760-mile (1,220-km) stretch downstream to the confluence with the Mississippi. Tugboats pushing strings of barges move freight along this route.

The major dams on the Missouri, along with their reservoirs, are part of the coordinated, basin-wide Missouri River basin project, authorized by the U.S. Congress in 1944, which envisioned a comprehensive system of flood control, navigation improvement, irrigation, municipal and industrial water supply, and hydroelectric generation facilities for the 10 states in the Missouri River basin. Though the project was only partially completed, it completely changed water resource development in the basin (USACE, 2004).

Figure 3-5. Black Eagle Falls Dam on the Missouri River in Great Falls
Source: bigskyfishing.com

In the Great Falls area, there are five major sets of waterfalls on the Missouri River. The falls are known as: the Great Falls of the Missouri, Crooked Falls, Rainbow Falls, Colter Falls, and Black Eagle Falls. Black Eagle Falls is the only set that is actually within the city limits of Great Falls. Rainbow Falls is on the eastern edge of town near Malmstrom Air Force Base. The Great Falls of the Missouri is several miles east of town.

There are five hydroelectric dams on the Missouri River in Cascade County: Black Eagle Dam, Cochran Dam, Morony Dam, Rainbow Dam, and Ryan Dam. None of these dams are considered major dams by the U.S. Army Corps of Engineers (USACE, 2004). The first dam was Black Eagle Dam, built at the top of Black Eagle Falls in 1891. The second dam built was Rainbow Dam in 1910. Rainbow Dam sits on top of Rainbow Falls, just up river from Crooked Falls. The next dam to be built was Volta Dam in 1915. The Volta Dam was renamed Ryan Dam in 1940. Ryan Dam sits on top of the actual Great Falls of the Missouri. Morony Dam was constructed in 1930, and the last dam, Cochran, was built in 1958.

Crooked Falls is the only visible falls in the Missouri/Mississippi River system that has not had a dam constructed on it.

The USGS maintains a gauging station on the Missouri River near Great Falls (gauging station 06090300). The station is located on the left bank of the River, 700 feet (210 m) downstream from Morony Dam, and 12.6 miles (20.3 km) northeast of Great Falls at river mile 2,105.4. The drainage area into the River at this station is 23,292 sq. miles (60,326 sq. km) of land. Measurements for Missouri River flows at this gauging station have been recorded consistently since 1957. As increased quantities of water have steadily been diverted from the river for agricultural, residential, and industrial uses since 1957, surface flows in the Missouri have accordingly decreased. Between 1957 and 2004, the annual mean river flow at the Great Falls gauging station was 7,435 cubic feet per second (cfs). In 2003, the annual mean river flow at the station was 5,376 cfs, and in 2004, the annual mean river flow was 4,601 cfs (USGS, 2005).

Overall, Missouri River Basin water projects and withdrawals have significantly reduced the annual flow and magnitude of peak flows of the Missouri at Great Falls, and areas downstream, from that of the predevelopment era. However, the seasonal timing of peak flows in Great Falls remains fairly consistent with the predevelopment era, as the area continues to experience annual peaks in river flow in late spring and early summer. Specifically, the spring rains and snowmelt that occur in the river basin which drains into the river near Great Falls swell the volume of the river in April, June, and early July, as seen below in the USGS average daily streamflow for 2002 and 2003.

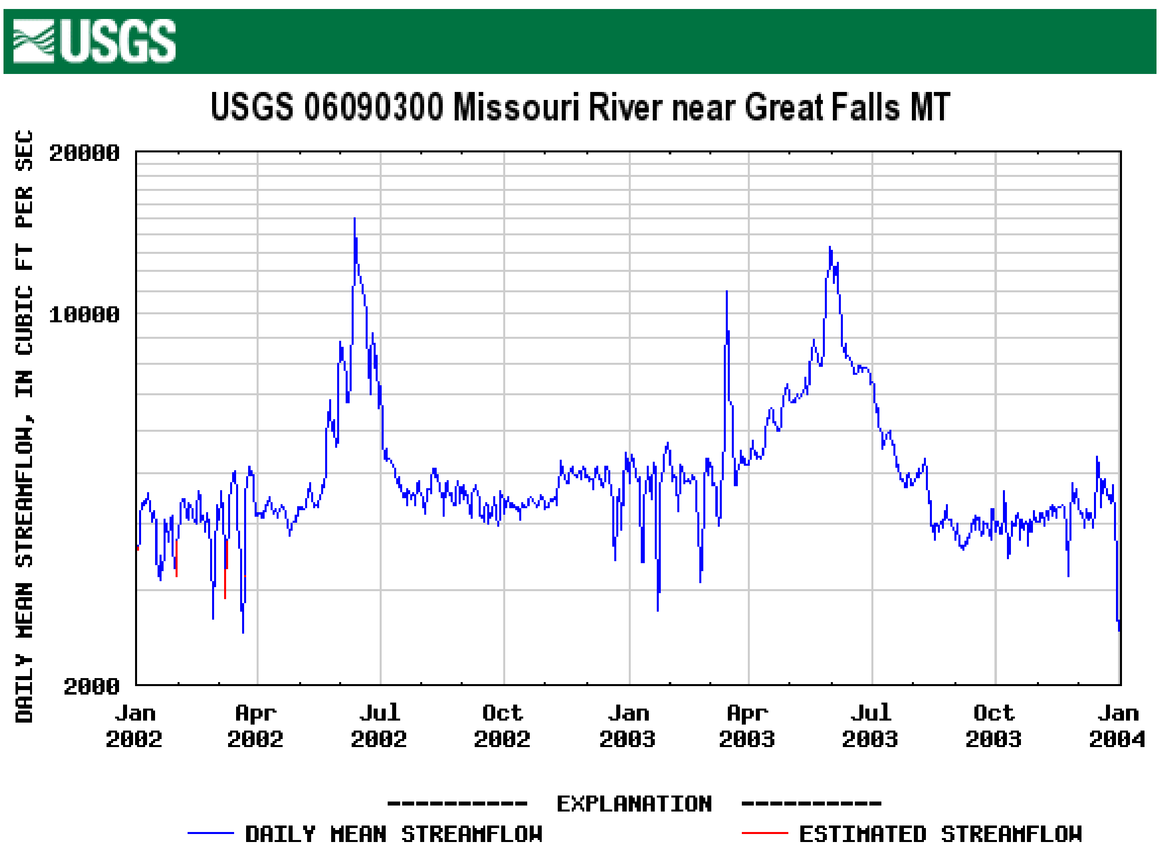


Figure 3-6. Missouri River Flow near Great Falls

3.2.2 WETLANDS AND FLOODPLAINS

The extensive use of dams along the Missouri River has provided substantial flood control for the river banks and farmlands along the Plains in Montana. However, as flood control has improved, floodplains and wetlands have been increasingly drained and developed. Both wetlands and floodplains have steadily declined with increased development in the Missouri River basin. In the last century, hundreds of thousands of acres of wetlands and nearly three million acres (1.2 million hectares) of riverine floodplain have been lost or substantially altered in the Upper Missouri River basin (USGS, 2004).

Wetlands within the project vicinity generally are limited to the incised drainage habitat and narrow fringes of the Missouri River and its tributaries (Westech, 2005). Though limited, these wetlands provide an invaluable resource for the filtration and adsorption of stream nutrients and contaminants, and for waterfowl and wildlife habitat. Five bird species on the State species of concern list have been documented in wetlands within ten miles (16 km) of Great Falls: white-faced ibis, black-crowned night heron, Franklin's gull, common tern, and black tern (Westech, 2005).

Wetlands

The regulatory definition of a Section 404 jurisdictional wetland, according to the Army Corps of Engineers, is "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" (USACE, 1987).

Floodplains similarly follow the fringes of the perennial streams in the area. Along the Missouri River in the vicinity of the project areas, the floodplains do not extend over the river banks due to the fact that the river runs through a deeply incised channel with sides from sixty to over several hundred feet high (Nerud, 2006). The configuration and size of the channel, along with the area dams, prevent the project sites from receiving most flood waters.

Additional site specific information for the two sites under consideration is provided below, in their respective subsections.

Development in, and encroachment upon, floodplains and wetlands is regulated at the local, state, and federal level. Table 3-1 summarizes some of the key regulations governing the floodplains, wetlands, and waters within the project vicinity.

3.2.3 LISTED SPECIES ASSOCIATED WITH MISSOURI RIVER

Generally, reduced average and peak flows and altered sediment transport associated with river development have deepened and narrowed the Missouri River channel, with consequences for sensitive wildlife and fish populations described in Section 3.4.4.

Three federally threatened or endangered aquatic species, listed under the Endangered Species Act (ESA), are found within the Missouri River drainage in Montana: the pallid sturgeon, least tern, and piping plover.

Table 3-1. Water-Related Regulations

Regulation/Permit	Nature of Permit	Agency/Authority
Clean Water Act (404 Permit)	Controls discharge of dredged or fill materials in wetlands and other water of the U.S.	U.S. Army Corps of Engineers, Omaha District
Federal Rivers and Harbors Act (Section 10 Permit)	Regulates construction of any structure in or over any federally listed navigable waters of the United States, the excavation from or depositing of material in such waters, or the accomplishment of any other work affecting the course, location, condition, or capacity of such waters.	U.S. Army Corps of Engineers, Omaha District
Montana Land-Use License or Easement on Navigable Waters	Protects riparian areas and the navigable status of water bodies.	MT Dept. of Natural Resources and Conservation, Trust Land Division
Short-Term Water Quality Standard For Turbidity (318 Authorization)	Requires a permit for any activity in any state water that will cause unavoidable short-term violations of water quality standards	MT Dept. of Environmental Quality
Public Water Supply Watersheds	Requires the approval of detailed plans prior to the beginning of new electric plant construction in a public supply watershed.	MT Dept. of Environmental Quality
Clean Water Act (401 Certification)	Requires applicant for a federal permit or license that may result in a discharge to waters of the United States to first obtain certification from the state.	MT Dept. of Environmental Quality
Stormwater Discharge General Permits (MPDES permit)	Regulates stormwater discharges to surface water or groundwater during and following construction activities.	MT Dept. of Environmental Quality
Montana Stream Protection Act (SPA 124 Permit)	Regulates the construction of new facilities or the modification, operation, and maintenance of an existing facility that may affect the natural existing shape and form of any stream or its banks or tributaries.	MT Fish, Wildlife and Parks
Cascade County Floodplain Permit	Requires a permit to build permanent structures or to place fill in a designated flood plain.	Cascade County Planning Department
Montana Natural Streambed and Land Preservation Act (310 Permit)	Requires a permit to perform work in or near a stream and ensures that projects are not damaging to the stream or to adjoining landowners.	Cascade County Conservation District
Montana Water Quality Act (MPDES Permit)	Regulates the pollution of state waters and the placement of wastes in a location where they are likely to cause pollution of any state water.	MT Dept. of Environmental Quality

Each of these species is found in the river waters below Fort Peck Dam. Fort Peck Dam is the closest major dam to the river's headwaters and the closest major dam to Great Falls. It is located over 250 miles (400 km) downstream of Great Falls, and was built during the dust-bowl depression of the 1930s for flood control, irrigation and barge traffic. Below the dam, the flows of the Missouri go down abnormally in the spring and back up in the summer. The river that once occupied its floodplain, wide and slow with braided channels, is now narrow and fast. River biota has dwindled as it lost its natural connections to the floodplain. High summer flows wash away the nests of the least tern and cause the absence of plant-studded sandbars needed for breeding and raising young (MRA, no date).

Studies by the U.S. Fish and Wildlife Service and the National Academy of Sciences indicate that lower reaches of the Missouri River are in serious decline and that action must be taken to reverse the damage and restore some semblance of the river's natural flow out of Fort Peck Dam if the pallid sturgeon, least tern and piping plover are to be saved from extinction (MRA, no date).

3.2.4 SURFACE WATER QUALITY

Both the federal Clean Water Act (CWA) and the Montana Water Quality Act require an ongoing program of water quality assessments and reporting as part of the process intended to protect and improve the quality of rivers, streams, and lakes in the state. The EPA administers the provisions of the CWA while the Water Quality Planning Bureau of DEQ provides water quality assessment of waters within the state. The state 303(d) list contains specific information relating to waters assessed as having one or more of their beneficial uses impaired or threatened by human activities. A water quality management plan must be developed for any water found to have beneficial uses impaired or threatened, to correct the causes of the identified impairments. In those cases where the impairment involves the need to reduce the load of specific concentrations in the water, the water quality management planning process must include the identification of a total maximum daily load (TMDL) for each pollutant causing any standards exceedances.

Water bodies listed as impaired or threatened in Montana include all of the major drainages downstream of the proposed project sites, including each of the reaches of the Missouri River in the Upper Missouri-Dearborn watershed, and Belt Creek in the Belt watershed (DEQ, 2004c) (Figure 3-7).

The Missouri River is listed as not supporting the beneficial uses of aquatic life, coldwater fishery, warm water fishery, and drinking water. Probable causes of the river impairment include PCBs, metals, siltation, turbidity, and thermal modifications. Probable sources of the impairment are listed as being industrial point sources, dam construction, hydromodification, and agriculture.

Belt Creek is listed as not supporting the beneficial uses of aquatic life, coldwater fishery, and drinking water. Probable causes of the stream impairment include metals, siltation, bank erosion, fish habitat degradation, and other habitat alterations. Probable sources of the impairment are listed as being highway/road/bridge construction, resource extraction, acid mine drainage, channelization, construction, hydromodification, agriculture, and grazing-related sources.

TMDL development has not yet begun for the impaired stream segments within the project area.

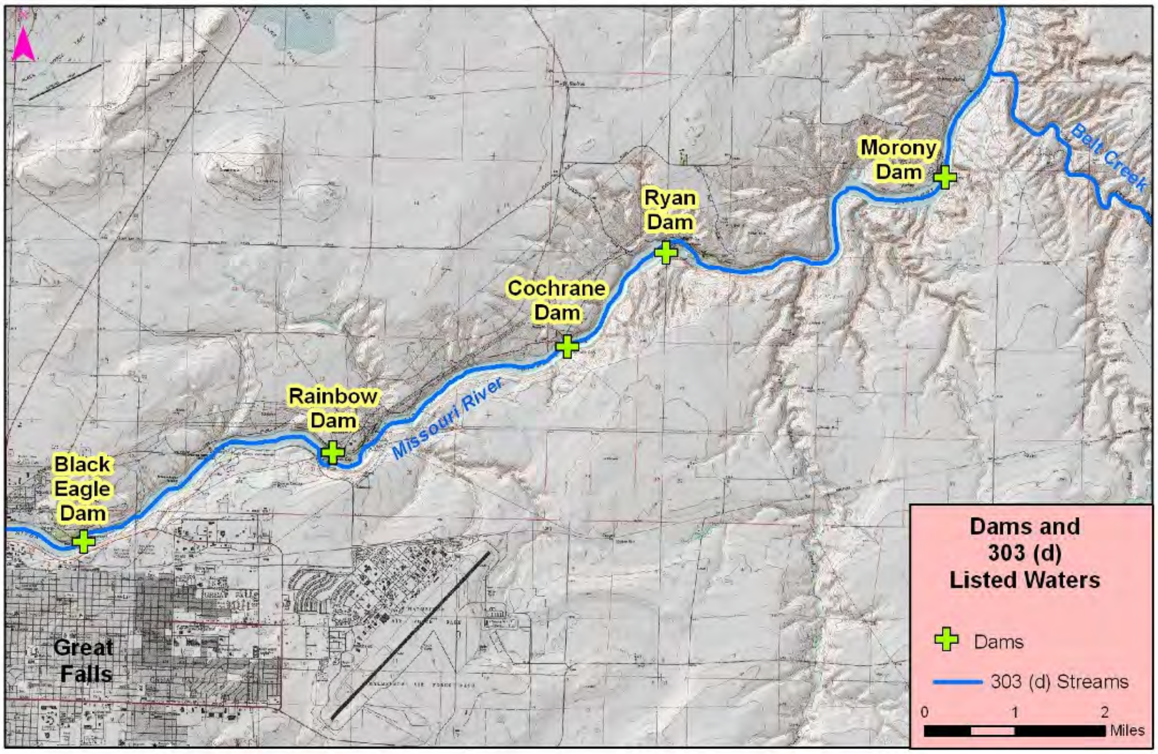


Figure 3-7. DEQ-Designated Impaired and Threatened Waters near Great Falls

3.2.5 WATER RIGHTS

Like most of the Western states, Montana is a Prior Appropriation state. Under the Prior Appropriation Doctrine, a party must have a water right to appropriate water from a river, stream, or other source. Users of municipal water supplies and other water users who buy their water from a water supply system do not need to have a water right. However, the municipality or water supply system owner must have a water right in order to divert water.

Water rights in Montana are regulated by the Montana Water Use Act of 1973 (Mont. Code Ann. §85-2-101 et seq.). A party may appropriate water by applying for a "Permit to Appropriate Water" from the Department of Natural Resources and Conservation (DNRC). In order to appropriate water, the party must prove by a preponderance of evidence that: 1) there is water physically available at the proposed point of diversion; 2) water is legally available during the period of appropriation, in the amount requested; 3) the water rights and/or water quality of a prior appropriator will not be adversely affected; 4) the water will be put to beneficial use on property in which the party has a possessory interest; and 5) the proposed means of diversion, construction, and operation of the diversion works is adequate. For appropriations meeting or exceeding 5.5 cubic feet per second or 3000 acre-feet per year, a higher evidentiary standard of "clear and convincing" applies, as well as additional information showing that the proposed use is reasonable (Mont. Code Ann. §85-2-311).

The priority of a water right in a Prior Appropriation state is probably the most important part of the right. Water rights are exercised in accordance with their order of priority, starting with the earliest (senior) rights and progressing to the later (junior) rights, until the water is all appropriated.

Generally, water rights automatically transfer with the land when the land is conveyed to someone else, unless specifically withheld through the appropriate legal documentation. However, in order to use these water rights at another location, DNRC approval is required. Changes in a water right subject to DNRC jurisdiction include a change in the point of diversion, the place of use, the purpose of use, or the place of storage. A change in a water right can be made so long as there is no "adverse effect" to other appropriators, both junior and senior. Before any change can be initiated, approval from the DNRC must be obtained.

Water rights in Montana can be divided into two categories: those that pre-date the 1973 Water Use Act, and Post-1973 developments. Water rights acquired prior to July 1, 1973, with the exception of exempt rights, are Statements of Claim, and subject to adjudication by the Water Court. Statements of Claim include many types of water rights in Montana, acquired in accordance with the particular rules that applied at that time. Specific types of Statements of Claim include:

Use water rights: water rights that were acquired by merely appropriating and beneficially using the water. No recording, approval from a government agency, or other written record of the right was required. Approximately 67 percent of the water rights filed in Montana's statewide adjudication are use rights. The priority date of use rights is generally the date the water was first put to beneficial use.

Filed rights: water rights that were filed with the local county Clerk and Recorder's Office under a system that was first statutorily recognized in 1885 and which continued until the July 1, 1973, effective date of the Water Use Act of 1973.

Decreed rights: water rights that were initially use or filed rights that have been adjudicated (decreed) by a district court. These rights are more certain in their existence, because a district court previously reviewed the evidence and decided, at least at the time of the decree that a water right existed.

Court Approved Rights on Adjudicated Streams: water rights that have been approved by a district court after 1921 on an adjudicated stream. The 1921 legislature required water users on adjudicated streams to petition the district court for new appropriations.

Murphy Rights: In 1969, the Montana Legislature enacted legislation granting the Montana Fish and Game Commission authority to appropriate waters on twelve streams to maintain instream flows for the preservation of fish and wildlife habitat. The Legislature established specific reaches to appropriate on these streams, including the Missouri River in Broadwater, Lewis and Clark and Cascade counties, and the Smith River in Cascade and Meagher counties (Doney, 1990).

As mentioned previously, certain water rights were exempted from the adjudication filing statutes. These included groundwater developments used for stock or domestic (one household) put to use prior to 1962, or put to use prior to July 1, 1973 and filed with the county under the groundwater codes. Stock drinking directly from surface water streams prior to July 1, 1973 was also exempted from the filing requirements.

Appropriations occurring after the passage of the Water Use Act are under the jurisdiction of the DNRC:

Provisional Permits: All appropriations of surface water and groundwater diversions exceeding 35 gallons per minute or 10 acre-feet require permits from the DNRC before water can be put to beneficial use. The application process and criteria are as previously discussed.

Groundwater Certificates: Except in controlled groundwater areas, a party does not need to apply for a permit to develop a well with an anticipated use of the 35 gallons per minute or less (not to exceed 10 acre-feet per year). The party must only file a Notice of Completion for well drilling with the DNRC. For groundwater appropriations over 35 gallons per minute, or exceeding 10 acre-feet per year, a party must submit an application to DNRC for a “Permit to Appropriate Water” before developing the well. There are no controlled groundwater areas within Cascade County (MDNRC, 2004).

State Water Reservations: The Water Use Act of 1973 authorized state and federal agencies to apply to the DNRC to acquire a state water reservation for existing or future beneficial uses. With regard to the study area, water reservations were granted on the Missouri River above Fort Peck Dam on July 1, 1992, and have a priority date of July 1, 1985.

Water Leases: The Department of Fish, Wildlife & Parks is authorized to lease water on a temporary basis for the purpose of maintaining or enhancing streamflows.

Montana has closed some of its river basins to certain types of new water appropriations because of water availability problems, water quality issues, and a concern for protecting existing water rights. There are several types of basin closures, including: controlled groundwater areas, petitioned surface water basins closed by administrative rule, DNRC ordered closures (Milk River), Compact closures, and Legislative closures. Included in the legislative closures is the drainage area of the Missouri River and its tributaries above Morony Dam in the Upper Missouri River Basin, which the Great Falls area is located within. Since April 16, 1993, this basin is closed to certain new appropriations of water until final decrees have been issued for all of the sub-basins of the Upper Missouri River basin (MDNRC, 2004).

3.2.6 GROUNDWATER

The Great Falls area has ample groundwater resources, and the depth to water varies depending on the aquifer used as a source of water (Figure 3-8). The shallow alluvial aquifer contains water that is generally is less than 100 feet (30 m). This aquifer does not appear to be present beneath the Salem site based on geotechnical soil borings and local well logs.

The Kootenai Formation is the most commonly used aquifer in the area. The aquifer is used mostly for domestic purposes and public water supply, and is recharged by snow pack and runoff

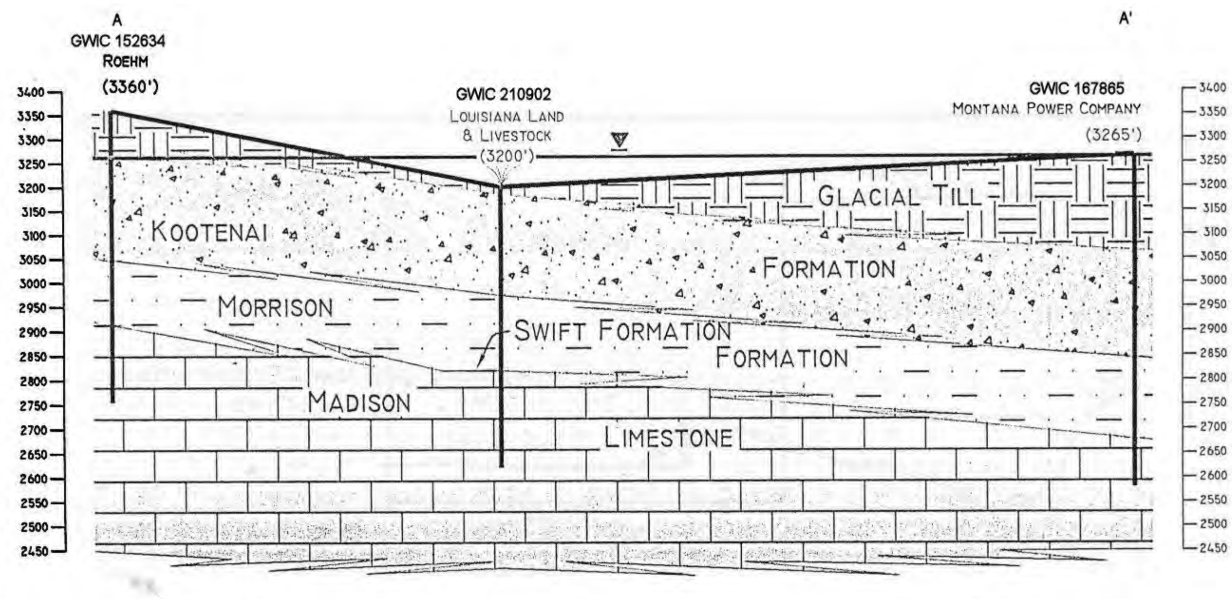


Figure 3-8. Geologic Cross-Section in Vicinity of the Salem Site

Source: PSBJ, 2006a

in streams. The thickness of the Kootenai Formation averages 200-250 feet (60-76 m). The upper portion of the Kootenai Formation consists primarily of mudstone with some claystone and siltstone. The lower portion of the Kootenai is characterized by sandstone and siltstone. The productive portion of the formation is normally found in these rocks. Estimated average hydraulic conductivity of this aquifer is 182 ft/day. The predominant groundwater flow within the aquifer is towards the Missouri River (Figure 3-9) (PBSJ, 2006a).

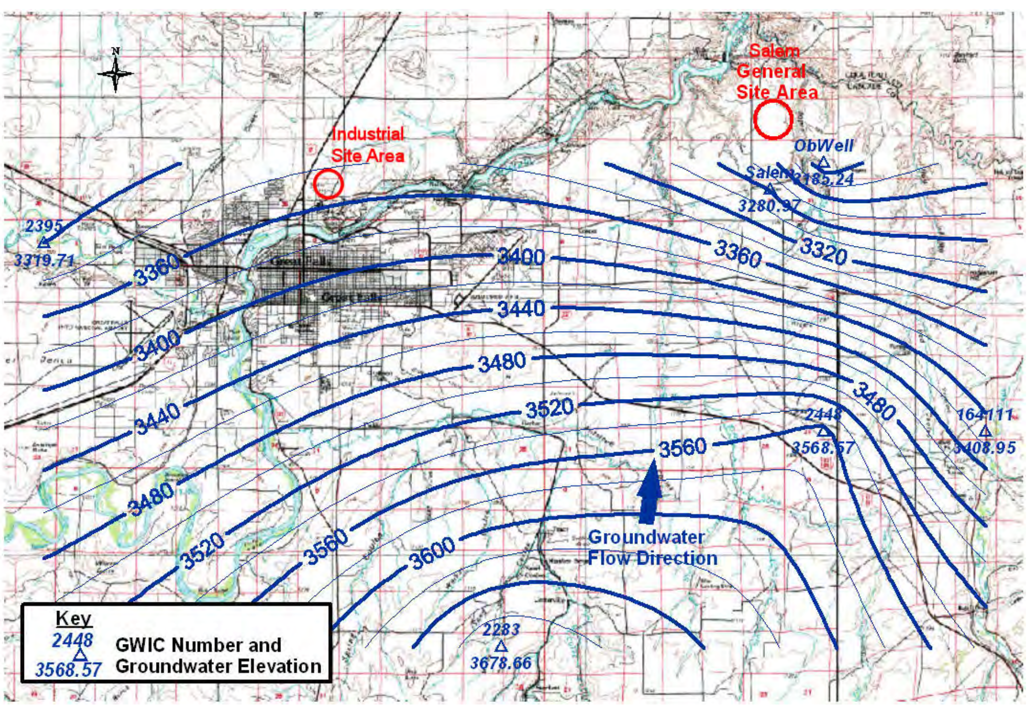


Figure 3-9. Kootenai Formation Groundwater Elevation Contours

Below the Kootenai Formation is the Morrison Formation of Jurassic Age. It is about 100-200 feet thick (30-60 m). The Morrison sediments consist of intercalated sandstone and shale beds. It is the confining unit for the underlying Madison Formation. The Morrison is not a water producing formation in the Great Falls area (PBSJ, 2006a).

The second most commonly used aquifer in the area is the Madison limestone aquifer. This aquifer is used mostly for domestic purposes and public water supply, and, like the Kootenai Formation aquifer, is recharged by snow pack and runoff in streams. The Little Belt Mountains are the recharge area for the Madison limestone aquifer. The thickness of the Madison aquifer averages 500 feet (150 m). The Madison aquifer is a confined aquifer in the vicinity of Great Falls. Estimated average hydraulic conductivity of this aquifer is 321 ft/day. The predominant groundwater flow direction within the water table aquifer is towards the Missouri River; specifically, in the areas south of the river the direction of groundwater flow is to the north-northeast (Figure 3-10) (PBSJ, 2006a).

The quality of the groundwater is generally good in the Great Falls vicinity, with the exception of a few water quality parameters. Elevated concentrations of sulfate, manganese, and cadmium, were measured in the alluvium, Kootenai, and Morrison formations. If the alluvial samples are ignored, then the data seem to indicate a logical progression and evolution of water quality with residence time and with depth/source rock type. Total dissolved solids (TDS), sulfate, hardness and bicarbonate/alkalinity increase from the shallow noncarbonate rocks (Kootenai) to the Morrison and then to the deeper carbonate rocks in the Madison. All of these waters are moderately to extremely hard (PBSJ, 2006a).

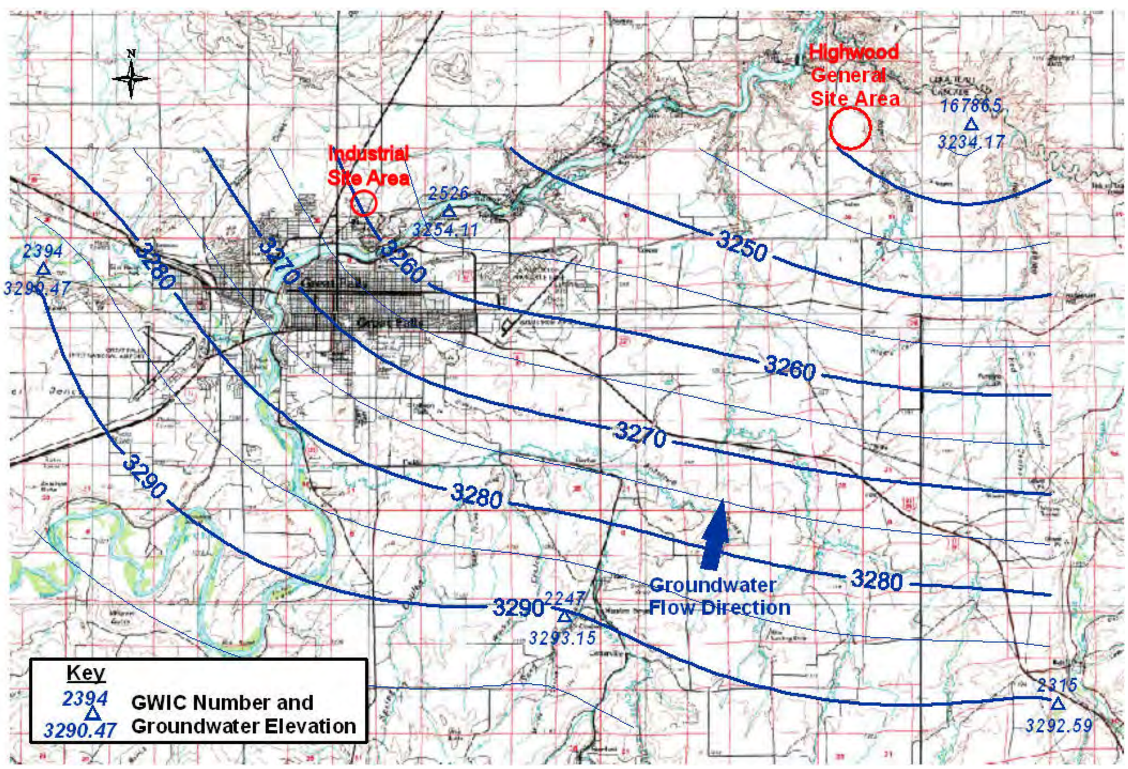


Figure 3-10. Madison Limestone Groundwater Elevation Contours

3.2.7 WATER UTILITIES

Incorporated areas of the City of Great Falls, including residents of Great Falls, Malmstrom Air Force Base and Black Eagle, are serviced by the City's Public Works Utility Branch, which operates water and wastewater treatment plants. Great Falls is classified as a medium (between 50,000 and 100,000 people served) surface water community public supply. Public drinking (potable) water is treated surface water from the Missouri River. The water treatment facility providing potable water to the city is located on the east bank of the Missouri just upstream from its confluence with the Sun River in Great Falls (GFWU, 2005). The public drinking water supply treated at the Great Falls plant meets all federal and state requirements and reported no violations, exemptions, or variations in water quality in 2004 (GFWU, 2005).

Wastewater generated within Great Falls is treated at the city's wastewater treatment facility, located on the north, or west, bank of the Missouri River. Powerful pump stations are located on the south side of the river and pump sewage from the city and other areas across the river to the facility. Veolia Water of North America is contracted by the city to manage and operate the treatment facility. The facility has a capacity to treat up to 21 million gallons per day (mgd) of wastewater, though it currently receives approximately 9 mgd (Jacobson, 2006a).

It is the traditional policy of the City of Great Falls that city services, including water and sewer, are not available to non-annexed/non-incorporated land. However, the City has indicated a willingness to consider allowing connection to water and wastewater utilities prior to annexation in exchange for the provision by SME of a waiver of right to protest annexation in the future.

3.2.8 SALEM SITE – SURFACE WATERSHEDS/AQUATIC FEATURES

The Salem site is located within the Upper Missouri River Basin and the Missouri-Sun-Smith River Sub-Basin. The Missouri-Sun-Smith River Sub-Basin consists of five watersheds that all drain into the Missouri River. The Salem site is located in two of these watersheds. The western majority of the site is located within the Upper Missouri-Dearborn watershed while the eastern portion of the site is located within the northwestern most tip of the Belt watershed (Figure 3-11).

Belt Creek is the primary drainage stream located within the Belt watershed, and it is a direct tributary to the Missouri. It joins the Missouri just downstream of the Salem site, approximately 15 river miles (24 km) northeast of Great Falls.

There are several intermittent streams in the vicinity of the Salem site. To the east, drainage from the site would flow into Rogers Coulee, a drainage channel which connects with Belt Creek just northeast of the site. To the west of the site, and located immediately west of Salem Road, there are several unnamed drainage channels with intermittent flows to the Missouri River. Both Rogers Coulee and the drainages discussed above are dry the majority of the year and contain flowing water only during major overland runoff events. Box Elder Creek is the first named tributary of the river located on the west side of the site. Surface water flows in a north to northeast direction throughout this area, into the Missouri River.

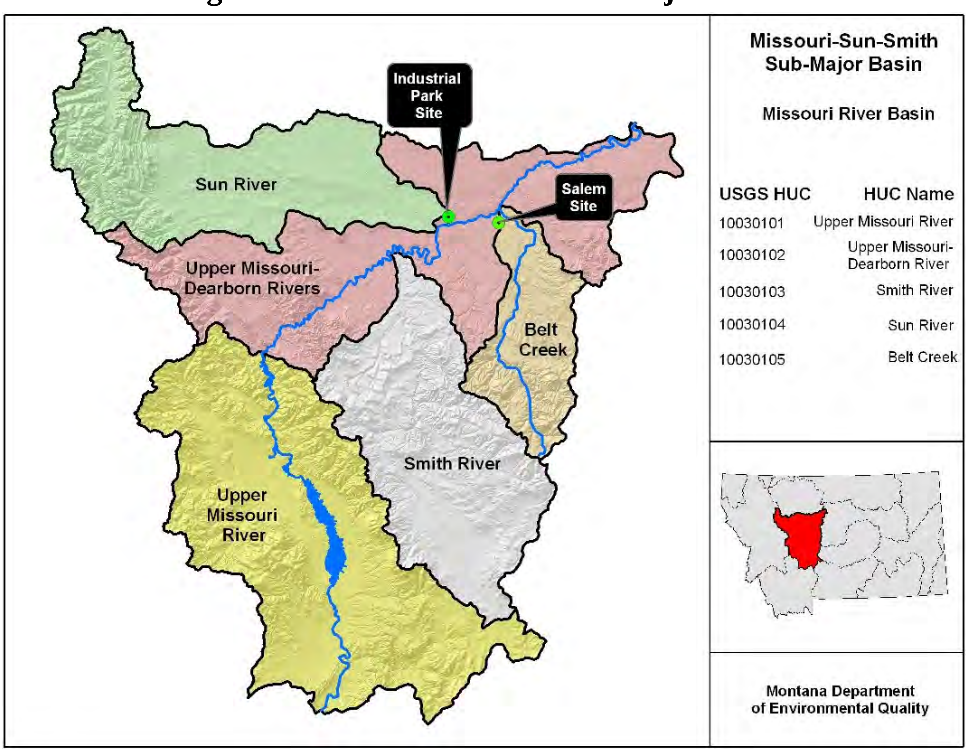
Lacustrine limnetic wetlands are associated with the unnamed tributaries and the Missouri River northwest of the site, where the raw water intake corridor would be located in the Morony pool, immediately upstream from the Morony dam.

Lacustrine limnetic wetlands have the following characteristics: they are (1) situated in a topographic depression or a dammed river channel; (2) lacking trees, shrubs, persistent emergents, emergent mosses or lichens with greater than 30 percent areal coverage; and (3) total area exceeds 20 acres (8 ha). Similar wetland and deepwater habitats totaling less than 8 ha are also included in the lacustrine system if an active wave-formed or bedrock shoreline feature makes up all or part of the boundary, or if the water depth in the deepest part of the basin exceeds 6.6 feet (2 m) at low water.

Lacustrine system wetlands are bounded by upland or by wetland dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens. Lacustrine systems formed by damming a river channel are bounded by a contour approximating the normal spillway elevation or normal pool elevation. Where a river enters a lake, the extension of the lacustrine shoreline forms the riverine-lacustrine boundary (USGS, 1998).

Figure 3-12, on the page following Figure 3-11, depicts the principal aquatic and hydrologic features in the vicinity of the proposed Salem site. As discussed above, the only flowing streams in the vicinity of the site are Belt and Box Elder Creeks. The remaining drainages are intermittent, that is, dry during most of the year and containing flowing water only during overland runoff events. According to the reconnaissance-level USFWS National Wetlands Inventory, five small, isolated palustrine emergent wetlands occur on the site. These are not "jurisdictional wetlands" under current interpretation of Section 404 of the Clean Water Act.

Figure 3-11. Watersheds in the Project Area



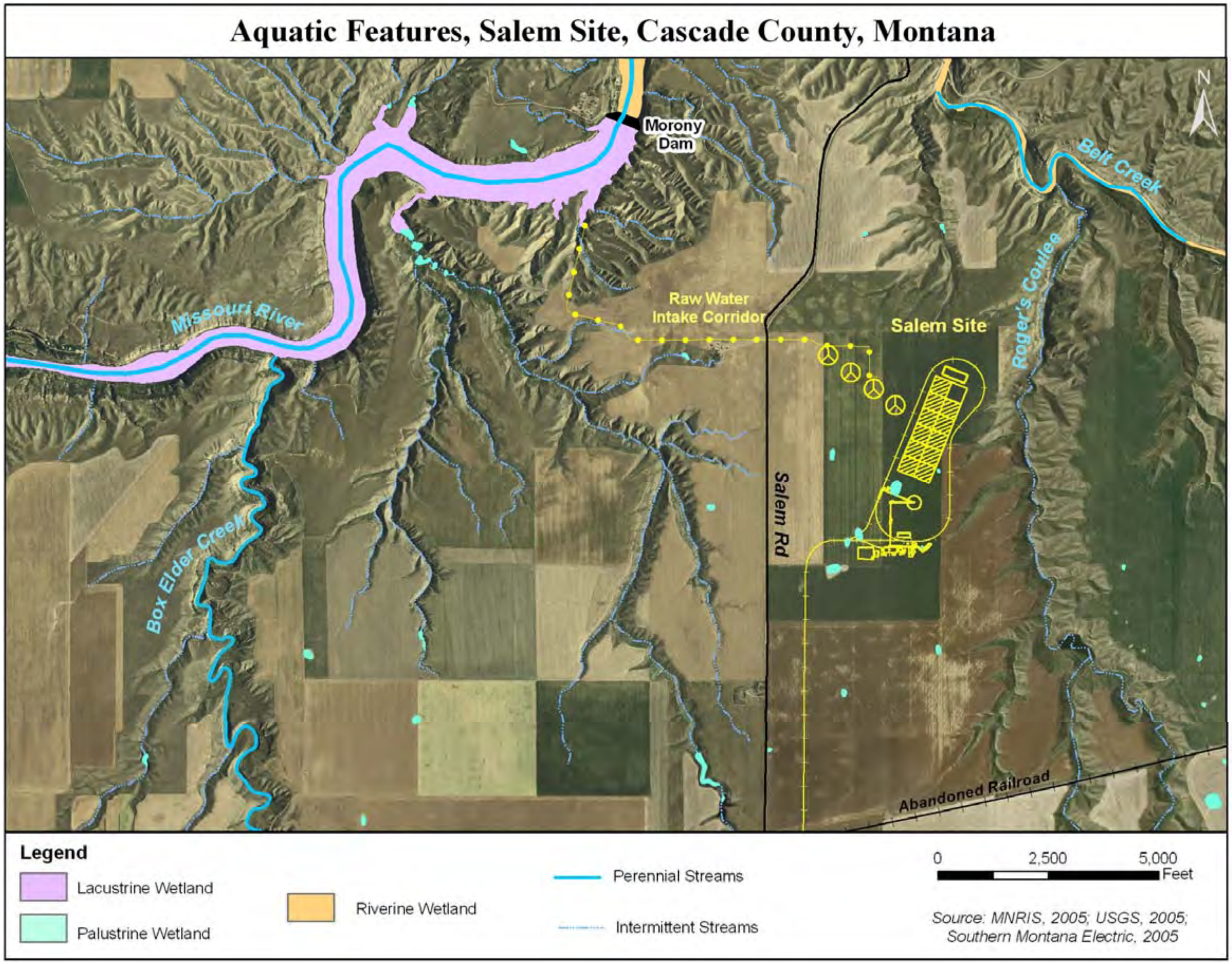


Figure 3-12. Aquatic Features of the Salem Site and Environs

3.2.9 INDUSTRIAL PARK SITE – SURFACE WATERSHEDS/AQUATIC FEATURES

The Industrial Park site also is located within the Upper Missouri River Basin and the Missouri-Sun-Smith River Sub-Basin. The site is located entirely within the Upper Missouri-Dearborn watershed.

Several unnamed drainages to the Missouri River are located immediately south and east of the site, and surface water flows in a south to southeast direction throughout this area, into the Missouri River. Lacustrine limnetic, lacustrine littoral, and riverine upper perennial wetlands are associated with the Missouri River, south and southeast of the site. A palustrine emergent wetland is located north-northwest of the site.

Lacustrine limnetic wetlands are associated with deep water while lacustrine litoral wetlands are shallow, extending from the shoreward boundary of the system to a maximum depth of 6.6 feet (2 m) below low water or to the maximum extent of nonpersistent emergents, if these grow at depths greater than 6.6 feet (2 m) (USGS, 1998).

Riverine perennial wetlands include all wetlands and deepwater habitats contained within a channel, provided they are not dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens. Riverine wetlands often are immediately bounded on the landward side by upland or by the channel bank. Water flows consistently in these wetlands, and the water gradient is high and velocity of the water fast. The natural dissolved oxygen concentration is normally near saturation. The fauna is characteristic of running water, and there are few or no planktonic forms. The gradient is high compared with that of the lower perennial subsystem, and there is very little floodplain development.

Finally, palustrine emergent wetlands are nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens. It also includes wetlands lacking such vegetation, but with all of the following four characteristics: (1) area less than 8 ha (20 acres); (2) active wave-formed or bedrock shoreline features lacking; (3) water depth in the deepest part of basin less than 2 m at low water; and (4) salinity due to ocean-derived salts less than 0.5 percent. Palustrine wetlands often are bounded by uplands, and their system of classification was developed to group the vegetated wetlands traditionally called by such names as marsh, swamp, bog, fen, and wet prairie, which are found throughout the United States. It also includes the small, shallow, permanent or intermittent water bodies often called ponds.

Figure 3-13 on the next page shows the primary aquatic and hydrological features of the landscape in the vicinity of the Industrial Park site. While the alternate power plant site is comprised almost entirely of upland habitats, it is within one mile (1.6 km) of the Missouri River itself; other hydrological features are still closer.

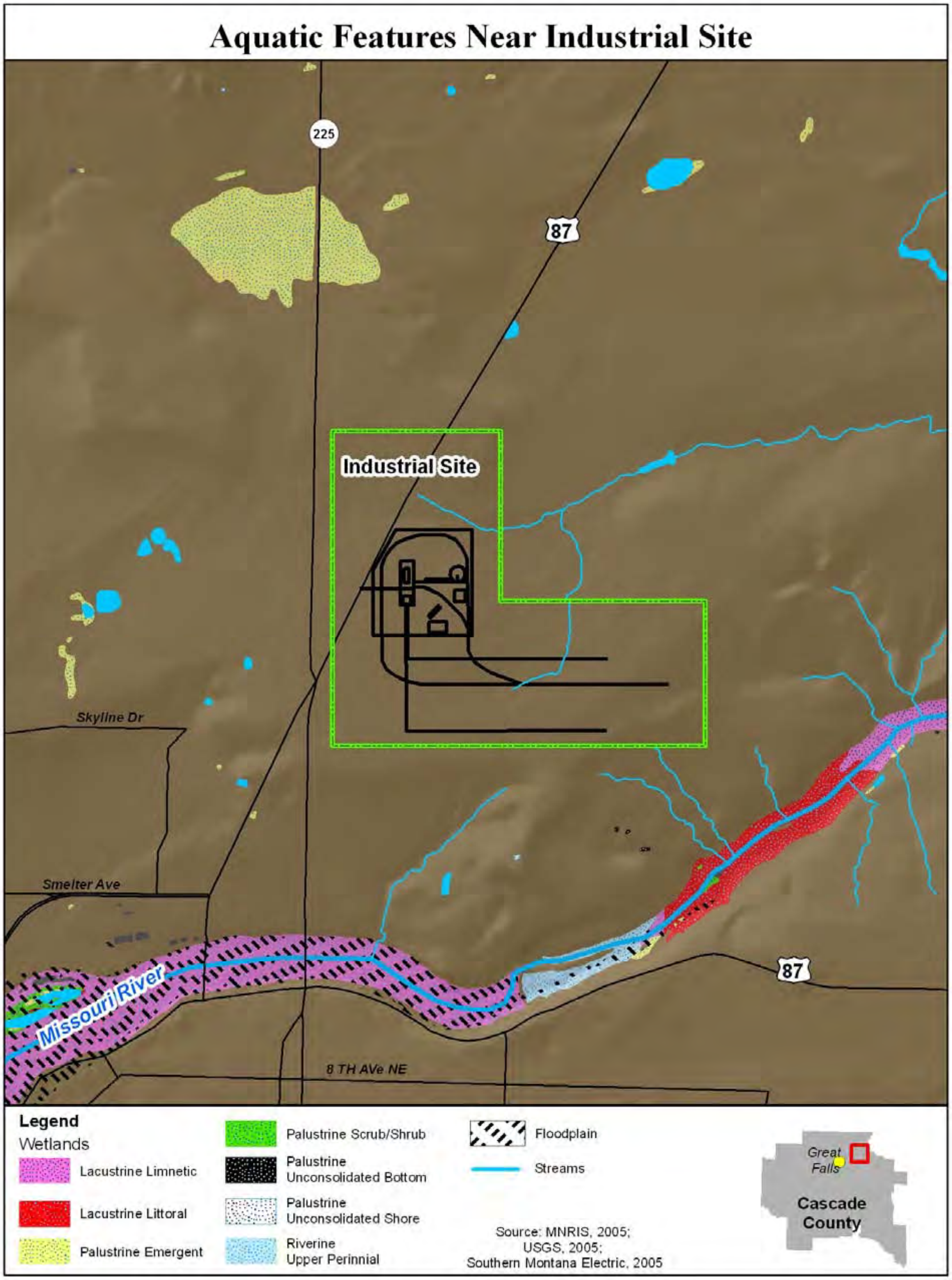


Figure 3-13. Aquatic Features of the Industrial Park Site and Environs

3.3 AIR QUALITY

3.3.1 LOCAL METEOROLOGY

Temperature and precipitation data for the project area were obtained from the Western Regional Climate Center (WRCC, 2006). These data include mean temperature and precipitation levels by month from 1971 through 2000. This 30-year period is the current standard for identifying long-term average temperature and precipitation levels in the United States.

Temperature and precipitation data were collected at the National Weather Service (NWS) station at the Great Falls airport. Precipitation data were also collected by the National Oceanic Atmospheric Administration (NOAA) Cooperative Observer Network at Highwood. The NOAA observers collect daily precipitation data, which are used to develop monthly normals. Temperature and precipitation data for Great Falls and Highwood are shown in Table 3-2.

Table 3-2. Great Falls and Highwood Temperature and Precipitation Summary/ Period of Record: 1971-2000

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Ann.
Great Falls Airport Temperature (degrees F)													
Max	32.1	37.7	45.3	55.6	64.7	77.5	82.0	81.2	69.6	58.0	42.1	34.2	56.4
Min	11.3	15.1	21.5	29.7	38.3	46.0	50.4	49.9	41.2	33.0	22.5	14.4	31.1
Mean	21.7	26.4	33.4	42.6	51.5	60.0	66.2	65.6	55.4	45.5	32.3	24.3	43.7
Great Falls Airport Precipitation (inches)													
Max	1.68	1.21	2.09	4.63	5.20	5.18	4.68	4.90	3.23	3.43	1.44	1.92	5.20
Min	0.05	0.15	0.10	0.05	0.69	0.54	0.05	0.12	0.09	0.02	0.18	0.03	0.02
Mean	0.68	0.51	1.01	1.40	2.53	2.24	1.45	1.65	1.23	0.93	0.59	0.67	14.89*
Highwood 7NE Precipitation (inches)													
Mean	0.62	0.46	1.10	1.69	3.09	3.27	2.01	1.61	1.58	1.16	0.69	0.70	17.97*

Note: Total Annual Precipitation*
Source: WRCC, 2004

Wind conditions in the project area were determined from data collected by the National Weather Service (NWS) at the Great Falls airport. Figure 3-14 shows a wind rose depicting the wind patterns at the Great Falls airport for the years 1987-1991, the data period used for air dispersion modeling. The Great Falls wind rose shows dominant winds from the southwest with the highest wind velocities from that direction as well. The site only reported 1.21 percent calm winds.

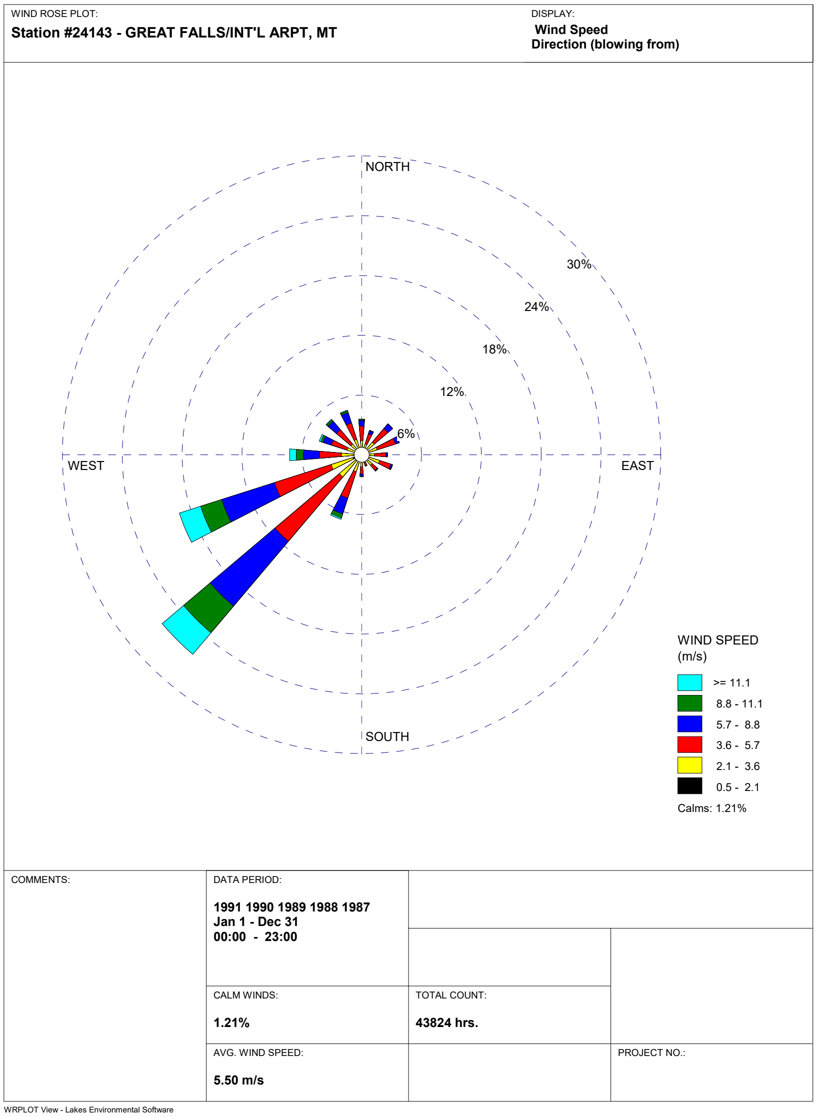


Figure 3-14. Great Falls NWS Station Wind Rose

3.3.2 TERMINOLOGY AND FEDERAL/STATE REGULATION OF AIR POLLUTANTS

Under the Federal Clean Air Act (CAA), as amended in 1970, 1977, and 1990, the United States Environmental Protection Agency (EPA) established primary standards to protect human health with an adequate margin of safety by setting maximum ambient air concentrations for seven threshold-value pollutants, or criteria pollutants (de Nevers, 2000). The six criteria pollutants, described below, are carbon monoxide (CO), ozone (O_3), nitrogen oxides (NOx), sulfur dioxide (SO_2), lead (Pb) and particulate matter (PM). NOx is composed primarily of nitric oxide (NO) and nitrogen dioxide (NO_2) with lesser amounts of NO_3, N_2O, N_2O_3, N_2O_4 and N_2O_5. PM is regulated as PM_{10} (particulate matter less than or equal to 10 microns in equivalent aerodynamic diameter [diameter]) and $PM_{2.5}$ (particulate matter less than or equal to 2.5 microns in diameter).

Micron or Micrometer

The micron or micrometer is a unit of length in the metric system equal to one-thousandth (10^{-3}) of a millimeter or one-millionth (10^{-6}) of a meter. The abbreviation of the micron is μm.

PM is a mixture of small solid and liquid particles that are suspended in the atmosphere. Smoke and fly ash contain PM in a wide range of sizes, from 0.05 to 200 μm in diameter. As a basis of comparison, the width of a human hair ranges between 20 and 100 μm. PM is released through factory and utility smokestacks, vehicle exhaust, wood burning, construction activity, agriculture, and natural sources like volcanoes. PM also can form in the atmosphere when oxidized sulfur or nitrogen reacts to form aerosol particles. Such aerosols are called secondary fine particles, adding to PM levels in the atmosphere (DOE, 2003b). PM is regulated based on its size, with $PM_{2.5}$ regulated separately from PM_{10}. $PM_{2.5}$ particles, which can be carried much farther and higher than larger particles (like PM_{10}), are more likely to carry heavy metals and cancer-causing organic compounds into the alveoli, the deepest and most susceptible part of the lungs, and thus are more stringently regulated (Davis and Cornwell, 1998).

CO is a colorless, odorless gas formed during combustion. CO is a product of incomplete combustion of carbon and is emitted during nearly all combustion activities. CO reacts with hemoglobin in the blood to form carboxyhemoglobin, effectively depriving the body of oxygen. Oxygen deprivation impairs perception and thinking, slows reflexes and causes drowsiness. Prolonged exposure to high levels of CO, particularly in those who have heart and circulatory ailments, can cause unconsciousness or even death.

Nitrogen oxides are formed during combustion, either by the oxidation of nitrogen in fuel or by the reaction of atmospheric nitrogen (typical air content is about 80 percent nitrogen or N_2) and oxygen (O_2) in the high temperatures of combustion. A small portion of NOx from combustion is emitted as NO_2. Most NOx emissions from combustion are NO, some of which eventually oxidizes to NO_2 in the ambient air. State and federal ambient air quality standards for NOx are based on NO_2.

Nitrogen oxides are one of the precursors to acid rain. Over time, NO in the atmosphere can react with water (H_2O) to form nitric acid (HNO_3). Nitric acid can form fine particles that remain suspended in the air or fall to the earth in the form of rain, snow, or fog. Acid rain (sometimes called acid precipitation or deposition) can cause soils, lakes and streams to become acidic, adversely affecting the ecosystem. Additionally, acid rain causes deterioration of cars, buildings, and irreplaceable historic monuments.

Nitrogen oxides also contribute to PM concentrations in the atmosphere, as NO_x particles react with ammonia, moisture, and related particles. Exposure to nitrogen oxides also can result in coughing and irritation of the respiratory tract, or in more severe cases, in difficulty breathing, damage to lung tissue, or premature death (EPA, 2003a). Nitrous oxide (N_2O) is also a potent greenhouse gas. Greenhouse gases are discussed further in Section 3.3.6.

SO_2 is formed through the oxidation of bound sulfur found in all organic fuels used by humans, including oil, coal, natural gas, peat, and wood. Sulfur dioxide also is released from volcanoes and decaying plants. As with nitrogen oxides, sulfur dioxide is a precursor to acid rain. Oxidized sulfur reacts with H_2O to form sulfuric acid (H_2SO_4). Sulfuric acid then falls to the earth in the form of rain, snow, or fog. SO_2 also reacts with other atmospheric chemicals to form tiny sulfate particles, which contribute to PM concentrations. Such particles can gather in the lungs and cause respiratory symptoms and disease, difficulty in breathing, and premature death (EPA, 2003b). Furthermore, these aerosols are a major cause of the visibility impairment that interferes with views of scenery in national parks and mountain ranges like the Appalachians.

O_3 is a strong photochemical oxidant that is formed when NO reacts with volatile organic compounds (VOC's, also referred to as hydrocarbons (HC)) and oxygen in the presence of sunlight. Ozone is considered a secondary pollutant because it is not directly emitted from pollution sources but is formed in the ambient air.

Ozone exposure can lead to eye irritation at concentrations above 0.1 parts per million (ppm). Coughing and chest discomfort are caused at concentrations of 0.3 ppm (Davis and Cornwell, 1998). Ozone impairs lung function and reduces resistance to colds and diseases such as pneumonia. Ozone plays a role in bronchitis, emphysema, asthma, and heart disease (NDEQ, 2002). With long-term exposure, ozone may cause permanent lung damage. In addition, high levels of ozone have been documented to damage certain trees, plants, and crops.

Additional Air Quality Concerns

In addition to the six criteria pollutants outlined in the CAA, several other substances raise concerns with regard to air quality. Four of these elements and chemical compounds are briefly discussed below:

Mercury (Hg)

A toxic heavy metal that is a byproduct of the combustion of fossil fuels, especially coal. Mercury can accumulate in the environment and is highly toxic to humans and animals if inhaled or swallowed. Exposure can permanently damage the brain, kidneys, and fetuses (EPA, 2003d).

Carbon Dioxide (CO_2)

Burning fossil fuels releases carbon that has been stored underground for tens of millions of years into the atmosphere in the form of carbon dioxide, the dominant gas contributing to an enhanced greenhouse effect. Equilibrium in the natural carbon cycle is disrupted when large amounts of carbon dioxide are released to the atmosphere by human activities, such as the burning of fossil fuels (EPA, 2003d).

Methane (CH_4)

Methane (CH_4) also is a greenhouse gas that traps heat in the atmosphere. A molecule of methane is estimated to be 21 times more potent as a greenhouse gas than a molecule of carbon dioxide. Over the last two centuries, methane's concentration in the atmosphere has more than doubled due to increasing methane emissions from human activities, including placing municipal solid waste in landfills, producing natural gas and petroleum, mining coal, burning fossil fuels, and as a byproduct of large scale cattle and domestic animal operations (EPA, 2003d).

Volatile Organic Compounds (VOCs)

Also known as hydrocarbons, VOCs are liquids or solids that contain organic carbon, and that readily vaporize. VOCs participate in the smog reaction and also contribute to the formation of secondary pollutants in the atmosphere, including ozone. Some VOCs are toxic and carcinogenic (most are not), while some add to global warming (de Nevers, 2000).

Lead (Pb) is a highly toxic metal that is emitted by industrial processes (including smelters and power plants) and resides in the atmosphere as particulate matter. Pb affects the brain, nerves, heart, and blood, and can lead to seizures, mental retardation, behavioral disorders, memory problems, kidney and liver damage, heart disease, anemia and mood changes. Infants and young children are especially vulnerable to lead exposure (EPA 2003c).

Table 3-3 lists the health and environmental effects of criteria pollutants in more detail.

Regulation of Criteria Pollutants

The Clean Air Act gives the states (e.g. Montana) the primary authority to manage their air quality resources. However, to ensure a certain amount of consistency from state to state, EPA requires air pollution control agencies to develop control plans based on broad Federal statutes and regulations. The overall control strategy is called the State Implementation Plan (SIP), which includes, among other programs, orders, and control plans, the Montana Air Quality Permitting Program under ARM 17.8.740 *et seq.* and the major New Source Review (NSR) Permitting Program, under ARM 17.8.801 *et seq.* and 17.8.901-906. The Montana Clean Air Act (75-2-101 *et seq.*, MCA) provides the means through which the federal CAA is implemented in Montana. Pursuant to the Montana CAA, an air quality permit is required from DEQ for the construction, installation, alteration, or use of equipment or facilities that may cause or contribute to air pollution. Section 4.5.2.2.1 discusses the regulatory requirements in greater detail. Appendix I contains the DEQ's supplemental preliminary determination on the air quality permit for SME-HGS (DEQ, 2006a).

State Implementation Plan

SIPs generally establish limits or work practice standards to minimize emissions of the criteria air pollutants or their precursors. The Proposed Action must meet the requirements of the Montana SIP.

New Source Review Permitting Program

Congress established the NSR permitting program as part of the 1977 Clean Air Act Amendments. NSR is a preconstruction permitting program that serves two important purposes:

- First, it ensures that air quality is not significantly degraded from the addition of new and modified factories, industrial boilers and power plants. In areas with unhealthy air, NSR assures that new emissions do not slow progress toward cleaner air. In areas with clean air, especially pristine areas like national parks, NSR assures that new emissions do not significantly worsen air quality.

- Second, the NSR program assures people that any large new or modified industrial source in their neighborhoods will be as clean as reasonably possible, and that advances in pollution control occur concurrently with industrial expansion.

Table 3-3. General Sources and Health/Environmental Effects of Criteria Pollutants

Pollutant	Description	Sources	Effects
Carbon Monoxide (CO)	An odorless, tasteless, colorless gas which is emitted primarily from any form of combustion	Carbon black manufacture Refineries Oil and gas liquids Mobile sources Other combustion sources Open burning	Deprives the body of oxygen by reducing the blood's capacity to carry oxygen, causes headaches, dizziness, nausea, listlessness, and in high doses, death
Ozone (O_3)	A toxic gas associated with photochemical smog, formed when nitrogen oxides (NO_x) and volatile organic compounds (VOCs) react together in the presence of sunlight and warm temperatures	VOCs and NO_x from: -Fossil fuel power plants -Refineries -Natural gas transmission -Chemical manufacture -Mobile sources (i.e. vehicle tailpipe exhaust)	Irritates eyes, nose, throat and respiratory system; especially bad for those with chronic heart and lung disease, as well as the very young, old, and pregnant women
Particulate Matter (PM_{10} and $PM_{2.5}$)	Respirable particles less than 10 µm and 2.5 µm (microns) in size	Paper industry Fugitive dust Construction activities Fossil fuel power plants Other combustion sources Open burning	Aggravates ailments such as bronchitis and emphysema, especially bad for those with chronic heart and lung disease, as well as the very old, young, and pregnant women
Sulfur Dioxide (SO_2)	A pungent, colorless gas that combines with water vapor to become sulfurous acid, a mildly corrosive compound; when sulfurous acid combines with oxygen, it produces sulfuric acid (H2SO4), a very corrosive and irritating chemical	Inorganic chemical manufacture Refineries Calciners Fossil fuel power plants	Increases risk of adverse reactions in asthmatic patients, irritates respiratory system; harmful to plants; dissolves stone and corrodes iron and steel; causes "acid rain" which harms water bodies and aquatic life
Nitrogen Dioxide (NO_2)	A poisonous gas produced when nitrogen oxide is a byproduct of sufficiently high- temperature combustion	Combustion processes: -Fossil fuel power plants -Motor vehicles -Industry -Fertilizer manufacturing -Oil and gas development	Harmful to lungs; irritates bronchial and respiratory systems; increases symptoms in asthmatic patients; precursor to ozone
Lead (Pb)	A widely-used metal that may accumulate in the body	Secondary smelting and refining of nonferrous metals; Steel works Blast furnaces	Disturbs motor function and reflexes; impairs learning, causes intestinal disease, anemia, and damage to the central nervous system, kidneys, and brain; children most vulnerable

NSR permits are legal documents by which the facility owners/operators must abide. The permit specifies what construction is allowed, what emission limits must be met, and often how the emissions source may be operated. NSR requires stationary sources of air pollution to get permits before they start construction. NSR is also referred to as construction permitting or preconstruction permitting.

There are three types of NSR permitting requirements. A source may have to meet one or more of these permitting requirements. The three types of NSR requirements are:

1. Prevention of Significant Deterioration (PSD) permits which are required for new major sources or a major source making a major modification in an attainment area (ARM 17.8.801 *et seq.*).

2. Non-attainment NSR permits which are required for new major sources or major sources making a major modification in a non-attainment area (ARM 17.8.901-906); and

3. Minor source permits.

Hazardous Air Pollutants (HAPS)

HAPs, also known as air toxics, are those pollutants that are known or suspected to cause cancer or other serious health or environmental effects (EPA Toxics). HAPs are emitted in much lower quantities than the more common criteria air pollutants and are generally not found in the ambient environment in measurable amounts. EPA has identified 188 HAPs, which are included on the Hazardous Air Pollutants List (as defined in Section 112(b) of the CAA). The formation and emissions of HAPs from industrial sources are regulated through the National Emission Standards for Hazardous Air Pollutants (NESHAPs).

Section 112 of the Clean Air Act requires regulations for HAPs. Until EPA's mercury regulations were finalized in 2005, reductions of mercury emissions from electric generating units were being addressed through the HAP regulations. Any new plant that could be a major source for mercury had to undergo a case-by-case technology review. This analysis was referred to as a 112(g) preconstruction approval and was implemented by state agencies like DEQ through federally-approved state rules.

The main HAPs emissions of concern from the proposed power plant are mercury (Hg), hydrogen chloride (HCl), hydrogen fluoride (HF), trace metals and radionuclides (including radon). DEQ performed Best Available Control Technology (BACT) analyses for these HAPs during the SME air quality permit application review.

3.3.3 AIR QUALITY IN CLASS II AREAS

As mentioned in Section 3.3.2, for criteria air pollutants, air quality is described by the concentration of various pollutants in the atmosphere. The significance of a pollutant concentration is determined by comparing the concentration in the atmosphere to applicable national and/or state ambient air quality standards. These standards represent the maximum allowable atmospheric concentrations that may occur and still protect public health and welfare with a reasonable margin of safety. The U.S. EPA has established the National Ambient Air Quality Standards (NAAQS) described above. The PSD permitting program establishes PSD Increments, which are maximum allowable increases in air contaminant concentrations in attainment or unclassified areas. The Montana Board of Environmental Review has also established Montana Ambient Air Quality Standards (MAAQS). The NAAQS, MAAQS, and PSD Increments for criteria air pollutants are provided in Table 3-4.

Table 3-4. NAAQS, MAAQS, and PSD Increments

Pollutant	Averaging Period	NAAQS[1] (μg/m3)	MAAQS[2] (μg/m3)	PSD Class II Increment[3] (μg/m3)
PM_{10}	Annual	--	50	17
	24-hour	150	150	30
PM2.5	Annual	15	--	NA
	24-hour	35	--	NA
NO_2	Annual	100	94	25
	1-hour	--	564	
SO_2	Annual	80	52	20
	24-hour	365	262	91
	3-hour	1300	--	512
	1-hour	--	1300	
CO	8-hour	10,000	10,000	--
	1-hour	40,000	26,000	--
Ozone	1-hour	--	196	--
	8-hour	157	--	--
Pb	Quarterly	1.5	--	--
	90-day	--	1.5	--

[1] Code of Federal Regulations Title 40 Part 50.
[2] Administrative Rules of Montana (ARM) 17.8.201-230
[3] Administrative Rules of Montana (ARM) 17.8.804.

The NAAQS and MAAQS generally are defined as the maximum acceptable ground level concentrations that may be exceeded once per year, except that annual standards may never be exceeded and the 1-hour average MAAQS for SO_2 may not be exceeded more than 18 times in any consecutive 12 months.

The PSD Increments are pollutant-specific ambient air concentrations above an ambient air baseline concentration that may be exceeded once per year, except that annual standards may never be exceeded. The baseline concentration is defined for each pollutant and is the ambient concentration existing at the time that the first PSD application affecting an area is submitted.

The PSD program was established to prevent areas where the ambient air is currently in attainment with the NAAQS from degrading such that ambient air concentrations rise above the NAAQS. Attainment means that the maximum concentrations of the particular criteria pollutant in the area are less than the NAAQS. Nonattainment means that maximum concentrations of the particular criteria pollutant in the area are above the NAAQS. Nonattainment designations are further categorized as serious nonattainment and moderate nonattainment. At this time, the air quality classification for the Cascade County area is "Better than National Standards" or Unclassifiable/Attainment for the NAAQS (40 CFR 81.327).

Air pollutants of most concern in the Great Falls area are SO_2 and CO. The primary source of SO_2 emissions is the Montana Refining Company (MRC) petroleum refinery. Dispersion modeling performed on behalf of MRC has been used to identify an area of potential concern where MRC is required to operate an SO_2 ambient air quality monitor (DEQ, 2003a). Ambient CO monitors have measured elevated CO concentrations near major intersections in Great Falls in the past. CO data are still being collected in Great Falls near high traffic areas to ensure that the CO concentrations do not exceed ambient standards.

$PM_{2.5}$ data are being collected in most major population centers in Montana, including Great Falls. $PM_{2.5}$ monitoring began at Great Falls High School on January 1, 2000. This site is in a residential neighborhood near the city's center. Fine particulate is the pollutant most likely to accumulate and become troublesome during stagnant conditions so the values coming from this site provide an excellent measure of air quality in Great Falls (DEQ, 2003a).

Ambient air quality data collected in Great Falls have been reported to EPA and are listed in Table 3-5.

Table 3-5: Cascade County Monitoring Data

Pollutant	Avg. Period	Monitored Concentration ($\mu g/m^3$)	NAAQS	MAAQS
PM_{10} (1)	24-hr	23 $\mu g/m^3$	150 $\mu g/m^3$	150 $\mu g/m^3$
	Annual	7 $\mu g/m^3$	---	50 $\mu g/m^3$
$PM_{2.5}$ (2)	24-hr	12 $\mu g/m^3$	35 $\mu g/m^3$	---
	Annual	4.5 $\mu g/m^3$	15 $\mu g/m^3$	---
SO_2 (2)	24-hr	0.025 ppm	0.14 ppm	0.10 ppm
	Annual	0.003 ppm	0.03 ppm	0.02 ppm
CO (2)	1-hr	3.7 ppm	35 ppm	23 ppm
	8-hr	2.0 ppm	9 ppm	9 ppm

(1) PM_{10} Data Collected by SME at the Project Site in 2004/2005.
(2) USEPA, Air Data, County Air Quality Report, Criteria Air Pollutants. Accessed at www.epa.gov, May 11, 2006.

Existing air quality in Cascade County is impacted by existing industrial sources as well as area source activities such as vehicles, road dust, residential wood burning and agriculture. Table 3-6 contains a list of major industrial sources in the Great Falls area along with the reported 2004 emissions from existing sources and permitted allowable emissions from proposed sources.

Table 3-6. Six Cascade County Major Industrial Emissions Sources

Facility Name	Type of Source	Actual Emissions[1]	
Montana Ethanol Project	Proposed Ethanol Plant	CO – 154 tpy VOC – 96.0 tpy PM_{10} – 147 tpy	NO_x – 189 tpy SO_2 – 10.0 tpy
International Malting Company	Malting Plant	CO – 78.9 tpy VOC – 5.16 tpy PM_{10} – 60.4 tpy	NO_x – 69.2 tpy SO_2 – 37.1 tpy
Malmstrom Air Force Base	Heating Boilers	CO – 17.7 tpy VOC – 0.54 tpy PM_{10} – 1.27 tpy	NO_x – 28.0 tpy SO_2 – 37.1 tpy
Montana Megawatts I , LLC	Proposed Gas-fired Power Plant	CO – 95.2 tpy VOC – 22.0 tpy PM_{10} – 99.1 tpy	NO_x – 98.4 tpy SO_2 – 11.4 tpy
Montana Refining Company	Petroleum Refinery	CO – 40.6 tpy VOC – 279 tpy PM_{10} – 13.0 tpy	NO_x – 190 tpy SO_2 – 782 tpy
Highwood Generating Station	Proposed Coal-Fired Power Plant	CO – 1177 tpy VOC – 38 tpy PM_{10} – 366 tpy	NO_x – 944 tpy SO_2 – 443 tpy

Note: [1] 2004 Emissions reported to DEQ for existing sources. Permitted allowable emissions for proposed sources.
Source: Data compiled from DEQ records.

3.3.4 AIR QUALITY IN CLASS I AREAS

In accordance with applicable requirements of the federal CAA and the Administrative Rules of Montana (ARM), potential impacts on the PSD Class I increments in all Class I areas and Air Quality Related Values (AQRVs) in federal mandatory Class I areas are required to be assessed for PSD projects. Federal mandatory Class I Areas, as defined in the CAA, are national parks over 6,000 acres (2,428 ha), national wilderness areas and national memorial parks over 5,000 acres (2,023 ha), and international parks that were in existence as of August 7, 1977. Three Indian reservations in Montana have been redesignated as a Class I areas, but are not mandatory or federal Class I areas. All of the Class I reservations are located outside the area that would be impacted by the Proposed Action. Table 3-7 documents the federal mandatory Class I areas within 250 km of the proposed project site and Figure 3-16 displays their location on a map of Montana.

AQRV's are resources, as identified by the Federal Land Managers (FLMs) for one or more federal mandatory Class I areas, which may be adversely affected by a change in air quality. The resource may include visibility or a specific scenic, cultural, physical, biological, ecological, or recreational resource identified by the FLMs for a particular area that is affected by air quality. While the sensitivity of an AQRV to air pollution may be known, the long term monitoring of its health or status may not have been accomplished. Figures 3-15 and 3-17 are scenes from two of the Class I areas in Table 3-7.

Table 3-7. Federal Mandatory Class I Areas Considered

Class I Area	Distance from Proposed Site miles (km)
Gates of the Mountains Wilderness Area (GMW)	53 (86)
Scapegoat Wilderness Area (SGW)	73 (118)
Bob Marshall Wilderness Area (BMW)	80 (129)
Glacier National Park (GNP)	114 (184)
Mission Mountain Wilderness Area (MMW)	124 (199)
UL Bend Wilderness Area (ULBW)	134 (215)
Anaconda Pintler Wilderness Area (APW)	142 (228)


Figure 3-15. Class I Area: Big Salmon Lake in Bob Marshall Wilderness Area

The PSD Class I increments are defined as the maximum allowable increase in pollutants over baseline concentrations in Class I areas. The PSD Class I increment demonstration can be performed in a two-step process. In the first step, the highest modeled impacts from a proposal are compared to the EPA proposed Class I increment significance levels that were established as four percent of the corresponding Class I increments. If the impacts from a proposal are below the significance levels, the Class I increments demonstration is complete and no further analysis is necessary. If any significance levels for applicable pollutant(s) are exceeded, a cumulative impact analysis should be conducted for all averaging periods with modeling results that exceed the significance levels. The cumulative analysis should include impacts from the project and other PSD-major sources in the surrounding area that could impact the Class I area. Table 3-8 lists the EPA proposed Class I significance levels and the Class I PSD increments.

Under the regulations promulgated for visibility protection (40 CFR §51.301 and ARM 17.8.1101(3)) visibility impairment is defined as "…any humanly perceptible change in visibility (visual range, contrast, coloration) from that which would have existed under natural conditions." Visibility can be affected by plume impairment (heterogeneous, visual plume) or regional haze (homogeneous). Plume impairment results from a contrast or color difference between a plume and a viewed background such as the sky or a terrain feature. Plume

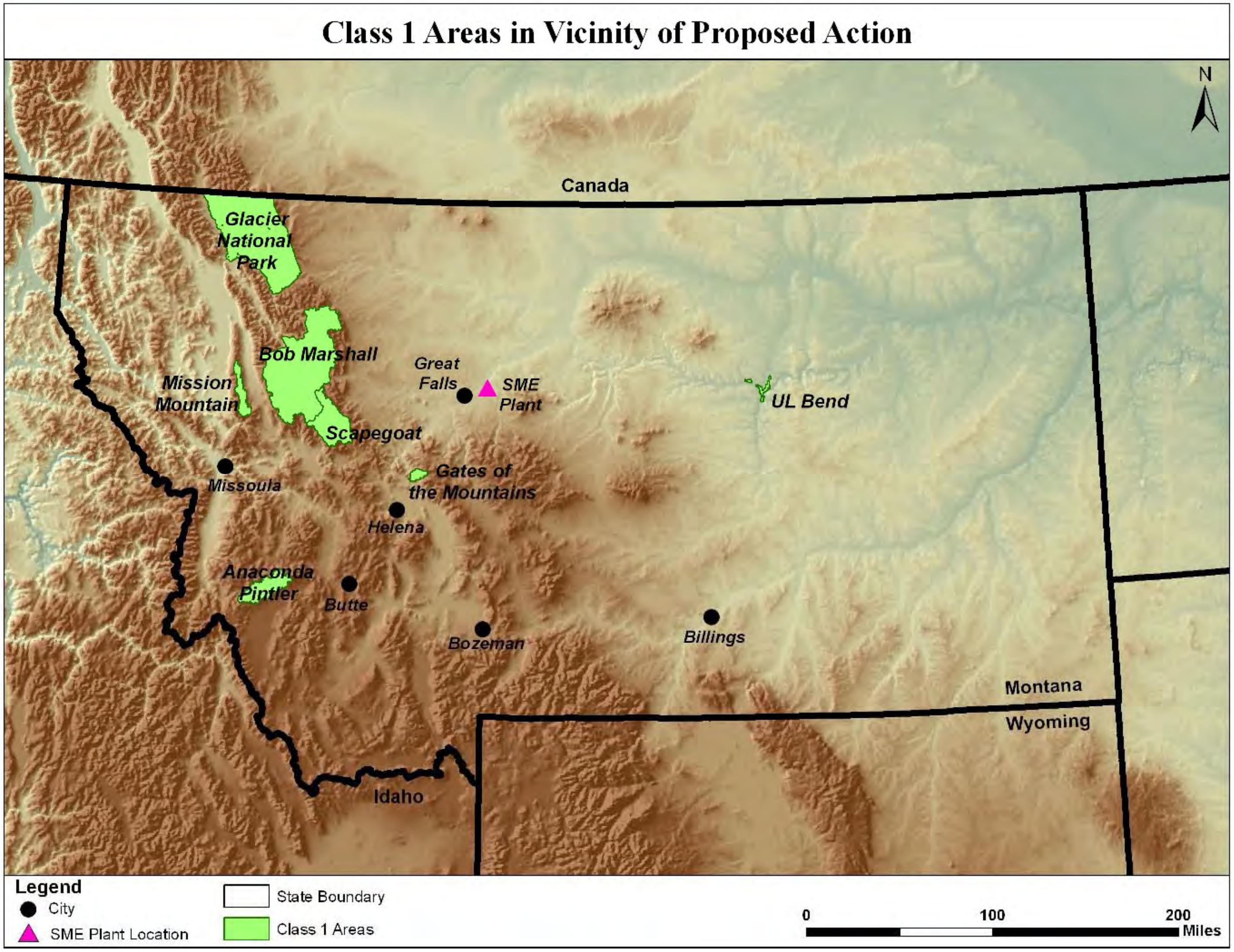


Figure 3-16. Federal Mandatory Class I Air Quality Areas Within 250 Km of the Proposed SME CFB Power Plant

Table 3-8. PSD Class I Significance Levels and Increments

Pollutant	Averaging Period	EPA Proposed Class I Significance Level ($\mu g/m^3$)	Class I Increment ($\mu g/m^3$)
Nitrogen Dioxide (NO_2)	Annual	0.1	2.5
Sulfur Dioxide (SO_2)	Annual	0.1	2
	24-hour	0.2	5[a]
	3-hour	1.0	25[a]
PM_{10}	Annual	0.2	4
	24-hour	0.3	8[a]

[a] Not to be exceeded more than once per calendar year

Figure 3-17. Class I Area: Glacier National Park's St. Mary Lake with Wild Goose Island

impairment is only a concern in cases where the federal mandatory Class I area is within a 50-kilometer (km) (31-mile) distance from the source, so that minimal dispersion of the plume occurs before reaching the Class I area.

Regional haze occurs at distances (over 50 km) where the plume has become evenly dispersed in the atmosphere and there is no definable plume. The primary causes of regional haze are sulfates and nitrates (primarily as ammonium salts), which are formed from SO_2 and NO_X through chemical reactions in the atmosphere. These reactions take time, such that near a source little NO_X or SO_2 will have formed nitrate or sulfate, whereas far from a source nearly all SO_2 will have formed sulfate and most NO_X will have formed nitrate.

For this proposed action, the evaluated AQRVs for the federal mandatory Class I areas within a 250-km radius of the proposed site include:

- Visibility – Visual Plume
- Visibility – Regional Haze
- Acid Deposition

Note that these AQRVs are not air quality standards for specific pollutants like the NAAQS. The fundamental methods and criteria for determining and interpreting impacts to federal mandatory Class I areas are set forth in several EPA and FLM documents, including –

- Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Report, December 1998 (IWAQM, 1998)
- FLMs' Air Quality Related Values Workgroup (FLAG) Phase I Report , December 2000 (FLAG, 2000)

- National Park Service (NPS) and U.S. Forest Service (USFS) guidance

EPA-approved dispersion models/programs are used to evaluate visibility and acid deposition impacts. The analyses use the FLM-established thresholds of visibility degradation measured in 24-hour light extinction change to evaluate source impacts to regional haze (far-field/multisource impacts), EPA-established criteria for visual plume impacts (near-field impacts), and the FLM-established annual Deposition Analysis Thresholds (DAT) for acid deposition. DAT for total nitrogen and total sulfur deposition are each 0.005 kilogram per hectare per year for the western United States. Impacts higher than these levels trigger the requirement for additional analyses.

Regional haze is measured using the light extinction coefficient (b_{ext}). The percentage change in the light extinction coefficient (Δb_{ext}) attributable to a particular project with respect to the background light extinction is used to determine the regional haze impacts from that project. The Δb_{ext} value attributable to a project that is generally considered to be acceptable is five percent on a 24-hour average basis. A predicted change in extinction between five percent and 10 percent may require a cumulative analysis that includes impacts from other nearby stationary sources.

It is important to note that the decision thresholds for AQRVs are not absolute. The FLM and DEQ are required to make a determination on a "…case-by-case basis taking into account the geographic extent, intensity, duration, frequency and time of visibility impairments…" (40 CFR §51.301 and ARM 17.8.1101(2)). However, the decision thresholds are useful as an initial benchmark for analysts to judge whether a proposed action would have an adverse impact on visibility and deposition and whether the FLM would be likely to object to a proposed action.

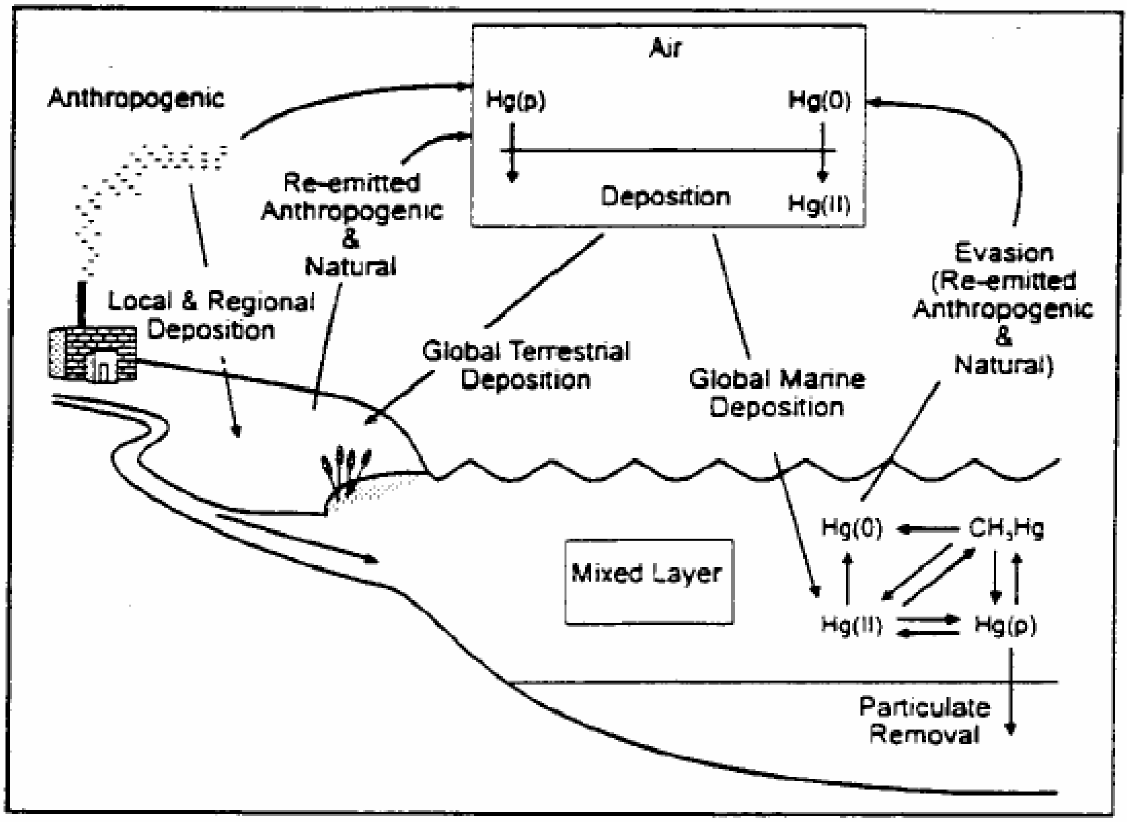
FLMs rely on the best scientific information available in the published literature and best available data to make informed decisions regarding levels of pollution likely to cause adverse impacts. They consider specific agency and Class I area legislative mandates in their decisions and, in cases of doubt, "err on the side of protecting the AQRVs for future generations" (Senate Report No. 95-127, 95th Congress, 1st Session, 1977). For air quality dispersion modeling analyses, FLMs follow 40 CFR §52.21(l) (Appendix W of 40 CFR Part 51, EPA's *Guideline on Air Quality Models*) and the recommendations of the IWAQM. FLMs allow modeling analyses conducted on a case-by-case basis considering types and amount of emissions, location of source, and meteorology. When reviewing modeling and impact analysis results, the FLMs consider frequency, magnitude, duration, and location of impacts.

3.3.5 MERCURY IN THE ENVIRONMENT

Background

At typical temperatures and pressures, elemental mercury (Hg) is a heavy, silver-white liquid metal (EPA, 1997c). Mercury is also a hazardous air pollutant and a high-priority concern for the U.S. EPA (Abbott, 2005) and Montana DEQ (AP, 2006a). As a chemical element common in the earth's crust (Levin, 2001), mercury can neither be created nor destroyed. However, mercury can cycle through the environment – including air, land and water – as part of both natural and human (anthropogenic) activities (Figure 3-18). Measured data and modeling results both

Figure 3-18. The Global Mercury Cycle



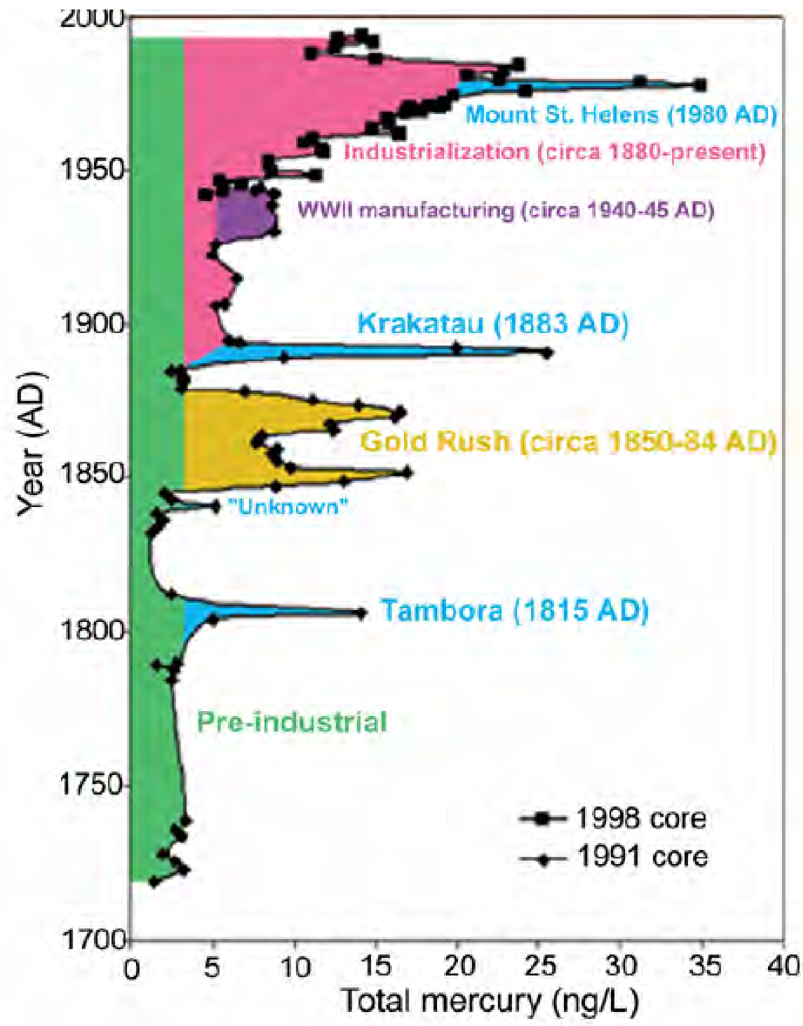
Source: EPA, 1997c

indicate that the amount of mercury mobilized and released into the biosphere has increased since the beginning of the industrial age (EPA, 1997a). Figure 3-19 is a graph displaying a profile of historic concentrations of mercury developed from an age-dated, 160-m (530-ft) deep ice core from the Upper Fremont Glacier in Wyoming's Wind River Range (Abbott, 2004). Increasing background mercury deposition from the atmosphere is evident, with occasional spikes in concentration caused by volcanic eruptions.

Mercury plays an important role as a process or product ingredient in several industrial sectors. It has also been used in many household products, including thermometers, lamps, paints, batteries, electrical switches, pesticides, and even toys and shoes (Ohio EPA, 2000). In the electrical industry, it is used in components such as fluorescent lamps, wiring devices and switches (e.g., thermostats) and mercuric oxide batteries. Furthermore, it is a component of dental amalgams used in repairing dental caries (cavities). In addition to specific products, mercury is utilized in numerous industrial processes, the largest of which in the U.S. is the production of chlorine and caustic soda by mercury cell chlor-alkali plants (EPA, 1997a).

Mercury can exist in three different oxidation or valence states: Hg^0 (metallic or elemental), Hg^+ (mercurous) and Hg^{2+} (mercuric). The properties and behavior of mercury depend on its oxidation state. Elemental mercury is a liquid but also has a fairly substantial vapor pressure, meaning that mercury vapor will be present at normal environmental temperatures. Mercurous

Figure 3-19. Historic Mercury Concentrations from 160-m Ice Core in Upper Fremont Glacier, Wind River Range, Wyoming



Source: Abbott, 2004
ng/L = nanograms (billionths of a gram) per liter

and mercuric forms of mercury generally exist as solids in combination with other chemicals and do not have a measurable vapor pressure. Mercury can also be combined with organic molecules (primarily by bacteria in sediments) to form organic mercury compounds.

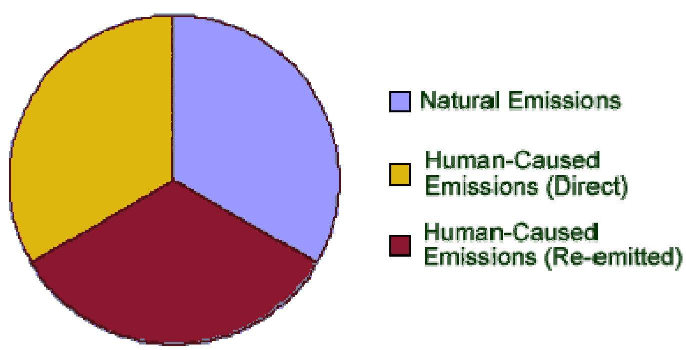
The most dominant form of mercury in the atmosphere is elemental or metallic mercury (Hg^0), which is present as mercury vapor. Reactions with other chemicals and solar radiation in the atmosphere can convert elemental mercury to ionic or charged forms (Hg^{2+}, Hg^+). Most of the mercury occurring in water, soil, sediments, or biota (i.e., all environmental media except the atmosphere) is in the form of inorganic mercury salts and organic forms of mercury (EPA, 1997a).

Mercury Emissions and Deposition

Scientists estimate that natural sources of mercury – such as volcanic eruptions, forest fires, and emissions from the ocean – constitute roughly a third of current worldwide mercury air emissions (EPA, 2006a). Mercury emissions can originate from natural sources such as geysers and hot springs in Yellowstone National Park. Recent measurements have shown that Yellowstone's Norris and Mammoth thermal areas are emitting mercury to the air at the rate of 205-450 lbs/year (93-205 kg/yr) (NPS, 2005).

Anthropogenic sources account for the other two-thirds of mercury emissions. Recent estimates of annual total global mercury emissions from all sources, both natural and anthropogenic, are about 4,400 to 7,500 metric tons per year. Much of the mercury circulating through today's environment was released years ago, when mercury was more commonly used than at present in many industrial, commercial, and residential applications. Land and water surfaces can repeatedly re-emit mercury into the atmosphere after its initial release into the environment (refer to Figure 3-18). Figure 3-20 below shows that anthropogenic emissions are roughly split evenly between these re-emitted emissions from previous human activity, and direct emissions from current human activity (EPA, 2006a).

Figure 3-20. Sources of Global Mercury Emissions

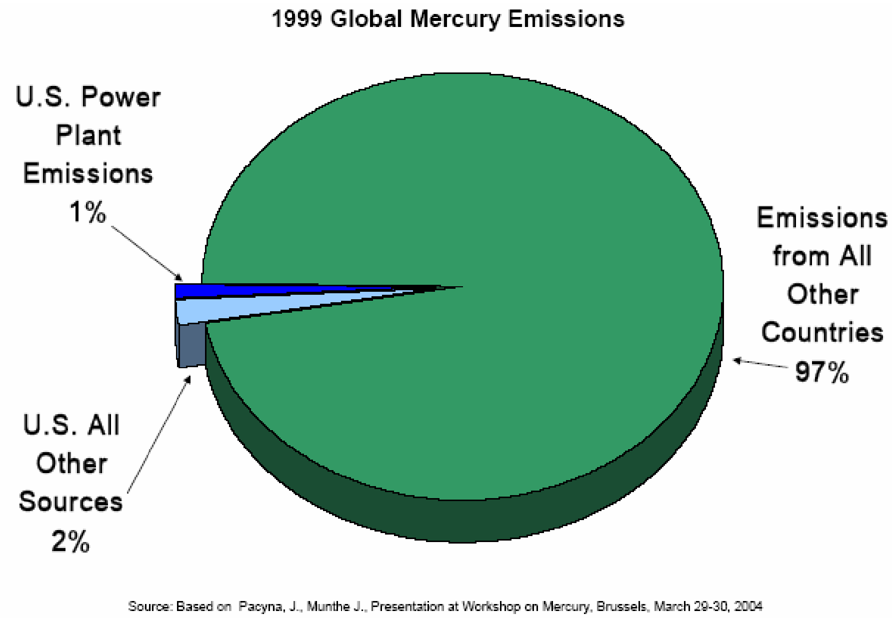


Source: EPA, 2006a

U.S. anthropogenic mercury emissions are estimated to account for roughly three percent of the global total, and emissions from the U.S. power sector are estimated to account for about one percent of total global emissions (UNEP, 2002) (refer to Figure 3-21). In recent years, with increasing awareness of mercury's toxicity, increasing regulation, and technological innovation and substitution, U.S. anthropogenic emissions of mercury have decreased. They have declined 45 percent since 1990 (EPA, 2006b) (refer to Figure 3-22). The two biggest declines were in emissions from medical waste incinerators and municipal waste combustors.

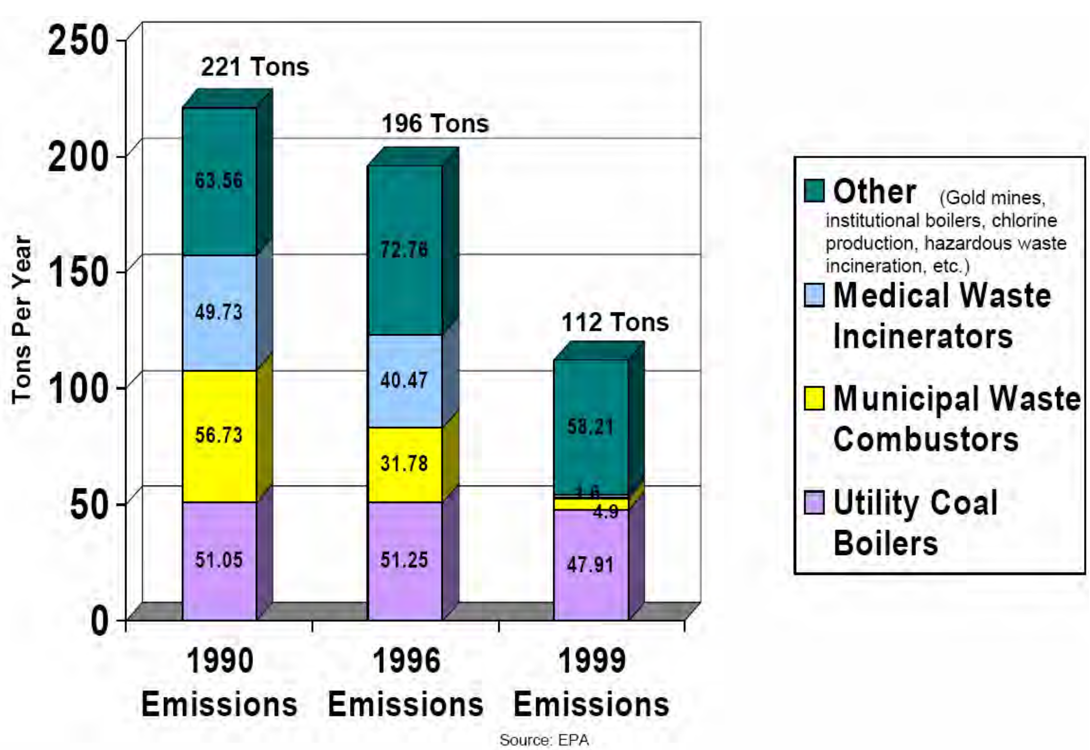
Mercury occurs naturally in coal at trace amounts, and unless controlled, is released to the atmosphere when coal is burned. It is estimated that 48 tons of mercury, or about one-third of the total amount of mercury released annually by human activities in the United States, are released into the atmosphere annually by coal-fired power plants (EPA, 2006b). Montana power plants currently emit approximately one-half ton (1,042 lbs) of mercury, or about one percent of total U.S. power plant emissions (DEQ, 2006b).

Figure 3-21. Pie Chart of U.S. and Utility Mercury Emissions Compared to Total Global Emissions



Source: EPA, 2006b

Figure 3-22. Declines in Anthropogenic U.S. Mercury Emissions Since 1990



Source: EPA, 2006b

Current estimates are that 80 percent or more of the mercury deposited within the United States was emitted from sources outside the U.S. and Canada (EPA, 2006b; see Figure 3-23).

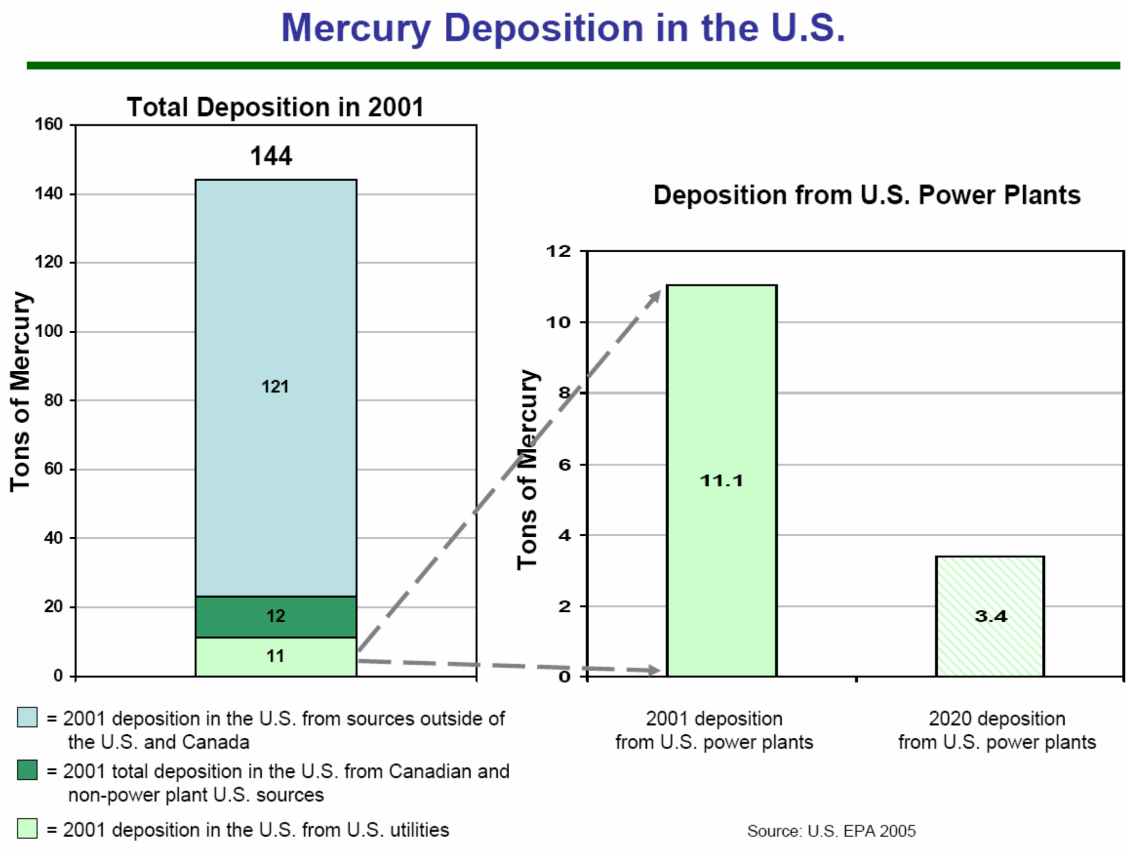


Figure 3-23. Mercury Deposition in the United States (2001) by Source
Source: EPA, 2006b

On March 15, 2005, EPA issued the Clean Air Mercury Rule (CAMR), which will permanently cap and reduce mercury emissions from coal-fired power plants (USEPA, 2005c). This rule will reduce mercury emissions in two phases. The first will reduce emissions using currently mandated technology by 2010 and the second will reduce emissions further by 2018. Additional and updated information related to mercury emissions from electric generating units is available at http://www.epa.gov/mercury/ . The CAMR relies on markets to reduce pollution, and allows companies to buy and sell allotted pollution limits.

The CAMR has served as the impetus for Montana and other states to develop their own rules concerning mercury emissions (AP, 2006). EPA assigned most states and two Indian tribes an emissions budget for mercury, and these states must submit a SIP revision detailing when they will meet their budget for reducing mercury from coal-fired power plants (USEPA, 2006d).

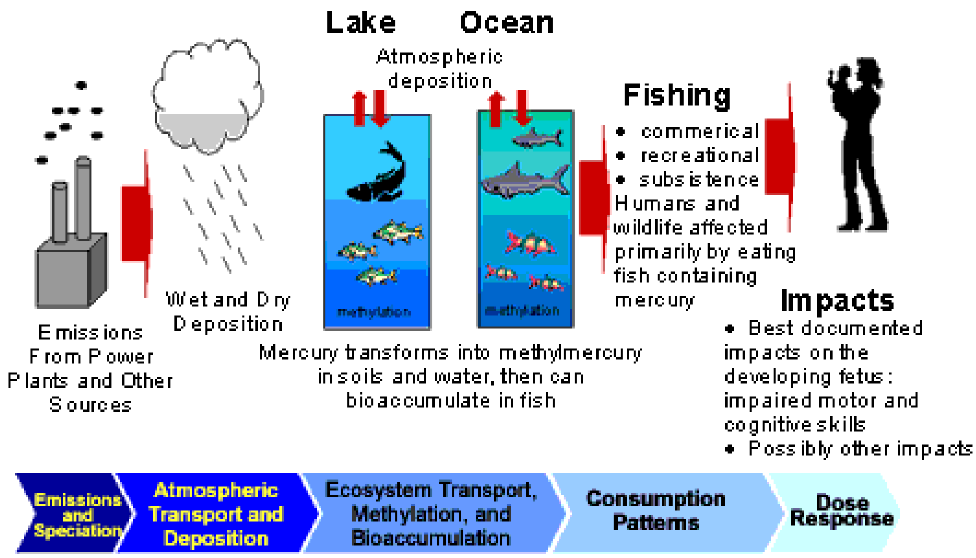
Montana had until November 16, 2006 to comply. On March 23, 2006, the Montana Board of Environmental Review authorized rule making to regulate mercury emissions at coal-fired power plants in the state. Montana's proposed rule, which provided for more stringent mercury emissions control requirements and deadlines than CAMR, was prepared by DEQ and reviewed by the Board (DEQ, 2006c). Montana's mercury rule, which became effective on October 27, 2006, is at least as stringent, and in many aspects more stringent, than the CAMR.

While the overall trend in the global mercury burden since pre-industrial times appears to be increasing (by an estimated two to five times), there is some evidence that mercury concentrations in certain locations have been stable or decreasing over the past few decades. The downward trend in mercury concentrations observed in the environment in some geographic locations over the last few decades generally corresponds to declining regional mercury use and consumption patterns over the same time frame (USEPA, 1997c).

Transformation to Methylmercury and Exposure Pathways

Once in aquatic systems, mercury can exist in dissolved or particulate forms and can undergo a number of chemical transformations (Figure 3-24). Sediments contaminated with mercury at the bottom of surface waters can serve as an important reservoir of the element, with sediment-bound mercury recycling back into the aquatic ecosystem for decades or longer. Mercury also has a long retention time in soils, from which it may continue to be released to surface waters and other media for long periods of time, possibly hundreds of years (EPA, 1997a).

Figure 3-24. Mercury Exposure Pathways



Source: EPA, 2006e

Plants, animals and humans can be exposed to mercury by direct contact with contaminated environmental media or ingestion of mercury-contaminated water and food. Mercury that enters water bodies and sediments can ultimately be transformed through "methylation" (attachment of one carbon and three hydrogen atoms) into a more toxic form, methylmercury (CH_3Hg). Methylmercury can be formed in the environment both by microbial metabolism as well as by abiotic, chemical processes, although it is generally believed that microbial metabolism is the dominant process (UNEP, 2002).

> **The Long Term Hazards of Toxic Substances – Bioaccumulation and Biomagnification**
>
> **Bioaccumulation:** The process by which organisms, including humans, can take up toxins and contaminants more rapidly than their bodies can eliminate them. For example, the body burden of mercury can grow over time if an organism continually ingests this heavy metal, perhaps accumulating to toxic levels. If, on the other hand, an organism ceases to ingest mercury, the body burden will decline at a rate specific to each species. In human beings, about half the body burden of mercury can be eliminated within 70 days of ceasing to ingest it.
>
> **Biomagnification:** The incremental increase in the concentration of toxins at each higher level in the food chain or food pyramid of an ecosystem. Biomagnification occurs because the food sources for species higher on the food chain are progressively more concentrated in persistent toxins like mercury.

Unlike other forms of mercury, methylmercury is readily absorbed across biological barriers and the gastrointestinal tract. Methylmercury can build up in tissues of organisms (bioaccumulation) and increase in concentration along the food chain (biomagnification) (EPA, 1997c).

Almost all human exposure to methymercury is through fish consumption (EPA, 1997d). Estimates developed by the World Health Organization and published by the U.S. Agency of Toxic Substances and Disease Registry (ATSDR) indicate that 99.6 percent of methylmercury intake in the general population arises from fish consumption (ATSDR, 1999).

As of the year 2000, some forty states (including Montana) had issued fish consumption advisories for methylmercury on certain water bodies while 13 states, including Montana (northern pike, lake trout, and walleye over 15 inches) had statewide advisories for some or all game fish from lakes and rivers. The Montana Sport Fish Consumption Guidelines provide recommendations on the amount and type of sport fish that can be safely eaten, how to prepare caught fish, and what special precautions should be taken by higher-risk individuals. By employing a margin of safety, the guidelines are intended to protect consumers from the most subtle effects of mercury toxicity. The guidelines are generally designed to protect higher-risk segments of the population, in particular, pregnant women, women of childbearing age, children, and anglers who regularly consume fish caught in Montana waters in larger quantities over long periods of time (MDPHHS and FWP, no date).

Montana fish consumption guidelines vary substantially by fish species and size, water body, and consumer (adult men or women and children). They apply to approximately 30 water bodies in the state, all but two of which are lakes and reservoirs. The Missouri River does not have a fish consumption guideline (MDPHHS, 2005).

Generally, mercury levels in Montana fish are relatively low. For example, the state's brook, rainbow and cutthroat trout, perch, and small panfish average less than 0.15 ppm of methyl-mercury. By way of comparison, commercially available canned tuna averages 0.17 to 0.20 ppm. However, certain species and size classes of fish in some locations do contain levels that warrant concern for those eating these fish on a frequent or prolonged basis (MDPHHS, 2005).

Health and Ecological Effects

The study of mercury's effects on health reflect the dose-response principle, which states that organisms respond to toxic substances according to the amount or dose of the substance that gets into their bodies. This is one of the fundamental principles of the field of toxicology – with increasing dose or exposure to a substance, there are likely to be greater effects.

Mercury is a well-documented human toxin at sufficiently high doses. For example, clinically observable neurotoxicity has been observed following exposure to large amounts of inorganic mercury (e.g., "Mad Hatters Disease"). Consumption of highly contaminated foodstuffs (e.g., methylmercury contaminated fish or grain) has also induced acute neurotoxicity. The most subtle effects of mercury are believed to be associated with methylmercury exposure during pregnancy. Effects on individuals exposed in utero at comparatively low doses may include impaired cognitive test performance and deficits in sensory ability. These effects may progress to tremors, inability to walk, convulsions and death if exposure levels are extremely high (EPA, 1997e). High exposures to inorganic mercury may also result in permanent kidney damage (EPA, 2003).

Links between mercury exposure and autism have been suggested, but these possible links remain speculative rather than definitive. For example, a recent study in Texas reported a positive correlation between environmentally released mercury pollution and rates of special education and autism at the county level (Palmer et al., 2005). However, this study did not look specifically at mercury released from power plants and it is unclear what significance power plant emissions played in their reported association.

In addition to neurotoxicity from acute and chronic exposure in human beings, mercury poisoning can potentially cause adverse health effects on individual animals and plants, up to and including mortality, and therefore may potentially affect wildlife populations and ecological communities (EPA, 1997a). Severe neurological effects were already observed in animals at Minamata, Japan, prior to the recognition of human poisonings – birds experienced severe difficulty in flying and exhibited other grossly abnormal behavior (UNEP, 2002). However, these effects occurred at levels of fish contamination that were 10 to 20 times higher than the Food and Drug Administration (FDA) limit for human consumption of 1 ppm and roughly 100 times higher than the levels in Montana fish cited earlier in this section (FDA, 1994).

Adverse effects of elevated mercury levels in fish include death, reduced reproductive success, impaired growth and development, and behavioral abnormalities. Reproductive effects are the primary concern for mercury poisoning in wildlife and can occur at dietary concentrations well below those which cause overt toxicity. Effects of mercury on birds and mammals include death and sub-lethal effects such as reduced reproductive success, impaired growth and development, liver and kidney damage, and neurobehavioral effects (EPA, 1997a).

In sum, mercury is ubiquitous in the earth's biosphere, occurring in the air, water, land, and soil, as well as in living organisms. In the industrialized era, human activities have mobilized greater amounts of mercury, thereby exposing organisms, ecosystems, and human beings to increased levels of mercury, including increased levels of a particularly toxic form, methylmercury. Almost all human exposure to methylmecury is from ingesting contaminated fish. In low, periodic, or occasional doses, methylmercury can be voided by the body and is not generally problematic; at sustained, excessive doses, it may accumulate in certain tissues and organs to concentrations that can cause a variety of adverse health effects on humans and wildlife. These negative effects may be acute or chronic, and from sub-lethal to lethal. While mercury contamination is widespread, indeed global, cases involving serious human health impacts have arisen from specific point source discharges to water or accidental food contamination rather than dispersed emissions to air.

3.3.6 Global Climate Change

In recent decades climatologists and other earth scientists have expressed growing concern that the earth's climate appears to be warming as a result of an accumulation of greenhouse gases (GHGs) in the atmosphere. The earth's surface temperature has risen by about one degree Fahrenheit over the last century, and the warming process has accelerated during the past two decades (Figure 3-25) (EPA, 2000c).

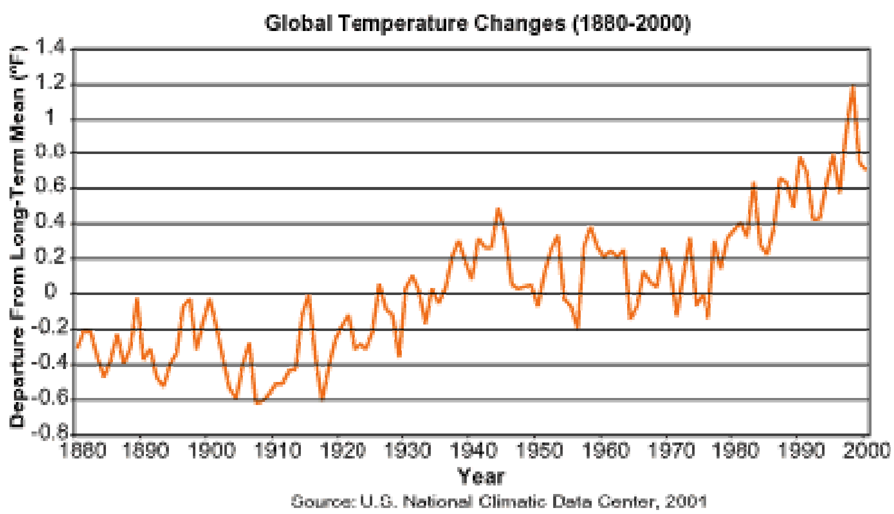


Figure 3-25. Average Global Temperature Trend from 1880 to 2000
Source: EPA, 2000c

Some GHGs occur naturally in the atmosphere, while others result from human activities (EPA, 2005h). Naturally occurring GHGs include water vapor, carbon dioxide, methane, nitrous oxide, and ozone. Certain GHGs are being released in growing quantities by expanding human populations and economic activities, particularly the combustion of fossil fuels (oil, natural gas, and coal) and the clearing/burning of forests, all of which emit carbon dioxide, the principal greenhouse gas, adding to the levels of this naturally occurring gas. Another important greenhouse gas – methane – escapes to the atmosphere from cattle flatulence and rice paddies, as well as from natural gas pipeline leaks and decomposition in landfills; in other words, methane levels in the atmosphere are rising due to expanding food and energy production and waste generation. Still other greenhouse gases include nitrous oxide emitted during combustion and chlorofluorocarbons (or CFCs, which also attack the stratospheric ozone layer), now banned as a result of the Montreal Protocol and other international agreements (EPA, 2000c).

In 1997, DEQ inventoried GHG emissions in Montana for 1990, during which approximately 40 million tons of CO_2 equivalent were emitted in the state. Carbon dioxide was the major GHG emitted in Montana, comprising 74 percent of 1990 emissions. Methane was next, accounting for approximately 14 percent of emissions, followed by halocarbons at 9.5 percent, and nitrous oxide at 2.5 percent.

Fossil fuel consumption was the major source of GHGs released in Montana, accounting for 71 percent of emissions. Petroleum comprised 53 percent of fossil fuel-related GHG emissions, coal 35 percent, and natural gas 12 percent. Emissions of halogenated fluorocarbons from Montana aluminum production made up 11 percent of total state emissions in 1990, while methane emissions from livestock were responsible for 10 percent. Overall, energy-related emissions accounted for 72 percent of GHGs, industrial production and agriculture each accounted for approximately 12.5 percent, and waste-related facilities accounted for three percent (DEQ, 1997). In 1999, funded by a grant from EPA, DEQ prepared a draft "Foundation for an Action Plan" to control GHGs emissions in the state; among other emissions sectors it considered, this document investigated strategies to reduce or offset utility industry GHG emissions (DEQ, 1999).

Energy from the sun heats the earth's surface and drives the earth's weather and climate; in turn, the earth radiates energy back out to space (Figure 3-26). GHGs are transparent to incoming solar radiation but trap some of the outgoing infrared (heat) energy, retaining heat rather like the glass panels of a greenhouse. Without this natural "greenhouse effect," temperatures would be much lower than they are now, and life as we know it would not be possible. Because of greenhouse gases, the earth's average temperature is a more hospitable 60 degrees Fahrenheit (EPA, 2000c).

Since the beginning of the Industrial Revolution, atmospheric concentrations of carbon dioxide have increased nearly 30 percent, methane concentrations have more than doubled, and nitrous oxide concentrations have risen by about 15 percent. These increases have enhanced the heat-trapping capability of the earth's atmosphere. Sulfate aerosols, common air pollutants, cool the atmosphere by reflecting light back into space; however, sulfates are short-lived in the atmosphere and vary regionally (EPA, 2000c). Also, with national and worldwide efforts to curb emissions of these pollutants, their offsetting influence is believed to be diminishing.

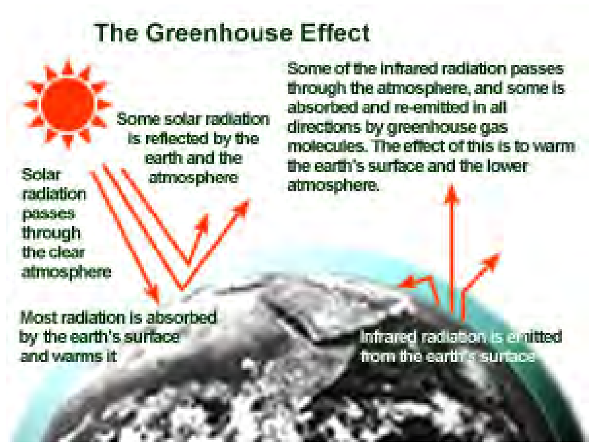


Figure 3-26. The Greenhouse Effect

Source: EPA, 2000c

The National Research Council of the National Academy of Sciences concluded in 2001 that the "warming process has intensified in the past 20 years, accompanied by retreating glaciers, thinning arctic ice, rising sea levels, lengthening of the growing season in many areas, and earlier arrival of migratory birds" (NRC, 2001). Among the predicted changes in the United States are "potentially severe droughts, increased risk of flood, mass migrations of species, substantial shifts in agriculture and widespread erosion of coastal zones" (NAST, 2000). While U.S. agricultural production could increase, due to "fertilization" of the air with carbon dioxide, "many long-suffering ecosystems, such as alpine meadows, coral reefs, coastal wetlands and Alaskan permafrost, will likely deteriorate further. Some may disappear altogether" (Suplee, 2000; Anon., 2000).

In 2001, the Intergovernmental Panel on Climate Change (IPCC) released *Climate Change 2001: Impacts, Adaptation and Vulnerability*, a report prepared by Working Group II (which included approximately 50 lead authors from more than 20 countries). The report concludes:

> *The stakes associated with projected changes in climate are high* [emphasis in original]. Numerous Earth systems that sustain human societies are sensitive to climate and will be impacted by changes in climate…Impacts can be expected in ocean circulation; sea level; the water cycle; carbon and nutrient cycles; air quality; the productivity and structure of natural ecosystems; the productivity of agricultural, grazing, and timber lands; and the geographic distribution, behavior, abundance, and survival of plant and animal species, including vectors and hosts of human disease. Changes in these systems in response to climate change, as well as direct effects of climate change on humans, would affect human welfare, positively and negatively. Human welfare would be impacted through changes in supplies of and demands for water, food, energy, and other tangible goods that are derived from these systems; changes in opportunities for nonconsumptive uses of the environment for recreation and tourism; changes in non-use values of the environment such as cultural and preservation values; changes in incomes; changes in loss of property and lives from extreme climate phenomena; and changes in human health (IPCC, 2001).

While climate change is the ultimate global issue – with every human being and every region on earth both contributing to the problem and being impacted by it to one degree or another – it does manifest itself in particular ways in specific locales like Montana. During the past century, the average temperature in Helena increased 1.3°F and precipitation has decreased by up to 20 percent in many parts of the state (EPA, 1997h).

Over the next century, Montana's climate may change even more. In this region and state, concerns have been expressed by scientists and conservationists over a range of potential impacts, including:

- glaciers melting and disappearing in Glacier National Park and elsewhere in the Rocky Mountains (ABC News, 2006; NWF, 2005);
- a potential decline in the northern Rockies snowpack and stressed water supplies both for human use and coldwater fish (USGS, 2004; ENS, 2006; NWF, 2005; Farling, no date);
- survival of ski areas receiving more rain and less snow (Gilmore, 2006), drying of prairie potholes in eastern Montana and a concomitant decline in duck production (NWF, 2005);
- an increase in the frequency and intensity of wildfires as forest habitats dry out, and perhaps a conversion of existing forests to shrub and grasslands (NRMSC, 2002; NWF, 2005; Devlin, 2004);
- loss of wildlife habitat (USGS, 2004; NWF, 2005);
- possible effects on human health from extreme heat waves and expanding diseases like Western equine encephalitis, West Nile virus, and malaria (EPA, 1997h; RP, 2005);
- possible impacts on the availability of water for irrigated and dryland crop production alike (EPA, 1997h; RP, 2005)

3.4 BIOLOGICAL RESOURCES

3.4.1 INTRODUCTION

The biological resources analysis has been prepared and submitted as a part of the environmental review process described in the NEPA, MEPA, and the Endangered Species Act (ESA). The purpose of this report is to characterize the general biological resources, rare and sensitive species, threatened and endangered species, and wetlands in the vicinity of the project area. The analysis includes an assessment of the potential impacts to these biological resources (Section 4.6) for each alternative as a result of the proposed project.

General descriptions for the project area are from McNab and Avers (1994) for Section 331D, the northwestern glaciated plains. This section includes level to gently rolling continental glacial till plains and rolling hills on the Missouri Plateau. Steep slopes border some of the larger rivers. Elevation ranges from 2,500 to 5,000 ft (763 to 1,525 m). This section is within the Great Plains physiographic province. Glacial till is underlain by soft Cretaceous marine shale. These soils are generally deep and range in texture from loamy to clayey.

Annual precipitation averages 10 to 15 inches (250 to 380 mm), with maximums occurring in spring and early summer. Winters are extremely cold with desiccating winds and snow. Climate is cold continental, with dry winters and warm summers. Temperature averages 37 to 45^{o} F (3 to 7^{o} C), and the growing season lasts 100 to 130 days. There are high densities of dendritic drainage patterns on areas of exposed marine shales. Low to medium density drainage patterns occur on the better drained glacial till. The higher order streams show subtle structural and glacial influence. Major rivers include the Missouri, Milk, and Poplar. Fire and drought are the principal sources of natural disturbance, and most of the area is in cropland or is grazed by livestock.

The area surrounding Great Falls is characterized by large tracts of grasslands that have been heavily cultivated for decades, with clusters of urban, suburban, industrial and rural development. The climate is semi-arid and the few rivers and tributaries present drain into the Missouri River. Topography is mostly flat or gently rolling hills and buttes, with incised canyon drainages created by creeks, rivers, and wind erosion. Shrubs and trees are mostly confined to these small canyon habitats or cultivated near structures. Development at either site for the boilers, turbine-generator, pollution control equipment, solid waste storage facilities, and associated infrastructure would affect about 320 acres (130 ha).

The Salem plant site is cultivated for small grains, and is mostly agricultural fields. A few home sites with outbuildings are located in the area, and dirt access roads mostly follow Section lines. This site was surveyed in detail and is discussed below.

Because the Industrial Park site is currently considered an alternative to the Salem site, specific locations and lengths of connections for raw water, potable water, wastewater, and power transmission lines have not been formally identified. The Industrial Park site has been cultivated in the past, but is currently vegetated with a mixture of grasses including smooth brome (*Bromus* *inermis*), crested wheatgrass (*Agropyron spicatum*), thickspike wheatgrass (*A. dasytachyum*), and Kentucky bluegrass (*Poa pratensis*), and a variety of weedy forbs. Past developments have disturbed the area, and buildings, storage sheds, and roads are common. Wildlife species recorded at the site included western meadowlark (*Sturnella neglecta*), unidentified vole (likely *Microtus pennsylvanicus*), Richardson's ground squirrel (*Spermophilus richardsonii*), and badger (*Taxidea taxus*). If this site is selected, the electrical interconnections, potable water and wastewater would likely be shorter than for the Salem site due to closer proximity to established infrastructure; the raw water line from the Morony Reservoir would be longer, however.

The project is divided into infrastructure components, and survey results and potential project impacts are discussed for each segment. Wildlife data for the potential project area and each segment are organized for brevity and clarity. The existing Montana Natural Heritage Program (MNHP) database query results, wildlife sightings during project area surveys, fish species in Morony Reservoir, and noxious weeds are in table format, and other general wildlife and vegetation are included in descriptive text sections.

3.4.2 PRE-FIELD RESEARCH

Biologists conducted pre-field research for previously recorded wildlife sighting records within a 10-mile (16-km) radius of the proposed Salem plant site, and the alternate GFIP location (WESTECH, 2005). Sighting data were also collected for the 28.4 miles (46 km) of transmission lines connecting the proposed plant sites to main conductor lines. Pre-field research consisted of contact with landowners, evaluation of aerial photographs, query of the MNHP database for past sightings within a 10-mile (16-km) radius of HGS (Table 3-9), and interviews of state and federal resource specialists at Montana Fish, Wildlife, and Parks (FWP) and the U.S. Fish and Wildlife Service (USFWS) (WESTECH 2005).

Wildlife habitats in the vicinity of proposed sites for the HGS were identified using designations by WESTECH (1993). This typing method is based on Coenenberg et al. (1977) and has been used in numerous wildlife studies in Montana and other states, and has been accepted for use in NEPA documents. Habitat type and subtype codes are based on existing, rather than climax, vegetation and/or other features such as rock outcrops and ponds.

Lists of fish, amphibians, reptiles, mammals and birds that could potentially occur in the region encompassing the HGS were developed from published and unpublished literature sources, including Montana Bird Distribution Committee (MBDC, 1996), Foresman (2001), Holton and Johnson (2003), Maxell et al. (2003), Werner et al. (2004), and FWP (2005). Water quality status of affected water bodies was obtained from the 2004 DEQ integrated report (DEQ 2004d). During the field reconnaissance all fish and wildlife species were recorded by the habitat in which they or their evidence occurred. Suitable habitat was defined as any useable habitat for fish; breeding habit for amphibians; foraging, security and denning habitats for reptiles and mammals; and preferred breeding/nesting habitat for birds. Consequently some migrant birds may occur seasonally and may have been recorded in the study area even though "suitable habitat" is not present (WESTECH, 2005).

Table 3-9. Montana Species of Concern Recorded Within 10 miles of Great Falls, MT

Species		Suitable Habitat[b]
Common Name	**Scientific Name**	
Plants		
Roundleaf water hyssop	*Bacopa rotundifolia*	Muddy shores of ponds and streams; last recorded in 1891
Many-headed sedge	*Carex sychnocephala*	Moist meadows; lake shores; thickets at low elevations; last recorded in 1890
Chaffweed	*Centunculus minimus*	Drying vernal pools (seasonal wetlands); last recorded in 1891
	Entosthodon rubiginosus	Moss; last recorded in 1887
	Funaria americana	Moss; last recorded in 1902
Guadalupe water-nymph	*Najas guadalupensis*	Submerged in shallow fresh water of oxbow sloughs and ponds; drying vernal pools; last recorded in 1891
Dwarf woolly heads	*Psilocarphus brevissimus*	Drying vernal pools; last recorded in 1891
California waterwort	*Elatine californica*	Shallow waters and mudflats along the edges of wetlands; last recorded in 1891
Fish		
Blue sucker	*Cycleptus elongatus*	Missouri River below Morony Dam
Amphibians- none		
Reptiles		
Spiny softshell	*Apalone spinifera*	Missouri River below Morony Dam
Mammals - none		
Birds		
Ferruginous hawk	*Buteo regalis*	Sagebrush steppe, grasslands with rolling to steep slopes
Bald eagle	*Haliaeetus leucocephalus*	Larger rivers, lakes and reservoirs
Burrowing owl	*Athene cunicularia*	Grasslands with rodent and badger burrows
White-faced ibis	*Plegadis chihi*	Wetlands
Black-crowned night heron	*Nycticorax nycticorax*	Wetlands
Franklin's gull	*Larus pipixcan*	Wetlands
Common tern	*Sterna hirundo*	Wetlands
Black tern	*Chlidonias niger*	Wetlands

a *Source:* MNHP (2005b) and USFWS letter dated May 12, 2005.
b Suitable habitat for animals is defined in Section 3.2.4.1.

3.4.3 FIELD INVENTORY

The reconnaissance field dates were selected in response to project timing, regulatory schedule/procedures, and landowner availability. They were not selected as a function of reproductive season for threatened and endangered species (TES) or species of concern. Field reconnaissance was conducted on April 18-19, and July 6, 2005 by driving all accessible public roads (some were impassable due to rain/mud) in the project vicinity. These roads provided vantage points for the GFIP and Salem sites, transmission line corridors, several sections of the Missouri River that may be crossed by transmission lines, Morony Dam and Reservoir, the fresh (potable) and waste water pipeline corridor, the raw water pipeline route including the area of the pump house on the Missouri River bank, and the proposed railroad route (WESTECH 2005). Species observed during the field surveys are shown in Table 3-10.

The proposed project covers a large area, and therefore different methods were used to assess habitat during surveys. Habitat that was accessible and surveyed on the ground comprised 34 percent of total area; not accessible but visible from vantage points was 38 percent; and not accessible nor visible from vantage points, therefore not surveyed comprised 28 percent (WESTECH, 2006a).

Proposed Railroad Spur

The proposed railroad spur running south from the Salem plant site would cross lands that are almost entirely cultivated for small grains, except for small strips of grass (primarily smooth brome and Kentucky bluegrass) associated with gravel barrow pits and field edges. No vegetated drainages are crossed by the route (WESTECH, 2005).

Two alternatives to the proposed rail spur alignment were considered. One would follow the abandoned railroad grade to Great Falls, the same corridor proposed for the fresh and waste water pipelines discussed below. The other would place the rail spur in the incised drainage habitat on the south side of the Missouri River, spanning Box Elder Creek and deeper drainages (WESTECH, 2005).

Figure 3-27. Transmission Line Crossing of Incised Drainage

Transmission Line 1

The proposed electrical transmission line from the Salem plant to the Great Falls substation north of the Missouri River would cross cultivated grain fields, several gentle-to-moderately steep incised drainages (Figure 3-27), Box Elder Creek, and the Missouri River including its associated upland habitats and rolling grasslands. The actual amount of each habitat disturbed by construction of the transmission line would depend on the final route location, spacing and location of structures, etc. The transmission line would span the Missouri River; there are 5-6 other transmission lines, including Northwest Energy's 230kV Broadview-to-Great Falls transmission line, already spanning the

Table 3-10. Wildlife Species Observed During Project Area Surveys

Site Observed	Common Name	Scientific Name
Railroad spur	Gray partridge	*Perdix perdix*
	Mourning dove	*Zenaida macroura*
	Common nighthawk	*Chordeiles minor*
	Horned lark	*Eremophila alpestris*
	European starling	*Sturnus vulgaris*
	Vesper sparrow	*Pooecetes gramineus*
	Western meadowlark	*Sternella neglecta*
	White-tailed jackrabbit	*Lepus townsendii*
	Northern pocket gopher	*Thomomys talpoides*
	Richardson's ground squirrel	*Spermophilus richardsonii*
	Red fox	(*Vulpes vulpes*)
Transmission line 1	Loons	Gaviiformes
	Grebes	Podicipediformes
	Pelican	Pelecaniformes
	Herons	Ciconiiformes
	Geese	Anseriformes
	Cranes	Gruiformes
	Plovers	Charadriiformes
Transmission line 1, Box Elder Creek, several upland sites	Killdeer	*Charadrius vociferous*
Transmission line 1, grasslands	Longbilled curlew	*Numenius americanus*
Box Elder Creek	Common snipe	*Gallinago gallinago*
Missouri River, fallow grain fields	Franklin's gull	*Larus pipixcan*
Box Elder Creek or along river	Beaver	*Castor canadensis*
	Muskrat	*Ondatra zibethicus*
	Raccoon	*Procyon lotor*
Fresh and Waste Water Pipeline Corridor	Horned lark	*Eremophila alpestris*
	American robin	*Turdus migratorius*
	European starling	*Sturnus vulgaris*
	Clay-colored sparrow	*Spizella pallida*
	Vesper sparrow	*Pooecetes gramineus*
	Savannah sparrow	*Passerculus sandwichensis*
	Western meadowlark	*Sternella neglecta*
	Northern pocket gopher	*Thomomys talpoides*
	Richardson's ground squirrel	*Spermophilus richardsonii*
Raw Water Pipeline	Common carp	*Cyprinus carpio*
	Unidentified sucker	*Catostomidae*
	Unidentified minnows	*Cyprinidae*
Wetlands	No species observed	N/A

Missouri River between Rainbow Dam and Morony Dam. Box Elder Creek would also be spanned (WESTECH, 2005).

The upland habitats provided by incised coulees, the Missouri River uplands, and the rolling grasslands near the substation provide year-round range for mule deer (*Odocoileus hemionus*), the only big game species recorded during the reconnaissance; most raptors (i.e., birds of prey including eagles, hawks, falcons and owls) would nest in these habitats as well (WESTECH, 2005). No active nests were found during the reconnaissance, but surface access limitations precluded searches of large portions of these habitats.

Shrubs, including rose (*Rosa* spp.), skunkbush sumac (*Rhus trilobata*), western snowberry (*Symphoricarpos occidentalis*), junipers (*Juniperus* spp.), chokecherry (*Prunus virginiana*) and currants (*Ribes* spp.) were an important component of the incised drainages and uplands associated with the Missouri River (WESTECH, 2005). Shrub stands provide habitat for species such as ring-necked pheasant (*Phasianus colchicus*), yellow warbler (*Dendroica petechia*), common yellowthroat (*Geothlypis trichas*) and spotted towhee (*Pipilo maculates*), as well as browse for mule deer.

Some trees are found in the drainage and Missouri River uplands habitats, primarily Rocky Mountain juniper (*Juniperus scopulorum*) with occasional Douglas-fir (*Pseudotsuga menziesii*), ponderosa pine (*Pinus ponderosa*) and Russian olive (*Eleagnus angustifolia*). Scattered willows (*Salix* spp.) and cottonwood (*Populus* spp.) were present along the moist river and creek banks. Trees and taller shrubs provided nesting substrate for several species of birds observed during the reconnaissance, and provided potential nest sites for raptors (WESTECH, 2005).

Box Elder Creek and the Missouri River provided the only perennial stream habitat observed during the survey. Box Elder Creek, in the vicinity of the transmission line crossing, could not be accessed but appeared to be a small (3-5 feet or 1-1.5 m wide), shallow perennial stream. According to the Montana Fisheries Information System (MFISH) information for Box Elder Creek (FWP 2005), it is managed as trout water, although brook trout in this reach of the stream are considered rare. Fathead minnows (*Pimephales promelas*) and longnose dace (*Rhinichthys cataractae*) are considered common (FWP, 2005; WESTECH, 2005).

Transmission Line 1 would cross the Missouri River downstream from Cochrane Dam, above the pool formed by Ryan Dam. The river in this reach has steep banks with little or no emergent vegetation. According to MFISH information (FWP, 2005), this reach of the Missouri River is managed as non-trout water. Although there is good species diversity in this reach of the river, most game species are rare (FWP, 2005; WESTECH, 2005).

Transmission Line 2 and Switchyard

Depending on final design, the transmission line that would run west/southwest from the Salem plant site to the proposed switchyard on the existing NWE 230kV transmission line would be placed in cultivated fields and would span Box Elder Creek parallel to Transmission Line 1 (discussed above) (WESTECH, 2005).

Fresh and Waste Water Pipeline Corridor

Depending on final design, the fresh and waste water pipelines that would run south/southwest from the Salem plant site to Great Falls would be buried in cultivated fields alongside a gravel county road and an abandoned railroad grade, and would also cross Box Elder Creek (discussed above) on the existing railroad grade (WESTECH, 2005).

Raw Water Pipeline

The raw water pipeline can be described in two distinct segments: 1) the portion from the Salem plant site to the directional drill site on the top of the hill above the Missouri River; and 2) the portion that will be directionally drilled from the hilltop to the collector well at the river (Figure 3-28).

Segment 1 would be buried in existing grain fields. Segment 2 would be directionally drilled from hilltop to the collector well.

Figure 3-28. Proposed Raw Water Intake Route

Figure 3-29. Morony Reservoir at Site of Proposed Intake

The intake structure for the raw water pipeline would be placed in the Missouri River pool above Morony Dam (Figure 3-29). The river bank at this location is grassland with a few scattered non-native Russian olive trees. The river bed visible from the bank appeared to be cobble and gravel with considerable sediment (WESTECH, 2005).

Several species of fish are known to be present in Morony Reservoir (Gardner, 2005; PPL Montana, 2006). The utility PPL Montana has conducted long-term sampling of fishes in several reservoirs, including Morony, summarized in Table 3-8 (PPL Montana, 2006). These data cover gillnetting results from 10 years sampled between 1992 and 2005. The data include total fish caught by species and catch per unit hour, which divides numbers of fish by net hours to estimate fish caught by level of effort. Gillnetting tends to under-represent small fish, such as fingerlings and minnows, and thus does not provide a complete inventory of species. However, the results show a reasonable diversity of fish in the reservoir with white sucker most abundant; walleye

Table 3-11. Fish Species in Morony Reservoir; Gillnet Sampling 1992 to 2005 Catch per Unit Effort (CPUE)[1]

Year	Total Net Hours	Rainbow trout		Brown trout		Walleye		White sucker		Longnose sucker		Yellow perch	
		#	CPUE	#	CPUE	#	CPUE	#	CPUE	#	CPUE	#	CPUE
1992	127	0	0.00	1	0.01	25	0.20	183	1.44	1	0.01	5	0.04
1995	102	1	0.01	2	0.02	2	0.02	153	1.50	3	0.03	7	0.07
1997	119	0	0.00	1	0.01	5	0.04	275	2.30	0	0.00	1	0.01
1998	80	0	0.00	0	0.00	2	0.03	180	2.25	0	0.00	9	0.11
1999	130	3	0.02	0	0.00	9	0.07	154	1.18	0	0.00	24	0.18
2000	120	1	0.01	0	0.00	14	0.12	152	1.27	0	0.00	9	0.08
2001	110	1	0.01	0	0.00	11	0.10	104	0.94	0	0.00	25	0.23
2002	103	1	0.01	0	0.00	10	0.10	81	0.78	0	0.00	2	0.02
2003	101	2	0.02	0	0.00	7	0.07	110	1.09	0	4.00	0	0
2005	119	1	0.01	0	0.00	11	0.09	42	0.35	0	0.00	4	0.03
Totals		**10**	**0.088**	**4**	**0.036**	**96**	**0.828**	**1434**	**13.11**	**4**	**4.037**	**86**	**0.77**

[1]Source: PPL Montana 2006.

Table 3-11 (cont.). Fish Species in Morony Reservoir; Gillnet Sampling 1992 to 2005 Catch per Unit Effort (CPUE)[1]

	Carp		Mountain whitefish		Flathead chub		Black bullhead		Sauger		Total Fish
	#	CPUE	#	CPUE	#	CPUE	#	CPUE	#	CPUE	
1992	0	0	0	0		0	0	0	0	0	**215**
1995	1	0.01	0	0	1	0.01	7	0.1	0	0	**176**
1997	3	0.03	0	0	0	0	1	0	0	0	**286**
1998	0	0	0	0	0	0	0	0	0	0	**191**
1999	0	0	0	0	0	0	0	0	0	0	**187**
2000	0	0	0	0	0	0	4	0	2	0	**181**
2001	0	0	0	0	0	0	0	0	0	0	**140**
2002	1	0.01	0	0	0	0	0	0	0	0	**94**
2003	0	0	0	0	0	0	0	0	2	0	**119**
2005	0	0	0	0	0	0	1	0	2	0	**60**
Totals	**5**	**0.04**	**0**	**0**	**1**	**0.01**	**13**	**0.1**	**6**	**0.1**	**1649**

[1]Source: PPL Montana 2006.

and yellow perch fairly abundant; and rainbow trout, brown trout, longnose sucker, black bullhead, carp, sauger and flathead chub in low numbers. FWP and PPL Montana are using Morony Reservoir to rear sauger (*Sander canadensis*), a Montana species of concern, for reintroduction into riverine habitats (Gardner, 2005; WESTECH, 2006c).

Water Quality

The reach of the Missouri River from Rainbow Dam to Morony Dam is listed as impaired on Montana's 2000 303(d) list. This list classifies water bodies based on the level of pollutants that reduce water quality, and impair designated uses (DEQ, 2004d). Waters on the 303(d) list must have Total Maximum Daily Loads (TMDLs) developed to return the waters to full support of all designated uses. The river reach adjacent to the proposed site is listed as impaired due to excess metals, siltation, fish habitat degradation, suspended solids, turbidity, and other habitat alterations (DEQ, 2004d).

Wetlands

Wetlands delineations satisfying Section 404 of the Clean Water Act were not conducted in the HGS project areas during field survey (WESTECH, 2005). However, field work and review of aerial photographs of the entire area suggested that jurisdictional wetlands are generally limited to narrow fringes of perennial streams such as Box Elder Creek and the Missouri River. There appeared to be few if any permanent, seasonal or temporary wetlands in upland habitats that would be affected by the various aspects of the project (WESTECH, 2005). Five small, isolated wetlands (designated as "freshwater emergent wetland" and "other") are shown within the proposed Salem site on the USFWS National Wetlands Inventory (USFWS, 2006). These wetlands are not jurisdictional under current federal agency interpretation of Section 404.

Another isolated wetland appears to be near the proposed water pipeline route; this wetland can be easily avoided. The upper ends of several incised drainages visited during the survey did not show defined channel (bed and bank) characteristics, but a channel (often intermittent) was present farther down the drainage. However, drainages with water flow for more than 95 days out of the year are considered state waters, and most drainages classified as "intermittent" on USGS topographic maps meet this criteria.

3.4.4 FEDERALLY LISTED ENDANGERED OR THREATENED, AND STATE LISTED SPECIES OF CONCERN

Endangered or Threatened Species

The USFWS identified two federally listed species that could occur in the project region, bald eagle (threatened) and Canada lynx (threatened) (WESTECH, 2005).

Bald eagle
There is a bald eagle nest near the confluence of Belt Creek and the Missouri River, approximately one mile (1.6 km) downstream from Morony Dam (Dubois, 2005; WESTECH, 2005). The site is about two miles (3.2 km) from both the Salem plant site and the proposed raw

water pipeline intake on the Missouri River above Morony Dam, and is not visible from either site. The nest was inactive in 2004 (Dubois, 2004; WESTECH, 2005) but was active in 2005 and produced one fledgling (Taylor, 2005; WESTECH, 2005). There are no other known bald eagle nests or territories upstream from Belt Creek to the City of Great Falls (Taylor, 2005; WESTECH, 2005).

Figure 3-30. Bald Eagle

Canada lynx
Eastward range extensions of lynx into Montana, Idaho and Washington follow boreal forests at higher elevations (Foresman, 2001). Lynx distribution and abundance is closely associated with those of their primary prey species, the snowshoe hare (*Lepus americanus*), found in young, dense lodgepole pine stands. Lynx den in areas of dense canopy closure with a high density of downed trees, located near stands that provide suitable foraging habitat. Both stand types must be adjacent to each other to provide suitable lynx habitat, or suitable travel corridors must exist between them (Foresman, 2001). The project area does not support suitable Canada lynx habitat, and lynx have not been reported within 10 miles (16 km) of the project vicinity (MNHP, 2005a; WESTECH, 2005).

Animal Species of Concern

One fish, one reptile and eight bird species that are considered to be of special concern in Montana (that is, at risk or potentially at risk of declining or disappearing in the state) have been recorded within 10 miles (16 km) of the HGS project (Table 3-6; MNHP, 2005a). Additional species may occur but have not been documented by MNHP (WESTECH, 2005).

Aquatic species
The blue sucker (*Cycleptus elongatus*) and spiny softshell turtle (*Trionyx spiniferus*) are known to occur along the Missouri River below Morony Dam (WESTECH, 2006d), downstream of the proposed project site. Both species prefer large prairie rivers and streams. Construction of dams on these rivers is credited with restricting the distribution of both species (MNHP, 2005b). FWP is rearing sauger in Morony Reservoir, the body of water which includes the proposed raw water intake site (WESTECH, 2006c). Sauger is a state species of concern, and the fish in this Morony Reservoir population will be used in reestablishment programs in other Montana waters (Gardner, 2005; WESTECH, 2006c).

Avian species
In Montana, ferruginous hawks (*Buteo regalis*) prefer to nest in prairie shrub habitats, often with steep slopes, with an abundance of small mammals (rodents to jackrabbits) for prey; they generally avoid nesting in areas converted to agriculture (MNHP, 2005b). The incised drainage habitat and uplands associated with the Missouri River could be considered nesting habitat for the ferruginous hawk, along with several other species such as prairie falcon (*Falco mexicanus*), Swainson's hawk (*B. swainsoni*), and red-tailed hawk (*B. jamaicensis*) (Taylor, 2005). There are

no known nests in the project vicinity; the nearest reported nest is about 10 miles (16 km) to the northwest (MNHP, 2005a; WESTECH, 2005). Ferruginous hawks, along with many other species of raptors, would be expected to be present in the HGS project vicinity during migration.

Similarly, the burrowing owl (*Athene cunicularia*) is a ground-dwelling bird associated with burrows of ground squirrel (*Spermophilus* spp.), prairie dogs (*Cynomys* spp.) and badgers in prairie grasslands (MNHP, 2005a). Therefore the species could occur in the incised drainage and grassland habitat of the HGS project vicinity, although no nests are known from the area (WESTECH, 2005).

The white-faced ibis (*Plegadis chihi*), black-crowned night heron (*Nycticorax nycticorax*), Franklin's gull (*Larus pipixcan*), common tern (*Sterna hirundo*) and black tern (*Chilidonias niger)* are generally associated with wetlands and large rivers. All five species could occur along the Missouri River in the HGS project vicinity during migration, but none would be expected to nest there (MNHP, 2005b). Franklin's gulls were observed in agricultural fields during the survey in April 2005. All nesting records of these species are from Benton Lake National Wildlife Refuge, about 7-12 miles (11-19 km) from the HGS project (WESTECH, 2005).

Mammalian Species of Interest

Mule deer (*Odocoileus hemionus*) are the most common big game animal in the project vicinity (Figure 3-31). They are non-migratory, year-round residents of the area, primarily using the "breaks" habitats (also referred to as "incised drainages" and "Missouri River associated uplands") but also feeding in adjacent grain fields and Conservation Reserve Program (CRP) fields. The Salem plant site is on the west edge of a 70 square-mile (181 sq.-km) "mule deer census area", which is surveyed four times per year (one aerial survey after hunting season and three more in spring). In recent years with mild winters FWP typically counts about 500 mule deer in this area, which extrapolates to approximately seven deer per square mile (18/sq. km). Similar densities would be expected in the Highwood Generating Station project area (WESTECH, 2006e).

Figure 3-31. Mule Deer

There are a few white-tailed deer (*Odocoileus virginianus*) along Belt Creek and Rogers Coulee (the first drainage east of the Salem plant site), and they could be expected in low numbers in most drainages with riparian habitat. FWP typically counted about 50 white-tailed deer in the adjacent mule deer census area, indicating that they are much less common than mule deer, or about 0.7 deer/mi^2, or just one-tenth the density of mule deer (WESTECH 2006e).

The area affected by the HGS is not particularly good pronghorn (*Antilocapra americana*) habitat, primarily because the native vegetation on level-to-gently rolling areas has been converted to agriculture. In the mule deer census area east of the Salem site, FWP typically counted about 100 pronghorn, or about 1.4/mi^2 (WESTECH 2006e).

Other game/furbearer species in the area are sharp-tailed grouse (*Tympanuchus phasianellus*), gray partridge (*Perdix perdix*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), mountain lion (*Puma concolor*), and bobcat (*Lynx rufus*) (WESTECH 2006e).

Plant Species of Concern

Within 10 miles (16 km) of the HGS there are records of eight species of plants considered species of concern in Montana from (Table 3-6; MNHP, 2005d; WESTECH, 2005).

Two species of moss (*Entosthodon rubiginosus* and *Funaria americana*) were recorded along the Missouri River upstream of the current Cochrane Dam in the late 1880s and early 1900s (WESTECH, 2005).

Noxious Weeds

Table 3-12 includes the species found in the proposed project area:

Table 3-12. Noxious Weeds Observed During the Field Reconnaissance[1]

Common name	Scientific name	Locations
Canada thistle	*Cirsium arvense*	Common and widespread. Observed in small patches in barrow pits and pastures throughout the area, and particularly at the Great Falls Industrial Park site and along Box Elder Creek near the crossing of the fresh and waste water pipeline corridor.
Field bindweed	*Convolvus arvensis*	Common. Spotty distribution along road edges, barrow pits and fields. Observed at the Great Falls Industrial Park site.
Whitetop	*Cardraria draba*	Spotty. Observed along Box Elder Creek near the crossing of the fresh and waste water pipeline corridor, and in incised drainages and mesic sites along the Missouri River.
Leafy spurge	*Euphorbia esula*	Spotty in small patches near the existing Great Falls substation and in incised drainages along the north shore of the Missouri River between Rainbow and Cochrane Dams.
Spotted knapweed	*Centaurea maculosa*	Common and widespread in incised drainages and uplands along the Missouri River.
Dalmatian toadflax	*Linaria dalmatica*	Observed along Highway 87/89 near Malmstrom AFB. May be more widely distributed than observed.

[1]Source: WESTECH, 2006f

3.5 ACOUSTIC ENVIRONMENT

3.5.1 NOISE TERMINOLOGY

Noise is generally defined as "unwanted sound." It varies enormously, and can be intermittent or continuous, steady or impulsive, stationary or transient. Noise can influence humans or wildlife by interfering with normal activities or diminishing the quality of the environment. Human and animal perception of noise is affected by intensity, frequency, pitch and duration, as well as the auditory system and physiology of the animal. Noise levels heard by humans and animals are dependent on several variables, including distance, ground cover, and objects or barriers between the source and the receiver, as well as atmospheric conditions.

The loudest sounds that can be detected comfortably by the human ear have intensities that are 1 trillion (1,000,000,000,000) times larger than those of sounds that are barely audible. Because of this vast range, a logarithmic unit known as the decibel (dB) is used to represent the intensity of a sound. Such a representation is called a sound level. Humans typically have reduced hearing sensitivity at low frequencies compared with their response at high frequencies, and the "A-weighting" of noise levels, or A-weighted decibels (dBA), closely correlates to the frequency response of normal human hearing. Common noise levels and their effects on the human ear are shown in Table 3-13.

Table 3-13. Common Noise Levels and Their Effects on the Human Ear

Source	Decibel Level (dBA)	Exposure Concern
Soft Whisper	30	Normal safe levels.
Quiet Office	40	
Average Home	50	
Conversational Speech	66	
Busy Traffic	75	May affect hearing in some individuals depending on sensitivity, exposure length, etc.
Noisy Restaurant	80	
Average Factory	80 – 90	
Pneumatic Drill	100	Continued exposure to noise over 90 dB may eventually cause hearing impairment.
Automobile Horn	120	

(DOD, 1978)

Certain land uses, facilities, and the people associated with these noise levels are more sensitive to a given level of noise than other uses. Such "sensitive receptors" include schools, churches, hospitals, retirement homes, campgrounds, wilderness areas, hiking trails, and some species of threatened or endangered wildlife. Recommended land use and associated noise levels developed by the Dept. of Housing and Urban Development (HUD) are illustrated in Table 3-14.

Table 3-14. Recommended Land Use Noise Levels				
	Ldn Noise Levels (dBA)			
Land Use Category	Clearly Acceptable	Normally Acceptable	Normally Unacceptable	Clearly Unacceptable
Residential	< 60	60-65	65-75	> 75
Commercial, Retail	< 65	65-75	75-80	> 85
Commercial, Wholesale	< 70	70-80	80-85	> 85
Manufacturing	< 55	55-70	70-80	> 80
Agriculture, Farming	< 75	> 75		
Natural Recreation Areas	< 60	60-75	75-85	> 85
Hospitals	< 60	60-65	65-75	> 75
Schools	< 60	60-65	65-75	> 75
Libraries	< 60	60-65	65-75	> 75
Churches	< 60	60-65	65-75	> 75
Nursing Homes	< 60	60-65	65-75	> 75
Playgrounds	< 55	55-65	65-75	> 75

(HUD, 1991)

For environmental noise studies, noise levels are typically described using A-weighted equivalent noise levels, Leq, during a certain time period. The Leq metric is useful because it uses a single number to describe the constantly fluctuating instantaneous ambient noise levels at a receptor location during a period of time, and accounts for all of the noises and quiet periods that occur during that time period.

The 90th percentile-exceeded noise level, L_{90}, is a metric that indicates the single noise level that is exceeded during 90 percent of a measurement period, although the actual instantaneous noise levels fluctuate continuously. The L_{90} noise level is typically considered the ambient noise level, and is often near the low end of the instantaneous noise levels during a measurement period. It typically does not include the influence of discrete noises of short duration, such as car doors closing, bird chirps, dog barks, car horns, wind gusts, etc. For example, if a continuously operating piece of equipment is audible at a measurement location, typically it is the noise created by the equipment that determines the L_{90} of a measurement period even though other noise sources may be briefly audible and occasionally louder than the equipment during the same measurement period (BSA, 2005).

The day-night average noise level, L_{dn}, is a single number descriptor that represents the constantly varying sound level during a continuous 24-hour period. The L_{dn} is typically calculated using 24 consecutive one-hour L_{eq} noise levels. The L_{dn} includes a 10 dBA penalty that is added to noises which occur during the nighttime hours between 10:00 p.m. and 7:00 a.m. to account for people's higher sensitivity to noise at night when the background noise level is typically low.

The ambient noise at a receptor location in a given environment is the all-encompassing sound associated with that environment, and is due to the combination of noise sources from many directions, near and far, including the noise source of interest. Noise levels typically decrease by approximately 6 dBA every time the distance between the source and receptor is doubled, depending on the characteristics of the source and the conditions over the path that the noise travels. A 6 dBA change in noise level is clearly perceptible to most people, and a 10-dBA increase in noise level is judged by most people as doubling of the sound level. The reduction or attenuation in noise levels is increased if a solid barrier – such as a man-made wall or building – or natural topography, blocks the direct line-of-sight (and noise propagation) between the noise source and receptor.

3.5.2 NOISE GUIDELINES

Federal guidelines as well as City of Great Falls noise regulations or ordinances exist that may govern environmental noise levels or to limit noise generated by the Proposed Action. As a result of the Noise Control Act of 1972, the U.S. Environmental Protection Agency (EPA) developed acceptable noise levels under various conditions that would protect public health and welfare with an adequate margin of safety. EPA identified outdoor L_{dn} noise levels less than or equal to 55 dBA as sufficient to protect public health and welfare in residential areas and other places where quiet is a basis for use (EPA, 1979). Although the EPA guideline is not an enforceable regulation, it is a commonly accepted target noise level for environmental noise studies. Both NEPA and the Endangered Species Act (1973) define noise-related disturbances on wildlife as “harassment”. No guidelines or regulations have been developed to quantify animal annoyance noise levels, and there are no well-established limits or standards for limiting noise exposure in animals (Bowles, 1995).

Train noise is regulated through the Federal Railroad Administration (49 CFR 210 and 40 CFR 201). A partial summary of the railroad noise standards is listed in Table 3-15.

Table 3-15. Summary of Railroad Noise Standards (40 CFR 201)

Noise Source	Noise Level at 100 feet (dBA)	Noise Level at Receiving Property Line (dBA)
Locomotive – stationary, idle throttle setting.	70	65
Locomotive – stationary, all other throttle settings.	87	65
Locomotive – moving.	90	65
Rail car operations – moving at speeds of 45 mph or less.	88	65
Rail car operations – moving at speeds greater than 45 mph.	93	65

Notes: Locomotive standards listed are for equipment manufactured after December 31, 1979.
Source: BSA, 2005

The Montana Department of Transportation (MDT) determines traffic noise impacts based on the noise levels generated by peak-hour traffic. The MDT criteria state that traffic noise impacts occur if predicted one-hour L_{eq}(h) traffic noise levels are 66 dBA or greater at a residential property during the peak traffic hour (MDT, 2001a).

The City of Great Falls has a noise ordinance defined in the municipal code (City of Great Falls, 2005a). Tables 3-16 and 3-17 list the noise ordinance limitations.

Table 3-16. Noise Level Limitations for Structures and Open Spaces – Great Falls Municipal Code

Zoning District	Daytime Noise Level Limit (8 a.m. to 8 p.m.)	Nighttime Noise Level Limit (8 p.m. to 8 a.m.)
Residential	55 dBA	50 dBA
Light commercial	65 dBA	60 dBA
Heavy commercial	70 dBA	65 dBA
Industrial	80 dBA	75 dBA

Notes:
1 At boundaries between zones, the lower noise level shall be applicable.
2 Construction projects shall be subject to the maximum permissible noise levels specified for industrial districts.
3 All railroad right-of-ways and the operation of trains shall be considered as industrial districts.
4 Source: City of Great Falls 2005a; BSA, 2005.

Table 3-17. Maximum Permissible Noise Levels for Motor Vehicles – Great Falls Municipal Code

Vehicle Type	Weight	Maximum Noise Level Measured at 50 feet (dBA)	Maximum Noise Level Measured at 25 feet (dBA)
Trucks and buses	Over 10,000 pounds	82	88
	Under 10,000 pounds	74	80
Passenger cars and motorcycles	NA	74	80

Source: City of Great Falls 2005a; BSA, 2005

The Salem and Industrial Park sites both are located in unincorporated areas of Cascade County. However, according to the City of Great Falls planning department, SME has approached the City regarding annexation. If either site is annexed into the City, then the City noise ordinance would be applicable for the specified zoning district. For example, the malt plant located adjacent to and northeast of the Industrial Park Site was recently annexed into the City and zoned I2 – Heavy Industrial. The City noise ordinance also is applicable for transportation (e.g., trains and heavy trucks) of power plant materials through the City limits (City of Great Falls 2005b).

3.5.3 EXISTING ACOUSTIC ENVIRONMENT AT BOTH ALTERNATIVE SITES

The Salem site is located in a rural area approximately eight miles (13 km) east of Great Falls in Cascade County. The surrounding land use is agricultural with scattered rural residences. Approximately eight residences are located within three miles of the Salem Site, and the closest residence is located about 0.5-mile (0.8-km) northwest. A Lewis and Clark Interpretative site (i.e., the Portage Staging Area) is located about one mile north, the Morony Dam on the Missouri River is located approximately 1.5 miles (2.4 km) northwest, and the closest point on Belt Creek is located approximately 1.5 miles northeast. Primary noise sources include traffic on county roads, noise generated by wind blowing through grass, water flowing in nearby creeks, wildlife, insects, birds, and aircraft flying overhead (BSA, 2005). These noise sources are characteristic of rural settings.

The Industrial Park site is located in Cascade County, Montana northeast of Great Falls and about 0.5 mile (0.8 km) north of Black Eagle. The surrounding land use is mixed with residential, commercial, and industrial uses, which are primarily unincorporated. Approximately seven groups of residences are located within one mile of the Industrial Park site, primarily along Black Eagle Road, Rainbow Dam Road, and Bootlegger Trail. Primary noise sources include traffic, industrial equipment (e.g., large fans), wind-generated noise, insects, birds, and aircraft flying overhead (BSA, 2005). The more developed condition of the Industrial Park site is reflected in these predominantly artificial noise sources compared to the predominantly natural noise sources of the Salem location.

In late August and early September 2005, the acoustical consulting firm Big Sky Acoustics (BSA) conducted ambient (background) noise level measurements at both the Salem and Industrial Park sites in general accordance with the American Society for Testing and Materials (ASTM) E1014, *Standard Guide for Measurement of Outdoor A-weighted Sound Levels* (ASTM, 2000). These measurements were taken to establish the typical ambient noise levels within approximately three miles of the Salem Site and one mile of the Industrial Park Site, where the primary noise sensitive receptors are located. Short-term measurements of 10-minute duration were conducted at a total of seven locations, and the L_{eq} and L_{90} for each 10-minute period were recorded. BSA completed two continuous 24-hour measurements, and the L_{eq} and L_{90} in 30-minute increments were also recorded (BSA, 2005).

Around the Salem Site, the L_{90} ambient short-term noise levels ranged from 20 to 47 dBA, and were influenced by chirping insects. Around the Industrial Park Site, the short term noise levels ranged from L_{90} 28 to 44 dBA, and were influenced by nearby traffic and chirping insects (Table 3-18).

BSA also conducted 24-hour measurements to determine the general existing ambient noise level trends versus time of day in the vicinity of the proposed Salem and Industrial Park sites. The 48 consecutive, 30-minute L_{eq} data were used to calculate the L_{dn} levels at the measurement locations. The measured L_{dn} data at the 24-hour measurement locations are listed in Table 3-19. The calculated noise levels based on the measurements were L_{dn} 47 dBA at the Salem site and L_{dn} 53 dBA at the Industrial Park site. Since the measurements were completed in the summer months, insect noise appears to have influenced the measured L_{dn} values. Based on site

Table 3-18. Measured Short-term Ambient Noise Levels at Salem and Industrial Park Sites

Measurement Location	Date and Start Time (hours)	Measured L_{eq} (dBA)	Measured L_{90} (dBA)	Dominant Noise Sources
Salem Site				
1A	8/25/05 at 2151	29 dBA	25 dBA	Insects chirping.
	8/26/05 at 0837	34 dBA	31 dBA	Insects chirping and wind in grass.
	9/01/05 at 1814	48 dBA	47 dBA	Insects chirping.
1B	8/25/05 at 2211	22 dBA	20 dBA	Insects chirping.
	9/01/05 at 1832	46 dBA	45 dBA	Insects chirping.
1C	8/25/05 at 2241	28 dBA	23 dBA	Insects chirping.
	9/01/05 at 1843	47 dBA	38 dBA	Insects and birds chirping.
Industrial Park Site				
2A	8/25/05 at 2325	37 dBA	31 dBA	Pump station hum.
	9/01/05 at 1640	38 dBA	34 dBA	Insects chirping.
2B	8/25/05 at 2344	42 dBA	38 dBA	Traffic on US 87 and insects chirping.
	8/26/05 at 1024	52 dBA	44 dBA	Traffic on 36th Avenue NE, insects chirping, and heavy equipment to south.
	9/01/05 at 1721	45 dBA	39 dBA	Traffic on 26th Avenue NE and insects chirping.
2C	8/26/05 at 0002	41 dBA	39 dBA	Hum of industrial machinery to the west.
	8/26/05 at 1048	48 dBA	44 dBA	Traffic on US 87 and Rainbow Dam Road.
	9/01/05 at 1602	49 dBA	39 dBA	Traffic on Rainbow Dam Road.
2D	8/26/05 at 0020	31 dBA	28 dBA	Insects chirping.
	9/01/05 at 1622	42 dBA	35 dBA	Insects chirping.

Source: BSA, 2005

observations and the 10-minute measurement results around each site (Table 3-16), the estimated L_{dn} values during quiet periods would be approximately L_{dn} 30 dBA at the Salem site and L_{dn} 45 dBA at the Industrial Park site.

Table 3-19. Long-term 24-hour Ambient Noise Levels at Salem and Industrial Park Sites

Measurement Location	Site	Date and Time (hours)	Calculated L_{dn} (dBA)	Estimated L_{dn} During Quiet Periods (dBA)
1	Salem	8/31/05 at 1800 to 9/01/05 at 1800	47 dBA	30 dBA
2	Industrial Park	8/31/05 at 1730 to 9/01/05 at 1730	53 dBA	45 dBA

Source: BSA, 2005

At the Salem site, the L_{90} ambient noise levels were 18 to 35 dBA from 8:00 p.m. to 8.00 a.m., which is typical for quiet rural environments at night. At the Industrial Park site, the L_{90} ambient noise levels were 36 to 45 dBA from 8:00 p.m. to 8:00 a.m., which is typical for quiet suburban areas at night (Harris, 1998). At both locations, L_{90} ambient noise levels were substantially higher during the daytime (8:00 a.m. to 8:00 p.m.) (Figures 3-32 and 3-33).

Figure 3-32. Measured 24-hour Ambient Noise Levels – Salem Site

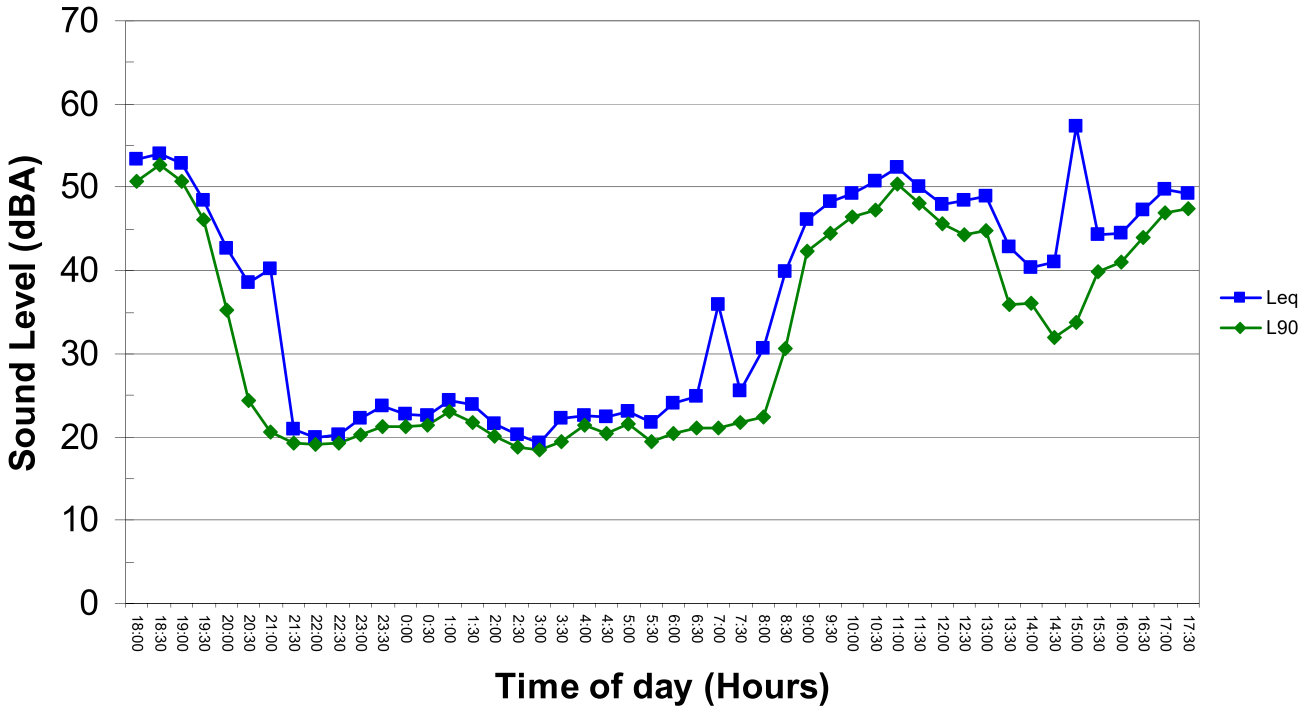
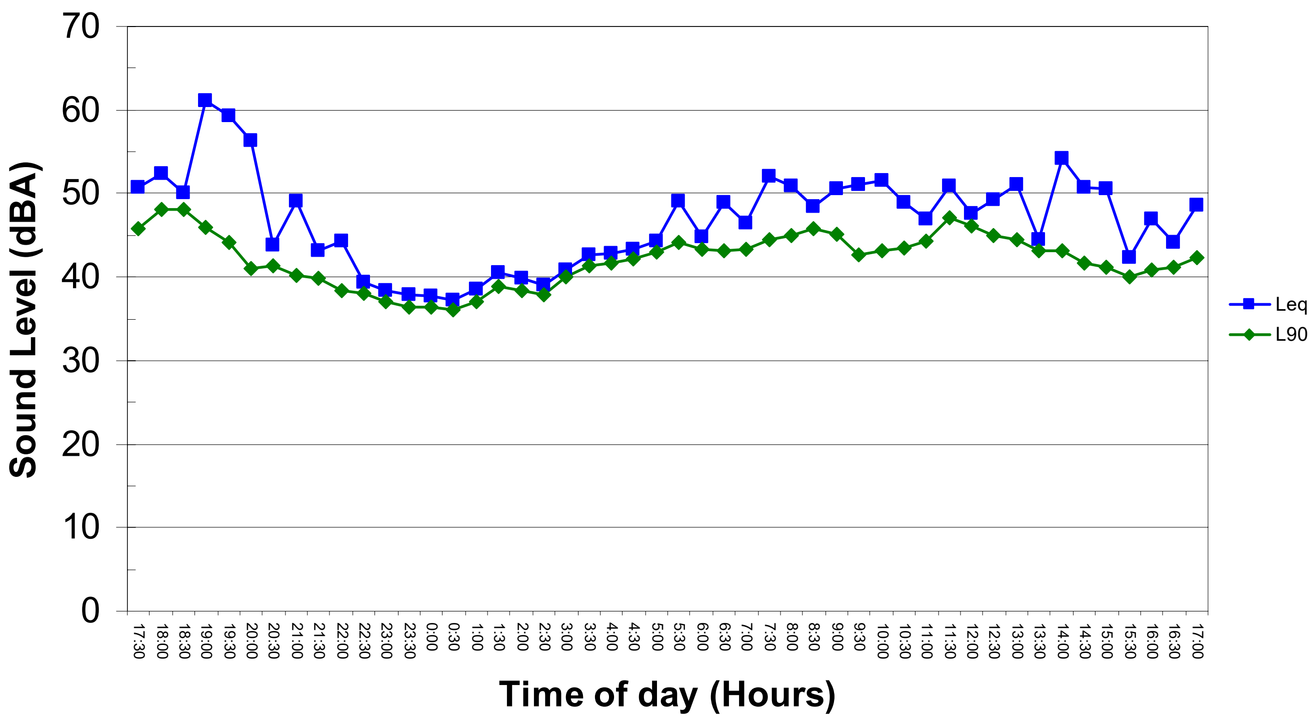


Figure 3-33. Measured 24-hour Ambient Noise Levels – Industrial Park Site



3.6 RECREATION

Montana's rugged outdoors is justly celebrated for the outstanding recreational opportunities it provides residents and visitors alike. The state boasts two national parks – Yellowstone and Glacier – that are internationally famous for their scenery, wilderness and wildlife. Set aside in 1872 and best-known for its geysers and geothermal activity, Yellowstone National Park, most of which is in Wyoming, was the first national park established not only in the United States but the entire world, initiating a global "national parks movement" that continues to this day. Renowned for its spectacular lakes, steep mountains, glaciers, and U-shaped, glacier-gouged valleys, Glacier became the country's 10th national park in 1910 (Uhler, 2002), even before the National Park Service itself was created in 1916. Glacier abuts the international border with Alberta and Canada's Waterton National Park, and the two parks form a single unit known as the Glacier-Waterton International Peace Park.

Nine national forests managed by the U.S. Forest Service, concentrated in western Montana, and nearly eight million acres (3.2 million hectares) managed by the Bureau of Land Management (BLM), concentrated in eastern Montana, also furnish facilities and opportunities for hiking, backpacking, camping, fishing, hunting, cross-county and downhill skiing, snowmobiling, "off-roading," boating, canoeing, kayaking, and other recreational pursuits.

In addition to de facto and recommended wilderness areas within Montana's national parks, five designated wilderness areas in national forests and one in a national wildlife refuge are located within 150 miles (240 km) of Great Falls, the Salem site and Industrial Park alternative site: Gates of the Mountains (Helena National Forest), Scapegoat (Lewis and Clark, Lolo, and Helena national forests), Bob Marshall (Flathead, Lolo, and Lewis and Clark national forests), Mission Mountain (Flathead National Forest), UL Bend (Charles M. Russell National Wildlife Refuge), and Anaconda Pintler (Beaverhead-Deerlodge and Bitterroot national forests).

Montana Fish, Wildlife & Parks operates the State of Montana's state park system. Four state parks are located within 50 miles (80 km) of Great Falls: Giant Springs, Sluice Boxes, Tower Rock, and Ulm Pishkun (FWP, no date).

Figure 3-34. Giant Springs State Park astride the Missouri River

Giant Springs State Park (Figures 3-34 and 3-35) is located just outside Great Falls on the Missouri River at river mile 2108, a little more than one mile (1.6 km) upstream of Rainbow Falls. The 851-acre (344-ha) park is about a mile east-

Figure 3-35. Fishing the Missouri River from Giant Springs State Park near Great Falls

southeast of the alternative Industrial Park site and about nine miles west of the preferred Salem site. Giant Springs, discovered by the Lewis and Clark Expedition in 1805, is one of the largest freshwater springs in the world, discharging some156 million gallons of water per day. This day-use park offers visitors an opportunity to picnic by the Missouri River, visit the Giant Springs Trout Hatchery and visitor center, walk along the Rivers Edge Trail, view nearby Rainbow Falls overlook, or visit the neighboring Lewis and Clark Interpretive Center operated by the U.S. Forest Service. Outdoor activities available at Giant Springs State Park include boating, fishing, picnicking, bicycling, and wildlife viewing. Park facilities include a visitor center, group use area, grills, playground, an interpretive trail and sanitation facilities (FWP, no date).

Established in the mid-1970s, Giant Springs State Park encompasses slightly over 3,000 acres (120 ha) in total (most of which is conservation easement). About 90 percent is on the north shore of the Missouri River. The park receives about 160,000 visitors a year (Auchly, 2005).

Sluice Boxes State Park, located in a rugged area that features remains of mines, a railroad, and historic cabins, is situated 28 miles (45 km) southeast of Great Falls on Belt Creek, a tributary of the Missouri River that passes within a mile of the Salem site and discharges into the Missouri two miles (3.2 km) from the Salem site. However, the park is located well upstream – more than 25 miles (40 km) away – of where Belt Creek passes near the proposed HGS site.

Tower Rock State Park, the newest state park in Montana, is located on the Missouri River at river mile 2181, about 33 miles (53 km) southwest of Great Falls. Tower Rock itself is described and named in the journals of Lewis and Clark. As Lewis wrote, “It may be ascended with some difficulty nearly to it's summit and from it there is a most pleasing view of the country we are now about to leave. From it I saw that evening immense herds of buffaloe in the plains below [sic].” This park is about 36 miles (58 km) from Great Falls and the Industrial Park site and more than 40 miles (93 km) from the Salem site.

The Lewis and Clark National Historic Trail Interpretive Center is operated by the U.S. Forest Service. It is located on Giant Springs Road near the state park, above the bluffs overlooking the Missouri River (USFS, 2005). The 25,000 square-foot building includes a permanent exhibit hall, 158-seat theater, an education room for hands-on, curriculum-based activities, and a retail store (Figure 3-36). The center is handicapped accessible and offers parking for tour buses as well as recreational vehicles. Several trails offer outdoor recreation opportunities to learn about plants native to the Northern Plains. This interpretive center is about a mile (1.6 km) east-southeast of the alternative Industrial Park site and about nine miles (14 km) west of the preferred Salem site. The center's mission is to evoke in the public a personal sense of President Thomas Jefferson's vision of expanding America to the west. It seeks to inspire awe toward the challenges faced by the Corps of Discovery as they portaged the great falls of the Missouri River and explored the 'unknown.' The center also aims to bring to life the daily experiences of the expedition and the environment and native peoples of the 'uncharted West'; and lastly, celebrate "the indomitable spirit of human discovery we all share" (USFS, 2005).

Figure 3-36. Lewis and Clark Interpretive Center

The City of Great Falls Parks and Recreation Department manages and maintains a number of parks within the city limits (CGFPR, no date). The Elks Riverside Park runs along the Missouri River southwest and within a couple of miles of the alternative Industrial Park site. It has picnic shelters and tables, barbecue facilities, open space, tennis courts, horseshoe pits, and restroom facilities. Among its other parks, Great Falls Parks and Recreation also runs the River Side Railroad Skate Park, a park dedicated to skateboarding, and Gibson Park, named for Great Falls' visionary founder Paris Gibson. The Anaconda Hills Golf Course is an 18-hole, public facility about a half-mile south (0.8 km) of the Industrial Park site (TGC, 2004).

Figure 3-37. River Side Railroad Skate Park in Great Falls

The 25-mile (40 km) long River's Edge Trail meanders through the City of Great Falls area, broadly paralleling the Missouri River while connecting parks and other points of interest along the river, including Black Eagle Falls, Rainbow Falls, Crooked Falls and "The Great Falls of the Missouri" just below Ryan Dam (RT, 2000). This public trail is free and open during daylight hours for 365 days of the year to all non-motorized recreationists, including bicyclists, walkers, joggers, runners, roller blading enthusiasts, and others. The trail was developed as a cooperative partnership by the City of Great Falls, Cascade County, the Montana Department of Fish, Wildlife & Parks, the Montana Department of Transportation, the electric utility PPL Montana, a volunteer trail advocacy group (Recreational Trails, Inc.), and a supportive community. Eleven miles (18 km) of the trail are paved and wheelchair accessible; 14 miles (23 km) of the trail run along the Missouri River reservoirs and are gravel or single or double track. North and south shore trails are served by 11 trailhead parking areas. PPL Montana provides conservation and trail easements on native lands along the reservoirs that comprise much of the gravel and single track portions of the trail.

Figure 3-38. Sign at Entrance to Lewis and Clark Expedition Portage Staging Area near Salem Site

No recreation takes place directly on the two alternative sites for the proposed generating station. The preferred Salem site is a wheat field while the alternative site is former agricultural land that is now within the City of Great Falls' designated Central Montana Agricultural and Technology Park. With regard to the Salem location, the nearest public recreational site of some importance is the Lewis and Clark Expedition staging area historic site about 1.5 miles (2.4 km) away. The staging area includes a wayside along the Salem Road north of the proposed plant site; the wayside contains historic markers/signs describing the Corps of Discovery's month-long portage around the great falls of the Missouri River in June 1805 (Figure 3-38).

On this portion of the Missouri River, recreational fishing requires a warm water game fish stamp (FWP, 2005; Montana fishing regulations). However, fishing opportunities in the Morony Reservoir itself are reported to be non-existent because public access onto PPL-Montana property is prohibited (Urquhart, 2005). No other recreational facilities, parks, or opportunities are close to the Salem site.

The closest recreational sites to the alternative Industrial Park location are the several parks and River's Edge Trail mentioned above that run along the Missouri River. The closest of these is approximately a mile away from the southern edge of the Industrial Park alternative for the proposed SME generating station.

3.7 CULTURAL RESOURCES

Cultural resources are sites, features, structures, or objects that may have significant archaeological and historic values. Additionally, they are properties that may play a significant traditional role in a community's historically based beliefs, customs, and practices. Cultural resources encompass a wide range of sites and buildings from prehistoric campsites to farmsteads constructed in the recent past, as well as traditional cultural properties (TCP) still used today.

Sections 106 and 110 of the National Historic Preservation Act (NHPA, P.L. 89-655) provide the framework for federal review and protection of cultural resources, and ensure that they are considered during federal project planning and execution. The implementing regulations for the Section 106 process (36 CFR Part 800) have been developed by the Advisory Council on Historic Preservation (ACHP). The Secretary of the Interior maintains a National Register of Historic Places (NRHP) and sets forth significance criteria (36 CFR Part 60) for inclusion in the register. Cultural resources may be considered "historic properties" for the purpose of consideration by a federal undertaking if they meet NRHP criteria. The implementing regulations define an undertaking as "a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a federal agency, including those carried out by or on behalf of a federal agency; those carried out with federal financial assistance; those requiring a federal permit, license or approval; and those subject to state or local regulation administered pursuant to a delegation or approval by a federal agency." Historic properties may be those that are formally placed in the NRHP by the Secretary of the Interior, those that meet the criteria and are determined eligible for inclusion, and those that are yet undiscovered but may meet eligibility criteria.

3.7.1 Cultural Resources Inventory

3.7.1.1 Prior Investigations

Archaeologists conducted prefield research for previously recorded cultural resource sites within the general vicinity of the proposed HGS plant site and the alternate Great Falls Industrial Park location, as well as the corridors centered on the HGS's 28.4 miles (45.7 km) of connections (Dickerson, 2005). The prefield research encompassed a records search of the Montana State Historic Preservation Office (SHPO) records center and cultural resource site files at the Department of Anthropology, University of Montana, Missoula.

The file search and literature review revealed that 17 cultural resource investigations have been undertaken within one mile (1.6 km) of the HGS, its 28.4 miles of connections, and the Great Falls Industrial Park alternate plant site. Only two of those projects encompass significant portions of SME's current project area. During the early 1980s, Herbort (1981) conducted a cultural resource inventory of lands encompassing the HGS as well as adjoining areas as part of the Resource 89 Siting project. More recently, Wood (2004a) completed an intensive cultural resource examination and inventory of 328 acres (133 ha) around and within the entire Great Falls Industrial Park alternate plant site.

The 15 additional cultural resource projects previously conducted in the area overlap, or are situated adjacent to areas that SME currently proposes for development. Included are multiple inventory and subsurface testing projects completed for the Missouri-Madison Hydroelectric project (Greiser, 1980; Bowers, 1982; Deaver, 1990, 1991; Deaver and Peterson, 1992; Rossillon, 1992; Rossillon et al., 1993, 2003; Dickerson, 2000), cultural surveys near Giant Spring (Keim, 1997; Wood, 2004b) and Malmstrom Air Force Base (Greiser, 1988; Hoffecker, 1994), and documentation for the Great Northern Railway (Axline, 1995a, 1995b).

A professional archaeologist at Renewable Technologies, Inc. (RTI) completed the cultural resource inventory of the HGS project areas (Salem and Industrial Park sites) in 2005 (Dickerson, 2005). At the Salem site, the inventory encompassed a total of 1,180 acres (478 ha), covering the proposed HGS plant site and various 250-foot wide corridors, totaling 28.4 miles (46 km) in length, where proposed rail spur, electric transmission lines, as well as water intake and discharge pipelines will be located. Wood (2004a) inventoried the Industrial Park site in its entirety in 2004; hence RTI did not resurvey that portion of the project area.

The portion of the project area encompassing the Salem site had been previously inventoried in 1981, however, Montana SHPO staff consider that work to be out-dated and they requested that the area be resurveyed (Warhank, 2005).

The purpose of the RTI investigations of the project area was to: (1) identify any cultural resource properties within the surveyed portions of the project area; (2) provide baseline data regarding cultural resources, their constituents and locations; and (3) to present the current National Register status for each property and/or to provide an evaluation of each site's integrity, historic significance, as well as recommendation for determining National Register eligibility.

Section 3.7.1.2 presents a summary of the methodology for the cultural resources surveys conducted for SME's project areas. Section 3.7.1.3 presents a summary of the cultural resources located at the HGS and related connection lines. No cultural resources were found within the project boundaries of the alternate Industrial Park site during the 2004 project conducted by Wood, so no summary data are provided here.

3.7.1.2 Inventory Methodology

Prefield Research

Existing and readily available cultural site records, notes, maps, project reports, and related literature for previous cultural resource investigations within the project vicinity were collected and reviewed by RTI staff. A literature search was conducted at the Montana SHPO in Helena. All types of literature were reviewed to determine the locations of all known cultural resources with, and near, the proposed plant sites and connection line corridors. Additional information concerning specific cultural sites was obtained from the University of Montana, Department of Anthropology Archaeological Records Office in Missoula.

The identified previous cultural resource studies resulted in the identification and documentation of 21 historic and prehistoric sites located within one mile (1.6 km) of SME's proposed plant sites and connection corridors. Due to the sensitivity of cultural site location information, and its protection under federal and state laws, the locations of the various cultural sites are not presented in this document. Figure 4 in the RTI report (Dickerson, 2005:11) presents such information.

The largest of the sites is the Great Falls Portage National Historic Landmark. Many of the remaining sites are associated with historic hydroelectric developments at the Rainbow, Ryan, and Morony facilities (Dickerson, 2005:10). Other historic sites include the Giant Spring fish hatchery and access road, the Great Northern railway, the Chicago, Milwaukee, St. Paul, and Pacific railway, the Malmstrom Air Force Base Aircraft Alert Facility building, and multiple small trash dumps.

Prehistoric cultural properties are few and broadly dispersed in the project vicinity. They consist primarily of lithic scatters and sites containing small numbers of stone circles or stacked-rock cairns.

Only five of the above mentioned, previously recorded cultural properties lie within SME's project area. These sites include the Great Falls Portage National Historic Landmark (24CA238), the Chicago, Milwaukee, St. Paul, and Pacific Railroad (24CA264), historic transmission lines associated with the Morony (24CA289, Feature 2) and Rainbow (24CA291, Feature 34) hydroelectric facilities, and the Rainbow-Ryan Road (24CA416). The remaining 16 previously recorded sites are situated outside SME's project area.

Field Inventory

In 2004, Gar C. Wood and Associates (Wood, 2004a) conducted the cultural resource inventory of the area presently considered as the alternate Industrial Park site. The inventory used currently established standards from the MT SHPO and US Secretary of Interior for cultural resource pedestrian survey, inventory, analysis and recording. No sites were found or recorded within the alternate Industrial Park site area. No further discussion related to cultural resources for this particular site is warranted.

Figure 3-39 depicts the Area of Potential Effect (APE) of the Proposed Action, in particular the HGS Salem site. As noted in the figure, it includes a rectangular area whose length runs east-west and whose width runs north-south. The southwest corner of the APE is in the City of Great Falls, while the eastern and northern sides lie several miles east and north of the Salem site, respectively. Figure 3-39 shows key components of the Proposed Action as well as previously recorded and newly recorded historic properties.

Area of Potential Effect (APE)

Section 106 of the National Historic Preservation Act requires federal agencies to define and document the APE of "federal undertakings" in consultation with the SHPO. The reason for defining an APE is to determine the area in which historic properties must be identified, so that effects to any identified properties can, in turn, be assessed.

According to 36 CFR 800.16(d), the Area of Potential Effect is the **geographic area** or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if such properties exist. The area of potential effects is influenced by the **scale and nature of the undertaking** and may be different for different kinds of **effects** caused by the undertaking.

The APE should include:

- all alternative locations for all elements of the undertaking
- all locations where the undertaking may result in ground disturbance
- all locations from which elements of the undertaking (e.g. structures or land disturbance) may be visible or audible; and
- all locations where the activity may result in changes in traffic patterns, land use, public access, etc.

RTI's 2005 inventory of the proposed Salem plant site and related 28.4 miles (46 km) of connection lines were also conducted utilizing currently accepted professional standards for cultural resource survey, inventory, and recording. RTI staff conducted an intensive pedestrian cultural resource inventory of the project area during the period of October 4-13, 2005. The area examined in 2005 covered 1,180 acres (478 ha). Field work involved walking parallel transects spaced no more than 30 meters (100 feet) apart. Specific details of the survey methodology are contained in the project report (Dickerson, 2005:12-13). Field documentation consisted of marking exact site locations on topographic maps, measuring property dimensions, and describing the nature and extent of all cultural remains. Selected artifacts and cultural features were photographed. Site maps were produced showing the relative locations of all documented remains. No subsurface testing was conducted, nor were any cultural materials collected.

Historic Research

During the current investigation, RTI consulted a myriad of sources to gather information about the documented historic sites. Maps were reviewed that display the routes of historic roads and rail lines. An informal interview was made of the local resident of an area farmstead (Dickerson, 2005:13). Numerous cultural resource reports and historic overviews were consulted for information directly pertaining to historic development of the Great Falls hydroelectric facilities as well as the Chicago, Milwaukee, St. Paul, and Pacific Railroad's (Milwaukee Road) North Montana Line. Additionally, county land and title records were examined for information of historic title transfers for all recorded farmsteads within the project area.

Previously recorded cultural sites were reexamined with amendments made to existing Montana Cultural Resource Inventory System (CRIS) site forms. All newly discovered sites were recorded on CRIS forms.

3.7.2 Inventory Results

Ten cultural properties lie within the APE of SME's HGS Salem site. The ten include five previously recorded sites, and five discovered and recorded as part of the recent project (Dickerson, 2005:13). Nine of the ten sites were fully recorded or amended. One newly discovered farmstead (field number RTI-05025-04) was identified but not fully documented due to lack of access to the property. All of the properties are affiliated with the historic period.

Table 3-20 presents a list of the 10 sites documented within the project area. The sites include the Great Falls Portage National Historic Landmark (24CA238), the Chicago, Milwaukee, St. Paul & Pacific Railroad (24CA264), the Morony Transmission Line (24CA289, Feature 2), the Rainbow Transmission Line (24CA291, Feature 34), the Rainbow-Ryan Road (24CA416), three historic farmsteads (24CA986, 24CA987, and 24CA988), the Cooper Railroad Siding (24CA989), and another historic farmstead that has not been fully recorded (temporary field number RTI-05025-4).

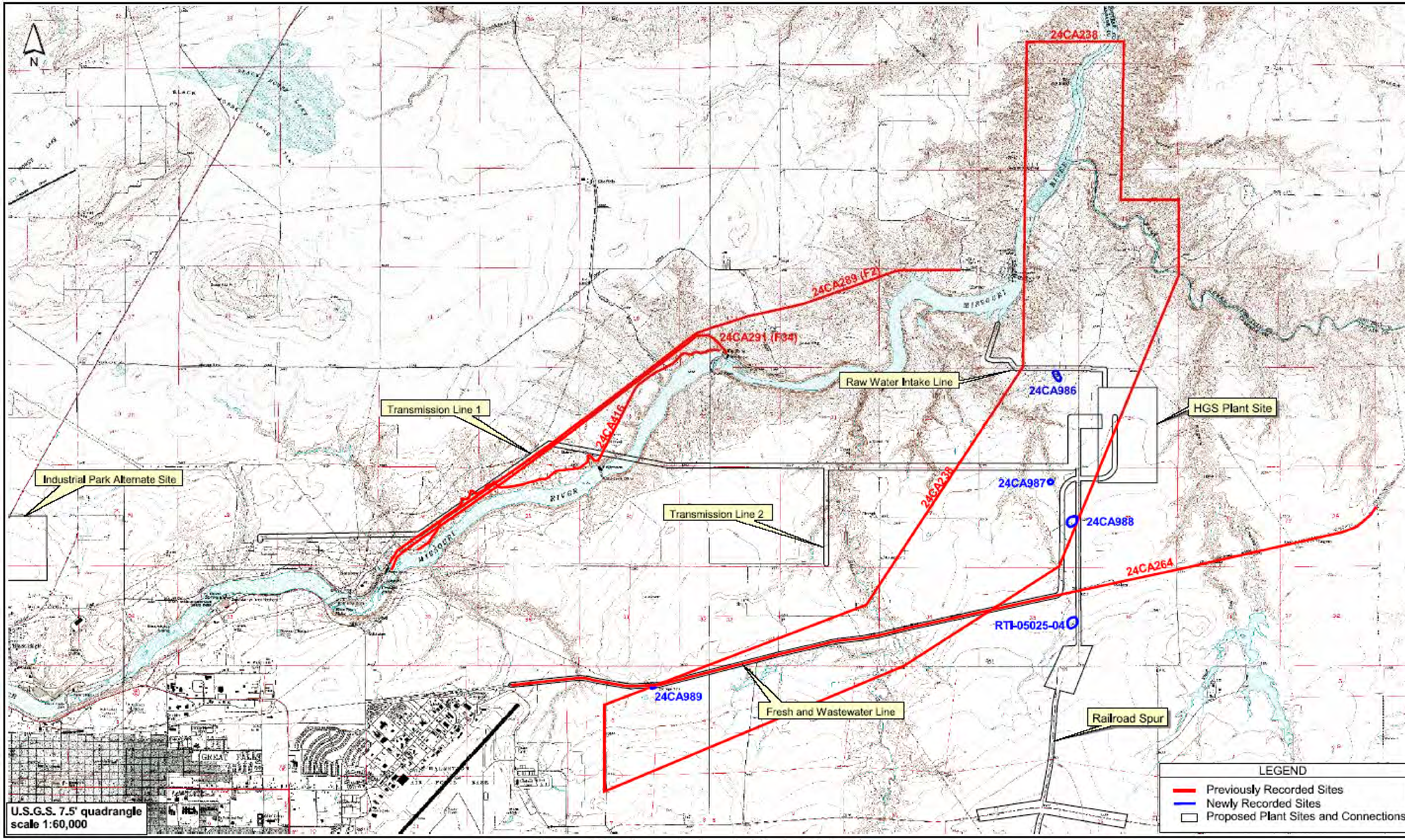


Figure 3-39. Area of Potential Effect of the Highwood Generating Station at the Salem Site

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Table 3-20. Cultural Sites Documented Within SME's Project Area

Site Number	Description	Legal Location*	National Register Eligibility/Status
24CA238	Great Falls Portage National Historic Landmark	T20N, R5E, Secs 3-7; T21N, R5E, Secs 13-14, 23-27, 33-35	Listed, National Historic Landmark
24CA264	Chicago, Milwaukee, St. Paul & Pacific Railroad	T20N, R4E, Sec 1; T20N, R5E, Secs 5, 6; T21N, R5E, Secs 32-35	Eligible; portion lying within SME's project area is a non-contributing element
24CA289 Feature 2	Morony Transmission Line	T21N, R4E, Secs 24-26	Contributing Element of an Eligible District
24CA291 Feature 34	Rainbow Transmission Line	T21N, R4E, Secs 24-26	Contributing Element of an Eligible District
24CA416	Rainbow-Ryan Road	T21N, R4E, Secs 25, 26; T21N, R5E, Sec 19	Eligible
24CA986	Historic Farmstead	T21N, R5E, Sec 23	Ineligible
24CA987	Historic Farmstead	T21N, R5E, Sec 26	Ineligible
24CA988	Historic Farmstead	T21N, R5E, Sec 26	Ineligible
24CA989	Cooper Siding	T20N, R5E, Sec 6	Ineligible
RTI-05025-4	Historic Farmstead	T21N, R5E, Sec 35	Unevaluated; presumed ineligible**

Source: Dickerson, 2005

* The legal locations listed above encompass only those portions of sites situated within SME's project area.

** Property RTI-05025-4 was noted in the field, but not formally recorded or evaluated for National Register eligibility.

Detailed descriptions and record forms for each site are contained in the project report: *Southern Montana Electric Generation and Transmission Cooperative's Highwood Generating Station, Cascade County, Montana: Cultural Resource Inventory and Evaluation* (Dickerson, 2005).

The Great Falls Portage National Historic Landmark (24CA238) (Figure 3-40) is a historic landscape area associated with the portage of the Lewis and Clarke, Corps of Discovery, travels around the Great Falls of the Missouri River in 1805. The site was designated as a National Historic Landmark on May 23, 1966, but its formal boundaries were not approved until June 17, 1985. The Great Falls Portage National Historic Landmark (NHL) is an approximately one-mile (1.6-km) wide discontinuous corridor spanning from the lower portage camp, located immediately north of the mouth of Belt Creek, to White Bear Island at the southern outskirts of Great Falls. RTI's 2005 inventory covered portions of the northern section of the NHL corridor extending northeast from the eastern boundary of Malmstrom Air Force Base. Within the inventory project area, RTI found no physical evidence of the Corps of Discovery's portage activities. No camp features, artifacts, or similar evidence were found on the surface.

Chicago, Milwaukee, St. Paul & Pacific Railroad (Milwaukee Road) (24CA264) (Figure 3-41) A 5.5-mile (8.9-km) section of the Milwaukee Road's North Montana Line east of Malmstrom Air Force Base lies within the current project area. SME proposes to bury fresh- and waste-water discharge lines within a section of the railroad grade extending from the HGS to points connecting with the Great Falls potable water and wastewater systems.

Figure 3-40. View of the Great Falls Portage National Historic Landmark's (24CA238), Northern End with Morony Dam in the Center and Belt Creek Canyon in the Distance

Figure 3-41. View toward East-Northeast of 242A262, the Historic Chicago, Milwaukee, St. Paul & Pacific Railroad

This historic period linear site consists of discontinuous sections of the Milwaukee Road and its spur lines in the Great Falls area. The property has been documented and described by several authors, a summary of which is provided by Dickerson (2005:20-21). A 5.5-mile (8.9 km) long section of the Milwaukee Road North Montana Line located east of Malmstrom Air Force Base lies within the current project area. The Milwaukee Road linear site, in its entirety within

Cascade County, has been recommended as eligible for listing on the National Register (Dickerson, 2005:22), however due to a lack of integrity exhibited by the 5.5-mile (8.9-km) segment within the proposed SME project area, Dickerson proposes that the particular segment to be a non-contributing element of the historic property.

Morony Transmission Line (24CA289, Feature 2) and Rainbow Transmission Line (24CA291, Feature 34) SME proposes to construct a new overhead transmission line that will run from the HGS to the Great Falls Switchyard. The new transmission line will cross the historic lines in one location and will run parallel for the remainder of the project area.

These historic sites constitute two parallel electric transmission lines recorded within the project area. The lines are associated with the Morony and Rainbow hydroelectric facilities constructed in the early 1900's. The historic electric transmission lines through the project area are contributing elements to the National Register eligible property of the Great Falls Historic Hydroelectric District (RTI, 1991: Section 7, page 30; Rossillon et al., 2003:28-30). It is understood that the transmission lines played integral roles in the early twentieth century development of the Missouri-Madison hydroelectric system.

Rainbow-Ryan Road (24CA416) Approximately 0.75 mile (1.2 km) of the historic road grade is within SME's project area.

Constructed in the 1920's to aid access between the Rainbow and Ryan power plants, the road was reconstructed as part of Montana's WPA-funded highway program in 1939. The roadway within the subject project area consists of a 22-foot wide graded gravel surface with four crossing structures consisting of three culverts with stone headwalls and one timber bridge with stone abutments. Previous and recent investigators of this site have recommended that the property is eligible for listing on the National Register. Investigators have considered the site eligible for National Register listing because it embodies significant design qualities and construction techniques used for secondary highways constructed with Public Works funds during the Depression era (Rossillon et al., 2003:34).

Historic Urquhart Farmstead (24CA986) The site is about 0.5 mile (0.8 km) northwest of the HGS. SME proposes to construct a buried raw-water intake pipeline immediately north of the farmstead.

The historic Urquhart Farmstead has structures which post-date the purchase by the Urquhart family in 1929. There are 11 historic buildings (pre-1955) on the property that continue in use as a family farm. According to the recent investigation (Dickerson 2005:32), the property appears to lack integrity of materials, design, and workmanship, thus making the recommendation that it is not eligible for listing on the National Register.

Historic Somppi Farmstead (24CA987) The farmstead is 0.5 mile (0.8 km) southwest of the Salem site of the HGS. SME proposes to construct two overhead electric transmission lines immediately north of the site and to bury fresh- and waste-water pipelines to the southeast. John Somppi acquired the property, on which the documented historic structures are associated, during the period of 1934 to 1946 (Dickerson, 2005:34). There are three historic buildings including a house, granary, and a shed. All of the buildings have been abandoned for many years and are in relatively poor condition. The recent documentation of the historic property suggests that the farmstead lacks historic integrity. Many of the buildings have been moved to their current locations from other locations. Because the historic arrangement of the small farmstead has been extensively altered, the investigator recommends that the property is not eligible for listing on the National Register.

Historic Kantola Farmstead (24CA988) The site is situated over one-half mile (0.8 km) southwest of the HGS. SME proposes to construct a railroad spur line within the Salem Road corridor immediately adjacent to the farmstead, and to install underground fresh- and waste-water pipelines immediately west of the property.

The land on which the site is located was patented by Victor Kantola in 1913 and the property remains in the ownership of the Kantola family to the present day (Dickerson, 2005:36). All improvements to the property post-date 1913 with many of the structures apparently constructed after 1920. There are eight historic buildings on the site, including an historic schoolhouse that was moved to the site. The historic farm house has been subjected to considerable alterations that compromise its original form, scale, and materials. Several of the buildings are not on their original sites, but were moved to the farm for re-use. The author of the recent investigation is recommending that due to a lack of integrity, the farmstead is not eligible for listing on the National Register.

Cooper Siding (24CA989) SME proposes to install buried fresh- and waste-water pipelines within the historic railroad bed.

Cooper was one of many sidings along the North Montana Line of the Milwaukee Road. The historic siding was used beginning in the 1940’s. A grain elevator was constructed adjacent to the tracks sometime prior to 1954. The line was abandoned in 1980, and the rails and ties were removed. The land later reverted to the ownership of adjacent land owners. The investigator of the recent study indicates that the Cooper Siding lacks historic integrity because almost all of the original buildings have been demolished (Dickerson 2005:25). The remains of the site do not easily convey an indication of the site’s original function. In this regard, it has been recommended that the site is not eligible for listing on the National Register.

Historic Farmstead (unrecorded, RTI-05035-4) During the recent inventory and investigation, RTI noted this potentially historic farmstead. The site is located immediately west of SME’s proposed railroad spur and south of the fresh- and waste-water pipelines.

The current owner did not grant RTI access to the property; therefore, formal investigation and recording could not be accomplished. The site was only briefly noted in the project report. The property contains at least seven historic buildings, including an historic house that has been extensively altered during the modern period. It is presumed from records search and a cursory and distant viewing of the property that the structures were possibly constructed sometime during the 1920’s to 1930’s. The investigators have presumed that, due to an apparent lack of integrity and significance, the site is potentially not eligible for listing on the National Register.

3.7.3 Traditional Cultural Properties

On January 20, 2006, RUS sent letters to eight organizations in the Montana-Wyoming Tribal Leaders Council – including the Blackfeet Tribal Business Council, Crow Tribal Council, Chippewa Cree Business Committee, Fort Belknap Community Council, Fort Peck Tribal Executive Board, Little Shell Tribe of Chippewa Indians of Montana, Northern Cheyenne Tribal Council, and Salish & Kootenai Tribal Council – informing them of the Proposed Action and EIS process and inviting comment and participation. In addition, identical letters were sent to Tribal Historic Preservation Officers at the Blackfeet Nation, the Chippewa Cree Tribe of the Rocky Boy's Reservation, the Fort Belknap Indian Community, the Northern Cheyenne Tribe, and the Confederated Salish and Kootenai Tribes of the Flathead Reservation.

By way of this letter, RUS formally requested consultation with the tribes on SME's proposal. RUS also asked tribal representatives to advise RUS if they have specific concerns regarding either of the proposed locations of the HGS, and in particular, for any information they may have on the possible presence of Traditional Cultural Properties (TCPs) or sacred sites at either of the proposed locations under study.

Traditional Cultural Property (TCP)

A Traditional Cultural Property (TCP) can generally be defined as a property that is eligible for inclusion on the National Register of Historic Places because of its association with cultural practices or beliefs of a living community that are important in maintaining the continuing cultural identity of the community. TCPs are essential to maintaining the cultural integrity of many Native American Indian nations and are critical to the cultural lives of many of their communities.

TCPs are often hard to recognize and may not come to light through conducing archeological or historical surveys. The existence and significance of such locations often can be ascertained only through interviews and consultation with traditional cultural practitioners. Moreover, it must be recognized that requiring religious practitioners to fully disclose their beliefs about a traditional place may, from their perspective, require them to violate tradition in a manner that they believe to be destructive to the place, their culture and themselves.

Due to the unique circumstances surrounding government-to-government consultation, it is incumbent upon the Federal Government to respectfully balance Native American Indian cultural values with other public interests and to view potential TCPs in a culturally sensitive manner in federal agency planning and program implementation.

Two responses were received from tribes to this request for consultation. The Northern Cheyenne Tribe expressed concern about cumulative air quality impacts and asked to receive the Draft EIS. The Blackfeet Tribal Historic Preservation Office requested a site visit, which was held on March 24, 2006. Two representatives of the Blackfeet Tribal Historic Preservation Office in Browning, MT met with the manager of SME and Montana Rural Development's Native American Coordinator and were given a tour of both possible sites and an explanation of the Proposed Action.

To date, no TCPs have been identified at either the Salem site or the Industrial Park site.

3.8 VISUAL RESOURCES

3.8.1 TERMINOLOGY AND METHODOLOGY

In environmental analysis, the term “visual resources” is often used interchangeably with “scenic resources” or “aesthetics.” The very notion of visual resources or a “viewshed” denotes an interaction between a human observer and the landscape he or she is observing. The inherently subjective response of the observant human viewer to the various natural and/or artificial elements of a given landscape and the arrangement and interaction between them is at the heart of visual resources impacts analysis.

A related term, visual quality, is what viewers like and dislike about the visual resources which comprise a particular scene. While different viewers may evaluate visual resources in different lights, there is a broad consensus that, say, views of Glacier National Park’s St. Mary Lake possess higher visual quality than views of, say, economically depressed urban settings or industrial facilities. Almost all observers would prefer to see the Grand Canyon of the Colorado River in Arizona when the air is crisp and clear, and the opposite rim visible in sharp relief, rather than when haze and smog from various sources obscure the vista. But as to whether a view of the Grand Canyon has higher visual quality than a view of Manhattan’s skyline depends entirely on the observer’s values, aesthetic sensibilities, and subjective preferences. Neighbors and travelers may, in particular, have different opinions on what they like and dislike about a scene. Viewers tend to define visual quality in terms of natural harmony, cultural order, and project coherence (MNDOT, 2005).

A “viewshed” is a subset of a landscape unit and consists of all the surface areas visible from an observer’s viewpoint. The limits of a viewshed are defined as the visual limits of the views located from the proposed project. A viewshed also includes the locations of viewers likely to be affected by visual changes brought about by project features (Caltrans, no date).

Americans look to the American countryside, and especially the landscapes of their public lands, as a source of inspiration and to provide places to escape modern/urban routines/settings and enjoy the beauty of nature firsthand (BLM, 2003c). Federal land management agencies such as the Bureau of Land Management (BLM), U.S. Forest Service, and National Park Service are very concerned with managing and protecting visual resources. Any activities that occur on public lands, such as recreation, mining, timber harvesting, grazing, building and maintaining power transmission lines, or road development for example, have the potential to disturb the surface of the landscape and thus impact or impair scenic values. Visual resource management (VRM) is a system developed by BLM for minimizing the visual impacts of surface-disturbing activities and maintaining scenic values for the future. BLM manages 264 million acres (107 million hectares) – one-eighth of the land area of the U.S. – more than any other federal or state agency in the country. BLM lands are located primarily in 12 Western states and include almost eight million acres (3.2 million hectares) in Montana alone (BLM, 2005; BLM, 2003d).

While BLM's VRM was developed for application on the public lands managed by that agency, it is a useful tool to assess impacts on private lands as well. At a location like the preferred site for the HGS – the Salem site – which, while on private land, is partially located within a National Historic Landmark designated in good part for its scenic values, it also makes sense to use VRM in at least a limited form. VRM consists of two stages – inventory (visual resource inventory) and analysis (visual resource contrast rating).

VRM's visual resource inventory consists of identifying the visual resources of an area and assigning them to inventory classes using BLM's visual resource inventory process (BLM, no date-a). The process involves rating the visual appeal of a tract of land, measuring public concern for scenic quality, and determining whether the tract of land is visible from travel routes or observation points. Based on these three factors, BLM-administered lands are placed into one of four visual resource inventory classes. These inventory classes represent the relative value of the visual resources. Classes I and II are the most valued, Class III represents a moderate value, and Class IV represents the least value.

VRM's analysis stage involves determining whether the potential visual impacts from proposed surface-disturbing activities or developments will meet the management objectives established for the area, or whether design adjustments will be required. A visual contrast rating process is used for this analysis, which involves comparing the project features with the major features in the existing landscape using the basic design elements of form, line, color, and texture.

This EIS utilizes the VRM framework to identify and describe visual resources at the two sites in question. It also uses a simplified version of the VRM approach to rate the impacts of building and operating a coal-burning power plant and appurtenant facilities – primarily the power transmission line interconnectors – at both the Salem and Industrial Park sites. However, this Visual Resources section does not examine the "visibility" issue as it relates to air quality in federal mandatory Class I areas, which are covered in the Air Quality sections (Sections 3.2 and 4.4).

The first step in the VRM Visual Resource Inventory is the scenic quality evaluation. Scenic quality is a measure of the visual appeal of a tract of land. This evaluation assesses a landscape according to seven key factors and rating criteria: landform, vegetation, water, color, influence of adjacent scenery, scarcity, and cultural modifications (Table 3-21). In the visual resource inventory process, the landscape under evaluation is given an A, B, or C rating based on its aggregate score in the seven rating criteria.

Table 3-21. BLM's VRM Scenic Quality Inventory and Evaluation Chart

Key factors	**Rating Criteria and Score**	.	.
Landform	High vertical relief as expressed in prominent cliffs, spires, or massive rock outcrops, or severe surface variation or highly eroded formations including major badlands or dune systems; or detail features dominant and	Steep canyons, mesas, buttes, cinder cones, and drumlins; or interesting erosional patterns or variety in size and shape of landforms; or detail features which are interesting though	Low rolling hills, foothills, or flat valley bottoms; or few or no interesting landscape features.

	exceptionally striking and intriguing such as glaciers. **5**	not dominant or exceptional. **3**	**1**
Vegetation	A variety of vegetative types as expressed in interesting forms, textures, and patterns. **5**	Some variety of vegetation, but only one or two major types. **3**	Little or no variety or contrast in vegetation. **1**
Water	Clear and clean appearing, still, or cascading white water, any of which are a dominant factor in the landscape. **5**	Flowing, or still, but not dominant in the landscape. **3**	Absent, or present, but not noticeable. **0**
Color	Rich color combinations, variety or vivid color; or pleasing contrasts in the soil, rock, vegetation, water or snow fields. **5**	Some intensity or variety in colors and contrast of the soil, rock and vegetation, but not a dominant scenic element. **3**	Subtle color variations, contrast, or interest; generally mute tones. **1**
Influence of adjacent scenery	Adjacent scenery greatly enhances visual quality. **5**	Adjacent scenery moderately enhances overall visual quality. **3**	Adjacent scenery has little or no influence on overall visual quality. **0**
Scarcity	One of a kind; or unusually memorable, or very rare within region. Consistent chance for exceptional wildlife or wildflower viewing, etc. *** 5+**	Distinctive, though somewhat similar to others within the region. **3**	Interesting within its setting, but fairly common within the region. **1**
Cultural modifications	Modifications add favorably to visual variety while promoting visual harmony. **2**	Modifications add little or no visual variety to the area, and introduce no discordant elements. **0**	Modifications add variety but are very discordant and promote strong disharmony. **-4**

* A rating of greater than 5 can be given but must be supported by written justification.
Source: BLM, no date-a

SCENIC QUALITY
A = 19 or more
B = 12-18
C = 11 or less

The next step in the VRM visual resource inventory is the sensitivity level analysis. Sensitivity levels are a measure of public concern for scenic quality. The landscape being inventoried is assigned high, medium, or low sensitivity levels by analyzing the various indicators of public concern. These include:

1. Type of Users. Visual sensitivity will vary with the type of users. Recreational sightseers may be highly sensitive to any changes in visual quality, whereas workers who pass through the area on a regular basis may not be as sensitive to change.

2. Amount of Use. Areas seen and used by large numbers of people are potentially more sensitive. Protection of visual values usually becomes more important as the number of viewers increases.

3. Public Interest. The visual quality of an area may be of concern to local, State, or National groups. Indicators of this concern are usually expressed in public meetings, letters, newspaper or magazine articles, newsletters, land-use plans, etc. Public controversy created in response to proposed activities that would change the landscape character should also be considered.

4. Adjacent Land Uses. The interrelationship with land uses in adjacent lands can affect the visual sensitivity of an area. For example, an area within the viewshed of a residential area may be very sensitive, whereas an area surrounded by commercially developed lands may not be visually sensitive.

5. Special Areas. Management objectives for special areas such as Natural Areas, Wilderness Areas or Wilderness Study Areas, Wild and Scenic Rivers, Scenic Areas, Scenic Roads or Trails, and Areas of Critical Environmental Concern (ACEC), frequently require special consideration for the protection of the visual values. This does not necessarily mean that these areas are scenic, but rather that one of the management objectives may be to preserve the natural landscape setting. The management objectives for these areas may be used as a basis for assigning sensitivity levels.

6. Other Factors. Consider any other information such as research or studies that includes indicators of visual sensitivity.

The third step of the VRM Visual Resource Inventory, subdivides landscapes into three distanced zones based on relative visibility from travel routes or observation points. The three zones are: foreground-middleground, background, and seldom seen. The foreground-middle ground (fm) zone includes areas seen from highways, rivers, or other viewing locations which are less than 3-5 miles (5-8 km) away. Seen areas beyond the foreground-middleground zone but usually less than 15 miles (24 km) away are in the background (bg) zone. Areas not seen as foreground-middleground or background (hidden from view) are in the seldom-seen (ss) zone.

3.8.2 Salem Site

The Salem site is characterized by a gently sloping landscape ranging from about 3,260 ft. MSL to about 3,320 ft. (994 - 1,012 m) MSL. Off-site, this plateau-like landscape is incised by steep-sided coulees or gullies (e.g. Rogers Coulee just to the east of the project site) that cut into the land surface and range from a few feet deep to 100-200 feet (30-60 m) deep. These coulees run largely north-south and drain to Belt Creek to the northeast of the Salem site and the Missouri River to the northwest. The lands on the site itself and in the immediate vicinity are farmed (except for the coulees), with wheat being the dominant crop. The Highwood Mountains are prominently visible to the east at a distance of about 15 miles (24 km). Looking toward the south, the Little Belt Mountains that rise to over 9,000 ft. (2,740 m) MSL also are visible about 30-40 (48-64 km) miles away. Looking westward, the front range of the main Rocky Mountains also can be seen on clear days. Figures 3-42 to 3-44 are photographs from the site that illustrate some of its primary features.

Figure 3-42. Salem Site Looking South

Figure 3-43. Salem Site Looking North

Figure 3-44. Salem Site Looking East with Highwood Mountains Visible in Distance

Table 3-22 contains the scenic quality inventory for the Salem site.

Table 3-22. VRM Scenic Quality Inventory and Evaluation Chart for Salem Site

Key factors	Score
Landform	3
Vegetation	2
Water	0
Color	2
Influence of adjacent scenery	4
Scarcity	1
Cultural modifications	1
Overall score	**13**

Table 3-23 contains the sensitivity level analysis for the Salem site.

Table 3-23. VRM Sensitivity Level Analysis for Salem Site

Indicators of public concern	Sensitivity level
Type of users	Low
Amount of use	Low
Public interest	High
Adjacent land uses	Low
Special areas	High
Other factors	Medium
Overall rating	**Medium**

The next evaluation step of VRM's visual resource inventory for the Salem site is assigning a distance zone. The three zones are foreground-middleground, background, and seldom seen. The Salem site primarily would be foreground-middleground; this zone includes areas seen from highways, rivers, or other viewing locations less than 3-5 miles (5-8 km) away.

Based on these three evaluations, the visual resource inventory would assign the landscape at the Salem site a ranking of Class III, that is, as possessing moderate visual or scenic values.

3.8.3 INDUSTRIAL PARK SITE

The Industrial Park site is characterized by a generally flat landscape at approximately 3,500 ft. (1,070 m) MSL. It appears to have been cultivated at some time in the past but currently is vegetated with a mixture of native and non-native grasses and forbs. Immediately off-site are views of the International Malting Company (IMC) malt plant, trailers, towers, transmission lines, and one or more new suburban subdivisions. When air quality and visibility are good and views are not impeded by fugitive dust or smoke from wildland fires, the Highwood Mountains to the east, Little Belt Mountains to the south, and Rocky Mountains to the west are visible in the distance. Figures 3-45 to 3-47 are photographs from the Industrial Park site that illustrate some of its primary visual features.

Figure 3-45. Industrial Park Site Looking Northeast toward IMC Malt Plant

Figure 3-46. Industrial Park Site Looking Southeast toward Great Falls

Figure 3-47. Industrial Park Site Looking North

Table 3-24 contains the scenic quality inventory for the Industrial Park site.

Table 3-24. VRM Scenic Quality Inventory and Evaluation Chart for Industrial Park Site

Key factors	Score
Landform	1
Vegetation	1
Water	0
Color	1
Influence of adjacent scenery	1
Scarcity	1
Cultural modifications	-1
Overall score	**4**

Table 3-25 contains the sensitivity level analysis for the Industrial Park site.

Table 3-25. VRM Sensitivity Level Analysis for Industrial Park Site

Indicators of public concern	Sensitivity level
Type of users	Low
Amount of use	Low
Public interest	Low
Adjacent land uses	Low
Special areas	Low
Other factors	Low
Overall rating	**Low**

The next evaluation step of VRM's visual resource inventory for the Industrial Park site is assigning a distance zone. The Industrial Park site would primarily be foreground-middleground; this zone includes areas seen from highways, rivers, or other viewing locations less than 3-5 miles (5-8 km) away.

Based on these three evaluations, the visual resource inventory would assign the landscape at the Industrial Park site a ranking of Class IV, that is, as having scenic resources of least value.

3.8.4 TRANSMISSION LINE INTERCONNECTION CORRIDORS

Under each site alternative, transmission line interconnections would be developed to connect the HGS to the existing regional electricity transmission grid. From the Salem site, two corridors have been proposed for 230-kV interconnections: the first would be 4.1 miles (6.6 km) long and would connect to the grid at the Great Falls-Broadview Tap Switchyard east of Great Falls (west-southwest of the Salem site); the second would be approximately 9.2 miles (23.8 km) long and run almost due west to connect with the grid at the Great Falls Switchyard. This latter would span the Missouri River just downstream of Cochrane Dam.

No specific corridors for the alternative Industrial Park site have been delineated on maps, but one route likely would run 1-2 miles (1.6-3.2 km) east to connect with the grid at the Great Falls Switchyard.

As shown in the photographs (Figures 3-48 and 3-49), there are no large, conspicuous existing power transmission lines in the immediate vicinity of the Salem site. However, there are a number of existing 230-kV power lines in the vicinity of and crossing the Missouri River and connecting into the Great Falls Switchyard (Figures 3-50 to 3-52). About 5-6 other transmission lines already span the river between Rainbow and Morony Dams. This is due primarily to the presence of the five PPL Montana Great Falls hydropower plants.

Figure 3-48. Typical Landscape West of Salem Site

Figure 3-49. Representative Habitat and Landscape Along Proposed Route of Both Transmission Lines Near Salem Site

Figure 3-50. Missouri River Downstream of Rainbow Falls; Existing 230 kV Transmission Lines Visible Approaching and Spanning River

Figure 3-51. 230 kV Transmission Lines Prominent Element in Scenery North of Missouri River and East of Great Falls Switchyard

Figure 3-52. Great Falls Switchyard from Lewis and Clark National Historic Trail Interpretive Center Parking Lot

3.9 TRANSPORTATION

3.9.1 ROADS AND TRAFFIC

Roadway evaluations focus on capacity, which reflects the ability of the road network to serve the traffic demand and volume. The capacity of a roadway depends mainly on the street width, number of lanes, intersection control, and other physical factors such as terrain and geometry. Traffic volumes typically are reported, depending on the project and database available, as the daily number of vehicular movements (e.g., passenger vehicles, buses, and trucks) in both directions on a segment of roadway, averaged over a full calendar year (average annual daily traffic (AADT)), or averaged over a period less than a year (average daily traffic (ADT)), and the number of vehicular movements on a road segment during the evening (p.m.) peak hour. These values are useful indicators in determining the extent to which the roadway segment is used and in assessing the potential for congestion and other problems.

The performance of a roadway segment is generally expressed in terms of the Level-of-Service (LOS). The LOS scale ranges from A to F, with each level defined by a range of volume to capacity ratios. LOS criteria A, B, and C are considered good operating conditions, where motorists experience minor to tolerable delays. LOS criterion D represents below average conditions. LOS criterion E corresponds to the maximum capacity of the roadway. LOS criterion F represents a gridlock situation. Table 3-26 presents the LOS designations for several types of two-lane highway segments (level terrain, rolling terrain, and mountainous terrain) and their associated volume to capacity ratios. These levels are based on the Highway Capacity Manual of the Transportation Research Board of the National Research Council of the National Academies of Science and Engineering (TRB, 1994).

Table 3-26. Level-of-Service for General Two-lane Highway Segments

			Criteria (Volume/Capacity)		
LOS	Description	**% Time Delay**	Level terrain	Rolling terrain	Mountainous terrain
A	Free flow with users unaffected by the presence of other users of the roadway.	≤ 30	0.04-0.15	0.03-0.15	0.01-0.14
B	Stable flow, but presence of the users in traffic stream becomes noticeable.	≤ 45	0.16-0.27	0.13-0.26	0.10-0.25
C	Stable flow, but operation of single users becomes affected by interactions with others in traffic stream.	≤ 60	0.32-0.43	0.28-0.42	0.16-0.39
D	High density, but stable flow; speed and freedom of movement are severely restricted; poor levels of comfort and convenience.	≤ 75	0.57-0.64	0.43-0.62	0.33-0.58
E	Unstable flow; operating conditions at capacity with reduced speeds, maneuvering difficulty, and extremely poor levels of comfort and convenience.	**>** 75	1.00-1.00	0.90-0.97	0.78-0.91
F	Forced or breakdown flow with traffic demand exceeding capacity; unstable stop and go traffic.	100	>1.00	>1.00	>1.00

Source: TRB, 1994

In this table, the volume to capacity ratio is the ratio of the flow rate to an ideal capacity of 2,800 persons per hour in both directions.

The HGS Salem site is located beside the Salem Road (Figure 3-53), north of the Highwood Road, in the northwestern part of Cascade County. The portion of the county-maintained Salem Road (designated L07-204 by the MDT) in Cascade County is 6.5 miles (10.5 km) long. On the east side of Belt Creek, it crosses into Chouteau County. It is an unpaved, graded, gravel road (MDT, 2001b). Salem Road is a lightly traveled, local, rural road used primarily by farmers and rural residents in the area. On an average 24-hour day, in its southern segment near Highwood Road, it is traveled 36 times – counting vehicles making trips in both directions. That is, its ADT is 36. In the north segment of Salem Road in Cascade County, toward the proposed HGS (Salem) site, its ADT is 21 (Peterson, 2005).

Figure 3-53. Salem Road Looking South near HGS Site

The Highwood Road – Secondary Highway 228 – (S-228) is a paved, two-lane, state secondary road on the Montana Secondary Highway System several miles south of the Salem site that would be used to access it from Great Falls both during construction and once it was placed in operation. The nearest ADT measurement taken by MDT is about seven miles (11 km) from its intersection with the Salem Road. The combined (both directions) ADT in 2004 was 549 (Combs, 2005).

The Industrial Park site is located just east of U.S. Route 87, north of Great Falls near Black Eagle, MT. In the immediate vicinity of the Industrial Park site, U.S. 87 is a paved, undivided, two-lane principal arterial on the National Highway System. MDT has collected ADTs at two locations along U.S. 87 in the general vicinity of the Industrial Park site. At the intersection of North River Road and U.S. 87, just across the Missouri River, south of the exit to the Industrial Park site, the combined ADT on 4-lane U.S. 87 is 7,718. The 2005 ADT on the 4-lane section of US 87/89 is 4528. North of this and the exit to the Industrial Park site, at the intersection of U.S. 87 and 25th Avenue NE, the combined ADT on U.S. 87 is 4,280 (Combs, 2005).

The LOS of any given road segment can vary by time of day, especially during peak travel periods, which, around cities and towns, typically are morning and evening "rush hours," when many commuters head to and from their workplaces. During peak periods, the LOS is often lower than at other times, reflecting some degree of traffic congestion. Hourly traffic counts would be necessary to complete a thorough analysis of LOS on roads approaching the two alternative power plant sites. However, they are not available in the present instance (Combs, 2006), and in the absence of these counts, LOS can be approximated by making a reasonable assumption as to the percentage of total ADT that occurs in peak hour periods.

With respect to the proposed Salem site, the ADTs for both S-228 and the Salem Road are so low (549 for S-228 and 36 and 21 for the Salem Road, respectively) that it can be safely assumed that both roads operate at LOS A over the entire day.

With respect to the alternate Industrial Park site, assuming conservatively that 50 percent of the ADT for U.S.87 occurs during four hours of peak traffic flow, this would mean 970 vehicles per hour going both directions pass the intersection of U.S. 87 and North River Road, or about 16 vehicles per minute, which is eight vehicles per minute per direction. The Highway Capacity Manual of the Transportation Research Board of the National Research Council rates this flow rate as between LOS B and LOS C. At all other times, U.S. 87 would have a LOS A. Thus, U.S. 87 generally would be considered to have good operating conditions, with motorists experiencing minor to tolerable delays.

3.9.2 AIRPORTS

Great Falls International Airport is located at an elevation of 3,677 ft. (1,121 m) MSL, three miles (five kilometers) southwest of downtown Great Falls and on the opposite side of the Missouri River (GFIAA, 2005). It is situated about four miles southwest of the Salem Industrial site and 12-13 miles (19-21 km) from the Salem site for the HGS. The airport has a 10,500-ft. (3,200-m) runway, a 24-hr. tower, and the services, communications, and facilities characteristic of a modern, international airport.

Enplanements (passenger boardings) at Great Falls International Airport have risen gradually from 122,887 in 1989 to 141,833 in 2000, for an average of about 390 passengers boardings per day in 2000 (GFIAA, 2002). The airport averages 120 aircraft operations daily. Twenty-four percent of these operations are commercial, 24 percent transient general aviation, 23 percent air taxi, 15 percent local general aviation, and 14 percent military (GFIAA, 2005).

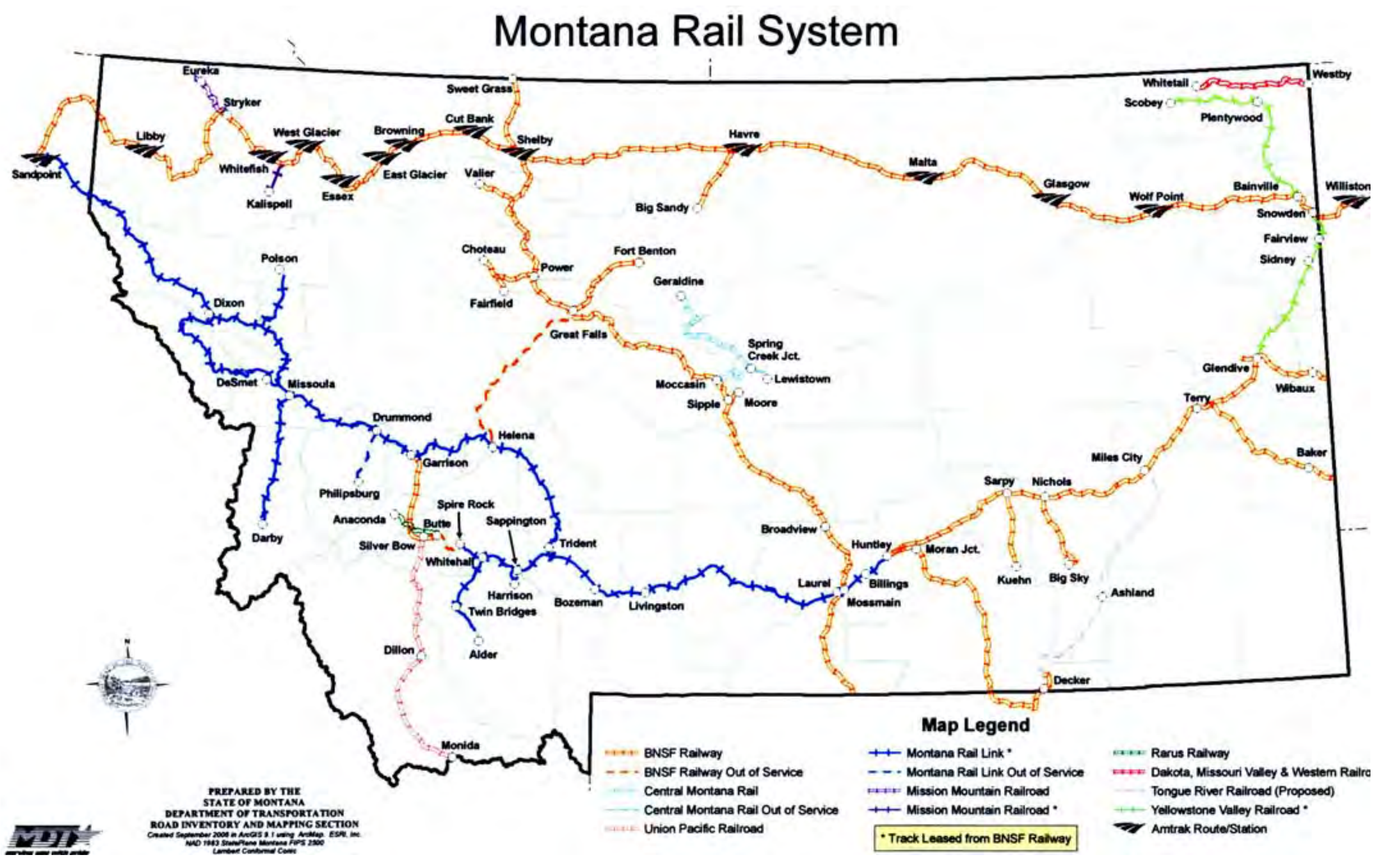
The present international airport site was recommended to the City of Great Falls in 1928 by the U.S. Department of Commerce as an excellent site for a future airport. In 1928, the City acquired 640 acres (260 ha) of land and construction was started on the first runway, which was completed in June 1929. By 1939 the airport's facilities included four runways, a large hangar, and an administration building. In 1941, the Civil Aeronautics Authority provided money for the further development of the Great Falls Municipal Airport, which was then known as Gore Field.

During World War II the airport was leased by the U.S. War Department and used as a base for the 7th Ferrying Command. During the war years, more than 7,500 bombers and fighter aircraft passed through Great Falls on their way to the war fronts in Europe and the Pacific. While using the airport as an airbase, the U.S. Army acquired an additional 740 acres (300 ha) of land and built many buildings and other facilities. In 1975, the terminal at Great Falls International Airport was replaced and all runways, aprons, and taxiways updated. With the use of Federal Aviation Administration (FAA) matching funds, the Airport Authority performs annual operations, maintenance, and capital improvements.

3.9.3 RAIL

A BNSF Railway line is located approximately six miles (10 km) south of the Salem location. (This is the railway to which the HGS proposes to build a rail spur.) Another BNSF railway passes within two miles of the Industrial Park site (MDT, 2001b). BNSF is one of the largest freight railroad operators in the United States, with 38,000 employees operating 5,675 locomotives and an average of 220,000 freight cars on a 32,000-mile (51,500-km) route system. More than 10 percent of the electricity produced in the U.S. is generated from coal hauled by BNSF, of which more than 90 percent comes from Wyoming and Montana's Powder River Basin (PRB), the world's largest single deposit of low-sulfur coal (BNSF, 2005). Figure 3-54 is a map of railroad routes in Montana.

Figure 3-54. Railroad Routes in Montana



3.10 FARMLAND AND LAND USE

3.10.1 FARMLAND

The total farmland in both Montana and Cascade County has generally decreased slightly in recent decades, while the size of the average farm unit has increased. The average size of a farm throughout the State of Montana is 2,139 acres (866 ha), while the average size of a farm in Cascade County is 1,339 acres (542 ha) (USDA, 2003). Farmland occupies approximately 70 percent of the state's total land area. Specifically, in 2002, cropland occupied 19 percent of Montana's land area, while rangeland and pasture accounted for another 51 percent (USDA, 2003).

In Cascade County, just over 80 percent of all land, or 1,388,530 acres (561,198 ha), is farmland. Of this land, 507,107 acres (205,220 ha) is in cropland, with 41,901 acres (16,957 ha) irrigated. The remaining farmland (881,423 acres or 356,700 ha) is rangeland and pasture. Nearly all the undeveloped land surrounding the proposed sites is used for cultivation, with the primary agricultural crop being winter wheat, followed by spring wheat and barley (USDA, 2003).

Figure 3-55. Typical Agricultural Land Use near Proposed Sites

The Farmland Protection Policy Act (FPPA) is intended to minimize the impact federal programs have on the unnecessary and irreversible conversion of farmland to non-agricultural uses. It assures that, to the extent possible, federal programs are administered to be compatible with state, local, and private programs and policies to protect farmland.

For the purpose of FPPA, farmland includes prime farmland, unique farmland, and land of statewide or local importance. Farmland subject to FPPA requirements does not have to be currently used for cropland. It can be forest land, pastureland, cropland, or other land, but not water-covered or urban built-up land.

Prime Farmland

As defined by the U.S. Department of Agriculture, this is the land with soils that possess the best combination of physical and chemical characteristics for sustainable production of food, feed, forage, fiber and oilseed crops, as well as being available for these uses.

Prime farmland may presently be under cultivation, pasture, or forest, but it may not be urban or built-up land. The soil qualities, growing season and water supply are those needed for sustained high-yield production of crops when proper management is applied.

Farmland of Statewide Importance

This is unique farmland that is of statewide importance for the production of food, feed, fiber, forage, and oil seed crops. Generally, additional farmlands of statewide importance include those that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some may produce as high a yield as prime farmlands if conditions are favorable.

The Salem site is located entirely on Pendroy Clay soils. Pendroy Clays typically are used for dryland crops as well as rangeland, and are not listed as prime or any other important farmlands in the Cascade County soil survey (NRCS, 2004). The land evaluation productivity index for Pendroy Clays for the state Land Evaluation and Site Assessment (LESA) system is 46 of 100 (NRCS, 2002). A rating under 50 generally means that the soil is of marginal quality for agricultural uses, and that approximately 73 percent of soils ranked have a higher quality (NRCS, 2002).

Rangeland productivity measures the amount of vegetation that can be expected to grow annually on well-managed rangeland that is supporting the potential natural community. In a normal year, the average total dry-weight production of rangeland vegetation on Pendroy Clay soils is 1,300 pounds/acre, which is slightly less than the average rangeland vegetation productivity of soils in Cascade County (NRCS, 2004).

Pendroy Clay soils are in land capability class 4e, which consists of soils that have very severe limitations that restrict the choice of plants or require careful management, or both. The limitations of the Pendroy Clays primarily are due to their susceptibility to erosion (NRCS, no date).

The majority of the Industrial Park site is located on Ethridge-Kobase silty clay loams, with a small amount of associated facilities towards the southwest located on Linnet-Acel silty clay loams, and Kobase and Lothair silty clay loams towards the southeast.

LESA

The Natural Resources Conservation Service (NRCS) in Montana adopted a Statewide Land Evaluation and Site Assessment (LESA) System on June 20, 2003. The Statewide LESA System is used to rank and prioritize proposals for the Farm and Ranch Lands Protection Program (FRPP), and to systematically assess and identify prime agricultural lands through the use of a consistent rating scheme.

Factors are used to label a group of attributes such as soil potential, agricultural productivity, or environmental benefit. Factor scale refers to the way points are assigned to a factor, i.e. 0 to 100 points. A factor rating is the value assigned to a particular parcel. Weight refers to the relative importance of the factor in the LESA system, i.e. a multiplier applied to a factor rating (for example, 0.0 to 1.0). Score is used to denote the total of all weighted factor ratings, i.e. a LESA score.

Ethridge-Kobase and Kobase soils are used primarily for non-irrigated crops and for range, though occasionally they are used for irrigated cropland. Ethridge-Kobase soils are listed as prime farmland if they are irrigated (NRCS, 2004). The land evaluation productivity index for Ethridge-Kobase soils for the Montana State LESA system is 64 of 100 (NRCS, 2002). A rating between 50 and 75 generally indicates that the soil is of relatively good quality for agricultural uses, and that approximately 43 percent of soils ranked have a higher quality (NRCS, 2002).

Linnet-Acel soils are used mainly for non-irrigated cropland and rangeland; they are listed as farmland of statewide importance (NRCS, 2004). The land evaluation productivity index for Linnet-Acel soils for the state LESA system is 62 of 100 (NRCS, 2002), also indicating that soils are of good quality for agricultural uses.

Lothair soils are used mainly for rangeland, and are not listed as prime or any other important farmland. They have a LESA land evaluation productivity index of 46 out of 100, which generally indicates that the soil is of marginal quality for agricultural uses.

In a normal year, the average total dry-weight production of rangeland vegetation is 1,400 pounds/acre on Ethridge-Kobase soils, and 1,200 pounds/acre on Linnet-Acel and Lothair soils, which are average to slightly less than the average rangeland vegetation productivity values for soils in Cascade County (NRCS, 2004).

Ethridge-Kobase and Linnet-Acel soils all are in land capability class 3e, which consists of soils that have severe limitations that reduce the choice of plants or require careful management, or both. The limitations of these soils primarily are due to their susceptibility to erosion (NRCS, no date).

3.10.2 Zoning

CEQ regulations for implementing NEPA and MEPA require agencies to consider the consistency of a proposed action with approved state and local plans and laws, including all local ordinances and zoning policies.

In the late 1970's, the Cascade County Development Plan was adopted by the Cascade County Commissioners. The development plan labeled all land within Cascade County, that was not part of an incorporated city or town, city-county jurisdictional area, or other created zoning district, as residential/agricultural zoned land. Both the preferred location, the Salem site, and the alternative site, the Industrial site, are located entirely within Cascade County on unincorporated county land, and are thus subject to the County's zoning and permitting requirements (Clifton, 2005).

Land located within incorporated areas of the City of Great Falls is under city jurisdiction. All of the land in the City of Great Falls is zoned and subject to land development regulations. The Planning Advisory Board is designated as the City Zoning Commission. In that capacity, the Board reviews rezoning and conditional use petitions, holds public hearings, and makes recommendations to the City Commission. The Current Planning Section of the city has jurisdiction over zoning and permitting requirements and reviews land annexation applications. City building permits, safety inspection certificates, floodplain permits, design review, and zoning enforcement are the responsibility of the Community Development Department.

3.10.3 Salem Site

The Salem site is unincorporated county land that is zoned for agricultural uses (Clifton, 2005). This site lies eight miles (13 km) to the east of Great Falls and is currently used for dryland farming of wheat. The site is located east of the intersection between Salem Road and an abandoned railroad bed previously used by the Milwaukee, St. Paul, and Pacific railroads as a grain drop off/pick up location. The historical use

Figure 3-56. Farmstead Northwest of Proposed Salem Site

of the area has been limited to agricultural and open space activities. Though the site is currently unoccupied, there is a small abandoned building present on the site adjacent to the former railroad bed, which is most likely related to past agricultural activities.

Two single family residencies, or farmsteads, are located approximately one-half mile (0.8 km) from and adjacent to the proposed site, to the northwest and to the southwest, respectively. The raw water intake pipeline extending from the Missouri River to the proposed plant would be located immediately north of the Urquhart residence situated to the northwest (Figure 3-54).

The farmstead located to the southwest of the proposed facility is currently unoccupied. A railroad spur line within the Salem Road corridor would be constructed immediately adjacent to this farmstead and fresh- and waste-water pipelines would be buried just west of the property.

3.10.4 INDUSTRIAL PARK SITE

The Industrial Park site remains unincorporated county land, and it is zoned for Agriculture uses by Cascade County (Clifton, 2005). The site has historically been used strictly for agricultural or open space uses. The site itself is currently undeveloped open space, and there are no existing structures on site. However, the site is located adjacent to a functioning industrial park which houses several small businesses and industries. A malting plant currently is under construction by International Malting Company (IMC) approximately one-half mile (0.8 km) southwest of the proposed Industrial site location, and is expected to be completed in the near future. The malting plant is located on previously unincorporated land which has subsequently been annexed into the City of Great Falls (Clifton, 2006). Additionally, several established and developing residential areas are located one half-mile to a mile (0.8-1.6 km) west south-west of the proposed site.

3.11 WASTE MANAGEMENT

Under the Montana solid waste management laws (75-10-101 *et seq.* and 75-10-201 *et seq.*, MCA), licenses are required from DEQ for the disposal of solid waste and the operation of a solid waste management system in Montana.

Most municipal, commercial, and industrial solid waste, including construction debris, generated within Cascade County and disposed of off-site is delivered to the High Plains Sanitary Landfill and Recycle Center (HPSL) by either the City of Great Falls or Montana Waste Systems. The HPSL is regulated by rules adopted by DEQ in ARM 17.50.501 *et seq.*, 17.50.701 *et seq.*, and 17.50.410, 411, 415, and 416., which take the same general approach as the EPA's Criteria for Municipal Solid Waste Landfills found at 40 CRF Part 258. The landfill is exempt from liner and groundwater monitoring requirements under a waiver received from the DEQ. The waiver is based on the No Migration Demonstration approved by the DEQ based on site geology and hydrology. The HPSL is licensed under Montana Solid Waste License #225 and is owned and operated by Montana Waste Systems of Great Falls. The HPSL is located within Cascade County, approximately nine miles (14 km) north of the City of Great Falls and one mile (1.6 km) east of US Route 87. The landfill receives approximately 150,000 tons of refuse annually, or about 410 tons per day and has extensive capacity remaining (HPSL, 2006).

There are four other smaller private landfills in the Great Falls area. Three are Class III landfills that receive inert waste such as concrete rubble, and one Class IV landfill that receives mixed construction and demolition waste. These landfills primarily serve the landfill owners, all of whom are in the construction business, but occasionally take waste from outside parties. All are much smaller facilities. For example, the Shumaker Class IV landfill took in 7,505 tons of material in 2005, or 21 tons per day. The Shumaker landfill is located north of Malmstrom Air Force Base in the old railroad right-of-way. It is in the proposed water and wastewater corridor so the lines may have to be diverted slightly to the south at the landfill location.

Regulated hazardous waste cannot be accepted at the HPSL and must be delivered to a permitted hazardous waste destination, such as an incinerator or hazardous waste landfill, the nearest of which are located out of state in Oregon and Utah. A Class II landfill like the HPSL may receive household hazardous wastes or conditionally exempt small quantity generator hazardous waste.

3.12 HUMAN HEALTH AND SAFETY

3.12.1 CASCADE COUNTY AND THE CITY OF GREAT FALLS

The Cascade City-County Health Department is responsible for the prevention of disease, promotion of good health practices and protection of the environment within Cascade County and the City of Great Falls. The department administers 35 different programs in the areas of community and family, communicable disease prevention/control, health promotion/chronic disease prevention, environmental health, and public health. Additionally, the Health Department compiles and maintains statistics on the causes of mortality.

Between 1996-2000, the three leading causes of death in Cascade County were heart disease, cancer, and chronic lower respiratory disease (CLRD), while the three leading causes of death in the State of Montana were heart disease, cancer, and cerebrovascular disease (Table 3-27). The cancer incidence rate of Cascade County was slightly elevated (506.8 diagnoses per 100,000 people) compared to the overall rate of cancer in the State of Montana (443.6 diagnoses per 100,000 people) (CCCHD, 2002).

A State-funded environmental public health tracking project contracted with the Cascade City-County Health Department to identify and assess the environmental health concerns of populations within the county in 2003 and 2004 (EPHT, 2004). Of the 1,500 randomly selected households asked to participate in the study, 280 households returned useable survey responses. These survey results are summarized in Figure 3-57.

There are two National Priorities List (NPL) sites located within Cascade County: the Carpenter-Snow Creek and Barker-Hughesville sites (EPA, 2005d). The NPL is the list of national priorities among the known releases or threatened releases of hazardous substances, pollutants, or contaminants throughout the United States and its territories, and the sites listed in the NPL

Top 10 Environmental Health Issues of Concern to CASCADE COUNTY

1.	West Nile Virus	6.	Leaking Underground Storage Tanks
2.	Hantavirus	7.	Secondhand Smoke
3.	Pesticides	8.	Mining Runoff
4.	Herbicides	9.	Hazardous Waste Disposal
5.	Oil Refining	10.	Nuisance Properties

Top 10 Environmental Health Issues of Concern to FAMILY/HOUSEHOLD

1.	West Nile Virus	6.	Oil Refining
2.	Hantavirus	7.	Pollens
3.	Dust & particulates	8.	Herbicides
4.	Carbon Monoxide from cars	9.	Restaurant Food Practices
5.	Secondhand Smoke	10.	Pesticides

Figure 3-57. Environmental Health Concerns
Source: EPHT, 2004

also are known as Superfund sites. In 2003, the Agency for Toxic Substances and Disease Registry (ATSDR), classified both sites as public health hazards.

The Carpenter-Snow Creek site is located near the town of Neihart in the Little Belt Mountains southeast of Great Falls. The site is in an historic mining district, and due to the impact of mining activities, groundwater, soils and some streams are contaminated with heavy metals and arsenic. Approximately 96 abandoned mines have been identified in the Carpenter-Snow Creek Mining District, and at least 21 of these have been identified as probable sources of contamination to surface water. There are documented impacts from mining waste to soil, surface water and stream sediments in Carpenter Creek, Snow Creek, and Belt Creek.

In 2002 and 2003, EPA collected soil/mine waste, surface water sediment and groundwater samples in the town of Neihart (Neihart Operable Unit). Concentrations of lead and arsenic were above screening levels in some residential yards and alleys. Contaminant levels in the surface water of Belt Creek as it flows through Neihart were not above drinking water standards or levels that EPA considers unhealthy for aquatic life. Contaminant levels in the sediment of Belt Creek as it flows through Neihart did not exceed levels considered safe for recreational use.

Results from two groundwater samples indicated that none of the metals were present at levels above the human health drinking water standards. In 2004, EPA conducted a cleanup of lead-contaminated soils near two historic mills within Neihart. The Neihart tailings pile along Belt Creek was capped and armored to prevent runoff or failure in floods. EPA has sampled residential soils throughout Neihart. A human health risk assessment and draft feasibility study for Neihart were completed in 2005.

The Barker-Hughesville (BH) District site is located in both Cascade and Judith Basin Counties, in the Little Belt Mountains southeast of Great Falls. The site is in an historic mining district and due to the impacts of mining activities, area groundwater, soils and surface water are now contaminated with heavy metals and arsenic. Dissolved zinc is the metal of greatest concern. Because of the contamination and risks to public health and the environment, EPA proposed the

Table 3-27. Cascade County Health Profile

Source: CCCHD, 2002

HEALTH STATUS INDICATORS	Cascade				Montana			
Fertility Rates[4] (**teen** births per 1,000 teen females; **all** births per 1,000 females of childbearing age)	Teen		All Women		Teen		All Women	
	48.4 (n=693)		65.9 (n=5,418)		36.9 (n=6,460)		58.8 (n=53,995)	
Prenatal Care (percent beginning care in the first trimester; percent receiving adequate, i.e., early and continuous prenatal care)[4]	1st Trimester		Adequacy		1st Trimester		Adequacy	
	88.2%		62.8%		82.5%		72.6%	
Percent Low Birthweight[4] (below 5 lbs. 8 oz.)	6.5%				6.5%			
Infant Mortality (deaths per 1,000 live births)[4]	8.7				6.7			
Cancer Incidence Rate (diagnoses per 100,000 population)[5]	506.8 (95% C.I. ±21.6)				443.6 (95% C.I. ±6.1)			
Leading Causes of Death[4]	1. HEART DISEASE 2. CANCER 3. CLRD				1. HEART DISEASE 2. CANCER 3. CEREBROVASCULAR DISEASE			
Heart Disease Death Rate (per 100,000 population)[4]	231.4 (n=937)				229.4 (n=10,248)			
Motor Vehicle Accident Death Rate (per 100,000 population)[4]	16.5 (n=67)				23.3 (n=1,043)			
Suicide Rate (per 100,000 population)[4]	21.5 (n=87)				18.5 (n=827)			
Traumatic Injury Death Rate (per 100,000 population)[4]	65.9 (n=267)				63.7 (n=2,847)			
Percent of Motor Vehicle Crashes Involving Alcohol	6.3% (n=783)				9.5% (n=10,688)			
Percent of the Medicaid Population Receiving Mental Health Services (FY2001)	24.0%				19.6%			
Percent of 2-yr. Olds Seen by a Health Care Provider that are Fully Immunized (2001)	78% (n=32)				92% (n=1,965)			
STD Incidence (reported cases per 100,000)	225.2 (n=912)				160.9 (n=7,191)			
HEALTH RESOURCE ASSESSMENT, 2002	**Cascade**				**Montana**			
Local Hospitals, Critical Access Hospitals (CAH), and Total Number of Beds	Local Hospitals		CAH	# beds	Local Hospitals		CAH	# beds
	2 local		0	395	36 local; 2 child/ adult psych; 1 VA		27	2,937
Rural Health Clinics, Federally Qualified Health Centers, IHS and Tribal Health Facilities (number)	RHCs	FQHCs	IHS & Tribal		RHCs	FQHCs	IHS & Tribal	
	0	2	0		36	14	17	
Availability of Basic and Enhanced 9-1-1 Services	Basic + Enhanced				Basic-all counties; Enhanced-16 counties			
Availability of Emergency Medical Services:	#	Cascade County Locations						
Basic Life Support Services	3	Belt, Great Falls						
Advanced Life Support Services	8	Great Falls						
Nursing Homes (number of facilities and beds)	3 (647 beds)				105 (7,733 beds)			
Aging Services: number of Personal Care Home [PC], Adult Foster Care [AFC], and Adult Day Care [ADC] Licenses	PC (# beds)		AFC	ADC	PC (# beds)		AFC	ADC
	15 (431)		5	2	147 (3,173)		106	64
Home Care Services: number of Home Health Agency [HHA] and Hospice Licenses	HHA		Hospice		HHA		Hospice	
	2		1		51		30	
Public Health Resources: number of full-time equivalent Public Health Nurses [PHN], Registered Sanitarians [RS], Registered Dietitians [RD], and Health Educators [HlthEd]	PHN	RS	RD	HlthEd	PHN	RS	RD	HlthEd
	7.6	5.5	0	3	116.1	81.5	14.4	26.9
Primary Care Provider Resources: number of doctors [MDs and DOs], Nurse Midwives [NMW], Nurse Practitioners [NP], and Physician's Assistants [PA-C]	MD/DO	NMW	NP	PA-C	MD/DO	NMW	NP	PA-C
	96	3	26	13	1,060	31	298	210
Dental Resources: Dentists and Dental Hygienists	52 dentists		28 hygienists		477 dentists		391 hygienists	
Health Care Provider Shortage Status:	Federal HPSA: None							
Health Professional Shortage Areas [HPSA]	Mental Health HPSA: No				Dental HPSA: Medicaid population			
Medically Underserved Areas or Populations [MUA/MUP]	MUA/MUP: Cascade CCD & CT/BNAs 3,4,5,6,7,8,9,16,104							

[4] 1996-2000, Office of Vital Statistics.

[5] 1996-2000 average, age-adjusted to 2000 standard-million population, Montana Central Tumor Registry, DPHHS.

* Non-transporting

site for the NPL for Superfund clean up in December 2000. On September 13, 2001, the site was listed as a final NPL site in the *Federal Register*.

There are approximately 46 abandoned mines in the BH District. Sixteen have been identified as water contamination sources because of their proximity to surface streams. These abandoned mines and associated contamination are dispersed throughout a 6,000-acre (2,430 ha) watershed. Metals and arsenic contamination of soils, groundwater, and surface water have been documented in several studies conducted at the site since 1990. Ten discharging adits (horizontal mine openings) also have been identified. Cleanup on the sites is ongoing.

3.12.2 Salem Site and Industrial Park Site

On July 1, 2004, Phase I Environmental Site Assessments (ESAs) were completed on both the Salem and Industrial Sites in order to identify recognized environmental conditions (SME, 2004c). A recognized environmental condition (REC) is defined as the presence or likely presence of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater, or surface water of the property. The Phase I was completed in general accordance with procedures outlined in American Society for Testing and Materials (ASTM) E1527-00, Standard Practice of Environmental Assessments: Phase I ESA Process.

The ESAs included evaluation of individual properties adjacent to and within one mile (1.6 km) of the subject sites. The evaluation included assessment of historical information pertaining to the area including historic aerial photographs, historic topographic mapping, available fire insurance mapping, a review of regulatory records for the areas, and visual evaluation of the assessment areas. Historically, activities conducted within the assessment areas have been for agricultural purposes, much as they are today. There were no recognized environmental conditions or concerns identified during the site assessments at either the Salem site or the Industrial site (SME, 2004). However, the ESA at the Industrial site identified two Resource Conservation Recovery Information System (RCRIS) small quantity hazardous waste generators and a Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) – No Further Remedial Action site, within a ¾ mile (1.2 km) radius of the site. Additionally, the ESA identified one state hazardous waste site under the Montana Comprehensive Environmental Cleanup and Responsibility Act (CECRA) and one state leaking underground storage tank (LUST) within one mile (1.6 km) of the Industrial site.

3.13 Socioeconomic Environment

3.13.1 Cascade County and City of Great Falls – A Brief History

The preferred Salem site and the alternative Industrial Park site of the proposed HGS are located in Cascade County, MT. Both are also near the City of Great Falls, MT. The Salem site is approximately eight miles (13 km) to the east and the Industrial Park site a mile or two to the north, on the northern edge of the city, within the city's designated Central Montana Agricultural and Technology Park.

The City of Great Falls was settled around the Missouri River, one of the most important rivers in the American West. The Missouri has the fourth-largest drainage basin of any river in North America (after the Mississippi, St. Lawrence, and Mackenzie) and the second greatest "virgin" (original) discharge of any river in the American West (after the Columbia) (Benke and Cushing, 2005). The Missouri provided the city with its name as well as its reason for being. As the river traverses the city it drops over 500 feet (150 m) in a series of rapids and five impressive waterfalls – the Great Falls of the Missouri River (CGF, no date).

In June 1805, Merriwether Lewis and William Clark were the first known white explorers to catch sight of the "great falls" of the Missouri River. Since the Corps of Discovery was traveling by keelboat and canoe, this series of waterfalls presented a formidable obstacle to their advance. In fact, the Corps of Discovery took a month to portage all its gear and equipment upstream above the last falls, a mere 18 miles (29 km) away, using the portage route south of the river described in Section 3.9 (BSF, no date). By mid-July of 1805, the expedition had left the Great Falls behind and did not return. Except for the occasional trapper or mountain man passing through, the area remained undeveloped and uninhabited by Euro-Americans until the 1880's.

Figure 3-58. Great Falls, Montana today

Entrepreneur Paris Gibson first arrived at Great Falls in 1880, and almost immediately began to plan a city at the location. Gibson selected this site because he recognized its potential as a transportation hub for nearby coal fields and other natural resources. From the beginning, Great Falls was a planned city, unlike other Montana and western boom-and-bust mining towns. Everything from straight streets, minimum width of streets and the location of parks was meticulously planned. Gibson and railroad magnate James Hill expended considerable effort in laying out and developing the city. Great Falls officially began settlement in1884 and by 1886 had more than 1,000 residents and numerous businesses. The railroad arrived one year later, allowing the agricultural potential of the area around Great Falls to be tapped. In 1888, a silver smelter was built along the Missouri River just outside of town (BSF, no date).

Shortly after the invention of electrical generators, Gibson, recognizing the huge potential for hydroelectric power from the falls on the Missouri River, built the first dam at Black Eagle Falls, just outside downtown. Other dams and hydropower plants followed, earning Great Falls the nickname of "The Electric City". Throughout the first half of the 20th century, Great Falls continued to grow steadily, unlike many boom-and-bust mining and cattle towns throughout the West. By the late 1950's, Great Falls was the largest city in Montana, with a population of 55,000 in the 1960 census (BSF, no date).

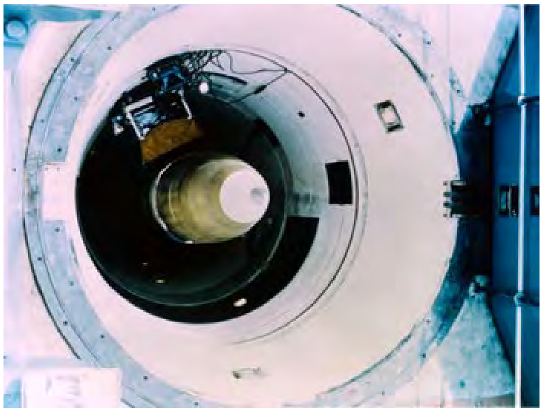


Figure 3-59. Minuteman III in its Silo

World War II facilitated this steady population growth. The city had appealed to the War Department for an Air Force Base (AFB) before World War II. With the onset of war, this airbase became a reality; known as East Base, it housed and trained bomber crews of the 2nd Air Force. East Base, located just east of Great Falls, was continuously expanded throughout the war and after it. The Strategic Air Command (SAC) took over the airbase in the 1950s and in 1959, the name of East Base was changed to Malmstrom AFB (Malmstrom or AFB). Starting in the late 1950s and continuing to the present, Malmstrom has housed a number of nuclear missile silos as an integral part of the nation's strategic defense system (BSF, no date). Malmstrom's 341st Space Wing controls 200 Intercontinental Ballistic Missiles (ICBMs), missiles tipped with nuclear warheads – originally Minuteman I and Minuteman II, now Minuteman III (Figure 3-57) – in underground silos scattered around nine central Montana counties (Anon., 2004). This missile complex is the largest in the Western Hemisphere. The 341st manages a variety of equipment, facilities, and vehicles worth more than $5 billion (MAFB, 2002).

With about 3,400 military personnel, the AFB contributes $134 million a year in payroll and direct spending in the Great Falls area. Adding in the indirect impact of Malmstrom on area businesses, the total economic impact of the base increases to about $284 million annually. The AFB accounts for 35 percent of the city's economic base. In addition to military employees and their 5,000 dependents, the MAFB also employs about 370 civilian workers, while another 1,270 civilians do at least some work involving Malmstrom under private contracts. The base also affects the Great Falls economy in less direct ways. Some 1,400 retired military people live in the Great Falls area, in part because of services available at the AFB. The 15,000 people with at least some connection to the AFB comprise more than 20 percent of Cascade County's population (Anon., 2004). City and state officials were relieved by the recent Department of Defense decision that Malmstrom AFB should be kept off the 2005 Base Realignment and Closure (BRAC) list (Baucus, 2005).

During the 1970s and 1980s, the closure of many resource extraction businesses in Montana, the departure of several railroads, and the adjustments facing agriculture all combined to stifle the growth of Great Falls. By 1990, the city still had a population of about 55,000 people, though some growth had occurred outside of the city limits (BSF, no date).

Figure 3-60. Cascade County Courthouse in Great Falls

In the 1990s certain new industries appeared in Great Falls, offsetting the disappearance of older manufacturing and resource extraction jobs. By the 2000 Census, the city had a population of 56,690 (USCB, 2005c), with additional population growth having occurred outside the official city limits.

Great Falls today still reflects the careful planning at the time of its creation in the 1880s. Virtually all streets are on a straight grid-pattern and the main streets in the downtown are wide and easy to navigate. Most streets are also tree-lined, which used to be unusual for western prairie towns. Numerous parks, especially along the Missouri River, are scattered throughout town. The changing nature of Montana's economy, from one based on raw materials extraction, manufacturing and agriculture to one based on tourism and services, has largely bypassed Great Falls (BSF, no date).

Great Falls has two colleges: the Great Falls campus of Montana State University (MSU) and the University of Great Falls. The MSU-Great Falls College of Technology provides about 2,000 students with a two-year educational curriculum that offers associate degrees and preparation for transfer to a four-year university (MSU-GF, 2004). The University of Great Falls is a private, Catholic university founded in 1932 (UGF, no date).

Great Falls is the seat of government for Cascade County. The county was created in 1887 out of four other counties two years before Montana became the 41st state (CC, no date). U.S. Census counts for Cascade County show its growth through the 20th century (Table 3-28).

Table 3-28. Cascade County Population Growth, 1900-2000

Year	Cascade County Population
1900	25,777
1910	28,833
1920	38,836
1930	41,146
1940	41,999
1950	53,027
1960	73,418
1970	81,804
1980	80,696
1990	77,691
2000	80,357

Source: USCB, 1995; USCB, 2005b

The decade of the 1950s, coinciding with the expansion of East Base/Malmstrom AFB, showed more population growth than any other in the century.

3.13.2 Cascade County and City of Great Falls – Demographic Data

The City of Great Falls is by far the largest settlement in Cascade County, which is predominantly a rural, low population density, agricultural county. Table 3-29 presents recent demographic and economic data on Montana, Cascade County, and the City of Great Falls from the U.S. Census Bureau.

Table 3-29. Socioeconomic Characteristics of State of Montana, Cascade County, and City of Great Falls

Characteristic	Montana	Cascade County	City of Great Falls
Population, 2004 estimate[1]	917,621	79,849	56,155
Population, % change, 2000-2004[2]	2.7%	-0.6%	-1.0%
Population, 2000	902,195	80,357	56,690
Population, % change, 1990-2000	12.9%	3.4%	2.4%
Land Area, 2000 (square miles)	145,552	2,698	19
Persons per square mile (population density), 2000	6	30	2,909
White persons, %, 2000	91%	91%	90%
Non-Hispanic white persons, %, 2000	90%	90%	NA[3]
Black or African American persons, %, 2000	0.3%	1%	1%
American Indian persons, %, 2000	6%	4%	5%
Asian persons, %, 2000	0.5%	0.8%	0.9%
Persons of Latino or Hispanic origin, %, 2000	2%	2%	2%
Language other than English spoken at home, %, 2000	5%	5%	5%
Foreign born persons, %, 2000	2%	2%	2%
High school graduates, % of persons age 25+, 2000	87%	87%	87%
Bachelor’s degree or higher, % of persons 25+, 2000	24%	22%	22%
Persons with a disability, age 5+, 2000	145,732	13,958	NA[3]
Median household income, 1999	$33,024	$32,971	$32,436
Per capita money income, 1999	$17,151	$17,566	$18,059
Persons below poverty, %, 1999	15%	14%	15%

Sources: USCB, 2005a; USCB, 2005b; USCB, 2005c
[1]2003 estimate for City of Great Falls
[2]2000-2003 for City of Great Falls
[3]Not Available

Both the City of Great Falls and Cascade County have had relatively stable populations over the last four decades. Both the city and the county mirror the State of Montana's ethnic/racial composition, which has smaller percentages of ethnic and racial minorities than in the country as a whole. The city and county also reflect statewide averages in educational attainment, per capita and household income, and poverty rates. Thus they are relatively typical or representative of Montana.

3.13.3 CASCADE COUNTY AND CITY OF GREAT FALLS – ECONOMIC DATA

Table 3-30 shows selected economic characteristics of Cascade County taken from the 2000 Census and broken down in three ways, by occupation, industry, and class of worker (USCB, 2000a).

Table 3-30. Profile of Selected Economic Characteristics, Cascade County, 2000

Subject	Number	%
Employed civilian population 16 years and over	**34,792**	**100.0**
OCCUPATION		
Management, professional, and related occupations	10,626	30.5
Service occupations	6,401	18.4
Sales and office occupations	10,324	29.7
Farming, fishing, and forestry occupations	331	1.0
Construction, extraction, and maintenance occupations	3,478	10.0
Production, transportation, and material moving occupations	3,632	10.4
INDUSTRY		
Agriculture, forestry, fishing and hunting, and mining	1,028	3.0
Construction	2,650	7.6
Manufacturing	1,212	3.5
Wholesale trade	1,289	3.7
Retail trade	4,925	14.2
Transportation and warehousing, and utilities	1,954	5.6
Information	832	2.4
Finance, insurance, real estate, and rental and leasing	2,579	7.4
Professional, scientific, management, administrative, and waste management services	2,259	6.5
Educational, health and social services	8,297	23.8
Arts, entertainment, recreation, accommodation and food services	3,454	9.9
Other services (except public administration)	1,894	5.4
Public administration	2,419	7.0
CLASS OF WORKER		
Private wage and salary workers	25,403	73.0
Government workers	5,949	17.1
Self-employed workers in own not incorporated business	3,256	9.4
Unpaid family workers	184	0.5

Source: USCB, 2000a

The City of Great Falls, with more than 70 percent of the population of Cascade County, dominates the employment statistics. Hence, among the county's occupations, "management, professional, and related operations" and "sales and office" workers outnumber those engaged in "farming, fishing, and forestry operations" more than 60:1, even though Cascade County has 94 times more rural and agricultural land than urbanized land (USCB, 2003). Table 3-31 lists the major employers in Great Falls.

Table 3-31. Major Employers in Great Falls

Company	# of Employees
Malmstrom Air Force Base	4572
Benefis Healthcare Center	2044
Great Falls Public Schools	1417
Montana Air National Guard	979
Great Falls Clinic	663
National Electronics Warranty (N.E.W.)	600
Cascade County	500
City of Great Falls	480
Wal-Mart	480
Sletten Construction Co.	375
Albertson's	300
Davidson Companies	251
US Post Office	218
Heritage Inn	190
MSU-College of Technology	190
The Great Falls Tribune	180
Burlington Northern/Santa Fe	180
Park Place Health Care	160
Express Personnel	150
University of Great Falls	126
Target	115
Shopko	100
Montana Refining Co.	78
Pasta Montana, LLC	59

Source: Montana Department of Labor and Industry, Research & Analysis Bureau; GFDA, no date.

The breakdown of Great Falls' labor force by industry is shown in Table 3-32.

Table 3-32. Industry Annual Average Employment in Great Falls

Private Business	27,212
Agriculture, Forestry, Fish	314
Manufacturing	1,216
Transportation, Communication, Utilities	1,512
Wholesale Trade	1,557
Retail Trade	8,196
Finance, Insurance, Real Estate	2,323
Services	10,325
Government	5,356
Total of all industries	**58,011**

Source: Montana Department of Labor and Industry, Research & Analysis Bureau); GFDA, no date.

Between 1995 and 2005, the labor force of the Great Falls Metropolitan Statistical Area (MSA) grew slightly from about 37,000 to a peak of about 40,800; the labor force was 9 percent larger at the end of this 10-year period (Table 3-33). The unemployment rate of the Great Falls MSA held relatively steady between 1995 and 2005, ranging between 4-5 percent. In 2005 through October, the MSA has had a slightly lower unemployment rate than the United States as a whole.

Metropolitan Statistical Area (MSA)
As defined by the federal Office of Management and Budget, an MSA is an urban area that meets specified size criteria: either it has a core city of at least 50,000 inhabitants within its corporate limits, or it contains an urbanized area of at least 50,000 inhabitants and has a total population of at least 100,000. The Great Falls MSA is coincident with Cascade County.

Labor Market Area

Because the economic impacts of the Proposed Action at either site extend beyond the political boundaries of Great Falls, the Great Falls Labor Market Area (LMA) provides a more comprehensive look at the affected economic environment of the region. A labor market area is an economically integrated geographic area within which individuals can reside and find employment within a reasonable distance or can readily change employment without changing their place of residence (BLS, 2005). Normally, it is based on a 60-mile (97 km) radius from some pre-set point, such as the county seat, 60 miles (97 km) being about a one-hour drive. The Great Falls Labor Market Area corresponds approximately to the Great Falls MSA above.

The Great Falls Development Authority estimates that approximately 14,900 workers are available to employers, as shown in the pie chart below (Figure 3-61) (GFDA, no date).

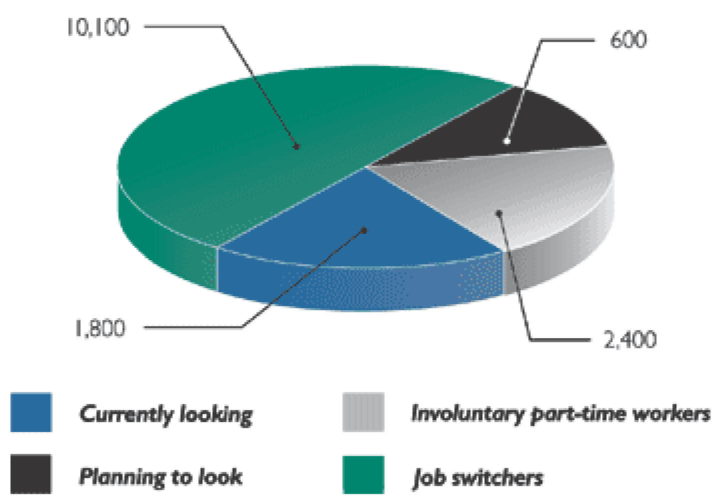
There are 13 major and/or chain hotels in Great Falls, with more than 1,300 rooms available to rent (Hotel-Guides.us, 2005). In the 2000 Census, 35,225 housing units were counted in Cascade County, of which 62 percent were detached, single-family houses and 10 percent were mobile homes; the remainder consisted of attached townhouses, condominiums, and apartments (USCB, 2000b). Of these 35,225 housing units, 32,547 were occupied, for an occupancy rate of 92 percent, a vacancy rate of 8 percent, and 2,678 vacant units. Eighty-two percent of the housing units were heated with utility-supplied natural gas.

Table 3-33. Average Annual Unemployment Rate for the Great Falls, MT Metropolitan Statistical Area vs. U.S. Unemployment Rate[1]

Year	Labor Force	Employment	Unemployment	Unemployment Rate (%)	U.S. Unemployment Rate (%)
1995	37,259	35,396	1,863	5.0	
1996	37,073	35,225	1,848	5.0	
1997	37,537	35,554	1,983	5.3	
1998	37,962	35,882	2,080	5.5	
1999	36,858	34,839	2,019	5.5	
2000	38,287	36,386	1,901	5.0	
2001	38,419	36,719	1,700	4.4	
2002	38,411	36,776	1,635	4.3	
2003	38,558	36,922	1,636	4.2	
2004	39,209	37,566	1,643	4.2	
2005 Jan.	40,262	38,116	2,146	5.3	5.2
2005 Feb.	40,217	38,178	2,039	5.1	5.4
2005 Mar.	40,376	38,268	2,108	5.2	5.2
2005 April	40,773	39,049	1,724	4.2	5.2
2005 May	40,377	38,808	1,569	3.9	5.1
2005 June	40,494	38,621	1,873	4.6	5.0
2005 July	40,740	39,156	1,584	3.9	5.0
2005 Aug.	40,542	38,895	1,647	4.1	4.9
2005 Sept.	39,861	38,300	1,561	3.9	5.1
2005 Oct.	40,723(p)	39,137(p)	1,586(p)	3.9(p)	5.0

Source: BLS, 2005
[1]Not seasonally adjusted for Great Falls; seasonally adjusted for U.S.
p= preliminary

Figure 3-61. Great Falls Labor Market and 30-mile (48 km) Radius Surrounding Area



Source: GFDA, no date

3.14 ENVIRONMENTAL JUSTICE/PROTECTION OF CHILDREN

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations*, directs Federal agencies to identify and address any disproportionately high adverse human health or environmental effects of its projects on minority or low-income populations.

Cascade County does not have disproportionate numbers of minorities or a disproportionate level of poverty relative to the State of Montana. Its population is 1.1 percent black (compared to 0.3 percent for all of Montana), 4.2 percent American Indian (6.2 percent for Montana), 0.8 percent Asian (0.5 percent for Montana), and 2.4 percent Hispanic (2.0 percent for Montana). In Cascade County, 13.5 percent of persons lived below the poverty line in 1999, compared to 14.6 percent for the state as a whole (USCB, 2005b).

Historically, the Great Falls area was inhabited primarily by the Plains Indians and the Blackfeet Indian Nation. There are no Indian reservations or other tribal lands currently in the County, though the Little Shell Indian Tribe, made up of approximately 4,000 Chippewa Indians, considers Cascade County its homebase. The Little Shell Indians applied for federal recognition as a tribe in 1984 and received preliminary approval in 2000. The tribe is currently awaiting final official recognition. The tribe hopes to acquire tribal lands within Cascade County following recognition. In November 2005, Cascade County commissioners passed a resolution supporting the Little Shell Tribe's quest for 200 acres (80 ha) in the Great Falls area pending their recognition. Approximately 800 Little Shell tribal members currently live in Cascade County (Tribune, 2005).

Executive Order 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, directs federal agencies to "identify and address environmental health risks and safety risks that may disproportionately affect children." Order 13045 further directs federal agencies to "ensure that [their] policies, programs, activities, and standards address disproportionate risks to children that result" from these risks.

Generally, children are not present on the subject properties, or in their immediate vicinity, but may be presumed to live in residences southwest of the Industrial Park site and in and around the city limits of Great Falls.

An independent report on environmental justice in Cascade County was generated from Scorecard (Scorecard Copyright © 2005). Scorecard profiles environmental burdens in every community in the U.S., identifying which, if any, groups experience disproportionate toxic chemical releases, cancer risks from hazardous air pollutants, or proximity to Superfund sites and polluting facilities emitting smog and particulates. The report indicates that there is no disproportionate distribution of environmental burdens within Cascade County to groups based on race/ethnicity, education level, job classification, or home ownership status (Scorecard, 2005). Additionally, there is no disproportionate distribution within the county of chemical releases, cancer risks from hazardous air pollutants, or proximity to Superfund sites. However, there is some increased burden from existing facilities emitting criteria air pollutants near families and children below the poverty line when compared to families and children above the poverty line. Approximately 7.4 facilities emitting criteria air pollutants are located within one square mile of families and children below the poverty line within the county, compared to an average of 3.7 such facilities located within one square mile of families and children above the poverty line (Scorecard, 2005).

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4.0 ENVIRONMENTAL CONSEQUENCES

In response to public comments, RD and DEQ have made a number of edits to the text of Chapter 4. Other than updated maps to reflect the modified location of the HGS, there are no large changes. Any additions or changed text in the FEIS from the DEIS as a result of public comments are shown in double underlining. Deletions are not shown.

4.1 INTRODUCTION

Chapter 4 assesses the potential environmental consequences associated with the Proposed Action consisting of the construction and operation of the proposed HGS and four wind turbines at the Salem site) and secondary action(s) including the construction and operation of power transmission lines, a rail spur, and potable, raw water and wastewater lines. Hereafter, the term "Proposed Action" will include all related secondary actions as they are necessary for the operation of the HGS or to meet the purpose and need of the Proposed Action. Connected Actions are possible projects or activities that may be linked to the Proposed Action or secondary action(s). There are two connected actions associated with the proposed HGS at the Salem site. Both pertain to mining of minerals needed for the operation of the HGS. These connected actions are not considered this EIS.

The main connected action is the surface mining and transport of coal to supply fuel for the generating station. However, environmental impacts associated with the particular mine or mines (Spring Creek and/or Decker, in Montana's Powder River Basin) from which coal would be purchased to fuel the HGS are already addressed in previous EISs (USGS-MDSL, 1977; USGS-MDSL, 1979; MDSL, 1980). These EISs are incorporated by reference into the present EIS.

Another connected action is the mining and transport of limestone from the Graymont Indian Creek Lime Plant and quarry near Townsend. This limestone quarry/plant is an existing facility that has been evaluated with the appropriate level of MEPA analysis and has operating permit #00105 from DEQ.

Potential environmental consequences can be direct or indirect, on-site and/or off-site. Direct impacts are those that are directly caused by the Proposed Action, like an increase in air pollutants emitted. Indirect impacts are those that follow in turn from the primary or direct impact; increased air pollutants, for example, could lead to increased smog, visibility impairment in Class I areas like national parks and wilderness areas, or increased deposition of toxic substances and their uptake by living organisms.

Potential environmental consequences are discussed under each resource topic for three possible alternatives related to the Proposed Action: 1) No Action, in which no HGS would be built at the Salem or alternate (Industrial Park) site; 2) Proposed Action, or the construction and operation of the HGS at the preferred Salem site east of Great Falls; and 3) construction and operation of SME's proposed generating station at the alternate site, which is the Industrial Park location just north of the City of Great Falls. Consequences of mitigations are also discussed.

4.2 METHODOLOGY

MEPA and NEPA both require the disclosure of more than the direct and indirect effects. Rather than include the following three categories with each resource, they are combined at the end of the chapter so the reader can understand the overall effects of these categories of effects.

- Neither NEPA nor MEPA requires an agency to avoid adverse or even significant effects, but they must be disclosed. Typically, agencies attempt to avoid, minimize, reduce, or mitigate adverse affects. "*Unavoidable*" adverse effects are those that would occur regardless of the proposed mitigations or other actions that would eliminate adverse effects.

- The "*relationship between short-term uses and long-term productivity*" varies somewhat according to resource. Short-term uses of a resource could be for a couple of years or the life of the project. Long-term productivity may refer to productivity during the life of the project and beyond for some resources and for others long term would only apply when the project is completed. The key to this section is to look at the trade-offs between short-term uses and long-term productivity with and without the Proposed Action, Agency Alternative, and any mitigations. The gains and losses are described.

- An irreversible or irretrievable commitment of resources would occur when resources were either consumed, committed, or lost as a result of the project. The commitment of a resource would be "***irreversible***" if the project started a "process" (chemical, biological, and/or physical) that could not be stopped. As a result, the resource, or its productivity, and/or its utility would be consumed, committed, or lost forever. Commitment of a resource would be considered "***irretrievable***" when the project would directly eliminate the resource, its productivity, and/or its utility for the life of the project or some period of time, but the resources would recover.

The interdisciplinary study team (see Chapter 7, List of Preparers) followed a structured process to analyze the potential environmental impacts, or effects, resulting from the two alternatives for constructing and operating a coal-fired electricity generating station for SME. This procedure, called the cause-effects-questions process, is described the six steps outlined in the following text box.

Using this process, both direct and indirect effects that could potentially occur as a result of different management scenarios were identified. As mentioned above, direct effects are impacts that would be caused by the alternative(s) at the same time and in the same location as the action. Indirect effects are impacts that would be caused by the alternative(s) that occur later in time or farther removed in distance than the action, or, as described above, by means of a longer chain of cause-and-effect linkages.

Causes-Effects-Questions:
A Structured Analytic Process

Step 1: Identify the specific activities, tasks, and subtasks involved in the Proposed Action(s) and alternative(s) (Table 4-1).

Step 2: For each specific activity, task, and subtask, determine the full range of direct effects that each could have on any environmental resource. For example, removing vegetation could cause soil erosion. See Appendix K for more detail.

Step 3: For each conceivable direct effect, identify which further effects could be caused by the direct effects. For example, soil erosion could cause stream sedimentation, which could kill stream species, which could diminish the food supply for fish, leading to decreased fish populations. This inquiry can identify multi-stepped chains of potential causes-and-effects. See Appendix K for more detail.

Step 4: Starting at the beginning of each chain of causes-and-effects, work through a series of questions for each potential effect:

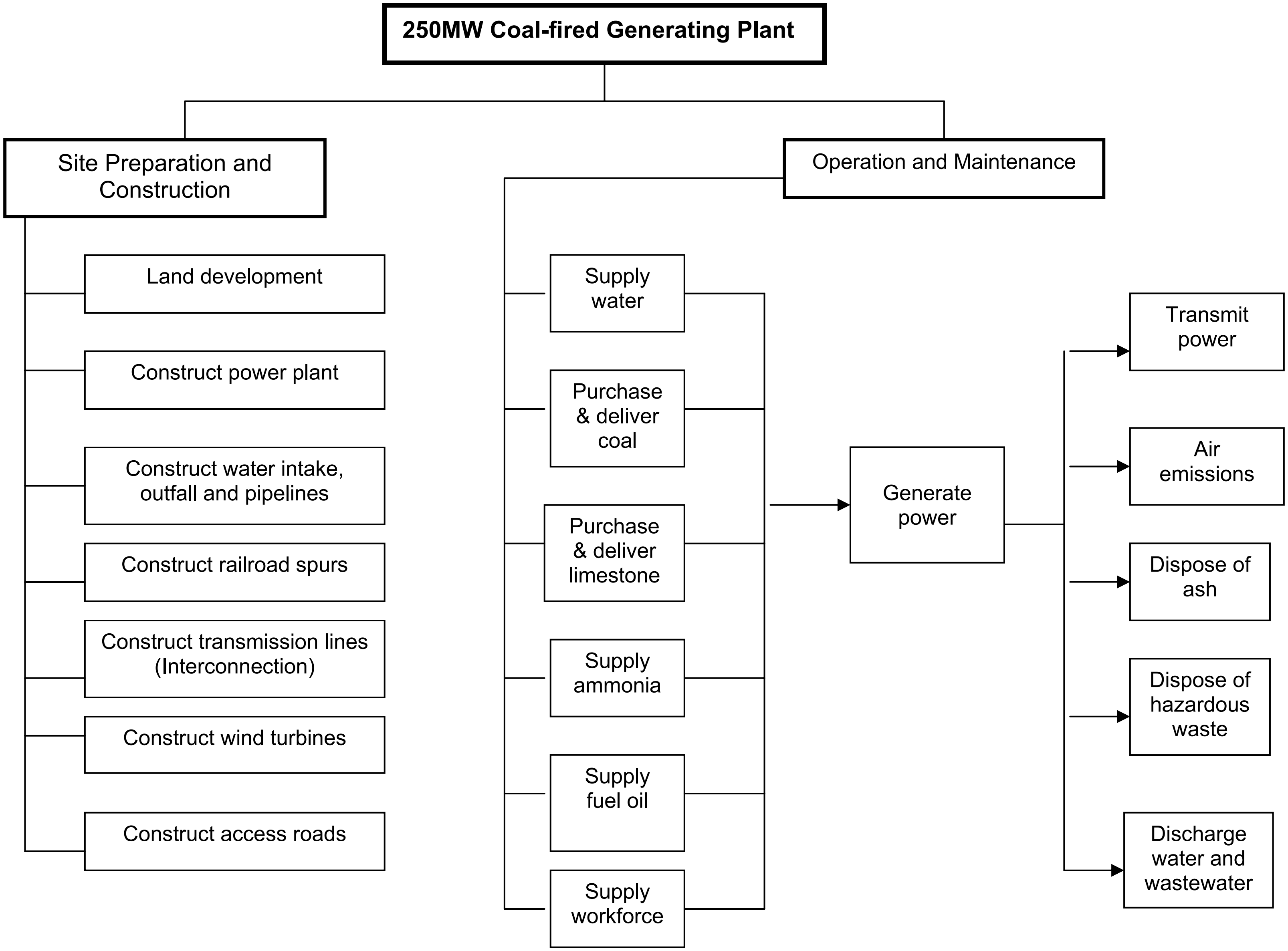
- Would this effect actually occur from this project?
  If not, why not? What would preclude it from happening?
- If the effect cannot be ruled out, characterize which types of data, other information, and analyses are needed to determine the parameters of the effect, including its extent, duration, and intensity. Identify the sources from which the data is to be obtained.

Step 5: Gather the data and conduct the analyses identified by the above steps, utilizing only relevant information.

Step 6: Document the results of this study process.

Figure 4-1 presents the preliminary cause-effects activities and tasks diagram for the proposed SME generating station. Appendix K presents the entire preliminary cause-effects-questions diagram that the study team prepared at the outset of the analysis. This visual aid helped organize the investigation and focus it on relevant issues.

Figure 4-1. Preliminary Cause-Effects Activities and Tasks Diagram for Proposed Southern Montana Electric Generating Station



4.2.1 DEFINITIONS

Discussions of environmental consequences in the following sections will utilize a general vocabulary consisting of the following terms and definitions:

Types of Impact

Beneficial – A positive change in the condition or appearance of the resource or a change that moves the resource toward a desired condition.
Adverse – A change that moves the resource away from a desired condition or detracts from its appearance or condition.
Direct – An effect that is caused by an action and occurs in the same time and place.
Indirect – An effect that is caused by an action but is later in time or farther removed in distance, but is still reasonably foreseeable.

Duration of Impact:

Short-Term – Impact would occur during a transition phase only, or in the case of potential future developments, during the site preparation and construction phases only. Once these phases have ended, many resource conditions are likely to return to pre-transition/construction conditions.
Medium-term – Impact would extend past the transition, or construction phase for future developments; it could conceivably last 5-10 years, and depending on the resource, could persist for the life of a project.
Long-term – Impact would likely persist for 25-30 years or longer, often beyond the project life, depending on the specific resource and type of project.

Context of Impact:

Localized – Impacts would affect the resource area only on the project site or its immediate surroundings, and would not extend into the region.
Regional – Impacts would affect the resource area on a regional level, extending well past the immediate project site.
Worldwide – Impacts would affect the resource on a global level, extending well past the immediate project site and regional area.

Intensity of Impact:

Negligible – The impact is at the lowest levels of detection – barely measurable and with no perceptible consequences.
Minor – Change in a resource occurs, but no substantial resource impact results.
Moderate – Noticeable change in a resource occurs, but the integrity of the resource remains intact.
Major – Substantial impact to or change in a resource area that is easily defined, noticeable, and calculable but may not be measurable, or exceeds a trigger level.
Significant – The impact to or change in a resource is well defined, highly noticeable, measurable, and meets one or more of the significance criteria described in MEPA or NEPA summarized below, and/or violates an applicable state, federal or local statute or regulation.

4.2.2 EIS SIGNIFICANCE CRITERIA

The Highwood Coal-Fired Power Plant could have a wide variety of impacts on different components of the environment. The importance, or "significance," of each of these diverse impacts depends on several factors. For example, if a state or federal law clearly would be violated by any aspect of the Proposed Action, then that obviously would be a significant impact. Other factors affecting significance are matters of professional judgment, such as the importance of losing some wildlife habitat. The Council on Environmental Quality (CEQ) regulations implementing NEPA and DEQ's MEPA regulations provide a list of factors to be considered in determining impact significance. This EIS is based on an assessment method that combines these multiple factors into an overall assessment of significance. The following major factors influence the significance of most types of impacts:

- Magnitude of the impact (how much);
- Duration or frequency of the impact (how long or how often);
- Extent of the impact (how far);
- Likelihood of the impact occurring (probability).

Several levels were identified for each of these factors, as shown below.

Magnitude:
- major
- moderate
- minor

Duration:
- long term
- medium term (intermittent)
- short term

Frequency:
- often
- intermittent
- seldom

Extent:
- large
- medium (localized)
- small (limited)

Likelihood:
- probable
- possible
- unlikely (improbable)

Combinations of these factors would constitute various overall ratings of significance, as shown in Table 4-1. Given this general structure, specific definitions of these levels for each resource or impact topic were developed for this EIS.

Other factors affecting significance of impacts need to be taken into account during the impact analysis process. CEQ and MEPA regulations both contain the following similar requirements:

- The uniqueness and fragility of the resources or values; CEQ specifically defines different types of geologic features;
- The importance of the resource or value to the state and society, or conversely the degree to which impacts are likely to be highly controversial;
- The degree to which a precedence for future actions with significant impacts would be set as a result of the impact of the Proposed Action; and
- The potential for conflicts with local, state, or federal laws, requirements or plans.

CEQ regulations also include three additional factors that need to be considered:

- The degree to which the proposed action affects public health and safety;
- The degree to which the proposed action may adversely affect or cause the loss of significant scientific, cultural, or historic resources including sites on or eligible for the National Register of Historic Places; and
- The degree to which the proposed action may adversely affect endangered or threatened species or its habitat.

MEPA has one unique additional factor:

- The potential growth-inducing or growth-inhibiting aspects of the impact.

A Proposed Action also may generate impacts that are beneficial with regard to a given topic or resource area, in which case these impacts will be identified as "beneficial." By the same token, in some instances, impacts hypothetically may be neither beneficial nor adverse, or be negligibly beneficial or adverse, in which case they will be identified as such.

Table 4-1. Criteria for Rating Impacts

Levels of Impact				Impact Rating
Magnitude	**Duration**	**Extent**	**Likelihood**	
Major	Any Level	Large or Medium	Probable	**Significant**
Major	Long Term	Large or Medium	Possible	
Major	Medium-term, inter-mittent, or short-term	Any Level	Probable	
Major	Medium-term, inter-mittent, or short-term	Any Level	Possible	**Potentially Significant or <u>Potentially Non-Significant (to be determined on a case-by case basis)</u>**
Moderate	Any Level	Large or Medium	Probable	
Major	Any Level	Small	Probable	
Major	Long-term	Small	Possible	
Moderate	Any Level	Large	Possible	
Moderate	Any Level	Medium or Small	Possible	
Moderate	Any Level	Small	Probable	
Major	Any Level	Large	Unlikely	
Major	Long-term	Medium or Small	Unlikely	
Minor	Any Level	Large	Probable	
Minor	Long-term	Medium or Small	Probable	
Major	Medium-term, inter-mittent, or short-term	Medium or Small	Unlikely	
Minor	Medium-term, intermittent	Medium	Probable	**Non-Significant**
Minor	Any Level	Large	Possible	
Minor	Long-term	Medium or Small	Possible	
Moderate or Minor	Any Level	Any Level	Unlikely	
Minor	Short-term	Medium	Probable	
Minor	Medium-term, inter-mittent, or short-term	Small	Probable	
Minor	Medium-term, inter-mittent, or short-term	Medium or Small	Possible	

4.3 Soils, Topography, and Geology

4.3.1 No Action Alternative

The No Action Alternative would not have any impacts on the topography or the geology of the Salem or Industrial sites. There would be no change to contours or elevations of the land.

There would be no significant adverse impacts on soils from the No Action Alternative, although negligible to minor, long-term adverse impacts would continue from existing land use practices. Even on lands with very little slope, long-term background rates of erosion would continue, particularly on cultivated areas, due to the exposure of soils to wind and water from grazing, tilling, disking, plowing, and movement of farm machinery. This erosion is exacerbated by the high clay content of the soils in the area. Overall, in this area, as throughout most of the High Plains area and the nation as a whole, soil loss rates exceed soil formation rates. In Montana, average erosion rates on crop and pastureland are estimated to be 5.5 tons of soil per acre (12.3 metric tons per hectare) per year (USDA, 2000). Soil formation rates are estimated to be only 10–25% of these erosion rates, leading to a net loss of topsoil over the long term.

Insofar as SME would need to purchase power from existing sources of wholesale supply to meet energy supply needs in the service area, SME would be contributing indirectly to ongoing soil resource impacts, and possibly impacts to geology and topography, at different generating stations in the region or at potentially new generating stations located outside of the region.

4.3.2 Proposed Action – HGS at the Salem site

4.3.2.1 Construction

Under the Proposed Action, construction activities on the HGS are anticipated to occur for four years and three months. Two months or more are anticipated to be spent on site grading and site preparation activities. The total area of disturbance for these activities would include the total footprint of the power plant, approximately 545 acres (221 ha), and additional roadway, rail spur, and utility corridor zones. Installation of the proposed wind turbines and related facilities such as access roads and electrical and transmission cables would require several months.

All coal storage and processing facilities would be located within the 545-acre footprint of the power plant. Additionally, this area would include several storm water detention ponds and a waste monofill (Figure 4-2). The monofill would be constructed within the confines of the railroad loop for the disposal of ash and water treatment system byproducts. The monofill area within the rail loop would be laid out in a rectangular grid consisting of approximately 53 acres (21 ha). The monofill would be constructed as nine cells in a grid. Each cell would be an excavated pit approximately 36 feet (11 m) deep. Once filled and covered, the monofill grid would have a height of roughly 22 feet (7 m) above grade. Excavated material would be predominantly fine-grained, high content inorganic clay soils with high plasticity and low permeability, which would be used to construct a clay liner and perimeter containment berms with the balance stockpiled for use as final cover.

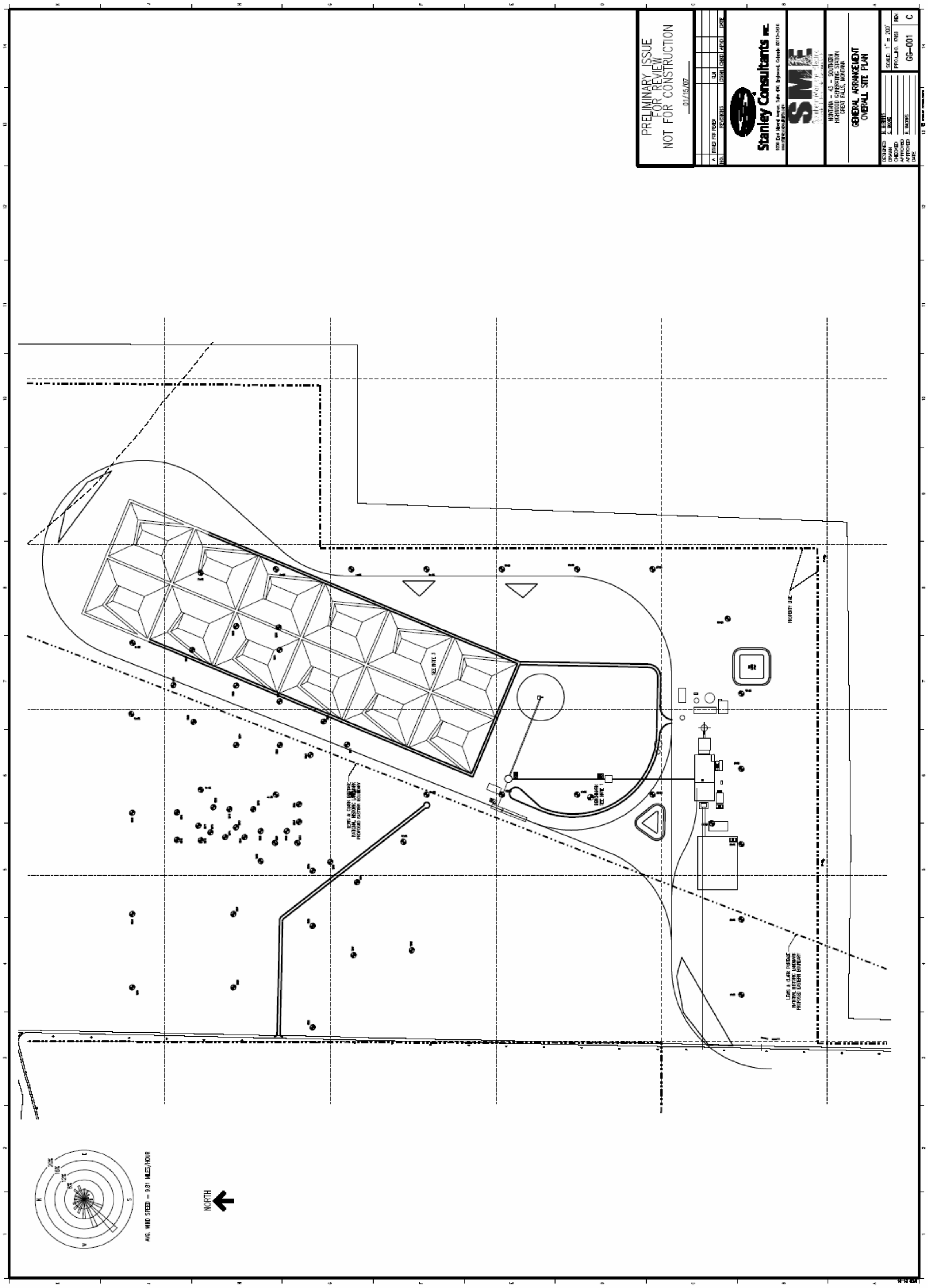


Figure 4-2. Construction Schematic of Ash Waste Monofill

Each cell of the monofill would be designed as a self-contained unit. During initial construction, only one cell (with the associated containment berms) would be constructed. Every three years, a new disposal cell would be constructed, and the excavation materials from this construction would be used as the cover material and topsoil to close the filled cell. The Pendroy Clay soils found onsite are characterized by very slow water transmission rates and infiltration rates. This material would be recompacted at optimum moisture content to create an engineered clay liner for the cell. As each cell is filled, a final cover would be placed on the cell. The final cover is designed to retain the precipitation that falls on the final cover and maximize evaporation and transpiration by the plants grown on the cover. The cap would be constructed with a gravel layer immediately on top of the ash to serve as a capillary break. The gravel would be covered with 48 inches of native on-site materials that would function as subsoil. The capillary break prevents the subsoil from losing water into the waste. Six inches of topsoil would be applied and planted with suitable vegetation to minimize erosion and transpire the moisture retained in the cap. This type of cap, know as an evapotranspiration (ET) cap, is in common use at Class II landfills and other waste repositories in Montana. It is easier to construct and maintain than a compacted clay cap and mimics the natural soil conditions while preventing infiltration. The seeded areas would be maintained along with the balance of the site landscaping for the life of the plant.

With the exception of retention ponds and the monofill site, all areas within the footprint of the site would be contoured to an even grade according to design specifications, and the net balance between soil cut and fill is anticipated to be even (Walters, 2006). If, at any point, soil is stockpiled on site, the stockpile would be stabilized and/or covered, utilizing best management practices.

For access to the construction site, the existing aggregate roadways currently leading to the site would be maintained. At the end of the construction period, these existing roadways would be regraded and covered with additional aggregate. A 1,800-ft. (545 m) long paved access road into the site would be constructed and maintained from the existing Cascade County road, Salem Road.

Additionally, 6,600 feet (2,012 m) of paved internal roadways would be constructed to facilitate both the construction and operations phases of the plant. These on-site, paved roads would be aggregate-based during construction and would be paved upon completion of heavy construction. Internal road construction would take six months.

A 6.3-mile (10.1-km) railroad spur would be installed at the Salem site in order to transport and supply coal to the HGS. The spur would extend south from the plant and tie into existing main line track that is located three miles (five kilometers) south of the city of Great Falls. Although the railroad spur would not cross any waterways, it would cross agricultural lands and Montana State Highway SR 228, Highwood Road, which would require a raised highway (SME, 2005e). When railroad track is laid down, it would permanently remove or cover up arable soils on the agricultural lands to be crossed.

Additionally, two short segments of electrical transmission line would be constructed; the first line segment, approximately 4.1 miles (6.6 m) long, would extend from the plant site to a new switchyard site proposed for a location south and west of the Salem site; the second line segment, approximately 9.21 miles (14.82 km) in length, would extend south and west from the plant site, crossing the Missouri River north and east of Cochrane Dam. Both line segments would be constructed in new rights-of-way typically extending 50 feet (15 m) either side of centerline. All poles and structures associated with the transmission lines would be directly embedded utilizing native or engineered soils, in the event that additional soil is needed as backfill.

Construction of the raw water supply system would include a collector well which would use a passive intake screen installed on the end of a lateral pipe that extends into the Morony Reservoir. A reinforced, below-grade, concrete caisson (vertical cylinder used as a sump) would be constructed near the river and would serve as the intake's "wet well." A fully enclosed pump house would be located on the top of the caisson with a finish floor elevation at approximately grade.

Installation of the four wind turbine generators (WTGs) would involve temporary disturbance of soils from various activities. Excavation and grading would be required at each WTG location for foundation placement, as well as a temporary crane pad for tower erection. The total area of site disturbance for each tower is estimated at approximately 1.1 acres (0.4 ha), or 4.4 acres (1.6 ha) total. A portion of the excavated native soil materials would be used to establish natural drainage away from the turbine tower foundation. Additional soils disturbance would occur for installation of high voltage underground cable (collection system), communications cable and the electrical grounding system between the HGS Switchyard and WTG locations. A total of approximately 3,300 feet (1,000 m) of excavated trench, typically three feet wide by four feet deep (0.9 m by 1.2 m) would be required.

Ongoing operation and maintenance at WTGs would require construction of approximately 2200 lineal feet of access roads. Road construction impacts would be reasonably small considering the relatively minor change in elevation between WTG locations, the HGS plant site and existing county road. Access road construction would be limited to placement of pit run and final road base gradation materials to establish a 25-foot (8-m) wide drivable surface with elevations of 12 inches or more above natural grade, or as otherwise required to interface with an improved primary plant access road. Culverts to re-establish natural drainage would be utilized where required; in addition, riprap and flow diversion devices would be specified as required for erosion protection. Top soils removed at the start of construction would be spread adjacent to completed roadways and disturbed areas would be reseeded with natural vegetation. Impacts to topography and geology from erecting the WTGs would be negligible; impacts to soils would be negligible to minor, localized, and temporary to short-term.

Construction equipment to be used during the various facets of site development for both the power plant and WTGs would include bulldozers, backhoes, <u>cranes</u>, earth scrapers, motor graders, heavy haul trucks, large tractors, concrete trucks, asphalt pavers, concrete pavers, rollers, and compactors.

As with almost any construction project involving the use of heavy equipment, there is some risk of an accidental fuel or chemical spill, and the potential contamination of soils. Fuel products (petroleum, oils, lubricant) would be needed to operate and fuel excavation equipment. To reduce the potential for soil contamination, fuels would be stored and maintained in a designated equipment staging area. Oils and lubricants are usually stored in metal storage cabinets appropriately labeled, often inside a garage or maintenance shed. A person(s) designated as being responsible for equipment fueling would closely monitor the fueling operation, and an emergency spill kit containing absorption pads, absorbent material, a shovel or rake, and other cleanup items, would readily be available on site in the event of an accidental spill. Following these precautions, the potential for an accidental chemical or fuel spill to occur and result in adverse impacts on soils would be negligible.

Construction equipment also has the potential to compact soil, reducing the porosity and conductivity of the soil. Such compaction is likely to slightly increase the amount of surface runoff in the immediate area. The underlying soil in the area of the site, Pendroy Clay, is already characterized by high runoff potential and relatively high soil erosion potential. Stabilization of the soils would be vital to prevent sediment runoff impacts to off-site water sources, possibly degrading water quality.

Siltation, or sedimentation, is a leading cause of stream and river impairment in Montana and the U.S., as it can cause disturbances in aquatic ecosystems. The National Pollutant Discharge Elimination System (NPDES) under the Clean Water Act prohibits the discharge of any pollutant, including sediments, to waters of the United States. The discharge of storm water runoff from construction sites is regulated under the NPDES program. Typically, sediment erosion rates from construction sites are 10 to 20 times greater than those from agricultural lands, and 1,000 to 2,000 times greater than those of forest lands (DEQ, 2003). Construction activities disturbing five acres or more of land are regulated by Phase I of the NPDES program. In Montana, DEQ is authorized to administer the NPDES Program through the Montana Pollutant Discharge Elimination System (MPDES) Program.

DEQ's Water Protection Bureau/Storm Water Program has issued general MPDES permits for construction sites, the chief requirement of which is the preparation and implementation of a Storm Water Pollution Prevention Plan (SWPPP). SWPPPs contain measures to reduce soil erosion and prevent pollution from petroleum, oil, and lubricants (POLs) and other chemicals or hazardous/toxic materials at construction sites. Specifically, SWPPP plans assess the characteristics of the site such as nearby surface waters, topography, and storm water runoff patterns; identify potential sources of pollutants such as sediment from disturbed areas, and stored wastes or fuels; and identify Best Management Practices (BMPs) which would be used to minimize or eliminate the potential for these pollutants to reach surface waters through storm water runoff.

BMPs at construction activity sites typically consist of various erosion and sediment control measures. At the Salem site, silt fences, straw bales, and other temporary measures would be placed in ditches and along portions of the site perimeter to control erosion during construction activities. At each outfall location, temporary sediment basins would be constructed and maintained until site vegetation is firmly established. These temporary sediment basins would be constructed before mass grading begins, so that they are in place and working for the entire construction period. Regular inspections of the erosion and sediment control measures would be performed after major storm or snowmelt events by qualified personnel, and as required in the MPDES General Permit.

In addition to preventing sediments from entering water bodies, erosion control methods would be in place to control the fugitive dust produced during construction activities. Dust control would be obtained through the use of water wagons on exposed earth or as required, the application of dust palliative on gravel surfaces. No human disturbances are anticipated, due to the lack of potential receptors in the immediate vicinity of the Salem site.

All disturbed areas (excluding those required for plant operations) would be stabilized and revegetated following completion of construction activities. Soils are likely to have been compacted during construction and would need to be ripped to reduce compaction prior to soil replacement. In addition, fertilizer and mulch may be needed to facilitate plant establishment. Proper seed selection would result in grasses with deep root systems and denser foliage, which would increase local retention times and reduce site outflows.

The construction activities would involve the conversion of existing agricultural lands into impervious areas. Increased urbanization and loss of pervious soils may result in increased surface runoff, perhaps contributing incrementally to localized drainage issues.

4.3.2.2 Operation

With the minor exception of the open monofill cell used in the disposal of ash, site soils would be stabilized once the proposed power plant is operational. Dust abatement would continue to occur on an as-needed basis on gravel surfaces.

The operation of the proposed power plant could hypothetically result in localized contaminant loading into the soil due to percolation of precipitation through coal stockpiles or leachate from the ash infiltrating into the soil from the monofill cells. The water would run off these piles or through the ash waste and could flush heavy metals such as arsenic and lead, which are inherently present in coal in trace amounts, into nearby soils where they could be adsorbed as the water slowly infiltrates down through the soil column. Leaching tests on the ash from proposed coal sources show no to very low concentration of specific metals will leach and that if any leachate was produced, it would be magnitudes lower than the standards for drinking water. Additionally, given the great depth to groundwater and the impermeability and thickness of clayey soils on site, the potential for extensive contamination problems is regarded as very low. Go to Section 4.13.2.2 for more information on ash disposal.

To further minimize any soil contamination, runoff within the power plant would be carefully managed. The ash monofill would be lined with compacted clay and groundwater in the vicinity of the monofill cells would be monitored. If contamination of soils is detected, SME would be required to follow the steps outlined in the site's Spill Prevention Control and Countermeasures Plan (SPCCP), or equivalent contingency and emergency plan, and the DEQ-approved solid waste management plan.

4.3.3 Alternative Site – Industrial Park Site

4.3.3.1 Construction

Construction activities at the alternative site would be very similar to those described for the Proposed Action, the Salem site, except that they would not include the wind turbines. Construction timing would be anticipated to be the same, though the total area of disturbance would be only about half that of the Salem site. At the Industrial Site, the total area of disturbance for construction activities would include the total footprint of the power plant, which is several hundred square feet less than at the Salem site, and additional roadway, rail spur, and utility (pipeline and transmission line) corridor zones.

An ash disposal monofill would not be constructed at the site due to space constraints. For access to the construction site, SME and its contractors would maintain existing aggregate roadways to be used for construction access across the Industrial Park. They would regrade and place additional aggregate on these existing roadways at the end of the construction period. SME and its contractors would also construct and maintain all paved internal roadways to facilitate plant construction and operations. These on-site, paved roads would be aggregate-based during construction and would be paved upon completion of heavy construction.

Eight miles (13 km) of new track and railroad bed would be needed, slightly more than the distance for the Salem site. The rail spur would start north of the Missouri River and travel north and west to the plant site. A 4.5-mile (7.2-km) long pipeline (compared to less than three miles for the Salem site) would be needed to transport make-up water from an intake structure on the Missouri River to the plant. Precise locations of transmission line corridors have not yet been determined, though it is likely that one transmission line would go to the Great Falls Switchyard, which is about 5.5 miles east of the Industrial Park site. A second line of 18 miles in length would likely be built to a switchyard installed on the Great Falls to Ovando line. The specific rights-of-way for potable water and wastewater lines have been selected, and are 1.5 and two miles in length, respectively, which are shorter than for the Salem site.

Construction equipment used during site development would be the same as the Proposed Action, and would include bulldozers, backhoes, cranes, earth scrapers, motor graders, heavy haul trucks, large tractors, concrete trucks, asphalt pavers, concrete pavers, rollers, and compactors. Impacts from the use of this equipment are described under the Salem site section.

A storm water MPDES permit for construction sites would be required for the Industrial Park site. BMPs employed at this site would be expected to mirror those described for the Salem site. The construction activities would involve the conversion of existing agricultural lands into impervious areas. Increased urbanization and loss of pervious soils might result in increased surface runoff, perhaps contributing incrementally to localized drainage and flooding issues.

4.3.3.2 Operation

Site soils would be stabilized once the proposed power plant is operational at the Industrial Park site. Dust abatement would continue to occur on an as-needed basis on gravel surfaces.

As discussed under the Salem site, the operation of the potential power plant may result in contaminant loading into the soil due to percolation of precipitation through coal stockpiles. Any runoff within the power plant would be carefully regulated and managed. If contamination of soils is detected, SME would be required to follow the steps outlined in the site's SPCCP, or equivalent contingency and emergency plan, and the DEQ-approved solid waste management plan.

Since the on-site ash monofill would not be constructed at the Industrial Park site, an alternative disposal location for the ash would have to be found. Either an off-site landfill of the same size as the Salem site would have to be licensed, constructed and operated, or the ash would have to be placed in another existing licensed solid waste management facility. The same volume of ash, 228 tpd, would have to be managed. Disposal at a new landfill would possibly require more road construction than at the Salem site, but the total amount of disturbance would not be known until the site was actually selected. The road construction standards might change because the haul to the new landfill would have to be done in smaller, road-worthy trucks. The use of an existing landfill would prematurely fill the landfill and would require that the solid waste facility be replaced earlier than it otherwise would be without the additional material from the power plant. Road-worthy trucks might also be needed to haul ash to an existing facility.

4.3.4 CONCLUSION

The No Action Alternative would not have any impacts on the topography or the geology of the Salem or Industrial sites. There would be no change to contours or elevations of the land. There would be no significant adverse impacts on soils from the No Action Alternative, although negligible to minor, long-term, possibly adverse impacts would continue from existing agricultural land use practices. Insofar as SME would need to purchase power from other generation sources of wholesale supply to meet energy its supply needs, it would be contributing indirectly to ongoing soil resource impacts, and possibly impacts to geology and topography, at different generating stations in the region or at potentially new generating stations located outside of the region.

The construction of a power plant and related facilities at the Salem and Industrial Park sites would involve extensive site grading and excavation activities that would disturb a considerable amount of soil and alter the topographic contours of the respective sites. Because the sites are relatively flat, the impacts associated with topography are considered negligible. Impacts to soil resources from construction activities at the Salem site would be slightly larger than those at Industrial Park site, due to the ash disposal monofill construction at the Salem site. At the Salem site, soil resource impacts from construction activities would have a moderate magnitude, medium-term duration, medium extent, and probable likelihood. The soil resource impacts from construction at the Industrial Park site would be of minor magnitude, medium-term duration, and medium extent, and have a probable likelihood of occurring. The overall rating for impacts on soil from the construction phase of the power plant would be adverse and non-significant for both the sites.

Due to the operation of the waste monofill for the duration of the plant's life, operation-related impacts on soil resources for the Salem site would be of minor magnitude, long-term duration, and small extent, and have a probable likelihood of occurring. Soil that is stockpiled while a monofill cell is being filled would have to be stabilized and monitored on a consistent basis. The impacts of plant operation on soil at the Salem site would be adverse and most likely non-significant.

Operation-related impacts on soil resources for the Industrial Park site would be of minor magnitude, short-term duration, and small extent, and have a possible likelihood of occurring. Soils are anticipated to be completely stabilized upon commencement of plant operations, and the only outstanding impacts to soil remain the permanent increase in impermeable surface area and the risk associated with soil contamination from site runoff or leachate. The impacts of plant operation on soil at the Industrial Park site would be adverse and non-significant. Nevertheless, since the amount of ash waste would not change, an alternative disposal site would have to be located. Impacts to soils at a new location are unknown and site-dependent.

4.3.5 MITIGATION

The compliance with the terms and conditions of the MPDES permit and the extensive use of best management practices (BMPs) during all construction activities would minimize the loss of soil due to erosion. Additionally, the regulation of all runoff within the power plant grounds, groundwater quality monitoring in the vicinity of the monofill cells, and adherence to a site-specific SPCCP, equivalent contingency and emergency plan, or DEQ-approved solid waste management plan would reduce the risk of a major adverse impact on soil resources to below the level of significance.

Oils, lubricants, and other chemicals would be stored inside a garage or maintenance shed within metal storage cabinets appropriately labeled. A person(s) designated as being responsible for equipment fueling would closely monitor the fueling operation, and an emergency spill kit containing absorption pads, absorbent material, a shovel or rake, and other cleanup items, would readily be available on site in the event of an accidental spill.

To minimize erosion and stabilize soils, all areas disturbed during construction would be stabilized, graded, and revegetated with appropriate grasses and forbs (using seeds) as soon as possible afterwards. Compacted soils may require ripping to mitigate the effects of compaction and allow roots to properly penetrate, develop, and obtain oxygen, moisture and nutrients; in addition, mulching and/or fertilizer may be needed to encourage initial plant growth.

4.4 WATER RESOURCES

4.4.1 NO ACTION ALTERNATIVE

The No Action Alternative would not significantly, adversely affect water resources at or near the Salem site or the Industrial Park. However, negligible to minor, long-term adverse impacts would continue from existing land uses.

Runoff from the agricultural lands on the sites can carry sediments, and possibly nutrients and other pollutants, to surface waters where they can potentially degrade water quality. Sedimentation is a leading cause of stream and river impairment in Montana and the U.S, and it can cause disturbances in aquatic ecosystems such as the degradation of fish spawning grounds, the potential reduction of recreational activities, increased cost of domestic water purification and decreased life span of dams and levies. Continuing agricultural practices such as grazing, plowing, disking, harvesting, fertilizing, and using pesticides (e.g. herbicides, fungicides, insecticides) on the Salem or Industrial Park sites would contribute incrementally (albeit to a minute extent) to this distant, regional water quality problem.

Insofar as SME would need to meet its energy supply needs by purchasing power from generation sources located elsewhere, SME could potentially be contributing indirectly to ongoing water resource impacts at different generating stations in the region or at potentially new generating stations located outside of the region.

4.4.2 PROPOSED ACTION – HGS AT THE SALEM SITE

4.4.2.1 Construction

Under the Proposed Action, construction activities would last approximately four years and three months. The maximum area of disturbance for these activities would include the total footprint of the power plant, approximately 545 acres (221 ha) (though not all of this would be disturbed), a water intake structure and associated pipelines, and additional roadway, rail spur, transmission lines, and utility corridor zones. Installation of the proposed wind turbines and related facilities such as access roads and electrical and transmission cables would require several months.

General construction impacts associated with the upland sites (the plant footprint and transportation corridors) could indirectly affect water resources by increased storm water runoff from the sites carrying sediment and contamination loads into surface water, and by contamination from construction equipment and activities infiltrating area soils and percolating down into the groundwater. Direct impacts to water resources from construction activities include the construction of the water intake structure in the Morony Reservoir, the installation of a transmission line and pipeline within the watershed of the Missouri River, and excavation and soil disturbance from installing four proposed wind turbines on site.

Under existing conditions, the main footprint of the Salem site drains to four distinct outfall locations. Drainage areas vary in size from 26 to 94 acres (11-38 ha). Along the western boundary of the site, storm flows are routed through in-place culverts under Salem Road. To the north and east, flows are to local coulees.

Under the Proposed Action, the Salem site would remain gravity drained. Disturbed areas would be revegetated. Proper seed selection would result in grasses with deep root systems and denser foliage, which would increase local retention times and reduce site outflows.

Internal site drainage would be accomplished through the use of open ditches and culverts. Most ditches would have a nominal slope of 0.5 percent and a width of six feet (two meters). This wide, flat shape would encourage infiltration of storm flows and would further reduce site outflows. Where concentrated flows intersect undisturbed ground, or where existing soils are erosive, riprap would be placed to reduce flow velocities. While the four outfalls would be maintained, the majority of them would have a reduced drainage area. One area would remain the same size and three areas would have an increase in drainage area (8.8 to 9.0 acres, 207 to 224 acres, and 58 to 105 acres). Detention storage of seven acre-feet and four acre-feet would be provided at the two larger areas; these detention areas are labeled as North Pond and South Pond in Figure 4-3 below. This detention storage would reduce peak outflows during future storm events such that they would not exceed peak outflows experienced under existing conditions.

During site preparation and grading activities, soils in the construction areas may become exposed, rutted, and compacted. Soil exposure, rutting, and compaction have the potential to increase water yields from sites, concentrate and channelize sheet flow, increase erosion rates, and increase sediment delivery to nearby waterbodies. These effects, if unmitigated, could deliver small quantities of sediment and nutrient loadings to the Missouri River or its tributaries, which as already noted, are currently impaired by excess silt and nutrient concentrations.

Best Management Practices (BMPs), such as silt fences, straw bales, and other temporary measures, would be placed in ditches and along portions of the site perimeter to control erosion during all construction activities. At each outfall location, temporary sediment basins would be constructed and maintained until site vegetation is firmly established. These temporary sediment basins would be constructed before mass grading begins, so that they are in place and working for the entire construction period.

As with almost any construction project involving the use of heavy equipment, there is some risk of an accidental fuel or chemical spill, which could adversely affect water quality if the spilled chemical were to percolate into groundwater or directly enter and adjacent surface water body. Fuel products (petroleum, oils, lubricant) would be needed to operate and fuel both construction and water pumping equipment. Fueling activities would be restricted to the equipment staging area, away from drainages. To reduce the potential for water resource contamination, fuels would be stored and maintained in a designated equipment staging area, away from water bodies.

A person(s) designated as being responsible for equipment fueling would closely monitor the fueling operation, and an emergency spill kit containing absorption pads, absorbent material, a shovel or rake, and other cleanup items, would readily be available on site in the event of an accidental spill. Following these precautions, the potential for an accidental chemical or fuel spill to occur and result in adverse impacts on water resources would be negligible.

Direct impacts to water resources from construction activities would occur from the construction of the water intake structure in the Morony Reservoir and the installation of transmission lines and water and wastewater pipeline within watersheds of the Missouri River and tributaries.

As part of the construction of the intake structure, a concrete caisson (vertical, cylindrical water-tight structure in which construction work is carried out) would be constructed several hundred feet landward from the edge of water. The pipeline would be jacked or drilled horizontally through the riverbank and extended out into the Morony Reservoir. The pipeline would emerge

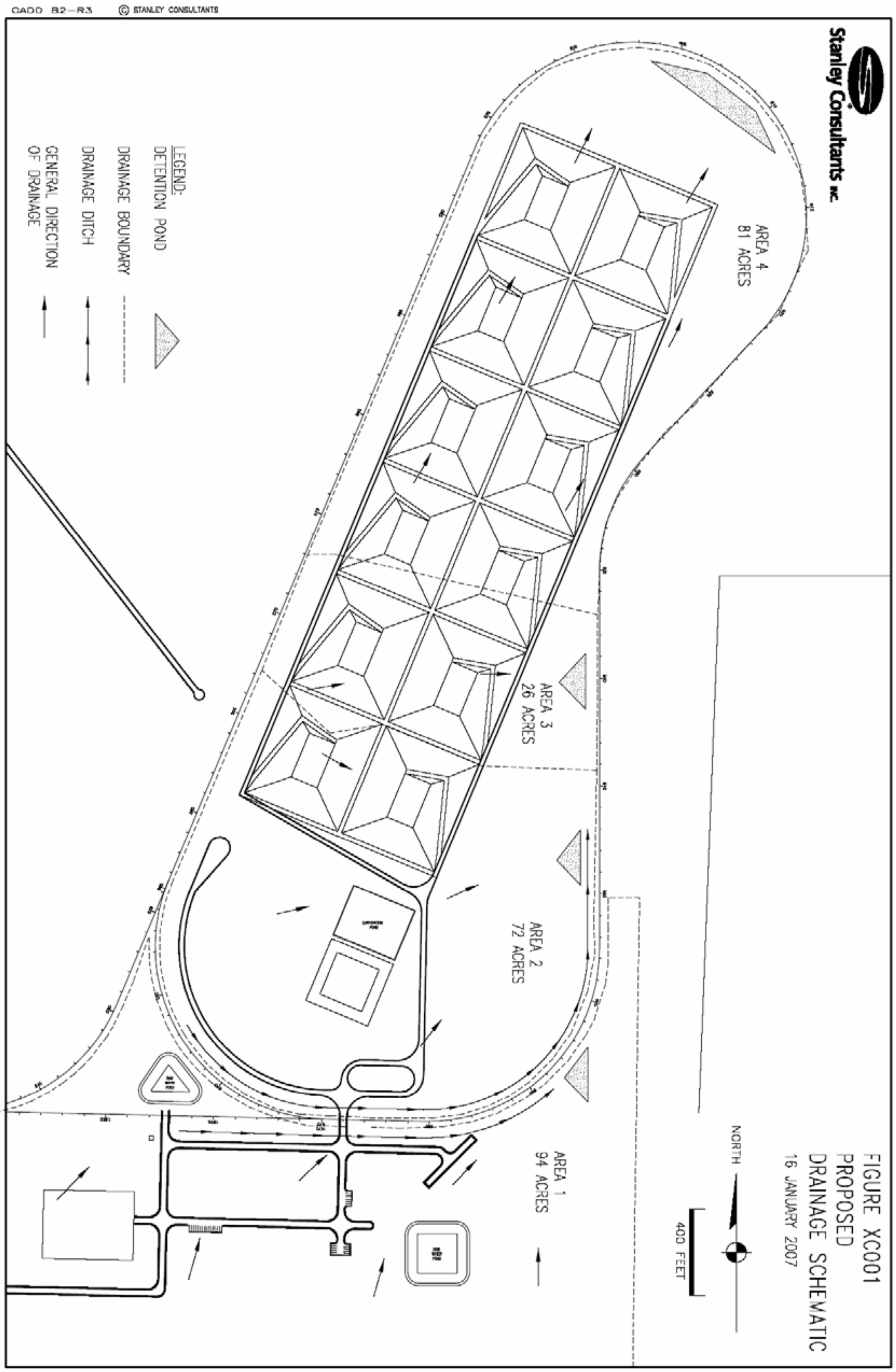


Figure 4-3. Proposed Drainage Schematic for Salem Site

from the ground, well below the water surface, and there would be no anticipated impact to the riverbank or to riverbank vegetation due to construction access or pipe placement. The pipeline would extend approximately 400 feet underwater to access the deeper portion of the reservoir.

Approximately eight vertical H-pile supports would be driven into the channel bottom as supports for the proposed pipeline. The supports would be driven to a depth to be determined during construction. The pipeline would be 20" welded steel pipe approximately 400 feet (120 m) long. A stainless steel passive intake screen would be installed on the end of the pipe. The diameter of the intake screen to be installed on the pipe extending into the river would be sized to meet the impingement velocity requirement and address Clean Water Act requirements. No measurable effects on fish, other aquatic life, or aquatic habitat are anticipated. Intake velocity of water through the intake screen would be below impingement velocity as required by 40 CFR Part 125 Subpart I (0.5 ft/sec).

The raw water supply system would consist of a collector well which would use a passive intake screen installed on the end of a lateral pipe that extends into the Morony Reservoir. The intake screen would be located and designed to prevent sediment and debris from entering the system while also providing protection to aquatic life. The passive intake would be designed according to Section 316(b) of the Clean Water Act which applies to new cooling water facilities that withdraw between two and 10 million gallons per day (mgd). The rule states that the maximum through screen intake velocity must be less than 0.5 feet per second (fps).

A reinforced, below-grade, concrete caisson (a vertical cylinder serving as a waterproof chamber or sump) would be constructed near the river and would serve as the intake's "wet well." The caisson would be located outside of the floodplain. A fully enclosed pump house would be located on the top of the caisson with a finish floor elevation at approximately grade. The pump house would contain two pumps designed to deliver a maximum of 3,200 gallons per minute (gpm) to the plant site. The pumps would deliver the water to the HGS plant site through a buried pipe approximately 2.3 miles (12,200 ft or 3,720 m) in length. The pipe would be buried at a minimum of 6.5 feet (2 m) below the ground surface.

HGS would discharge wastewater back to the City of Great Falls for disposal at its existing wastewater treatment facility via approximately 55,000 feet (16,800 m) of newly constructed 12"sanitary force main that would run from the project site to a point near Malmstrom Air Force Base where the line would intersect an existing wastewater line owned by the City of Great Falls. A third pipeline would be constructed to supply potable water to the site from the City of Great Falls. This pipeline, constructed of 6" ductile iron or HDPE, would follow the same routing as the discharge pipe, but would be located a minimum of 10 feet (3 m) to the side. This water supply pipeline would be buried at a depth of 7 feet (2.1 m).

An additional construction activity that could directly affect water resources by nature of its location includes the installation of a transmission line. The transmission line would extend south and west from the plant site, across the Missouri River north and east of Cochrane Dam and terminate at NorthWest Energy's existing Great Falls Switchyard, located north and west of Rainbow Dam. Multiple-pole or H-frame structures would probably be required at the Missouri River crossing point to maintain proper phase-to-phase and phase-to-ground clearances.

In order to protect the water quality of the Missouri River during construction activities taking place in or adjacent to the River, any and all BMPs required by the appropriate authority would be implemented and maintained. These BMPs could include such measures as the installation of double-walled silt curtain in the river surrounding construction activities and installation of silt fencing and other erosion and sediment control measures when working in the floodplain to protect all adjacent wetlands and drainage ways. Permits and authorizations that would likely be required for all construction activities in or adjacent to water bodies include: Corps 404 and Section 10 Permits; Montana DEQ 401 Certification and 318 Authorization; MFWP SPA 124 Permit; and Cascade County 310 and Floodplain permits. On March 21, 2006 SME submitted a Joint Application to county, state and federal authorities, including DEQ and the Army Corps of Engineers. On November 20, 2006 the Helena Regulatory Office of the Army Corps of Engineers' Omaha District advised SME that the proposed activity (intake structure and overhead power line crossing of the Missouri River) was authorized by Nationwide Permit 12 (Utility Line Activities).

Because construction activities in or near water bodies are so heavily regulated in Montana, the temporary impacts from construction, such as increased erosion on the river banks and increased turbidity in the water column, are anticipated to be reduced below the threshold of significance. Construction is not anticipated to significantly affect floodplains or wetlands, as in the area of impact both floodplains and wetlands are generally limited to the incised drainage habitat and narrow fringes of the river. In order to minimize impacts on waterfowl and wildlife habitat, it is likely that required permits for construction in or adjacent to the Missouri River would be limited to times when spawning, nesting, or breeding of aquatic and/or wetland species is not occurring. That would probably limit construction to late summer, fall, and winter months.

4.4.2.2 Operation

The operation of the power plant would require a large amount of water, with implications for both water supply and wastewater treatment and disposal. In the U.S., water withdrawals for thermo-electric power plants are the leading use of water and accounts for approximately 48 percent of all water withdrawals in the United States. Water withdrawals for irrigation are the second largest water user and account for approximately 34 percent of all water withdrawals (USGS, 2005).

In 2000, a total of 110 million gallons per day (123 thousand acre-feet per year) of water was withdrawn in Montana for use in thermoelectric power generation. All water used in the state for thermoelectric power is surface water. Comparatively, in the same year a total of 7,950 million gallons per day (8,920 thousand acre-feet per year) of water was withdrawn for irrigation uses in Montana, over 70 times the amount used for thermoelectric power. The amount of water withdrawn for thermoelectric uses in Montana represents 0.056 percent of the total water withdrawn in the entire nation (195,000 million gallons per day) for thermoelectric uses (USGS, 2005).

The proposed power plant would withdraw surface water required for its operation from Morony Reservoir, approximately 0.4 mile (0.6 km) upstream of Morony Dam on the Missouri River. Morony Dam is owned and operated by Pennsylvania Power & Light (PPL) Montana (Figure 2-

26). The land directly adjacent to the reservoir is also owned by PPL Montana. Morony Dam is operated as a run-of-the-river generation facility. Therefore, the outflow is maintained essentially equal to the inflow. The Morony Reservoir has a capacity of approximately 13,889 acre-feet and covers an area of approximately 304 acres (123 ha). Presently there is no public access to the Morony Reservoir for recreational purposes.

The plant would require a maximum of 3,200 gpm (7.13 cubic feet per second or 5,161 acre-feet per year) of "make-up water" to be pumped from the Morony Reservoir. The majority of this water (80 to 85 percent) would be a consumptive water use. This would represent almost five percent of all water withdrawn in the state for electrical power generation. The majority of make-up water would be used for cooling tower make-up due to the large evaporation, drift, and blowdown losses. A raw water tank would provide an on-site storage for service water and cooling tower make-up usage. A coal burning power plant is a thermoelectric plant which works by heating water in a boiler until it turns into steam. After the steam is used to spin the turbine-generator that produces electricity, it is sent to the condenser to be cooled back into water. Most of the water used in thermoelectric power generation is used in the condenser to cool the steam back into water. Then the condensed water is pumped back to the steam generator to become steam again while the cooling water is discharged as return flow or is recycled through cooling ponds or towers.

The annual mean flow of the Missouri River immediately downstream of the Morony Dam varies substantially, but is generally above 4,000 cfs. During extreme dry months, the monthly flow can drop down to 3,000 cfs. Assuming an extreme dry spell flow of 2,500 cfs for flows of the Missouri downstream of Morony Dam, the amount of withdrawal for the power plant (a maximum of 7.13 cfs) would reduce the river's flow by 0.29 percent.

This withdrawal would not in of itself significantly reduce flows in the Missouri River downstream of the site, though it would represent a small additional increment of consumptive use within the Missouri River Basin. This consumptive use of water has important implications for aquatic life, including threatened and endangered species, but is not cited by the state as the priority threat facing aquatic species in the Missouri River.

The water rights for supplying the water would be from an existing water reservation that is owned by the City of Great Falls. The city would continue to own the water reservation and would sell the water to the HGS through an agreement between the city and SME. The point of diversion for the existing water reservation is within city limits.

Consumptive Water Use

Much of the water that is withdrawn from rivers and aquifers for use by irrigated agriculture, industry and municipalities is actually returned to a watershed after being used. Often it is returned in altered form, carrying impurities like nutrients and suspended solids that can impair receiving water quality. Wastewater treatment plants endeavor to improve the quality of effluent prior to discharge so as to reduce the impact on receiving water.

In contrast, **consumptive use** is that portion of withdrawn water that is used or "locked up" and effectively removed from a watershed, like that incorporated into the tissues of growing crops. This water is sequestered, and no longer available for other uses. Consumptive use also includes water lost to a basin through diversion and evaporation, plant evapotranspiration, or conversion, or to the ground.

The point of diversion for the preferred HGS plant site is located downstream of the city in the Morony Reservoir. The city has prepared and submitted an application to the Montana Department of Natural Resources and Conservation to add a point of diversion and place of use to the existing water reservation (SME, 2005f).

The power plant would generate a maximum of 811 gpm of wastewater that must be discharged and would consist of concentrated river water and trace amounts of cooling tower water and boiler water treatment chemicals (DEQ, 2005). Best available pollution control technologies (BACT, or Best Available Control Technology) could reduce but not eliminate the chemical loading in the discharge water.

SME proposes to discharge wastewater back to the City of Great Falls for disposal and treatment at its existing wastewater treatment facility via a 12" newly constructed sanitary force main. The City of Great Falls wastewater treatment facility is licensed and permitted to treat and discharge up to 21 million gpd into the Missouri River (MPDES MT 0021920). The facility's discharge point is 1.5 miles (2.4 km) upstream of Black Eagle Falls Dam or approximately 12 river miles upstream from the proposed water intake pipe in Morony Dam Reservoir. The facility currently discharges between 9 and 10.5 million gpd. The facility thus has sufficient capacity to treat and discharge HGS' proposed 1,168,000 gpd maximum industrial and sanitary wastewater discharge. The environmental impacts from the discharge of the facility's treated wastewater were addressed during its MPDES permitting and 5-year review processes (Jacobson, 2006b).

The city's wastewater treatment facility has pretreatment requirements that must be met before it would accept any water from the power plant. Some of these requirements are summarized in the textbox below. Additionally, the city has set maximum allowable industrial loading (MAIL) numbers for heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, zinc). The loading numbers represent the total mass of each pollutant that the wastewater treatment plant can accept from all industrial sources combined. Wastewater discharged to the treatment facility from HGS would need to meet city-determined loading levels set below the MAIL values.

An Industrial Wastewater Application for Permit was submitted to the City of Great Falls on February 15, 2006 in order to allow the proposed power plant to discharge industrial wastewater as a Steam Electric Power Generating (40CFR Part 423) category of industry. A 12" forced main piping system would extend from the proposed plant and connect to the existing municipal sanitary sewer at the junction of the Highway 87 bypass and North 10th Avenue. Discharge from the plant would average 0.734 mgd (734,400 gpd) and have a maximum peak of 1.168 mgd (1,168,000 gpd). This wastewater would be generated from various plant operation sources, including boiler blowdown; cooling tower blowdown; turbine, boiler, and transformer sumps; and raw water treatment (softener, RO backwash).

A 5.8-million gallon basin would be constructed onsite in order to provide surge control and a limited amount of primary sedimentation for boiler blowdown, cooling tower blowdown, and sump discharges from turbine, boiler and transformer areas. The sump discharges would undergo treatment prior to entering the basin in a standard oil/water separator unit. No toxic organic compounds would be present in the discharged wastewater. SME would install wastewater sampling and monitoring equipment as per the requirements of the city. Among several compounds, trace amounts of the heavy metals arsenic, copper, zinc are expected to be present in the wastewater discharged from the plant. There is a possibility that extremely low concentrations of lead and mercury may also be present in the discharged wastewater. However, the concentration of all regulated compounds in the power plant waste stream would be well below (typically between 1 and 10 percent of) the maximum allowable discharge concentrations.

Highwood Generating Station Requirements under the Industrial Pretreatment Program:

- At least 180 days prior to discharging industrial wastes, submittal of a Disclosure Form and Permit Application. Process schematics and site plans shall be included in the application.
- Process water and domestic wastewater must be separated. Domestic wastewater shall not be discharged though the monitoring facilities.
- Highwood Station would need to install sampling facilities for process wastewater discharge. The sampling facilities must include:
    - An automatic sampler capable of collecting flow-proportioned composite samples.
    - A flow meter with totalizer that would enable daily and monthly flow totals to be determined.
    - The sample point must be such that the sample gathered by the automatic sampler is representative of the discharge of process wastewater being regulated.
    - The ability to collect grab samples of process wastewater representative of the flow at the time of sampling.
    - Reasonable access to the sampling facilities by the City of Great Falls personnel or representatives.
    - A properly calibrated open-channel type flow meter.
- A Spill Prevention Control and Countermeasure Plan.
- Secondary Containment must be provided for hazardous chemicals. Chemicals stored in containers larger than 55 gallons would probably require secondary containment depending on the degree of hazard. Storage of low-hazard chemicals in 55 gallon and smaller containers (not in use) should be in an area with no floor drain. 55 gallon and smaller containers of non-hazardous chemicals that are in use may be located at the point of application.
- Storm drainage and roof drains must not discharge into the sanitary sewer.
- Highwood Station must obtain a storm water discharge permit from the Montana Department of Environmental Quality if so required by that agency.
- Highwood Station would meet all requirements of OCCGF, particularly 13.14 and 13.20.
- Highwood Station would meet all requirements of 40CFR Part 423 as it applies to Pretreatment Standards for New Sources.
- Highwood Station would be responsible for sampling, analyzing and reporting results of sampling activity to the city. The city would also collect samples of process wastewater discharge.
- Dilution of process wastewater for the purpose of lowering pollutant concentrations would not be allowed.

Source: City of Great Falls, Water/Wastewater Treatment Plant

Other important sources of impacts associated with operations of the plant include site runoff and leaching. Runoff specifically from the coal piles on site would be directed to a dedicated, zero outflow evaporation pond. This pond would have a footprint of 3.5 acres (1.4 ha) and capacity of 12 acre-feet and is labeled Loop Pond in the proposed drainage schematic above (Figure 4-3). The ash disposal areas and the waste monofill would be located inside the southern area of the rail road loop. The ash disposal area would be constructed to include ponding areas to collect runoff from precipitation events. These containment areas would serve as evaporation ponds and would have zero discharge.

While leaching of coal and other site runoff, and the percolation of wastes into the groundwater, is an inherent concern to water resources, the clays found onsite are characterized by very slow water transmission rates and infiltration rates. These soils should serve as efficient cell and detention pond basin liners, and groundwater below the site would be monitored on a regular basis to ensure no contamination is occurring. If any contamination is detected by means of groundwater wells or other methods, SME would be required to conduct cleanup procedures in accordance with a DEQ-approved Solid Waste Management Plan and a site-specific SPCCP.

4.4.3 ALTERNATIVE SITE – INDUSTRIAL PARK

4.4.3.1 Construction

Construction activities at the Industrial Park Site and Best Management Practices (BMPs) employed to reduce the impacts associated with construction activities, would be very similar to the Salem site. The total area of disturbance for these activities at the Industrial Park Site would include the total footprint of the power plant, approximately 300 acres (121 ha), a water intake structure and associated pipelines, and additional roadway, rail spur, transmission lines, and utility corridor zones.

Though a storm water management plan has not been developed for the Industrial Park Site, the facility would be required to completely manage all storm water, to ensure that runoff from the construction areas would be minimized. Direct impacts to water resources from construction activities include the construction of the water intake structure in the Morony Pool and the installation of transmission line and pipeline within floodplain and wetland areas of the Missouri River.

A 4.5-mile (7.2-km) pipeline (compared to less than two miles (3.2 km) for the Salem site) would be needed to transport make-up water from an intake structure on the Missouri River downstream of the City of Great Falls to the plant. Insofar as this pipeline would be installed in an area of wetland, waters of the U.S., and/or floodplain, the temporary, minor impacts associated with riparian habitat disturbance would be commensurate with those at the Salem site.

If the Industrial Park site were to be chosen as the location of the power plant, it could be annexed into the city (please see relevant discussion under the Farmland/Land Use, Section 4.12). Both industrial and municipal wastewater generated from the plant would then be discharged back to the City of Great Falls for disposal at its existing wastewater treatment facility. Potable water would be supplied to the plant from the city's water treatment plant. The city municipal sewer and water lines currently run to the IMC plant, located approximately one half-mile (0.8 km) southwest of the site and SME would tap into those lines.

In order to protect the water quality of the Missouri River during construction activities taking place in or adjacent to the river, SME would be required to implement and maintain any and all BMPs required by the appropriate authority would be implemented and maintained. These BMPs would be similar to the ones required for the Salem site, and could include such measures as the installation of double-walled silt curtain in the river surrounding construction activities and installation of silt fencing and other erosion and sediment control measures when working in the floodplain to protect all adjacent wetlands and drainage ways.

Because construction activities in or near water bodies are so heavily regulated in Montana, the temporary impacts from construction, such as increased erosion on the river banks and increased turbidity in the water column, are anticipated to be reduced to below the threshold of significance. The construction is not anticipated to significantly affect floodplains or wetlands, as in the area of impact both floodplains and wetlands are generally limited to the incised drainage habitat and narrow fringes of the river. In order to minimize impacts on waterfowl and wildlife habitat, permitting would likely limit construction in or adjacent to the river to times when spawning, nesting, or breeding of aquatic and/or wetland species is not occurring.

4.4.3.2 Operation

The operation of the power plant at the Industrial Park site would be almost identical to the operation of the plant at the Salem site, with similar implications for water resources. The site would have the same requirements for water withdrawals from the Missouri River, and would also withdraw water from the Morony Reservoir. However, since the Salem site is located south of the river and the Industrial Park site north of it, the water intake structure would be placed on the opposite side.

The withdrawal of Missouri River water for plant operations would not significantly reduce flows in the Missouri River downstream of the site, though it would represent an additional increment of consumptive use within the Missouri River Basin. The water rights for supplying the water would be from an existing water reservation that is owned by the City of Great Falls.

The power plant would generate industrial wastewater that would not be consumptively used and would instead require discharge. A maximum of 811 gallons per minute of wastewater would be discharged to the City of Great Falls wastewater treatment plant. The discharged water would consist of concentrated river water and trace amounts of cooling tower water and boiler water treatment chemicals (DEQ, 2005). The city's wastewater treatment facility would require pretreatment standards to be met before it would accept any water from the power plant, as described under the Proposed Action.

Other important sources of impacts associated with operations of the plant include site runoff and leaching. Runoff from the site would be contained in zero outflow evaporation ponds. Ash generated from the burning of coal would be disposed of off site, eliminating the risk of leaching from an onsite waste monofill. The risks of leaching at any off-site disposal facility are unknown and site-dependent. Use of the High Plains Landfill would result in impacts similar to that of the Salem site given the similarities in bedrock (WMA, 1995). Although the leaching of coal and other site runoff could be a concern to water resources, the clays found onsite are characterized by very slow water transmission rates and infiltration rates. These soils should serve as effective detention pond basin liners, and groundwater in the vicinity of the site would be monitored on a regular basis to ensure no contamination is occurring. If any contamination is detected, SME would be required to follow cleanup procedures in accordance with a DEQ-approved Solid Waste Management Plan and a site-specific SPCCP.

4.4.4 CONCLUSION

The No Action Alternative would not significantly, adversely affect water resources at or near the Salem site or the Industrial Park. However, negligible to minor, long-term adverse impacts would continue from existing agricultural land uses. Continuing agricultural practices such as grazing, plowing, disking, harvesting, fertilizing, and using pesticides on the Salem or Industrial Park sites would contribute incrementally to a minute extent to sedimentation and nutrient loadings of the Missouri River.

Because SME would need to meet its energy supply needs by purchasing power from generation sources located elsewhere, SME could potentially contribute indirectly to ongoing water resource impacts at different generating stations in the region or at potentially new generating stations located outside of the region.

The proposed construction and operation of the power plant and wind turbines at the Salem site would create several potential impacts to water resources. The construction of the site could involve general impacts such as increased storm water runoff carrying sediment and contamination loads into surface water, and contamination from construction equipment and activities infiltrating area soils and potentially percolating down into the groundwater.

Potential direct impacts to water resources from construction activities would include the construction of the water intake structure in the Morony Reservoir and the installation of transmission lines and pipelines within the watershed of the Missouri River and tributaries.

There would be a minimal loss of non-jurisdictional wetlands from these actions, and water quality of the Missouri River would be protected by any and all BMPs required by the appropriate authority and permitting agency. Because construction activities in or near water bodies are so heavily regulated in Montana, the impacts from construction would be substantially reduced from what they otherwise could be in the absence of regulation. Required authorizations and permits reduce water resource impacts from the construction of the power plant to be of moderate magnitude, medium term duration, and medium extent, and have a probable likelihood of occurring. The overall rating for impacts on water resources from the construction phase of the power plant would be adverse and non-significant.

Operation of the power plant at the Salem site would involve water withdrawals from the Missouri River, which would reduce the river by 0.31 percent in a “worse-case scenario”. Though it would represent an additional increment of consumptive use within the Missouri River Basin, it is not in of itself a significant reduction in the Missouri River flows downstream of the site. The power plant would discharge a maximum of 811 gal/minute of wastewater. The operation of the power plant would result in impacts that would be of minor magnitude, long term duration, and medium extent, and have a probable likelihood of occurring. The overall rating for impacts on water resources from the operation phase of the power plant would be adverse and non-significant.

The construction and operation of the power plant at the Industrial Park site would involve similar activities and create many of the same impacts to water resources as the Proposed Action.

Impacts associated with the installation of the longer water intake pipeline would be comparable to those of the Proposed Action: temporary disturbance of non-jurisdictional wetland, and no direct effluent discharges to the Missouri River. At the Industrial Park site, SME would also hook up to city sewer and water lines. While this likelihood would make it easier for SME to manage its water resources, it does not change the impact of net water consumption amounts or water quality parameters that would be regulated and required at the plant. In other words, regardless of the alternative, the power plant operators would have to obtain and adhere to all local, state, and federal regulations, which would prevent any significant impacts from occurring to water resources.

The construction and operation of the power plant at the Industrial site, then, would have similar impacts as at the Salem site. The associated activities would result in impacts that would be of minor magnitude, long term duration, and medium extent, and have a probable likelihood of occurring. Overall, the rating for impacts at the Industrial Park would also be adverse and non-significant.

4.4.5 MITIGATION

The implementation of any and all BMPs required by appropriate permitting authorities would reduce the impacts to water resources associated with both the construction and operation of a coal-burning power plant. These BMPs could include such measures as the installation of double-walled silt curtain in the river surrounding construction activities and installation of silt fencing and other erosion and sediment control measures when working in the floodplain to protect all adjacent wetlands and drainage ways. Permits and authorizations that would likely be required for construction and operation activities include: Corps 404 and Section 10 Permits; Montana DEQ 401 Certification and 318 Authorization; Montana FWP SPA 124 Permit; and Cascade County 310 and Floodplain permits.

Depending on permitting requirements, construction activities in or adjacent to the Missouri River may be limited to times when spawning, nesting, or breeding of aquatic and/or wetland species is not occurring. Additionally, during plant operations at the Salem site, groundwater would be voluntarily monitored in the vicinity of the waste monofill in order to detect any possible contamination.

4.5 AIR QUALITY

4.5.1 NO ACTION ALTERNATIVE

The No Action Alternative would not contribute directly to air emissions or air pollution at either the Salem or Industrial Park sites. However, it would require that other power generation facilities increase, or expand production, to meet SME's demand for power. The impact of the consequent changes on air quality cannot be determined, because this would depend on the mix of energy sources used to generate SME's power, which is unknown. The discussions in Chapter 2 of this EIS describe the wide ranges in air emissions from various energy sources.

Under the No Action Alternative, air pollutant emissions and impacts to ambient air quality from meeting SME's projected electricity load would not simply "go away," but would be located in different places and occur to different degrees, depending on the energy source or mix of energy sources used to generate the electricity sold to SME. This uncertainty makes it impossible to predict, for example, whether emissions of mercury and greenhouse gases would be equal to, lower, or higher than those expected from the HGS.

4.5.2 PROPOSED ACTION – HGS AT THE SALEM SITE

4.5.2.1 Construction

Heavy equipment needed to build the power plant or any other heavy industrial facility would likely include, at a minimum, graders, bulldozers, backhoes, dump trucks, cement trucks, cranes and other diesel and gasoline-fueled heavy and light equipment. Intermittently, over a period of several years, this equipment would emit quantities of five criteria air pollutants: carbon monoxide (CO), nitrogen oxides (NOx), sulfur dioxide (SO_2), particulate matter (PM_{10}), and volatile organic compounds (VOCs). In addition to tailpipe emissions from heavy equipment, the temporary disturbance of several hundred acres of ground surface during excavation and grading activities to prepare the site for construction potentially could generate fugitive dust.

Construction personnel would be required to implement reasonable measures, such as applying surfactant chemicals or water to exposed surfaces or stockpiles of dirt, when windy and/or dry conditions promote problematic fugitive dust emissions. However, mines in windy areas have found that chemical surfactants do not work well. The area around Great Falls is fairly windy. High winds would peel off the treated layer, exposing dry soil or gravel beneath. Some form of soil pavement treatment might be a better solution in a windy area where equipment is in use. Adhering to these would minimize any fugitive dust emissions. Use of one or more of these mitigation measures, in addition to the fact that there are few nearby residents, would reduce the possibility of adverse impacts from fugitive dust emissions to below the level of significance.

Exhaust emissions from equipment used in construction, coupled with likely fugitive dust emissions, could cause minor to moderate, short-term degradation of local air quality, but would not be high enough to result in significant deterioration.

4.5.2.2 Operation

4.5.2.2.1 Emissions and Compliance with Regulatory Standards

The primary source of emissions from the plant would be the combustion byproducts of the CFB boiler. The combustion of coal in the boiler generates hot gases, which, in turn, generate steam. The steam powers a steam turbine that turns a generator to produce electricity. In addition to the CFB boiler, air pollutants would be emitted from the following equipment:

- Auxiliary boiler
- Coal thawing shed heater
- Building heaters
- Emergency generator and fire water pump
- Refractory brick curing heaters
- Material handling equipment and storage areas
- Cooling tower
- Fuel storage tank
- General vehicle travel

As described in Section 3.3.1, under the federal Clean Air Act (CAA), states are given the primary authority to manage their air quality resources. Compliance with applicable air regulatory programs would serve to mitigate impacts of HGS air emissions sources as described in the following sections.

Regulatory Programs

As described in Section 3.3.1, under the federal Clean Air Act (CAA), states are given the primary authority to manage their air quality resources. EPA requires air pollution control agencies such as DEQ to develop State Implementation Plans (SIPs), which are control plans based on federal statutes and regulations. The Montana SIP generally establishes limits or work practice standards to minimize emissions of the criteria air pollutants or their precursors. Among other requirements, air quality management in Montana's SIP includes general state emission standards, federal New Source Performance Standards (NSPS), hazardous air pollutant (HAP) regulations, federal Acid Rain Program requirements, the federal Title V operating permit program, and the Prevention of Significant Deterioration (PSD) permitting program. The proposed generating station would be required to comply with the requirements of each of these air quality programs.

The general state standards set the most basic level of air quality control for criteria pollutants, and cover all regulated sources in the state of Montana. These standards include a solid fuel sulfur content limitation, particulate limits for fuel burning sources based on the heat input of the source, particulate emission limits for other sources based on the weight of material processed, and limits on the opacity of visible emissions. Montana also has liquid and gaseous fuel sulfur content limits which would apply to the use of fuel oil for startup of the CFB and the fuel/gas firing of the auxiliary boiler and building heaters.

The NSPS set more stringent requirements for equipment that has been newly constructed, reconstructed, or modified since the standards were put into effect. While NSPS have historically applied only to newly constructed, reconstructed, or modified equipment, the recently promulgated NSPS, 40 CFR 60, Subpart HHHH, "Emission Guidelines and Compliance Times for Coal-Fired Electric Steam Generating Units," is applicable to certain existing emission units. The primary purpose of the NSPS program is to achieve long-term emissions reductions by assuring that the best demonstrated emission control technologies are installed as the industrial infrastructure is modernized. The specific applicability of the NSPS program upon the generating station equipment is discussed further below.

The National Emission Standards for Hazardous Air Pollutants (NESHAP) program establishes standards for certain industrial source categories for the emission of HAPs, otherwise known as the Maximum Achievable Control Technology (MACT) standards. The MACT standards can apply to existing and newly constructed or reconstructed source categories. The specific applicability of the NESHAP program upon the generating station equipment is discussed further below.

The federal Acid Rain Program is a national regulatory program applicable to certain emission units that burn fossil fuels and produce and sell electricity. The program is focused on the reduction of NO_x and SO_2 emissions from these sources. The emissions of SO_2 are regulated and reduced through a national cap-and-trade program where SO_2 "allowances" are bought and sold on a market. The NO_x emission reductions are achieved through specific NO_x emission limits placed upon certain coal-fired utility boilers that are subject to the program. The specific applicability of the Acid Rain program upon the proposed generating station is discussed further below.

The Title V Air Operating Permit program is administered by DEQ and requires "major sources" of regulated air pollutants to obtain an operating permit that provides the required monitoring, record keeping, reporting, and compliance certification requirements necessary for the on-going operation of the plant. An operating permit application has already been submitted for the proposed project and an operating permit is expected to be issued for the plant prior to operation.

Pursuant to DEQ rules (ARM 17.8.1211(4)), sources that are required to develop and submit a Risk Management Plan (RMP) pursuant to section 112(r) of the federal Clean Air Act, are required to register such a plan. The only expected equipment to be installed that may be subject to RMP requirements is the ammonia storage tank associated with the selective non-catalytic reduction (SNCR) control system to be installed on the CFB boiler. However, this program is not triggered for aqueous ammonia storage if the quantity stored is less than 20,000 lbs at a concentration of 20 percent or greater. If the concentration of aqueous ammonia is less than 20 percent, regardless of quantity, the storage of the ammonia would not be subject to RMP (40 CFR §68.130(a) and 40 CFR §68.115(b)(1)). Before the ammonia could be brought on-site, either the inapplicability of the RMP program would need to be documented or an RMP would need to be developed and submitted.

The PSD permitting program is a federally required permitting program administered by DEQ that involves the review of proposed new and modified major air pollution sources. This review is comprised of two main parts –

- A review of ambient air impacts upon the immediately surrounding area (referred to as a Class II area) and on more distant areas in the region that are designated as environmentally sensitive Class I areas;

- An assessment of the air pollution control technologies proposed by the source to ensure that the Best Available Control Technology (BACT) is installed for each criteria pollutant.

Appendix I contains the DEQ's supplemental preliminary determination on the PSD air quality permit for SME-HGS (DEQ, 2006a), which was subject to public comment along with the DEIS. The ambient air quality review is discussed in detail later in this section.

In addition to BACT for criteria pollutants required under PSD, the DEQ requires a BACT review for all pollutants of concern, including HAPs, as part of the pre-construction permitting.

The following subsections discuss how the requirements of these air quality programs would be addressed for the HGS.

CFB Boiler

The CFB boiler would be subject to the NSPS standard for electric utility steam generating units (Subpart Da), and would be capable of meeting the limits provided in this subpart for visible emissions (opacity), PM, SO_2, NOx, and Hg. EPA updated the current NSPS Subpart Da requirements on February 27, 2006. This updated NSPS Subpart Da applies to any electric utility steam generating unit (>250 MMBtu/hr heat input) that is newly constructed, modified, or reconstructed after the proposal date of the updated NSPS (February 28, 2005). The NSPS Da update sets new emission limitations on PM, SO_2, and NOx. The CFB boiler is required to meet these updated NSPS Da emissions limits.

The CFB boiler would be subject to the promulgated Clean Air Mercury Rule (NSPS Subpart HHHH – Emission Guidelines and Compliance Times for Coal-Fired Electric Steam Generating Units), which allocates mercury budgets to every state. Under the federal mercury program (known as the “model rule”), mercury emission allowances are then distributed to coal-fired electric utility units. Under the model rule, these allowances may be bought and sold through a trading program administered by the EPA. The federal mercury reduction program will go into effect in 2010. It is important to note that NSPS Subpart HHHH requires states to update their SIPs to reflect how the mercury rule would be implemented. The individual states have the flexibility to develop their own mercury reduction program that is different from the EPA’s “model rule.” However, regardless of what type of program is used, the state is required to meet the EPA determined state mercury budget.

The state of Montana has adopted its final rules on mercury emissions from coal-fired electrical generating units and the rules became effective on October 27, 2006. The Montana mercury standard is more stringent than the federal rule and is on a pound per trillion Btu (lb/TBtu) basis. The CFB boiler of the HGS would be subject to the requirements of the final mercury rule adopted in Montana.

The Acid Rain Program also would be applicable to the proposed CFB boiler. In order to comply with the program, the following steps would be required –

- Necessary SO_2 allowances would need to be obtained
- Applicable NO_x limitations would need to be complied with
- Required continuous monitoring, record keeping, and reporting would need to be followed

As part of the air quality permit application for HGS, a BACT review has been conducted by DEQ for the CFB boiler for the following pollutants: SO_2, NO_x, PM/PM_{10}, VOC, CO, sulfuric acid mist, lead, mercury, acid gasses (HCl and HF), and radionuclides. The conclusions of the BACT analysis were that the following control technologies would need to be implemented (Table 4-2). Each chosen technology would reduce emissions to levels that would meet or exceed the level of control required by all general state standards and NSPS requirements.

Table 4-2. BACT Summary for CFB Boiler

Pollutant	**Selected BACT Control Technology**
Filterable PM/PM_{10}	Fabric Filter Baghouse
SO_2	CFB Design, Low-Sulfur Coal, and Hydrated Ash Reinjection
NO_x	CFB Design with Selective Non-Catalytic Reduction
VOC	Proper Design and Combustion
CO	Proper Design and Combustion
Sulfuric Acid Mist, Acid Gases, Trace Metals, and Condensable PM/PM_{10}	CFB Design, Low-Sulfur Coal, Hydrated Ash Reinjection, and Fabric Filter Baghouse
Mercury (Hg)	IECS and, if necessary, ACI or equivalent
Radionuclides	Fabric Filter Baghouse

Control of filterable particulate (PM/PM_{10}) emissions from the CFB boiler would be accomplished through the use of a fabric filter baghouse. In this device, exhaust from the boiler would pass through rows of fabric filter bags. The exhaust gases pass through the bags, while the filterable particulate remains on the upstream face of the bags.

SO_2 emissions in the boiler result from the sulfur present as an impurity in the coal that is fired. The CFB boiler primarily would fire low-sulfur, sub-bituminous coal from the Powder River Basin. This coal varies in sulfur content, but is expected to typically have sulfur contents below one percent by weight. The design of the CFB boiler employs the firing of crushed coal mixed with limestone injected into the combustor. The use of limestone provides control of SO_2 by reacting with SO_2 to form calcium sulfate ($CaSO_4$), which can be removed from the exhaust in the fabric filter baghouse. In addition to this boiler design, the boiler would be equipped with a hydrated ash reinjection system that would take a portion of the limestone and ash collected in the fabric filter baghouse, hydrate it, and re-introduce it into the exhaust in a reaction vessel upstream of the fabric filter baghouse. Hydrated ash reinjection is a type of dry flue gas desulfurization (FGD) system that allows for additional conversion of SO_2 to $CaSO_4$. Overall, the use of limestone injection with hydrated ash reinjection would control 97 percent of the SO_2 emissions that would result from an uncontrolled boiler firing low-sulfur coal.

Emissions of NO_x from the boiler would be formed in two ways: thermal NO_x would be formed from the oxidation of nitrogen gas (present in the air fed to the boiler) at very high temperatures, and fuel NO_x would be formed from the oxidation of nitrogen that is bound in the coal fired in the boiler. The CFB boiler design has approximately 80 percent lower NO_x emissions than a comparably sized traditional pulverized coal boiler design. The lower emissions are due to the inherently lower flame temperature of the CFB boiler design, which helps minimize formation of thermal NO_x. The CFB NO_x emissions would be controlled through the use of a selective non-catalytic reduction (SNCR) system. This technology involves the decomposition of NO_x to nitrogen (N_2) and water. This is accomplished by injecting ammonia (NH_4) or urea ($CO(NH_2)_2$) into a high-temperature area of the furnace. The ammonia or urea reacts with the nitric oxide (NO) in the exhaust gas and reduces it to nitrogen and water. A byproduct of this technology is an increase in ammonia emissions (sometimes referred to as "ammonia slip"), resulting from a portion of the injected ammonia that does not react with the NO_x. Applying SNCR technology to the exhaust reduces NO_x emissions by an additional 50 percent beyond the control already provided by the CFB boiler design, for an overall reduction of 90 percent of NO_x emissions.

CO and VOC emissions from the CFB boiler would be controlled through proper design and combustion in the boiler. Add-on controls such as catalytic and thermal oxidation systems have been evaluated by DEQ as part of the proposed generating station's PSD permit application, but were determined to be infeasible due to the high expense and impracticality of reheating the exhaust gas to a temperature where those controls could be effective.

Though a BACT review for HAPs is not required under the federal CAA provisions, SME has conducted a BACT evaluation of HAPs from the CFB boiler per the request of DEQ pursuant to Montana's general air quality permit rules in 17.8.740 *et seq*. Sulfuric acid (H_2SO_4) mist, acid gases (primarily hydrofluoric acid (HF) and hydrochloric acid (HCl)), trace metals (including lead), and condensable PM_{10} would be emitted from the boiler. These pollutants form as a result of combustion conditions of the boiler and impurities in the coal. Emissions of these pollutants would be minimized through the use of the CFB boiler design, the hydrated ash reinjection system, and the fabric filter baghouse. Mercury emissions result from mercury present in the coal fired in the boiler. Control of mercury emissions is addressed under Section 4.5.2.2.4. Radionuclide emissions result from trace amounts of radioactive material that is present in coal and nearly all natural materials. The use of the fabric filter baghouse for particulate control represents BACT for radionuclides, as it would reduce radionuclide emissions from the CFB boiler by more than 90 percent.

Auxiliary Combustion Devices (Auxiliary Boiler, Emergency Generator, Emergency Fire Water Pump, Coal Thawing Shed Heater, Refractory Brick Curing Heaters, and Building Heaters)

The auxiliary boiler would be subject to the NSPS for industrial, institutional, and commercial steam generating units (Subpart Db), which establishes emission limits for visible emissions (opacity), PM, SO_2, and NO_x. Given that the auxiliary boiler would operate for a limited amount of time and would fire fuel oil, the applicability of NSPS emission limits is limited. EPA has updated NSPS Subpart Db on February 27, 2006. The updated NSPS Subpart Db applies to any steam generating unit (>100 MMBtu/hr heat input) that is newly constructed, modified, or reconstructed after the proposal date of the updated NSPS (February 28, 2005). The NSPS Db update sets more stringent emission limitations on PM than exist under the current rules. This updated PM limit would not be applicable to the auxiliary boiler given that no solid fuels (e.g. coal) would be fired.

The propane-fired building heaters would not be subject to a NSPS given that each unit is less than 10 MMBtu/hr. The only potentially applicable NSPS (NSPS Subpart Dc) applies to any steam generating unit >10 MMBtu/hr and < 100 MMBtu/hr heat input.

The EPA has proposed NSPS Subpart IIII (Standards of Performance for Stationary Compression Ignition Internal Combustion Engines) that applies to all owners or operators of stationary compression ignition (CI) internal combustion engines (ICE) for which construction, modification or reconstruction commences after July 11, 2005. This NSPS may be applicable to either the emergency fire water pump or emergency generator. Any applicable requirement of this NSPS, if promulgated as a final rule, would need to be met for these engines.

Two potentially applicable MACT standards that have been promulgated for these types of combustion emission units include the following:

- 40 CFR 63, Subpart ZZZZ (National Emissions Standard for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (RICE)) (Emergency Generator)

- 40 CFR 63, Subpart DDDDD (National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Process Heaters) (Auxiliary Boiler)

Even though the emergency fire water pump would be operated with a RICE, the engine would be exempt from 40 CFR 63, Subpart ZZZZ given that the engine is less than 500 horsepower. The emergency generator would be operated with a RICE, but would be classified as an "emergency stationary RICE" and, therefore, subject only to the initial notification requirements of the standard.

The auxiliary boiler would fire only liquid or gaseous fuels and operate less than 10 percent of the year. Therefore, the boiler would be considered in the "limited use liquid fuel subcategory" of 40 CFR 63, Subpart DDDDD. New "limited use liquid fuel subcategory" boilers are subject to certain emission limits and other requirements of this standard including a particulate matter, HCl, and CO limit.

The building heaters would fire only gaseous fuels and the heat input of each heater would be less than 10 MMBtu/hr. Therefore, these heaters would be considered to be in the "small gaseous fuel subcategory" of 40 CFR 63 Subpart DDDDD. New "small gaseous fuel subcategory" boilers are subject only to the initial notification requirements of the standard.

A BACT review has been conducted by DEQ for each of the auxiliary combustion devices for the following pollutants: SO_2, NO_x, PM/PM_{10}, VOC, and CO. Each of these devices would be subject to annual limits on operation that would result in reduced annual emissions.

- The auxiliary boiler would operate only during startup, shutdown, and commissioning of the CFB boiler, and to keep the CFB boiler warm during shutdown, for a maximum of 850 hours of operation per year.

- The emergency generator and emergency fire pump would operate only in emergencies and for required maintenance, for a maximum of 500 hours of operation per year each. The coal thawing shed heater would operate only when coal needs to be thawed, for a maximum of 240 hours of operation per year.

- Because the auxiliary combustion devices would have limited hours of operation (and therefore, have low annual emissions), many add-on controls would not be cost effective.

The conclusions of the BACT analysis were that the following control technologies would be implemented (Table 4-3). Each chosen technology would reduce emissions to levels that would meet or exceed the level of control required by all general state standards and NSPS requirements.

Table 4-3. BACT Summary for Auxiliary Combustion Devices

Pollutant	Selected BACT Control Technology
PM/PM_{10}	Process Limitations Including Limited Hours of Operation
SO_2	Low Sulfur Fuels and Process Limitations Including Limited Hours of Operation
NO_x	Auxiliary Boiler: Dry Low-NO_x Burner Technology with Process Limitations Including Limited Hours of Operation Others: Process Limitations Including Limited Hours of Operation
VOC	Proper Combustion Design with Process Limitations Including Limited Hours of Operation
CO	Proper Combustion Design with Process Limitations Including Limited Hours of Operation

The dry low-NO_x burner (DLN) technology that would be used on the auxiliary boiler would reduce NO_x emissions from the boiler by 40 to 60 percent compared with conventional burners.

Material Handling and Storage

The coal, limestone, and ash material handling sources would consist of material transfer points, and would be located at conveyor transfer points, railcar and truck unloading sites, storage silos, the coal crusher, and material storage piles and bunkers.

Coal drying, cleaning, conveying, processing, storage, and transfer equipment at the site would be subject to the NSPS standard for Coal Preparation Plants, Subpart Y. This regulation sets a visible emission limit of less than 20 percent opacity for subject equipment. Equipment subject to this regulation would comply through the use of water spray and enclosures (emergency coal pile, with associated reclaim hoppers and belt feeder), and with baghouse controls (remaining subject equipment).

Limestone crushing, conveying, and transfer equipment at the site would be subject to the NSPS standard for Nonmetallic Mineral Processing, Subpart OOO. This regulation sets a visible emission limit of seven percent opacity, and a particulate emission limitation of 0.022 grains per dry standard cubic feet (a grain is 1/7000 of a pound) for subject equipment. Limestone processing equipment subject to this regulation would comply through the use of an enclosure with a baghouse.

A BACT review for particulate emissions was conducted by DEQ for each of the material handling sources. The resulting controls for all coal, limestone and ash conveyors would be partial or full enclosures. Coal and limestone belt conveyors would be partially enclosed with a cover that extends past the conveyor belt, or is fully contained within a building. The limestone bucket elevator conveyors and ash handling pneumatic conveyors would be fully enclosed. On almost all material transfer emission points, SME would use enclosures with a baghouse or bin vent controls, which would reduce particulate emissions by 99.5 percent. Transfer points at the emergency coal pile, reclaim hoppers, belt feeder, and associated conveyor would be controlled with complete enclosure. The fly ash and bed ash conveyor and transfer emission points would be controlled with a wet dust suppression system.

The material storage areas were also evaluated by DEQ for BACT. The material to be stored on-site includes coal, limestone, fly ash, and bed ash. The proposed BACT controls for these storage areas were determined to be the use of a combination of enclosures (e.g. silos) with bin vent or baghouse control (for the active storage of coal, limestone, and ash) and reasonable precautions (for the emergency coal and ash storage areas). Reasonable precautions include compaction of storage piles and application of dust suppressants as necessary.

Cooling Tower

A wet cooling tower, with a design circulating water rate of 2,250 gallons per minute, would be used to dissipate heat from the power plant system. The proposed cooling tower would be an induced draft, counter-flow design. Cooling towers are a source of PM emissions given that a certain amount of cooling water becomes entrained in the air stream and is emitted from the tower as water droplets (known as "drift"). When the droplets evaporate, dissolved solids in the water crystallize and become PM emissions.

The most common method of reducing PM emissions from a cooling tower is with the use of a drift eliminator that removes water droplets prior to being emitted from the tower. Different types of drift eliminators have different associated control efficiencies. The cooling tower was evaluated for BACT and DEQ determined that a high efficiency drift eliminator (0.002% of the circulating water flow) constitutes BACT.

4.5.2.2.2 Impacts on Air Quality in Class II Areas

SME has submitted a PSD permit application to DEQ for the construction of a coal-fired, steam-electric generating station located near Great Falls, Montana, the aforementioned Highwood Generating Station (HGS). The proposed site is approximately eight miles (13 kilometers) east of Great Falls, Montana and approximately two miles (3.2 km) southeast of the Morony Dam, which is located on the Missouri River. The Universal Transverse Mercator (UTM) coordinates of the CFB stack are X-UTM - 497,297 m and Y-UTM - 5,266,363 m. The site elevation is approximately 3,310 feet (1,009 m) above mean sea level.

Prevention of Significant Deterioration Review

Part C of Title I of the federal CAA and ARM 17.8.801 *et seq* include preconstruction permitting requirements for new and modified major sources under the PSD program. The PSD regulations apply to new major stationary sources and modifications at existing major sources undergoing construction in areas designated as attainment or unclassifiable, under Section 107 of the 1990 Clean Air Act Amendments (CAAA), for any criteria pollutant (42 USC 7407).

An electric generating unit is one of the 28 listed source categories (fossil fuel-fired steam electric plants of more than 250 million Btu/hr heat input) that are considered major sources under the PSD program if they have the potential to emit 100 tons per year (tpy) or more of at least one criteria pollutant. Since HGS would be a new plant, a PSD permit is required for the plant if the potential to emit for at least one criteria pollutant is 100 tpy or more. The PSD application must include review each pollutant with potential emissions above the PSD significant emission rates (SERs). The potential emissions for each criteria pollutant expected to be emitted from the operation of the HGS plant were estimated in Section 3 of the PSD Application (Table 3.1-1: Facility-Wide Potential Annual Emissions Summary of Criteria Pollutants). The PSD SERs and a summary of the proposed plant PTEs are listed in Table 4-4. The plant requires PSD review for NOx, SO_2, CO, PM and PM_{10}. There are no longer any applicable air quality standards for PM so the analyses conducted for PM_{10} address PM.

Table 4-4. PSD Significant Emission Rates

	NO_X (tpy)	SO_2 (tpy)	CO (tpy)	VOC (tpy)	PM (tpy)	PM_{10} (tpy)	Pb (tpy)
PSD Significant Emission Rate	40.0	40.0	100.0	40.0	25.0	15.0	0.6
HGS Potential to Emit	944	443	1177	38.0	376	366	0.28
PSD Review Required	Yes	Yes	Yes	No	Yes	Yes	No

Criteria Pollutant Emissions

HGS would include the operation of the following types of emission sources:

- Circulating Fluidized Bed (CFB) Boiler
- Auxiliary Boiler
- Emergency Generator
- Emergency Fire Pump
- Coal Thawing Shed Heater
- Coal Railcar Unloading
- Coal Silos
- Coal Crusher
- Silos
- Bin Vents
- Storage Piles
- Cooling Towers
- Refractory Brick Curing Heaters

The specific emission calculation methodologies for these source types are described in Section 3 of the PSD Application, which is on file with DEQ and available to the public upon request.

Class II Area Modeling Analyses

Pursuant to ARM 17.8.820 and 40 CFR 52.21(k), SME must demonstrate that emissions from the proposed project would comply with the NAAQS, MAAQS, and Class II PSD Increments. DEQ reviewed all monitoring and modeling submitted by SME and found it to conform to all requirements.

Model Selection
At the time of submittal of the Application, EPA's modeling guidance (40 CFR Part 51, Appendix W) indicated that the Industrial Source Complex Short Term (ISCST3) dispersion model was the approved model for stationary source modeling for analyses including both simple and complex terrain types. The area surrounding the site is a combination of simple and complex terrain. Simple terrain has an elevation between ground level and stack release height. Complex terrain has an elevation that is at, or greater than, the height of the stack being modeled.

Further, the impacts of structures on plume travel (downwash, which can lead to elevated ground level concentrations) can be evaluated using the EPA's Building Profile Input Program (BPIP) or BPIP with plume rise enhancements (BPIP-PRIME) (EPA, 1985). Their use requires the use of ISC-PRIME. ISC-PRIME was proposed for approval by EPA in 65 FR 21506 (April 21, 2000).

Since the date of submittal of the PSD application, 40 CFR Part 51, Appendix W was revised on November 9, 2005, with an effective date of December 9, 2005. This current version of Appendix W indicates that AERMOD should be used for appropriate applications as a replacement for ISCST3. On December 15, 2006 DEQ received revised modeling of the HGS facility (Bison, 2006b). New modeling was conducted based on the footprint of the facility at the alternative location described in Section 2.2.2 of this EIS. The revised modeling followed the November 9, 2005 version of Appendix W, with the primary change being the use of the AERMOD model instead of the older ISC-PRIME model. The change in location and change in dispersion model made little difference in the modeled Class II impacts. Impacts at Class I receptors were not remodeled because only minor changes in results would be expected due to long distance to the receptors.

Meteorological Data
A PSD Class II dispersion modeling analysis requires the use of either one year of onsite meteorological data or five years of representative data. In this case, onsite data were not available. The Great Falls International Airport is relatively close to the proposed plant location, and has similar topography. Consequently, the National Weather Service (NWS) data from the Great Falls International Airport was an acceptable alternative. ISC-PRIME met data requires both surface data (wind speed, wind direction, temperature, and cloud cover) and upper air data (mixing heights) to be processed in a single model-ready input file. The most recent readily-available five years of data from the airport were processed with AERMET and used (1999-2003) in the AERMOD model. Concurrent upper air data from the Great Falls airport was used in the data processing.

Receptor Grids
The AERMOD model calculates ground level concentrations at specific locations referred to as receptors. A gridded network of receptors is referred to as a Cartesian receptor grid. Receptors

placed at increasing spacing with distance, extended to 28 km (17 miles) in all directions as well as along the HGS property boundary for the initial modeling analysis, are referred to as the significant impact area analysis. For refined modeling at locations where impacts were above the significance levels, receptor grids extended to a distance necessary to ensure that the overall high concentration in the impact area was located.

Terrain
The terrain elevation for each receptor was determined using United States Geological Survey (USGS) 7.5-minute Digital Elevation Model (DEM) data in the UTM NAD27 datum coordinate system. The UTM grid system divides the world into coordinates that are measured in East meters (measured from the central meridian of a particular zone, which is set at 500,000 m) and North meters (measured from the equator).

The DEM files obtained from the USGS have terrain elevations at 30-m intervals. The terrain height for each receptor was calculated by interpolating the terrain height from the digital terrain elevations surrounding the receptor. This methodology ensures a consistent and accurate determination of elevation for each of the individual receptors. AERMAP was used to process the receptor elevation data for use in the AERMOD model.

Emission Rates
EPA's modeling guidance requires that modeled emission rates match the averaging period being modeled. That is, to demonstrate compliance with a 1-hour standard, the maximum 1-hour emission rate is used in the model. When demonstrating compliance with a standard based on annual average data, the annual average emission rate on an hourly basis is used. Table 6.1-1 of the PSD Application provides the specific emission rates per pollutant and averaging period that were used in the dispersion modeling analysis.

Source Types
AERMOD allows emission sources to be modeled as point sources (stacks), volume sources (material handling activities), and area sources (haul roads and storage piles). Tables 2 and 3 of SME's December 2006 Air Dispersion Modeling Report (Bison, 2006b) provide the specific parameters utilized for these source types in the model.

Class II Area Significant Impact

In accordance with EPA guidelines, modeled concentrations resulting from the proposed project are compared to applicable Class II significant impact levels (SIL's) . If a significant impact (i.e., an ambient impact above the SIL for a given pollutant and averaging period) is not observed, no further modeling analysis (i.e., NAAQS, MAAQS, or Class II PSD Increment modeling) is required for that pollutant. If a significant impact is shown, NAAQS, MAAQS, and PSD Increment modeling are required. A Radius of Impact (ROI) is determined for each pollutant that would exceed the SIL. The ROI encompasses a circle centered on the HGS plant with a radius extending out to the farthest location where the emissions increase of a pollutant from the project would be above the SIL. All sources within the ROI are assumed to potentially contribute to ground-level concentrations and are evaluated for possible inclusion in the NAAQS, MAAQS, and PSD Increment analyses. Table 4-5 provides the results of the MSL and ROI analyses.

Table 4-5. Class II Significant Impact Modeling Results

Pollutant	Averaging Period	HGS Concentration (µg/m^3)		Significant Impact?	ROI (km)
		Significance Level	Peak Model Predicted		
PM_{10}	24-hr	5	11.0	Yes	1.1
	Annual	1	2.2	Yes	1.8
SO_2	3-hr	25	15.9	No	N/A
	24-hr	5	7.2	Yes	0.6
	Annual	1	0.24	No	N/A
NO_X	Annual	1	1.1	Yes	0.6
CO	1-hr	2,000	90.3	No	N/A
	8-hr	500	26.3	No	N/A

The maximum-modeled impacts of the project exceed the SILs for PM_{10}, SO_2 (24-hr averaging period), and NO_X. The modeled impacts are below the SILs for CO for both averaging periods. Consequently, CO is considered to have an insignificant impact and is not required to be evaluated further.

Class II Pre-Construction Monitoring Analysis

The modeled concentrations resulting from the plant must also be compared to the monitoring *de minimis* levels to determine if pre-construction monitoring is required. The results of the monitoring *de minimis* evaluation are provided in Table 4-6.

The maximum-modeled concentrations of PM_{10} were above the monitoring *de minimis* level for PM_{10}. Consequently, one year of PM_{10} monitoring data was required. Data were collected at a location near the proposed HGS plant. The results demonstrated that ambient concentrations of PM_{10} in the area are very low. The highest 24-hr concentration was 23 µg/m^3 (the 24-hr standard is 150µg/m^3) and the annual concentration was 7 µg/m^3 (the annual standard is 50 µg/m^3).

Table 4-6. Maximum Modeled Impacts Compared to Monitoring *de minimis* Levels

Pollutant	Averaging Period	Concentration (µg/m^3)		Monitoring Required?
		Monitoring *de minimis* Level	Peak Model Predicted	
PM_{10}	24-hr	10	11.0	Yes
SO_2	24-hr	13	7.2	No
NO_X	Annual	14	1.1	No
CO	8-hr	575	26.3	No
Lead	Calendar Quarter	0.1	0.0005	No
Fluorides	24-hr	0.25	0.12	No

Class II Area NAAQS and MAAQS Analysis

Since HGS has impacts above the SILs, all non-HGS sources that have the potential to impact the HGS significant impact area were included in the Class II NAAQS and MAAQS analyses. The non-HGS sources include: Montana Megawatts I, LLC (proposed gas-fired power plant), Montana Ethanol Project (proposed ethanol plant), International Malting Company (malting plant), Malmstrom Air Force Base (boilers), and Montana Refining Company (petroleum refinery).

The ambient concentrations from other activities, such as agricultural activities, highways, and naturally occurring levels of pollutants, are accounted for by adding a background concentration to the modeled concentrations prior to comparing the results to the NAAQS or MAAQS. The gaseous pollutant background concentrations used in the analysis are the typical values provided by DEQ for modeling analyses in Montana. SME's on-site PM_{10} monitoring data results were used for PM_{10} background values.

The modeling results in Table 4-7 demonstrate that the high modeled concentrations from HGS sources, non-HGS sources, and background concentrations combined are less than 25 percent of the respective NAAQS or MAAQS in all cases except 1-hr NO_X which is approximately 56 percent of the MAAQS. Consequently, it is not anticipated that the proposed plant would cause or contribute to an exceedance of a NAAQS or MAAQS. Further, although the magnitude of the NO_X impacts would be moderate, these impacts would occur at specific receptors and decrease rapidly with distance from the location of the high impact.

Table 4-7. SME NAAQS/MAAQS Compliance Demonstration

Pollutant	Avg. Period	Modeled Conc.[a] ($\mu g/m^3$)	Backgrnd Conc. ($\mu g/m^3$)	Ambient Conc. ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	% of NAAQS	MAAQS ($\mu g/m^3$)	% of MAAQS
PM_{10}	24-hr	10.3	23	33.3	150	22	150	22
	Annual	2.31	7	9.31	------	------	50	19
$PM_{2.5}$[b]	24-hr	10.3	23	33.3	35	95	------	------
	Annual	2.31	7	9.31	15.0	62	------	------
NO_2	1-hr	240[c]	75	315	------	------	564	56
	Annual	1.4[d]	6	7.4	100	7.4	94	7.9
SO_2	1-hr	72.0	35	122	------	------	1,300	9.4
	3-hr	44.3	26	70.3	1,300	5.4	------	-----
	24-hr	7.8	11	18.8	365	5.2	262	7.2
	Annual	0.7	3	3.7	80	4.6	52	7.1
Pb	Quarterly[e]	0.0005	Not. Avail.	0.0005	1.5	0.03		
	90-day[e]	0.0005	Not. Avail.	0.0005	-----	-----	1.5	0.03

[a] Concentrations are high-second high values except annual averages and SO_2 1-hr, which is high-6th-high.
[b] The $PM_{2.5}$ compliance demonstration assumes all PM_{10} is $PM_{2.5}$.
[c] One-hour NOx impact is converted to NO_2 by applying the ozone limiting method, as per DEQ guidance.
[d] Annual NOx is converted to NO_2 by applying the ambient ratio method, as per DEQ guidance.
[e] SME reported the 24-hour average impact for compliance demonstration.

Class II Area PSD Increment Analysis

The determination of the emissions that consume PSD Increment is based on the current level of actual emissions in relation to actual emissions at the baseline date. The major source baseline date is the date after which actual emissions associated with construction (i.e., physical changes or changes in the method of operation) at a major stationary source affect the available PSD Increment. The trigger date is the date after which the minor source baseline date may be established. The minor source baseline date is the earliest date after the trigger date on which a complete PSD application is received by the regulatory agency. The date marks the point in time after which actual emission changes from all sources affect the available PSD Increment.

The minor source baseline dates for NO_X, SO_2, and PM_{10} all have been triggered in the Great Falls area. The non-HGS emission sources used in the PSD modeling are the same as for the NAAQS and MAAQS modeling. However, the emission rate for non-HGS sources are the two-year average actual emission rate if the source has been in operation for more than two years (otherwise, the maximum is used).

The PSD modeling results in Table 4-8 show that the high modeled concentrations from PSD increment consuming sources (HGS sources and non-HGS sources combined) are 35 percent or less of the respective PSD Increments for all pollutants and averaging periods.

Table 4-8. Class II PSD Increment Compliance Demonstration

Pollutant	Avg. Period	Met Data Set	Modeled Conc. (μg/m^3)	Class II Increment (μg/m^3)	% Class II Increment Consumed	Peak Impact Location (UTM Zone 12)
PM_{10}	24-hr	Great Falls 2003	10.3	30	34%	(497227, 5266071)
	Annual	Great Falls 2003	2.31	17	14%	(497901, 5266560)
SO_2	3-hr	Great Falls 2003	12.6	512	2.5%	(497069, 5266071)
	24-hr	Great Falls 2003	6.33	91	7.0%	(497713, 5266416)
	Annual	Great Falls 1999	0.311	20	1.6%	(498700, 5267500)
NO_2	Annual[b]	Great Falls 2003	1.18	25	4.7%	(497701, 5266703)

a – Compliance with short-term standards is based on high-second-high impact.
b – Annual NO_x impacts are compared to the NO_2 standards.

CFB Startup Analysis

EPA's modeling guidance recommends that, for applications where the source can operate at substantially less than design capacity, and the changes in stack parameters could lead to higher ground level concentrations, the load or operating condition that causes maximum ground-level concentrations should be determined. SME's boiler startup procedures fall into this category of analyses.

Three boiler startup scenarios were evaluated. For CFB boiler startup, SME would use both fuel oil and coal to initiate boiler operations, with the switch from fuel oil to coal firing occurring at approximately 30 percent of maximum boiler load. Firing at approximately 70 percent of maximum boiler load, all emission controls are expected to be operating. Consequently, the CFB at 30 percent of maximum load with oil only, the CFB at 30 percent of maximum load with coal only, and the CFB at 70 percent of maximum load with coal only were evaluated.

Modeling results provided in Tables 7 and 8 of the December 2006 modeling report demonstrate that the high-modeled concentrations resulting from the startup scenarios are less than the NAAQS, MAAQS, and PSD Increments for all pollutants and averaging periods.

Class II Soil and Vegetation Impacts Analysis

Montana's PSD permitting regulations require that the impacts of a proposed plant's projected emissions on soil and vegetation be evaluated. The primary NAAQS for criteria pollutants were developed to provide adequate protection of human health, while the secondary standards were designed to protect the general welfare, i.e., manmade and natural materials including soils and vegetation. EPA guidance on new source review supports this by stating:

> *For most types of soils and vegetation, ambient concentrations of criteria pollutants below the secondary national ambient air quality standards (NAAQS) will not result in harmful effects (EPA, 1990).*

The results of the air quality analysis demonstrate that the impacts of the HGS plant are insignificant (i.e. less than the PSD modeling significance levels, which are more conservative than the NAAQS) for CO. The modeled concentrations of NO_2, SO_2, and PM_{10} for the plant and other interactive sources surrounding the plant were less than the NAAQS and MAAQS. Since the air quality analysis shows that emission impacts are either insignificant or below the NAAQS and MAAQS, the plant is predicted to have a minor impact on the soil and vegetation in the area surrounding the plant.

Effects of Criteria Pollutant Concentrations on Sensitive Plant Species

The EPA also provides a screening document as a guide for determining the impacts of the projected emissions on plants, soils, and animals (EPA, 1981). The December 2006 modeling report, Table 9, provides a comparison of modeled (predicted) concentrations to sensitive species concentrations by pollutant and averaging period. The predicted impacts are below the identified sensitive species concentrations and are considered to be minor.

Effects of Trace Element Deposition on Soils, Plants, and Animals

The EPA screening document also suggests an analysis of trace elements that could be deposited and contaminate soil and plant tissue. Predicted deposition levels were estimated by calculating the ratio of total HGS annual trace element emissions to total HGS annual NO_X emissions and multiplying the highest NO_X modeled concentration by this ratio. The resulting calculated trace element concentration was then multiplied by a deposition factor to calculate trace element deposition impacts.

The deposition analysis was performed for each of the trace elements for which screening concentrations were provided in EPA's screening document. The results of the analysis were provided in Table 10 of the December 2006 modeling report.

The calculated deposition levels were below all of the screening values for the forty-year life of the facility. Consequently, trace compound and elements deposition from the proposed plant is predicted to have a minor impact on soil, plants, or animals.

Minor Source Growth Analysis

Minor source growth is expected to occur in the surrounding area due to the construction and operation of the facility. Emissions of criteria pollutants and HAPS associated with this growth are expected to be minor.

Summary of Class II Area Impact Analysis

The Proposed Action would cause a number of on-site and off-site impacts on air quality, ranging from negligible to moderate in intensity. More specifically, the Proposed Action would result in:

- Short-term, minor to moderate degradation of local air quality from construction activities
- Long-term minor to moderate degradation of local air quality from operations
- Long-term minor impacts on sensitive species from criteria pollutant emissions and/or trace element deposition.

4.5.2.2.3 Impacts on Air Quality in Class I Areas

SME submitted modeling to analyze impacts on air quality and air quality related values (AQRV's) in Class I areas. AQRV analysis included ambient concentrations, visual plume analysis, acid deposition and regional haze. The modeling was based on the permitted emission rates for the Proposed Action.

The regional haze analysis for the Proposed Action considered visibility-affecting air pollutants, including the following –

- NOx
- SO_2
- Sulfate (SO_4)
- Elemental carbon (EC)
- Secondary organic aerosols (SOA)
- Coarse particulate matter (with aerodynamic diameter greater than 2.5 microns but not exceeding 10 microns)
- Fine particulate matter (with aerodynamic diameter not exceeding 2.5 microns)

The emission sources for the regional haze analysis included the CFB boiler and the material handling baghouses. Fugitive emissions were not included in the analysis since it is expected that these emissions would not be significant to the long-range transport (over 50 km) of emissions to the Class I areas that potentially could be affected. The same emissions were also used for the PSD Class I increment impact analysis and acid deposition analysis by considering the contributions from the appropriate air pollutants.

PSD Class I Increment Impacts from the Proposed Action

Analysis results indicate that the maximum predicted Class I increment impacts due to NOx and PM_{10} emissions from the Proposed Action would be below the applicable EPA-proposed Class I increment significance levels as shown in Table 4-9. Because the impacts are less than 50 percent of the Class I increments, the adverse impacts for both NOx and PM_{10} emissions would be minor for all applicable long-term/short-term averaging periods. The predicted annual SO_2 impacts from the Proposed Action would be less than 50 percent of the Class I increment for all Class I areas and thus would be considered minor.

The predicted 3-hour and 24-hour SO_2 impacts exceed the EPA-proposed PSD Class I significance levels in some Class I areas (i.e., Scapegoat Wilderness Area for the 24-hour period and the Gates of the Mountains Wilderness Area for the 3-hour and 24-hour periods), triggering the requirement for cumulative impact modeling. Cumulative impacts analysis including the HGS emissions and other PSD increment-consuming sources in the nearby area indicates that the total impact would be less than 50% of the 3-hour and 24-hour SO_2 Class I increments. As such, the predicted 3-hour and 24-hour SO_2 impacts would be minor. Table 4-9 summarizes the predicted impacts on the Class I increments from the Proposed Action.

Table 4-9. Class I PSD Increment Compliance Demonstration

Pollutant	Avg. Period	Class I SIL (µg/m^3)	Peak Modeled Conc. (µg/m^3)	Class I Increment (µg/m^3)	% Class I Increment Consumed	Class I Area of Peak Impact Location
PM_{10}	24-hr	0.3	0.197	8	2.5%	Scapegoat Wilderness Area
	Annual	0.2	0.0070	4	0.18%	UL Bend Wilderness Area
SO_2	3-hr	1.0	1.08 (HGS only) 2.34 (cumulative)	25	4.3% 9.4%	Gates of the Mountains Wilderness
	24-hr	0.2	0.25 (HGS only) 0.57 (cumulative)	5	5.0% 11%	Gates of the Mnt.and Scapegoat Wilderness
	Annual	0.1	0.0060	2	0.30%	UL Bend Wilderness Area
NO_2	Annual[b]	0.1	0.0061	2.5	0.24%	UL Bend Wilderness Area

a – Compliance with short-term standards is based on high-second-high impact.
b – Annual NO_x impacts are compared to the NO_2 standards.

Visual Plume Impacts from Proposed Action

Since all Class I areas are more than 50 km away from the site considered in the Proposed Action, a visual plume impact analysis is not required by the FLMs. ARM 17.8.1106 requires an analysis of visual plume impacts at Class I areas. Therefore, a visual plume analysis was performed at the Class I area closest to the proposed site (i.e., the Gates of the Mountain Wilderness Area, which is about 86 km to the southwest of the proposed site). The visual plume analysis examined both the plume contrast changes and color difference changes for an observer gazing both inside and outside of the Class I area. For the Proposed Action, a plume (with facility-wide emissions of NOx and PM_{10}) was modeled from the source to the Class I area at an angle of 11.5 degrees from the line of the source to the observer. The Level-1 screening analysis with the worst-case meteorological conditions was performed and results were compared with the "critical" values in the EPA Visual Plume Impact Screening and Analysis Workbook (EPA-450/4-88-015). The predicted visual plume impacts all were less than the critical values (i.e., less than the EPA critical thresholds) and thus minor. The total facility-wide allowable emissions rates of 103.4 lbs/hr nitrogen oxides (NOx) and 277 lbs/hr PM_{10} were used in the visual plume impact analysis of emissions from the Proposed Action.

Acid Deposition Impacts from Proposed Action

Acid deposition impacts from the Proposed Action were evaluated with respect to the annual nitrogen (N) and sulfur (S) deposition in the Class I areas that potentially could be affected. Nitrogen deposition occurs from the dry and wet deposition of nitrogen-containing chemicals, including NOx, nitric acid (HNO_3), and nitrate ion (NO_3^-). Sulfur deposition occurs from the dry and wet deposition of sulfur-containing chemicals, including SO_2 and sulfate (SO_4). The predicted annual average deposition rates for N and S were compared to the applicable FLM-established Deposition Analysis Threshold (DAT). Predicted peak annual average N and S deposition rates were below the corresponding DAT for all Class I areas. In conclusion, the acid deposition impacts from the Proposed Action would be minor (i.e., less than the FLM guidance thresholds).

Regional Haze Impacts from Proposed Action

The regional haze impact analysis was conducted with the CALPUFF modeling system, which includes three main programs: CALMET (the meteorological processor), CALPUFF (the dispersion model), and CALPOST (the post-processing utility). The CALPUFF modeling system is the EPA-preferred long-range transport model for Class I analyses. In the CALMET analysis, mesoscale (MM4 and MM5) meteorological data are used for the initial windfield predictions. CALMET then generates three-dimensional, hourly, gridded fields of met variables accounting for direct observations of meteorological variables and dispersion effects caused by terrain and surface (land use) characteristics. Direct observation data from surface, upper air, and precipitation stations within and near the modeling domain are used in this CALMET analysis. CALPUFF is a multi-layer, multi-species, non-steady-state puff dispersion model, which can simulate the effects of time- and space- varying meteorological conditions on pollutant transport, transformation, and removal. The meteorological fields predicted by CALMET are used as inputs to the CALPUFF model to ensure that the effects of terrain and surface characteristics on meteorology are considered. CALPOST takes dispersion data from the CALPUFF model and calculates air quality impacts, such as impacts to visibility, deposition of acidic species, and concentrations.

Regional haze is evaluated using the light extinction coefficient (b_{ext}). The percentage change in the light extinction coefficient (Δb_{ext}) attributable to a particular project with respect to the background light extinction is used to determine the regional haze impacts from that project. CALPUFF modeling results are processed using the CALPOST program. CALPOST compares visibility impacts from the modeled source(s) to pre-existing visual range at the affected Class I areas and calculates a percent reduction in background extinction ($\%\Delta b_{ext}$). The Federal Land Managers' Air Quality Related Values Workgroup Phase I Report (FLAG) guideline identifies a $\%\Delta b_{ext} \geq 5\%$ as the level at which a cumulative analysis is triggered and a $\%\Delta b_{ext} \geq 10\%$ as the level at which the FLM might object to the permit.

While the FLAG document provides guidance for conducting the regional haze impact analysis, 40 CFR §51.30 states that determination of adverse impact on visibility must be made on a case-by-case basis taking into account the geographic extent, intensity, duration, frequency and time of visibility impairments, and how these factors correlate with:

(1) Times of visitor use in the federal Class I area, and
(2) Frequency and timing of natural conditions that reduce visibility.

SME provided a preliminary regional haze analysis following the methodology described in the FLAG document (FLAG, 2000). The FLAG guideline calls for the most conservative CALPOST visibility calculation method, which compares all modeled impacts to an essentially unrestricted visual range and does not account for natural conditions such as rain, snow or fog, that reduce visibility.

SME's preliminary visibility analysis followed the FLAG guideline. SME's modeled $\%\Delta b_{ext}$ values were below 5 percent on 1,027 of the 1,081 days modeled. These results are considered preliminary results because they do not take into account the possible presence of natural conditions obscuring background visibility. SME refined the visibility modeling using weather data to more closely approximate the natural visual range on the days the modeled $\%\Delta b_{ext}$ values exceeded the FLAG guideline values. No $\%\Delta b_{ext}$ values ≥ 5 percent were modeled in the Anaconda-Pintler or Mission Mountains Wilderness Areas, so those areas were dropped from the refined analysis. The year 1990 was dropped form the Glacier National Park and UL Bend Wilderness analyses for the same reason. Preliminary visibility modeling results are contained in Table 4-10, and refined results are contained in Table 4-11.

The results of the refined analysis showed six days in which the modeled $\%\Delta b_{ext}$ values from the Proposed Action were ≥ 5 percent. Cumulative impact modeling was performed for those days to determine the $\%\Delta b_{ext}$ value from all the existing permitted PSD-increment consuming sources that could contribute to visibility reduction. The modeling showed four days with cumulative modeled $\%\Delta b_{ext}$ value greater than 10 percent.

Table 4-10. SME Preliminary Visibility Results

Class I Area	Met Data Year	Max. %ΔB_{ext} 24-hr Average	Number of Days %$\Delta B_{ext} \geq 5.0\%$	Number of Days %$\Delta B_{ext} \geq 10.0\%$
Anaconda-Pintler Wilderness Area	1990	1.91	0	0
	1992	1.39	0	0
	1996	1.81	0	0
Bob Marshall Wilderness Area	1990	8.37	1	0
	1992	10.09	2	1
	1996	14.37	7	2
Gates of the Mountains Wilderness Area	1990	6.03	1	0
	1992	17.70	6	2
	1996	16.25	10	2
Glacier National Park	1990	2.78	0	0
	1992	11.84	1	1
	1996	16.25	4	1
Mission Mountains Wilderness Area	1990	1.71	0	0
	1992	2.41	0	0
	1996	1.53	0	0
Scapegoat Wilderness Area	1990	13.18	1	1
	1992	10.00	4	1
	1996	13.39	8	4
UL Bend Wilderness Area	1990	4.50	0	0
	1992	8.47	5	0
	1996	9.01	4	0

The geographic extent of the modeled visibility impacts is fairly large on the peak day, but this is expected due to the wide expanse of the modeling domain. The intensity of visibility impacts, as reflected in the modeled %Δb_{ext} values from SME are less than 5 percent (the FLM level of concern) for >99 percent of the days modeled and are all less than 10 percent. Cumulative modeled %Δb_{ext} values are less than 10 percent (the FLM level of concern) for >99 percent of the days modeled.

Table 4-11. SME Final Visibility Results (Refined Methodology)

Class I Area	Met Data Year	Max. ΔB_{ext} 24-hr Average	Number of Days %$\Delta B_{ext} \geq 5.0\%$	Peak Cumulative %ΔB_{ext}
Bob Marshall Wilderness Area	1990	1.57	0	NA
	1992	6.90	1	14.45
	1996	9.92	2	19.21
Gates of the Mountains Wilderness Area	1990	5.62	1	5.63
	1992	4.32	0	NA
	1996	5.77	1	15.05
Glacier National Park	1992	3.92	0	NA
	1996	1.21	0	NA
Scapegoat Wilderness Area	1990	2.31	0	NA
	1992	4.30	0	NA
	1996	5.31	1	13.65
UL Bend Wilderness Area	1992	2.09	0	NA
	1996	4.47	0	NA

Peak modeled visibility impacts are strongly influenced by the high levels of humidity in the modeled air, a condition that generally results in rain, snow or fog. Although the final analysis accounts somewhat for naturally occurring impairments to visibility, it does not fully address the presence of snow or rain in the wilderness areas. DEQ has reviewed historical meteorological data to supplement the evaluation of the visibility assessment. The data records show that the meteorological conditions that result in higher modeled $\%\Delta b_{ext}$ values generally cause natural conditions that reduce visual range.

In summary, the regional haze analyses for both the proposed source only and the cumulative sources indicate that the Proposed Action would not cause a significant adverse regional haze impact in Class I areas and that impacts would be moderate. Visibility impacts that could be perceptible based on FLM guidelines were modeled primarily in November and March. Peak visitation times for the wilderness areas are July through October, when the weather is favorable and there is less chance of snow.

Summary of Class I Area Impact Analysis

The Proposed Action would cause off-site impacts on PSD Class I increments and several AQRVs (visual plume, regional haze, and acid deposition), ranging from negligible to moderate in intensity. None of these impacts would be significant, but they would contribute small changes to identified environmental resources in the Class I areas. More specifically, the Proposed Action would result in the following impacts on the Class I areas:

- Short-term/long-term direct minor adverse impact on applicable PSD Class I increments
- Direct minor, adverse impact on visual plume
- Direct long-term, minor adverse impact on acid deposition
- Direct short-term, moderate adverse impact on regional haze

4.5.2.2.4 Mercury Emissions

Chapter 3 contains an extensive discussion of mercury in the environment – including emissions and deposition data, atmospheric transport, transformation into methylmercury, human health and ecological effects, and recent efforts to regulate mercury emissions at both the federal and state levels. This information will not be repeated here.

The sub-bituminous PRB coal that would be utilized in the Highwood Generating Station is generally low in mercury content. The average mercury concentration is approximately 0.07 parts per million (ppm). Other types of coal (*e.g.*, the anthracite coal typically mined in the Eastern U.S.) can have mercury concentrations more than three times as high (Whilhelm et al., 2003), while the national average is 0.17 ppm (USGS, 2001), or almost two and a half times as high. SME's proposed facility would also have in place emission control equipment allowing for co-benefit capture rates of mercury emissions (DEQ, 2006a).

The HGS would employ an Integrated Emissions Control Strategy (IECS), including the CFB boiler, hydrated ash re-injection or equivalent FGS system, selective non-catalytic reduction, and a fabric filter (bag house). In February 2005, in conjunction with a major international CFB manufacturer, SME conducted a test burn in a scaled model CFB test boiler located in Connecticut. The test burn was conducted using 80 tons of southeastern Montana PRB coal and 20 tons of Montana limestone. Mercury capture rates of approximately 88 percent (0.7 lb/TBtu) from the test burn indicate that the HGS would be able to meet all federal regulations utilizing the proposed IECS (SME, 2005i).

When coal burns, mercury is released in one of three forms, or species: elemental mercury vapor, oxidized mercury vapor (Hg^{2+}), or mercury adsorbed to the surface of a solid particle. The different species of mercury respond differently to different types of control technologies. Elemental mercury is the most difficult of the three mercury species to control. To date, no technologies have been demonstrated in field-testing to consistently and significantly reduce elemental mercury emissions. Most research is focused on developing effective means for converting elemental mercury to one of the other two species of mercury (DEQ, 2006a).

Bituminous coal generally contains higher levels of chlorine, contributing to oxidization of mercury to Hg^{2+}, and has therefore proven to provide enhanced capacity for reducing stack mercury emissions. Conversely, sub-bituminous coal and lignite generally contain low concentrations of chlorine. Control of mercury emissions resulting from combustion of these fuels has proven to be highly variable.

The level of mercury removal in SME's 2005 pilot test results was much greater than for most utility boilers burning sub-bituminous coal and utilizing native control systems. It is also near the high end of values observed in the many test programs that have been and are being conducted on sub-bituminous coal combustion in utility boilers. However, the test burn alone does not provide sufficient data to allow boiler manufacturers to confidently extrapolate the data and guarantee mercury emissions control in a full-scale CFB unit with IECS (DEQ, 2006a).

DEQ verified information contained in the SME-HGS application for the Montana air quality permit, including mercury-specific source testing results obtained through the simulated and comprehensive combustion, performance, and emission testing program conducted prior to application. Taking into consideration this information, plus technical, environmental, and economic factors, as well as a recent mercury specific BACT determination for a similar source permitted for operation in Montana, DEQ determined that the appropriate mercury BACT emissions limit(s) for the proposed project incorporating the IECS would be either:

- 90 percent mercury reduction, based on a 12-month rolling average, or
- 1.5 lb mercury/TBtu (trillion Btu), based on a 12-month rolling average.

The two-part limit accounts for two complementary operational factors. First, coal quality is not constant, even within a given coal deposit. At the extremely low mercury content values under consideration, a small change in coal mercury content can have a significant impact in compliance potential. Second, control efficiencies generally decrease as inlet concentrations decrease, particularly as inlet concentrations become very low, as in the case of mercury concentrations in utility boiler exhaust. If SME-HGS should receive coal with higher than normal mercury content, it may be difficult to comply with the lb/TBtu limit, but compliance with the percent reduction requirement would be achievable. Conversely, if a particular coal supply contains less mercury than normal, the percent reduction requirement may be less readily attainable while the emission rate may be more so (DEQ, 2006a).

To confirm the performance of the CFB Boiler and IECS in reducing mercury emissions, SME-HGS would be required to monitor and analyze mercury control performance data after commencement of commercial operations and to report this information to DEQ. The results of the final analysis would then be used to confirm compliance with the BACT-determined mercury emissions limits.

Table 4-12. Current and Projected Future Maximum Mercury Emissions from Coal-Fired Power Plants in Montana[1]

Plant		Annual mercury emissions in lbs.		
		Current	2010-2014 (annual)	2018[5]
Existing facilities	*MW*			
PPL - Colstrip Unit 1	358	152.6	75.7	28.4
PPL - Colstrip Unit 2	358	152.6	75.7	28.4
PPL - Colstrip Unit 3	778	321.1	159.2	59.7
PPL - Colstrip Unit 4	778	321.1	159.2	59.7
CELP[2]	41.5	21.0	10.2	3.8
PPL - Corette	163	41.2	36.8	13.8
MDU - Lewis & Clark	50	32.8	24.7	4.7
Total existing		**1,042.4**		
New and proposed facilities				
RMP[3]	160	NA	17.1	10.3
Roundup Power Unit 1	390	NA	49.1	29.5
Roundup Power Unit 2	390	NA	49.1	29.5
SME-HGS	250	NA	36.4	21.8
Sum Total[4]		**1,042**	**693.2**	**289.6**

Source: DEQ, 2006b

1 Projected mercury emissions based on Draft Air Quality Permit limits, March 2006; estimated and projected mercury emissions are based on maximum capacity and average coal quality information from 1999 for existing sources and on the average coal quality information submitted in air quality permit applications for new sources; in addition, estimates are based on maximum nameplate capacity for 8,760 hours (24 hours per day times 365 days) per year, and thus on conservative operating capacity information.
2 Colstrip Energy Limited Partnerships
3 Rocky Mountain Power
4 Existing plus new and proposed
5 With implementation of CAMR and Montana's mercury limits

If the CFB Boiler operating with the IECS is unable to demonstrate compliance with the mercury limits established through the BACT determination, SME-HGS would be required to achieve the BACT-determined mercury reductions/limits through the installation and operation of mercury-specific emission controls. In that case, within 18 months after commencement of commercial operations, SME-HGS shall install and operate, as needed to comply with the applicable mercury emission limits, an activated carbon injection control system or, at SME-HGS's request and as approved by DEQ, an equivalent technology (equivalent in removal efficiency).

With the IECS in place, annual mercury emissions from the HGS would be approximately 34.5 lbs. (15.7 kg), slightly less than its 2010-2014 allotment of 36.4 lbs (16.5 kg) under Montana's mercury rules. Currently operating coal fired power plants in Montana have emitted as much as 1,042 lbs. (474 kg.) of mercury in a year (DEQ, 2006b). However, as seen in Table 4-12, by 2018, combined statewide mercury emissions are projected to decrease by 72 percent, from 1,042 lbs. to 290 lbs. annually, as a result of implementing the CAMR and Montana's mercury limits. Under Montana's mercury rules, each Montana coal-fired power plant, including SME-HGS, would have to reduce the rate of mercury emissions to 0.9 lb./TBtu by 2018 (DEQ, 2006b).

Due to low chlorine levels in its source sub-bituminous coal, stack mercury emissions from the HGS would be primarily in the form of elemental mercury rather than ionic mercury. Ionic mercury is more easily "scavenged" from the air by attaching to particles or through precipitation, and would therefore tend to be deposited closer to the HGS. In contrast, as explained in Section 3.3.5, the elemental mercury species in the form of mercury vapor does not tend to fall out nearby and is readily transported long distances through the atmosphere. Thus, mercury emissions from the HGS would likely cause a minor change in the local deposition of mercury, while contributing 0.0003 percent to the global stock of atmospheric mercury – estimated at 5,200 metric tons (UNEP, 2002) – and distributed around the world due to air currents.

In conclusion, the HGS, by meeting Montana's mercury emission limits, would likely have minimal impact on environmental mercury levels both locally and in Montana as a whole.

4.5.2.2.5 Greenhouse Gas Emissions

The greenhouse effect and the potential implications of global climate change are summarized in Chapter 3 (Section 3.3.6). This section focuses on carbon dioxide and other greenhouse gas emissions from the proposed HGS as well as the potential for mitigation and offsets.

The potential facility-wide CO_2 emission rate of the HGS is 2.1 million tons (1.9 million metric tons) per year. In addition, the HGS would release methane and nitrous oxide, two other greenhouse gases. Per molecule, both of these gases have a higher global warming potential than carbon dioxide and their emissions are often quantified in terms of CO_2 equivalents. The potential facility-wide, CO_2 equivalents emission rate of these gases is 0.67 million tons (0.61 million metric tons) per year. Total GHG emissions from the HGS are 2.8 million tons (2.5 metric tons) per year.

HGS carbon dioxide emissions would constitute 0.033 percent of U.S. annual emissions of 5,843 million metric tons and 0.007 percent of global yearly emissions of 26,000 million metric tons in 2002 (Marland et al., 2005). As such, HGS's emissions would represent a very small but tangible, incremental contribution to this cumulative global issue. At the present time, U.S. emissions of greenhouse gases from all sources are unregulated and uncapped, since the U.S. is not a signatory to the Kyoto Protocol and not bound by its mandatory national reductions.

Sequestration, Mitigation and Carbon Offsets

Increasing emissions of carbon dioxide and other greenhouse gases, rising greenhouse gas concentrations in the atmosphere, and growing concern about the possible impacts of climate change have spurred interest in mitigating CO_2 emissions. In theory, a power plant could capture CO_2 by chemically or physically combining it with something that will remain as a liquid or solid rather than as a gas. However, as a practical matter, capturing that carbon dioxide before it is released to the atmosphere is very difficult. Furthermore, once captured, the CO_2 would have to be stored ("sequestered") in such a manner as to keep it permanently out of the atmosphere.

The U.S. Department of Energy, among other agencies and institutions, is conducting various research projects on methods for efficient capture and storage of CO_2. However, research has not yet identified any commercially available technique that can capture much of the CO_2 from a large-scale power plant under normal conditions (Markel, 2005). Preliminary projections suggest that the likely cost of carbon capture would add 2-4 cents/kWh for a pulverized coal plant, and would probably also reduce the power output of the plant by roughly 25 percent (Herzog and Golomb, 2004).

As to storage of the carbon, the techniques under study include injecting it below ground such as into oil or gas reservoirs to help push out more oil and gas, or into un-mineable coal beds, to push out the natural gas (methane) that occurs with the coal. Another idea is to inject CO_2 into beds of basalt rock, letting the CO_2 become bound to the basalt. This method is being researched at Montana State University and is still in the experimental stages (Capalbo, 2005). It is not a concept this Proposed Action could count on using. Even if some form of underground carbon storage were to become practical, the transport of the CO_2 to the underground storage site would add further economic and energy costs.

Other methods for CO_2 sequestration include aforestation (planting tree stands) and agricultural sequestration. These methods seek to store carbon in standing biomass (e.g trees) or in increased organic matter in soils. Certain states and regional programs offer incentives for sequestration through these methods (Lewandrowski, e al 2004). DEQ prepared a draft Greenhouse Gas Project in 1999 (http://www.ucsusa.org/clean_energy/energynet/energynet-policy-update-01062005.html#montana). The area of land that would have to be reforested or afforested to fully offset carbon emissions from the HGS (or any comparable fossil fuel generation) would be enormous and impractical. There is simply not enough arable land available for aforestation on the entire earth to fully offset global annual carbon emissions; therefore, while this process will measurably reduce the accumulation of CO_2 in the atmosphere while providing other environmental and socioeconomic benefits, it cannot be considered as an option that would make coal consumption/combustion "carbon neutral".

Therefore, while direct capture and storage of the carbon emitted by coal fired power plants is not practicable at this time, offsetting the power plant's emissions with programs that tie up increased amounts of carbon in biomass are technically feasible and may become economically attractive depending on the program's structure. In the meantime, SME and the City of Great Falls are exploring various other means of offsetting carbon emissions from the HGS and SME's overall energy portfolio.

SME customers may currently purchase "green" power, other than hydropower, at a load of 0.08 MW at an add-on rate of $10.50/MWh. Because green power, such as wind and solar power and geothermal heat, is more expensive than existing power supply contracts, SME has found most customers are reluctant to utilize green power. SME currently provides hydropower from both BPA and WAPA to meet overall customer load. The BPA power purchase agreement will begin to decrease in 2008 and completely expire by 2011 (See Section 1.4 for more detailed information).

SME has asserted that it would continue to purchase up to 20 MW of hydropower from WAPA as allowed. 20 MW of hydropower equates to 194,416 tons per year of CO_2 emissions avoided, based on less efficient Montana coal-fired boilers. In addition, SME plans to install 6 MW of wind power at the HGS site. 6 MW of wind power equates to 23,330 tons per year of CO_2 emissions based on less efficient Montana coal-fired boilers. Moreover, SME has asserted that as demand dictates, it would continue to offer additional "green power" beyond the installed wind power at HGS. The amount of this power provided to customers will vary depending upon cost and interest at that time.

SME and the City of Great Falls have applied for a one million dollar grant – a federal appropriation request through Senators Baucus and Burns and Congressman Rehberg – to help study GHG mitigation options and develop a GHG mitigation strategy for HGS. At this point in time, the grant has not been awarded; the study plan and options are to be completed if the grant is awarded.

SME has asserted that it would continue to promote use of geothermal heat pumps and it plans to provide incentives to member systems for geothermal heat pump installations for all of the five member cooperatives and the City of Great Falls. A total of 425 geothermal heat pumps are currently in service in the SME service area. Each geothermal heat pump avoids approximately 3.62 tons of CO_2 emissions per year (GeoExchange, 2006). The current number of geothermal heat pumps equates to an offset of approximately 1,539 tons per year of CO_2 emissions. At this point in time, the type of incentive has not been defined, and the future number of geothermal heat pumps on the SME system is unknown. Therefore, future GHG offset estimates from additional use of heat pumps were not calculated.

SME has asserted that it has promoted and would continue to promote energy efficiency for residential, industrial, and agricultural energy consumers. SME states that it would further develop and implement energy conservation ideas and projects as they are identified and shown to be economically feasible.

SME asserts that it is examining urban reforestation as a GHG mitigation option. A paper entitled *Tree Planting in Great Falls, The Surrounding Region and in Other Montana Urban Areas* by the City of Great Falls City Forester discusses tree canopy goals and costs. The cost of a two-inch caliper balled and burlapped tree is estimated at $300 per tree. One tree is estimated to offset approximately 0.82 ton of CO_2 (CarbonNeutral Company, 2005). At this time, SME has not finalized a plan for an urban reforestation mitigation option and has not estimated potential GHG offsets from this concept. SME is also evaluating other terrestrial carbon sequestration options (SME, 2006).

The new HGS coal-fired boiler would emit approximately 0.997 tons of CO_2 per MW. Less efficient existing boilers in Montana emit approximately 1.110 tons of CO_2 per MW (based on 2003-05 data from EPA Acid Rain Database and Montana Annual Emission Inventory Reports).

4.5.3 ALTERNATIVE SITE – INDUSTRIAL PARK SITE

4.5.3.1 Construction

Potential short-term, construction-related impacts on air quality at the alternate site in the Industrial Park would be very similar to those of the Proposed Action at the Salem site. Exhaust emissions from equipment used in construction, coupled with likely fugitive dust emissions from the disturbed ground surface, could cause minor to moderate, short-term degradation of local air quality, but would not be high enough to result in significant deterioration. See Section 4.5.2.1 for further discussion. The closer proximity of low-density residential development to the Industrial Park site might result in somewhat greater exposure of residents to dispersed diesel exhaust and smoke than in the case of the Proposed Action, but not significantly greater.

4.5.3.2 Operation

The potential long-term, operation-related impacts on air quality at the alternate site in the Industrial Park would be virtually identical to those of the Proposed Action. Operating the HGS at the alternative site would cause a number of on-site and off-site impacts on air quality in Class II areas, ranging from negligible to moderate in intensity. More specifically, using the alternative site would result in:

- Short-term, minor to moderate degradation of local air quality from construction activities
- Long-term, minor to moderate degradation of local air quality from operations
- Long-term, minor impacts on sensitive species from criteria pollutant emissions and/or trace element deposition.

Operating SME’s generating station at the Alternate Site would cause off-site impacts on PSD Class I increments and several AQRVs (visual plume, regional haze, and acid deposition), ranging from negligible to moderate in intensity. None of these impacts would be significant, but they would contribute small changes to identified environmental resources in the Class I areas. More specifically, the Alternate Site would result in the following impacts on the Class I areas of interest:

- Short-term/long-term direct minor adverse impact on applicable PSD Class I increments
- Direct minor adverse impact on visual plume
- Direct long-term, minor adverse impact on acid deposition
- Direct short-term, moderate adverse impact on regional haze

Releases of mercury and greenhouse gases at the Alternate Site and small, but tangible, incremental contributions to long-term cumulative effects from those emissions would be identical to those of the Salem site.

4.5.4 CONCLUSION

The No Action Alternative would not result in any direct air quality impacts from either the Salem or Industrial Park sites, though it would contribute indirectly to air quality impacts by those power plants from which SME would purchase electricity. These impacts cannot be quantified because the fuel or energy source for the purchased electricity is not known.

Impacts of the Proposed Action – the Highwood Generating Station at the Salem site – and the alternative site – the Industrial Park site – would be similar to one another. Utilizing BACT, both alternatives would result in up to minor to moderately adverse, non-significant impacts on air quality. The wind turbines that would be installed under the Proposed Action would have no long-term adverse effect on air quality, but would indirectly have a beneficial effect by displacing up to 6 MW of electricity from other sources, potentially involving fossil fuel combustion and air emissions.

Using the impact significance definitions described at the beginning of Chapter 4 and presented for "Air Quality Degradation" in Appendix J, the air quality impacts of the Proposed Action would be of minor to moderate magnitude, long-term duration, and large extent, and have a probable likelihood of occurring. Overall then, the rating for air quality impacts from the Proposed Action would be adverse and these impacts would likely be non-significant.

The air quality impacts of the Industrial Park site would be rated the same as the Proposed Action.

4.5.5 MITIGATION

During construction, at whichever alternative site is chosen, SME and its construction contractors and sub-contractors would be required to comply with DEQ regulations to minimize emissions of fugitive dust. Construction personnel would be required to implement reasonable measures, such as applying surfactant chemicals or water to exposed surfaces or stockpiles of dirt, when windy and/or dry conditions promote problematic fugitive dust emissions. Measures such as sprinkling to keep the disturbed area damp or applying approved chemical treatments may be used.

Mitigation measures to minimize air quality degradation are already incorporated into the project design, starting from the selection of the CFB boiler itself. These measures, which include both air pollution control equipment and boiler operation practices, are summarized in Table 4-2 (the BACT Summary for CFB Boiler). The air quality permit requires SME to install and operate Continuous Emission Monitors (CEMs) to continuously measure emissions of air pollutants and verify compliance with permit limits. Additionally, CEMs for combustion gases would be linked to a computerized control room with equipment, which would adjust boiler parameters to maintain proper combustion or would set off alarms when a measurement was outside the specified operating range.

Mitigation measures intended to offset GHG emissions are listed in Section 4.5.2.2.5.

4.6 BIOLOGICAL RESOURCES

Adverse effects to flora and fauna may occur through construction or operation of the facilities or infrastructure as described in the Proposed Action. Wildlife can be directly affected by mortality due to construction or operation of the facility or its infrastructure, or indirectly through habitat loss, fragmentation, or conversion. Vegetation can be directly affected by its removal as the ground surface on which it occurs is developed, or indirectly through changing populations of wildlife that feed on plants.

Construction, maintenance, and operation of facilities in an area that contains wildlife habitat could constitute an adverse effect on those habitats. An adverse effect is found when an undertaking or action alters, directly or indirectly, any of the characteristics of a habitat that provides for life history needs such as feeding, cover, travel, or breeding.

The biological resource survey conducted in support of this EIS documented wildlife presence species and suitable habitats within the surveyed portions of the proposed project areas (WESTECH, 2005). The biological resources survey was conducted based on preliminary designs and locations of the proposed facilities. Once final design is completed and immediately prior to construction, an additional field survey will be needed to ensure that sensitive biological resources are identified, considered, and protected.

4.6.1 NO ACTION ALTERNATIVE

Under the No Action Alternative, no CFB coal-fired generating station would be constructed at either the Salem or Industrial Park sites. In addition, no 230-kV electrical transmission line interconnections would be developed in the Great Falls area. Thus, there would be no direct impacts on biological resources under the No Action Alternative, including threatened and endangered species, other species of concern, and noxious weeds.

However, SME would need to purchase power from another generation source within the WSCC to meet its projected baseload needs beginning in 2008. If generation and transmission capacity have to be expanded to meet a general growth in load to which SME would contribute, SME could be contributing indirectly and incrementally to the impacts on biological resources that occur at other locations in the Rocky Mountain West and Pacific Northwest. Depending on the type of generation (e.g., hydro, coal, natural gas, wind, solar, nuclear, geothermal) as well as the specific location of that generation and related transmission, a wide range of adverse impacts of varying intensity could occur on biological resources.

4.6.2 PROPOSED ACTION – HGS AT THE SALEM SITE

4.6.2.1 Threatened and Endangered Species and State Species of Special Concern

Bald Eagle

There is a bald eagle nest near the confluence of Belt Creek and the Missouri River, approximately one mile (1.6 km) downstream from Morony Dam. The site is about three miles (4.8 km) from both the Salem plant site and the proposed raw water pipeline intake, and is not visible from either site. The nest was active in 2005 but had fallen out of the tree sometime in 2006. The Montana Bald Eagle Management Plan (DOI 1994) provides guidelines for management activities within 2.5 miles (4.0 km) of a bald eagle nest, which define this project as within the home range of these nesting eagles. Zone III (Home Range) is defined as including all suitable foraging habitats within 2.5 miles (4.0 km) of all nest sites that have been active within five years. This zone is managed to maintain suitability of foraging habitat, minimize disturbance within key areas, minimize hazards, and maintain the integrity of the breeding area. Although the project is located within Zone III, it is located within an area with no potential habitat, no perch trees, and no screening vegetation to attract eagles. Disturbance to transitory bald eagles during construction would be minimal and limited to the time of construction.

Activities (connected actions) conducted by the contractor could conceivably be conducted outside of the project limits and closer to these nests, or other nests along the Missouri River. The Montana Bald Eagle Management Plan places limits on these high intensity activities. They should not be conducted within 0.5 mile (0.8 km) of nest locations or any other known bald eagle nests between March 1 and May 15, or within 0.25 mile (0.4 km) of nest sites from May 15 to July 15. Neither the water intake pipeline nor the current transmission line route is this close to the former nesting site near the confluence of Belt Creek and the Missouri River. If the contractor anticipates any construction operations, including the construction of transmission line interconnections and the spanning of the Missouri River by power lines, within the vicinity of an active bald eagle nest, roost site, or seasonal concentration area, or has any questions concerning the application of the regulations promulgated to protect this species, the Plan directs them to contact the USFWS and/or MFWP. The agencies can identify any restrictions that may apply to project planning, anticipated construction activities, and project scheduling. If these precautions are adhered to, the project would have no adverse effect on bald eagles.

Canada Lynx

The USFWS has published a proposed rule to designate critical habitat for the lynx which will replace the current habitat maps used by MNHP. This action is in response to a court-order, which requires that USFWS complete a final critical habitat designation for the lynx by November 1, 2006. The published map shows critical habitat west of Browning, Montana, in the high elevation habitats of Glacier National Park and the Bob Marshall Wilderness complex. There will be no designated critical habitat near the project area. The project area does not support suitable Canada lynx habitat, and lynx have not been reported within 10 miles (16 km) of the project vicinity; therefore this project would have no adverse effects on this species.

Animal Species of Concern

Habitat exists in the project area for the state listed species of concern that occur in the area. The blue sucker and spiny softshell turtle are likely to occur below Morony Dam, far enough away from the proposed project that there would be no adverse effects to these species. The sauger population may be impacted by activities during the raw water pipeline construction and placement of the intake, but these impacts would be short-term. The intake structure would be adequately screened to exclude all fish species.

The incised drainage habitat and uplands associated with the Missouri River are considered nesting habitat for the ferruginous hawk, prairie falcon, Swainson's hawk, and red-tailed hawk. No active nests were found during the survey; however, surface access limitations precluded searches of large portions of these habitats (WESTECH, 2005). Ferruginous hawks, along with many other species of raptors, would be expected during migration to be present in the HGS project vicinity. Similarly, the burrowing owl is a ground-dwelling bird associated with burrows of ground squirrel, prairie dogs, and badgers in prairie grasslands. Migratory songbirds can also be expected to use these sites for nesting and foraging. These species could occur in the incised drainage and grassland habitat of the HGS project vicinity.

The white-faced ibis, black-crowned night heron, Franklin's gull, common tern, and black tern are generally associated with wetlands and large rivers. All five species could occur along the Missouri River in the HGS project vicinity during migration, but none would be expected to nest there. All nesting records of these species are associated with Benton Lake National Wildlife Refuge, about 7-12 miles (11-19 km) from the HGS project.

Avoiding disturbance of shrub, tree, and wetland habitats would reduce adverse effects on these species by the proposed project. If these habitats must be removed, disturbed, or altered for construction or maintenance, construction contractors should avoid initiating these activities during spring nesting season. If these precautions are adhered to, the project would have no adverse effect on state listed species of concern.

Plant Species of Concern

Within 10 miles (16 km) of the HGS there are records of eight species of plants that are considered species of concern in Montana (MNHP, 2005d). Suitable habitats for most of these species (Table 3-6) are not available in the HGS project area, although roundleaf water hyssop, many-headed sedge, Guadalupe water-nymph, and California waterwort occur in shallow waters, edges of wetlands, and muddy shores of ponds and streams. These types of habitats may occur in the vegetated edge habitat created in the backwater area where the raw water intake would be located. Two species of moss (*Entosthodon rubiginosus* and *Funaria americana*) were recorded along the Missouri River upstream of the current Cochrane Dam in the late 1880s and early 1900s. Since Cochrane Dam was constructed in 1957, it is likely that the habitat for these two species was inundated. All of these records are comparatively old (Table 3-6), and were made prior to much of the human development in the area. Thus, impacts of the HGS on plant species of concern in Montana are likely to be non-existent to negligible.

Noxious Weeds

A noxious weed survey was not conducted during the field survey (WESTECH, 2006f), although a number of weedy species were observed in the field and recorded in Table 3-12. Noxious weeds tend to flourish in disturbed habitats and their expansion into new areas in particular is facilitated by linear construction projects such as roads and pipelines that disrupt soils and clear vegetation. Thus both the Salem site and the Industrial Park site, as well as the various connecting pipeline, transmission line, and road corridors would be expected to be susceptible to contributing to the spread of noxious weeds.

SME recognizes that a noxious weed inventory and Noxious Weed Management Plan must be prepared and submitted to the Cascade County Weed and Mosquito Management District prior to construction (WESTECH, 2006f; Cascade, no date-b). This plan would contain noxious weed control measures that would limit the adverse impact of the Proposed Action and Alternative site on the dispersion and expansion of noxious weeds. The district's requirements for weed management and revegetation of disturbed areas in Cascade County are located at: http://www.co.cascade.mt.us/getfile.phtml?ido=97 . Overall impacts are expected to be of a minor intensity, short-term duration and localized context.

Other Species of Interest

Several important species valued for hunting and wildlife viewing occur in the proposed project area. Mule and white-tailed deer and pronghorn antelope can be expected to occur on the proposed project site. Other game/furbearer species that could occur in the proposed project area include sharp-tailed grouse, gray partridge, coyote, red fox, mountain lion, and bobcat. No direct mortality is expected to occur from construction of the power plant and related infrastructure, but individual animals may be killed on the railway spur and on the access road.

4.6.2.2 Evaluation of Specific Proposed Action Components

Potential impacts on biological resources were derived from surveying the proposed project area and related infrastructure sites to determine whether any such biological resources exist in these areas (WESTECH, 2005). The majority of the facilities and infrastructure would be constructed on agricultural land that has been farmed for small grain for decades. Some shrub and tree habitat exists in small coulees that drain into the Missouri River on the north end of the project, and along the banks of the Missouri River.

Plant and Railroad Spur

The power generating plant and proposed railroad spur running south would be located on lands almost entirely cultivated for small grains. No vegetated drainages are crossed by the rail route. The entrance road to the plant will be upgraded to accommodate larger vehicles for construction, supply, and maintenance to the plant facility. Adverse effects on wildlife or suitable habitat by the construction or operation of the plant could occur if small mammals or birds are killed during construction or maintenance. Some individual wildlife, especially mule deer, white-tailed deer, or pronghorn could experience adverse effects through direct mortality caused by collision with trucks on the access road or nearby trains on the spur route. Scavengers such as coyotes, mountain lions, and birds could be killed when feeding on carrion on or near railway tracks.

Transmission Lines

The proposed electrical transmission line #1 from the Salem plant to the Great Falls substation north of the Missouri River would cross cultivated grain fields, several gentle-to-moderately steep incised drainages, Box Elder Creek, and the Missouri River including its associated upland habitats and rolling grasslands. The line would cross the Missouri River upstream of Cochrane Dam, above the reservoir formed by Ryan Dam. The river in this reach has steep banks with little or no emergent vegetation. Transmission line #2 would be placed in cultivated fields and would span Box Elder Creek parallel to Transmission Line 1. The shrub and tree habitats concentrated in Box Elder Creek and vegetated incised drainages would be most sensitive to disturbance. Songbirds and raptors, small mammals, and reptiles concentrate in these areas, especially during spring breeding season. Disturbance caused by construction and maintenance should be timed to avoid breeding season, and should leave as much of the vegetation intact and undisturbed as possible.

The actual amount of each habitat disturbed by construction of the transmission line would depend on the final route location, spacing and location of structures, etc. If construction requires disturbance of the bed and banks of any drainage, such as Box Elder Creek, Stream Protection Act (SPA 124) permits would be required by FWP. If construction requires placement of fill in or near a drainage, then the Corps should be consulted to ensure compliance with Section 404 of the Clean Water Act. A 318 authorization for temporary increases in turbidity may also be required by DEQ for work in or near state waters with a potential to deliver sediment to those waters.

Fresh Water and Wastewater Pipelines

The proposed route for the fresh and wastewater pipelines follows an existing gravel county road and an abandoned railroad grade. It would cross Box Elder Creek on the existing railroad grade. As long as the final design follows this route placement, there would be no adverse effects to biological resources from burying the pipelines along an already disturbed linear route.

Raw Water Pipeline and Associated Infrastructure

The raw water pipeline is comprised of two segments: 1) the portion that would run from the plant site to the directional drill site on top of the escarpment above the Missouri River, and 2) the portion that will be drilled down to the collector well at the river. The first portion is approximately 1.5 miles (2.4 km) long, and would be buried in existing grain fields. Surface disturbances would be reclaimed to grain fields and previous land use and habitat. The second portion would create construction disturbance associated with the drill pad in the existing grain field and the collector well at the bottom of the grade. Associated infrastructure improvements consist of upgrading the existing vehicle trail in the coulee, constructing the pump house on the river bank, and building the subsurface intake located on the bed of the Missouri River.

Upland and drainage habitats would not be affected by segment one and two, and disturbed areas around the pad and well site would be reclaimed to previous habitat. If drilling were not successful and the drill pad was relocated, or drilling failed and standard trenching techniques were required, appropriate state and federal agencies would be notified prior to relocation (e.g. MFWP, DEQ, Corps). Trenching may disturb valuable shrub and trees habitats concentrated in the coulee. Upgrading the existing vehicle trail in the coulee could also impact valuable habitats. Song birds and raptors, small mammals, and reptiles concentrate in these areas, especially during spring breeding season. Disturbance caused by construction and maintenance should be timed to avoid breeding season, and should leave as much of the vegetation intact and undisturbed as possible. The actual amount of each habitat disturbed by burying the pipeline and the drill pad would depend on the final route location, level of road upgrade required to accommodate construction and service vehicles, success of drilling, etc. Direct mortality to individual animals could occur during construction or during routine road use for maintenance.

The intake structure for the raw water pipeline would be placed on the bed of the Missouri River in the reservoir created above Morony Dam. Method and placement of the pipeline and well, and post-construction reclamation, are described in Chapters 2 (Section 2.2.2.1) and under Water Resources (Section 4.4.2.1) of this chapter. Several fish species are known to be present in Morony Reservoir, and FWP and PPL Montana are using Morony Reservoir to rear sauger (a Montana species of concern) for reintroduction into riverine habitats. The proposed method of installing the intake is unlikely to cause more than a localized temporary disturbance for fish in the reservoir and a minor amount of turbidity; extreme stressing or any mortality would be unlikely. Similarly, fish would not be harmed by the process of withdrawing water at the intake.

As noted above, several permits would be required by state and federal agencies if construction or operational activities would impact the bed, banks, or water quality of water bodies. These permits often apply even when live water is not present year-round. The water quality of wastewater returned to the Missouri River would need to comply with current federal and state water quality regulations, including any restrictions on pollutant loads due to ongoing Total Maximum Daily Load (TMDL) program imposed on the City of Great Falls' sewage treatment plant's discharge permit. The preferred method of disposal is to return HGS wastewater to the City of Great Falls, where it would be subject to pretreatment standards, and not water quality standards or limits applicable to discharges directly into the Missouri River.

If the final design follows the proposed route placement and no drilling complications arise, there would be no adverse effects to biological resources from burying the pipelines and directional subsurface drilling.

Wind Turbine Generators

Chapter 2 (Section 2.1.3.1) discussed the potential impacts of wind energy development on wildlife. In general, impacts consist of habitat fragmentation and the potential for direct mortality to birds and bats from collisions with the stationary tower/pole or spinning blades; the latter impact is usually of greater concern. This would also be true in the case of the HGS and Salem site, where fragmenting low-value wheat field habitat by installing wind turbines would constitute a negligible impact on wildlife.

In recent years, low-speed, tubular-constructed wind turbine technology has been emphasized, and the design of the proposed HGS wind turbines reflects this broader trend. These larger and slower-moving turbines can still kill raptors, passerines (perching birds), waterbirds (e.g. waterfowl, wading birds), other avian species, as well as bats, though at a substantially lower rate than earlier, smaller lattice-supported WTGs with faster-moving blades. Low wind speed turbine technology like that employed by the proposed HGS WTGs requires much larger rotors whose blade tips can exceed 200 mph (323 km per hour) under windy conditions. A bird approaching rapidly spinning turbine blades may experience “motion smear” – the inability of its retina to process high speed motion stimulation, similar to reaction of the human eye to an airplane propeller spinning faster and faster until it becomes virtually transparent. Motion smear occurs primarily at the tips of the wind turbine blades, making them deceptively transparent at high velocities. This increases the possibility that a bird could fly through this arc, get struck by a blade, and be killed (USFWS, 2003).

The USFWS has issued guidance for wildlife biologists and wind developers on ways to avoid and reduce mortality to birds and bats from WTGs (USFWS, 2003). The USFWS’s site development recommendations follow, along with HGS-specific comments (in italics).

1. Avoid placing turbines in documented locations of any species of wildlife, fish, or plant protected under the federal Endangered Species Act. *No federally listed species are documented at the proposed location of the four proposed WTGs on the Salem site*.
2. Avoid locating turbines in known local bird migration pathways or in areas where birds are highly concentrated, unless mortality risk is low (e.g., birds present rarely enter the rotor-swept area). Examples of high concentration areas for birds are wetlands, state or federal refuges, private duck clubs, staging areas, rookeries, leks, roosts, riparian areas along streams, and landfills. Avoid known daily movement flyways (e.g., between roosting and feeding areas) and areas with a high incidence of fog, mist, low cloud ceilings, and low visibility. *The proposed location is not located within any known local bird migration pathway or area of bird concentration.*
3. Avoid placing turbines near known bat hibernation, breeding, and maternity/nursery colonies, in migration corridors, or in flight paths between colonies and feeding areas. *The proposed location is not located near any known bat hibernation or breeding area, or within a migration pathway.*
4. Configure turbine locations to avoid areas or features of the landscape known to attract raptors (hawks, falcons, eagles, owls). For example, Golden Eagles, hawks, and falcons use cliff/rim edges extensively; setbacks from these edges may reduce mortality. Other examples include not locating turbines in a dip or pass in a ridge, or in or near prairie dog colonies. *The landscape where the WTGs would be located does not contain features known to attract raptors.*
5. Configure turbine arrays to avoid potential avian mortality where feasible. For example, group turbines rather than spreading them widely, and orient rows of turbines parallel to known bird movements, thereby decreasing the potential for bird strikes. Implement appropriate storm water management practices that do not create attractions for birds, and maintain contiguous habitat for area-sensitive species (e.g., Sage Grouse). *The orientation of the proposed turbine configuration at the Salem site in comparison with the predominant direction of bird movements locally is unknown.*

6. Avoid fragmenting large, contiguous tracts of wildlife habitat. Where practical, place turbines on lands already altered or cultivated, and away from areas of intact and healthy native habitats. If not practical, select fragmented or degraded habitats over relatively intact areas. *The HGS wind turbines would be installed on cultivated farmland and thus would not fragment wildlife habitat.*
7. Avoid placing turbines in habitat known to be occupied by prairie grouse or other species that exhibit extreme avoidance of vertical features and/or structural habitat fragmentation. In known prairie grouse habitat, avoid placing turbines within 5 miles of known leks (communal pair formation grounds). *The proposed farmland location of the HGS WTGs is not known to be occupied by prairie grouse but these could occur nearby*.
8. Minimize roads, fences, and other infrastructure. All infrastructure should be capable of withstanding periodic burning of vegetation, as natural fires or controlled burns are necessary for maintaining most prairie habitats. *The proposed wind turbine development at the HGS site would comply with this guideline*.
9. Develop a habitat restoration plan for the proposed site that avoids or minimizes negative impacts on vulnerable wildlife while maintaining or enhancing habitat values for other species. For example, avoid attracting high densities of prey animals (rodents, rabbits, etc.) used by raptors. *A habitat restoration plan would not be necessary because wildlife habitat would not be disrupted. Landscaping would take place to restore vegetation and soil cover after excavation and construction are complete.*
10. Reduce availability of carrion by practicing responsible animal husbandry (removing carcasses, fencing out cattle, etc.) to avoid attracting Golden Eagles and other raptors. *Carrion is not expected to be available near the HGS wind turbines. However, animals may be killed by coal supply trains on the railroad spurs associated with and in the vicinity of the power plant and wind turbines. SMC would need to remove these kills to prevent attracting Golden Eagles and other raptors.*

Considering the above landscape and site development issues, the relatively small scale of the proposed HGS wind development, the proposed design of the WTGs and the low quality of wildlife habitat present on site, the proposed HGS wind development would likely have minor to moderate impacts on wildlife, especially birds. These impacts would be localized and of long-term duration.

4.6.3 Alternative Site – Industrial Park Site

As described in Chapter 3, the alternative Industrial Park plant site appears to have been cultivated at some time in the past, but is currently vegetated in a mixture of grasses that includes smooth brome, crested wheatgrass, thickspike wheatgrass, and Kentucky bluegrass, as well as a variety of weedy forbs. Parts of this site have already been disturbed by human activities apparently associated with other developments in the industrial park. Wildlife species recorded during the biological survey at the site included the western meadowlark, unidentified vole (probably the meadow vole), Richardson’s ground squirrel and badger.

Construction of the SME generating station at this site would entail negligible to at most minor adverse impacts on wildlife habitat on the site itself. It would not be expected to have any adverse impacts on threatened and endangered species or state species of special concern at the site itself. Of greater possible concern would be temporary construction-related and long-term or permanent impacts on the biological resources as-yet unselected transmission, pipeline, and rail spur corridors

Impacts to habitat and wildlife from constructing transmission lines, the rail spur, the raw water intake and line, and potable water and sewage lines to the Industrial Park site would likely be short-term, localized, and negligible to minor in magnitude. If this site were to be selected, most of these utility connections would be shorter than for the Salem site due to closer proximity to established infrastructure. However, connection lines for water, wastewater, railroad transport, and electric transmission lines to the plant site could potentially have some adverse effects on biological resources. Since water, wastewater, and transmission lines are buried and elevated respectively, their installation would entail at most temporary and short-term impacts on possible wildlife habitat, since this habitat could be restored on the surface within the corridor; in contrast, a rail spur could potentially eliminate a small amount of habitat equal to the length of the track and bed times the width, as well as fragment habitats. However, most of area through which the spur is likely to pass has long been disturbed. If the Industrial Park site were to be selected instead of the Salem site, the same general biological mitigation measures would apply with regard to constructing utilities infrastructure.

4.6.4 Conclusion

Table 4-13 lists the impacts on biological resources resulting from the site preparation, construction, operation, and connected actions associated with a dam, reservoir, and raw water transmission main for each of the alternative project sites, including the No Action alternative.

Overall, the No Action Alternative would have no direct effects on biological resources at either of the proposed sites. However, it would contribute indirectly and cumulatively to adverse impacts on biological resources in other parts of the region, from SME’s purchase of power from unspecified generating sources.

Using the impact significance definitions described at the beginning of Chapter 4 and presented for “Aquatic Biological Resources Degradation” and “Terrestrial Biological Resources Degradation” in Appendix J, the biological impacts of the Proposed Action would be of minor magnitude, long-term duration, and small extent, and have a probable likelihood of occurring. Overall then, the rating for biological resources impacts from the Proposed Action would be adverse and non-significant.

The biological impacts of the Industrial Park site would be of minor magnitude, long-term duration, and small, and have a probable likelihood of occurring. Overall then, the rating for biological resources impacts from the alternative site would be adverse, but although impacts would most likely be non-significant, there is some potential for the impacts to become significant. The caveat for the analysis of the Industrial Park site alternative is that this rating must be considered preliminary, in that specific routes and corridors for transmission lines, pipelines, and the rail spur have not yet been selected. However, given the generally developed and disturbed habitats of the area as well as the nature of the proposed developments, any biological impacts from this alternative are likely to be at most minor.

Table 4-13. Summary of Direct Impacts on Biological Resources		
Alternative	**Impacts**	**Rating of Impacts**
No Action	• The No Action alternative would not change any land use or disturb existing habitat, and therefore would not have a direct adverse effect on biological resources.	• None
Highwood Generating Station - Salem site	• Temporarily displace terrestrial wildlife due to removal of vegetation and disturbance from construction equipment; • Eliminate potential habitats, but unlikely to adversely affect, state-listed species of concern from permanent removal of vegetation; • Short-term harm to wildlife/vegetation by degrading air quality; • Short-term harm to aquatic biota from degraded water quality; • Long-term increase in mortality of terrestrial mammals by rail strikes and increased traffic on access road; • Increase mortality to birds and bats from blade strikes on wind turbines; • Temporarily disturb habitats along water & power line routes during construction activities; • Temporarily or permanently disturb wetland habitats for installation of water intake; • Contribute to the potential spread of noxious weeds by disturbing existing vegetation cover and soils.	• Negligible • Negligible to minor • Negligible • Minor • Minor • Minor • Minor • Minor • Minor
Industrial Site	• Temporarily displace terrestrial wildlife due to removal of vegetation and disturbance from construction equipment; • Eliminate potential habitats, but unlikely to adversely affect, state-listed species of concern from permanent removal of vegetation; • Short-term harm to wildlife/vegetation by degrading air quality; • Damage habitat along water pipeline and power line routes during construction activities; • Contribute to the potential spread of noxious weeds by disturbing existing vegetation cover and soils.	• Negligible • Negligible • Negligible • Minor • Minor

4.6.5 MITIGATION

Mitigation measures are suggested primarily for the Salem site but some would apply to the Industrial Park site (or at least its utilities corridors) as well, except for measures related to the wind turbines; no mitigation measures are likely to be necessary for the highly disturbed, developed Industrial Park site itself. Less specific information was developed regarding biological resources on the various utilities corridors connecting to the Industrial Park site, but many of the measures suggested for the Salem site may be applicable.

Threatened and Endangered Species

Activities conducted by the contractor such as developing aggregate sources, gravel crushing, locating staging and stockpile sites could be conducted outside of the project limits and closer to the nests of bald eagles along the Missouri River. The Montana Bald Eagle Management Plan places limitations on these high intensity activities. They should not be conducted within 0.5 mile (0.8 km) of the Morony Dam nest location or any other known bald eagle nests between March 1 and May 15, or within (0.25 mile (0.4 km) of nest sites from May 15 to July 15. If the contractor anticipates any construction operations within the vicinity of an active bald eagle nest, roost site, or seasonal concentration area, or has any questions concerning the application of the regulations promulgated to protect this species, they should contact the USFWS and/or MFWP. These agencies can identify any restrictions that may apply to project planning, anticipated construction activities, and project scheduling.

State Species of Concern

Avoiding or minimizing disturbance of shrub, tree, and wetland habitats would reduce adverse effects on raptors and breeding bird species by the proposed project. If these habitats must be removed, disturbed, or altered for construction or maintenance of the proposed project or infrastructure, a pre-construction reconnaissance could be conducted to determine, to the extent practicable, the relative importance of such habitats to state species of concern. Disturbance of any such sites/habitats of importance to these species groups could be mitigated through the use of reasonable timing constraints during construction, reclamation/restoration of disturbed sites, or other appropriate measures.

Power Lines

Mitigation for birds of prey in the project area would include raptor-proofing all power poles that are to be erected or relocated for the proposed plant site and/or infrastructure. SME and its contractors should follow the “Suggested Practices for Raptor Protection of Power Lines”, Edison Electric Institute (EEI, 1996) or other appropriate guidance or recommendations for proper techniques.

Aquatic Resources

Since the Morony Reservoir is being used by MFWP to rear sauger, a state species of concern, SME will consult with MFWP on methods to minimize the impact of construction and maintenance of the raw water intake on sauger. Consultation with MFWP for this managed population would insure that construction and maintenance activities take place during appropriate seasons, and ensure that any turbidity, dewatering, or entrainment problems do not affect sauger.

In general for protection of fish species, it would be necessary to install adequate screening on the raw water intake to prevent death or injury to fish in the Morony Reservoir. The recommended state and federal permitting processes would address mitigation for affected resources.

Wind Turbines

The following recommended mitigation measures concerning wind turbine design and operation are derived from the U.S Fish and Wildlife Service's 2003 guidelines on minimizing impacts to wildlife from WTGs (USFWS, 2003).

- Use tubular supports with pointed tops rather than lattice supports to minimize bird perching and nesting opportunities.
- Avoid placing external ladders and platforms on tubular towers to minimize perching and nesting.
- Avoid use of guy wires for turbine or meteorological tower supports.
- If the turbines require lights for aviation safety, the minimum amount of pilot warning and obstruction avoidance lighting specified by the Federal Aviation Administration (FAA) should be used.
- Unless otherwise requested by the FAA, only white strobe lights should be used at night, and these should be the minimum number, minimum intensity, and minimum number of flashes per minute (longest duration between flashes) allowable by the FAA.
- Solid red or pulsating red incandescent lights should not be used, as they appear to attract night-migrating birds at a much higher rate than white strobe lights.
- If feasible, place electric power lines underground or on the surface as insulated, shielded wire to avoid electrocution of birds.
- Use recommendations of the Avian Power Line Interaction Committee for any required above-ground lines, transformers, or conductors.
- Follow USFWS guidance (USFWS, 2003) and protocols to monitor bird and bat mortalities. If after three years, monitoring demonstrates that bird and bat mortalities are not substantial, monitoring may be ended or modified in consultation with the appropriate regulatory agencies.

Carrion Removal from Railroad Spur and Access Roads

SME will monitor all established roads, as well as the railroad, within 1.0 mile of the wind turbines a minimum of once every two weeks, and will remove all carrion that are equal to or larger than a rabbit in size to a disposal site at least one mile from the turbines.

Noxious Weeds

SME would follow the requirements identified in the Cascade County Weed and Mosquito Management District's document, "Weed Management and Revegetation Requirements for Disturbed Areas in Cascade County, Montana." This document specifies the actions that need to be taken prior to disturbance, during operation, and upon reclamation, to prevent the spread of noxious weeds in the county.

4.7 ACOUSTIC ENVIRONMENT

For the noise analysis of the Proposed Action, acoustical consultants BSA used typical noise level data related to the construction and operation activities of a 250-MW coal-fired power plant. Noise generated by the power plant under the Salem and Industrial Park alternatives would vary in frequency and intensity during construction and operation activities. Although the power plant design is not complete, BSA evaluated a preliminary list of equipment and noise levels based on similar facilities (BSA, 2005; BSA, 2007).

During the construction of the power plant, noise would be produced by heavy equipment (e.g., scrapers, bulldozers, graders, loaders, dump trucks, pneumatic hammers), and building construction equipment (e.g., saws, drills, compressors, hammers, welding, etc.). Noise produced by diesel-powered equipment is typically 85 dBA at a distance of 50 feet (15 m) from the equipment (FTA, 1995). However, the noise of individual pieces of equipment can vary considerably depending on age, condition, manufacturer, use, and a changing distance from the equipment to a receptor location. Operation of the equipment also would vary considerably throughout the construction phase and from day to day. Although construction noise may be audible at a receptor located within several miles, construction activities and noise would be temporary and short-term compared to the operations of the proposed power plant.

Near the end of the construction phase, the steam lines of the plant must be thoroughly cleaned before the plant could begin operation by using high-pressure steam that would be blown out to the atmosphere. Although the noise produced by a steam blow-out varies due to stream pressure, temperature and moisture, the size and shape of the vent opening and the valve used, the noise of steam blow outs are typically 80 to 95 dBA at 1,000 feet (305 m) and last for several minutes.

The primary noise sources associated with the daily operation of the power plant would include transformers, primary air fans (PA fans), secondary air fans (SA fans), two induced draft fans (ID fans), a cooling tower (seven towers in array), a turbine, a boiler, and a coal crusher (EEI, 1984; Stanley, 2005a; Stanley 2005b). For this analysis, the noise levels created by a typical 250-MW coal-fired power plant were evaluated per the criteria cited in Section 4.2.2 and Appendix J of this EIS.

During initial start-up of the plant and restart operations after maintenance shutdowns, high-pressure steam would be intermittently discharged to the atmosphere. Although the noise produced by a steam vent would vary, the noise of start-up steam vents would be typically 75-80 dBA at 1,000 feet (305 m).

Brief and intermittent trips along the roads leading to either site would not significantly affect the L_{dn} value at a receptor, and therefore, the road traffic was evaluated separately. Assuming, worst case, that 55-60 employee vehicles and six heavy trucks transporting limestone travel the roads during the same hour at approximately 35 miles (56 km) per hour, the estimated noise level at 50 feet (15 m) from the road would be approximately L_{eq}(h) 56 dBA (FHWA, 1998). Noise of individual trucks might be audible within approximately 1-2 miles of the road (BSA, 2005).

Coal would be brought to the power plant using two trains per week, and would typically consist of 110 cars per train. Diesel locomotives typically are 87 to 96 dBA at 100 feet (30 m) from the track (Harris, 1998). For the prediction of the power plant noise levels, BSA assumed that one train would deliver coal to the plant during daytime hours and would travel at approximately 5-10 miles (16 km) per hour around the site. Although a single train during the day would not significantly affect the L_{dn} value near the tracks, the brief, intermittent noise of the diesel locomotives passing by can significantly exceed existing ambient levels at a receptor during the pass-by and be audible for several miles.

ID fans used in power plants can produce distinct, and typically annoying, audible tones intermittently at certain operating conditions of the fan and inlet dampers. The fans produce tones at the blade pass frequency of the fan, typically during partial-load operation, but the level of the resulting tone cannot be accurately predicted (EEI, 1984). The preliminary ID fan selection for the proposed power plant would have 12 blades and would operate at 1180 rpm. Using these data, BSA calculated the blade pass frequency of this preliminary fan would be at approximately 236 Hertz, and added 10 dB to the blade pass frequency of the typical ID fan data used for the calculations (EEI, 1984).

Using the Cadna-A Version 3.5 noise prediction software from DataKustik, BSA developed noise level contours for the combined typical power plant equipment and train operations at both the Salem and Industrial Park sites. This standard specifies the calculations to determine the reduction in noise levels due to the distance between the noise source and the receiver, the effect of the ground on the propagation of sound, and the effectiveness of natural barriers due to grade or man-made barriers such as walls. The calculations conservatively assume that the atmospheric conditions are favorable for sound propagation.

4.7.1 NO ACTION ALTERNATIVE

Under the No Action Alternative, no power plant would be constructed at either the Salem or Industrial Park sites to meet SME's projected base load needs. Rather, SME would purchase electricity from existing generation sources in the Northern Rockies or Pacific Northwest, which could be a mix of large-scale hydro, natural gas, coal, nuclear, and to a smaller extent, wind, solar, and other renewables. Under this alternative, during the immediate future, the acoustical environments of both the Salem and Industrial Park sites would be expected to remain much as they are at present.

Around the Salem site, L_{90} ambient short-term noise levels would continue to range from about 20 to 47 dBA, a range characteristic of rural or agricultural settings. The L_{90} ambient noise levels would continue in the 18 to 35 dBA range from 8:00 p.m. to 8.00 a.m., which is also typical of quiet rural environments at night. The overall L_{dn} at the Salem site would remain approximately 47 dBA, what it is today, with an estimated L_{dn} of 30 dBA during quiet periods. The acoustic environment of the Salem site would continue to be representative of a rural, agricultural area.

During the immediate future, around the Industrial Park site, noise levels would continue to range from about L_{90} 28 to 44 dBA, higher than the Salem site because of nearby traffic. The L_{90}

ambient noise levels would continue in the 36 to 45 dBA range from 8:00 p.m. to 8:00 a.m., typical of quiet suburban areas at night. The overall L_{dn} at the Industrial Park site would remain about 53 dBA, what it is today, with an estimated L_{dn} of 45 dBA during quiet periods. The noise profile of the Industrial Park site would continue to reflect that of an outer suburb on the edge of town, roads and an industrial area. However, unlike the Salem site, which is likely to remain rural, agricultural and thinly populated for the foreseeable future, the Industrial Park site is in an area that is undergoing development, both residentially and industrially. These developments would raise overall noise levels (expressed as L_{dn}) in the vicinity over the coming years.

The No Action Alternative would not contribute directly to noise at either the Salem or Industrial Park sites. However, by purchasing an equivalent amount of power from generation sources elsewhere, SME would be contributing indirectly to ongoing noise impacts at existing generating stations in the region. To the extent that expanding demand for electricity in the wider region drives construction of new generating facilities elsewhere, SME would be contributing indirectly to noise impacts associated with construction and operation of those facilities.

4.7.2 PROPOSED ACTION – HGS AT THE SALEM SITE

As described in Chapter 3, approximately eight scattered rural residences are located within three miles (5 km) of the Salem site. The closest residence is located approximately one mile (1.6 km) northwest and is owned by the current property owner of the Salem site. A Lewis and Clark Interpretative Site (i.e., the Portage Staging Area), which interprets the Great Falls Portage NHL, is located approximately 1.75 miles (2.8 km) north of the Salem site. Onsite, human noise-sensitive receptors would be the power plant workers. Wildlife (e.g., deer, antelope, birds, etc.) that live, forage, and pass through the site area are also noise-sensitive receptors.

Figure 4-4 shows the predicted L_{dn} noise level contours for the power plant and train operations overlaid on a USGS topographic map for the Salem site. As the figure reveals, the noise levels are not predicted to radiate equally in all directions. Noise contours were developed assuming that all the power plant equipment operated 24 hours per day and includes the effect of one coal delivery train traveling to the site during the day. The noise contours that are equal to the estimated quiet ambient noise levels at the Salem site (Table 3-15) are shown for reference in the figure. However, since the predicted power plant noise would be typically a low-frequency hum and the measured existing ambient level around the site was influenced by high-frequency insect noise, the plant might still be audible during quiet periods beyond the location of the estimated quiet ambient noise contour shown on Figure 4-4.

The Salem site noise contours and receptors are shown in Figure 4-4, while the predicted noise levels at the receptors are listed in Table 4-14. The EPA L_{dn} 55 dBA guideline is predicted to be met within 0.6 mile (1 km) of the plant location and 0.5 mile of the wind turbines. The measured existing ambient noise level of L_{dn} 47 dBA is predicted to be met within approximately 1.2 miles (1.9 km) of the Salem site, and the estimated quiet ambient noise level of L_{dn} 30 dBA is predicted to be met within approximately 3.1 miles (5 km). As shown in Table 4-14, the typical L_{eq} noise levels of the plant are predicted to be less than the 50 dBA nighttime residential noise limit of the Great Falls Municipal Code for residences (Table 3-16) at all of the receptor locations, and the

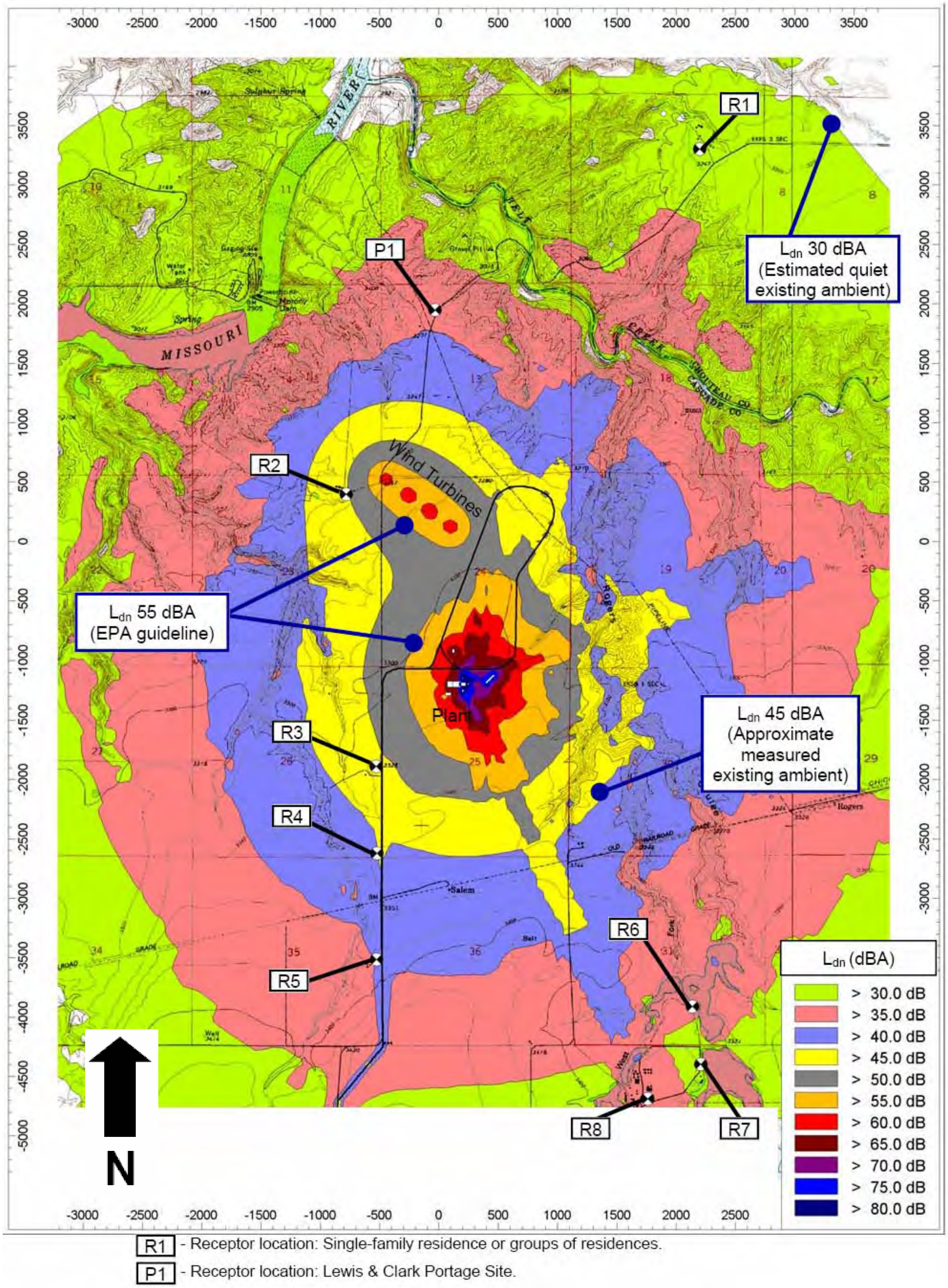


Figure 4-4. HGS L_{dn} Noise Contours at Salem Site
Source: BSA, 2007

Table 4-14. Predicted Noise Levels at Nearby Receptors – Salem Site

Receptor Locations	Type of Receptor	Noise Level L_{eq} (dBA)	Noise Level L_{dn} (dBA)
R1	Single-family residence	28	34
P1	Lewis and Clark Interpretive Site (i.e., Portage Staging Area)	30	37
R2	Single-family residence	44	51
R3	Single-family residence	44	50
R4	Single-family residence	41	45
R5	Single-family residence	39	42
R6	Single-family residence	30	37
R7	3 single-family residences	28	35
R8	Single-family residence	32	38

Source: BSA, 2007

typical L_{dn} noise levels are predicted to be less than or equal to the L_{dn} 55 dBA EPA guideline at all the receptor locations.

On-site workers, nearby residents, as well as wildlife, would be exposed to various noise sources during the construction and operation activities. Noise-induced hearing loss is the primary effect of exposure to excessive noise. Federal workplace standards for protection from hearing loss allow time-weighted average level of 90 dBA over an 8-hour period, 85 dBA averaged over a 16-hour period and 70 dBA over a 24-hour period. The primary human effect due to prolonged noise would be annoyance. Other non-auditory human effects include speech interference, stress reactions, sleep interference, lower morale, efficiency reduction, and fatigue (Harris, 1998).

Numerous studies have been conducted attempting to document the effects of noise on wildlife. Wildlife responses to noise vary considerably and are a function of many other variables besides noise, including the characteristics of the noise and its duration, life history characteristics of the species, habitat type, season and current activity of the animal, sex, age, previous noise exposure, as well as other physical stressors such as drought (CST, 1996). General wildlife responses to human-made noise are attraction, tolerance and aversion, which are summarized in the following list of potential responses (CST, 1996; EPA, 1971; Bowles, 1995).

- Most animals habituate to sounds (e.g., truck and equipment noise) disassociated with other threatening stimuli.
- Animals (e.g., ungulates) that habituate to traffic noise are vulnerable to oncoming vehicles.
- Steady sounds are less prone to startle animals than sudden onset noise.
- Human-made noise can mask meaningful noise (e.g., mating and other communication).
- Motivation to find food can make animals tolerant of noise.
- Different species have different levels of noise tolerance and habituation.
- Most effects of noisy disturbances are mild enough that they may never be detectable as changes in population size or population growth.
- Animal aversion is measured in avoidance responses and can be lessened if animals can predict exposure (e.g., warning signal before conveyor startup).

Wind turbine design modifications such as orienting rotors to face upwind have reduced noise from even larger turbines like those proposed at the Salem site (AWEA, no date). Big Sky Acoustics LLC has prepared noise level predictions for the proposed wind turbine generators associated with the HGS (BSA, 2006). BSA developed noise level contours for the combined noise of the coal-fired power plant equipment and the four proposed wind turbine generators. The noise prediction model and assumptions for the Salem Site (BSA, 2005) was modified to include the wind turbines. For the analysis, it was assumed that all four wind turbines and the power plant were operating simultaneously and continuously during a 24-hour period. This assumption should be considered conservative because the operation of the wind turbines would vary with the wind speed at the site. The octave-band sound power levels associated with a wind speed of 8 meters per second (18 mph) at 10 meters (33 feet) above the ground were used for the calculations as a representative wind speed (BSA, 2006).

The L_{eq} noise levels at the receptor locations due to the combination of the power plant and the wind turbines are predicted to be between 0 and 1 dBA greater than the noise levels predicted for the power plant only. The L_{dn} noise levels at the receptors due to the power plant and wind turbines are predicted to be 0 to 2 dBA greater than the noise levels predicted for the power plant only. Therefore, the dominant noise source(s) associated with the project would be the power plant equipment, and not the wind turbines (BSA, 2006).

4.7.3 Alternative Site – Industrial Park Site

As described in Chapter 3, approximately seven groups of residences are located within one mile (1.6 km) of the Industrial Park site, primarily off of Black Eagle Road, Rainbow Dam Road, and Bootlegger Trail. Onsite, human noise-sensitive receptors would be the power plant workers.

The Industrial Park site noise contours and receptors are shown in Figure 4-5, and the predicted noise levels at the receptors are listed in Table 4-13. The EPA L_{dn} 55 dBA guideline is predicted to be met within 0.7 mile (1.1 km) from the Industrial Park site. The measured existing ambient noise level of L_{dn} 53 dBA (Table 3-16) is predicted to be met within approximately 0.8 mile (1.3 km) of the Industrial Park site and the estimated quiet ambient noise level of L_{dn} 45 dBA (Table 3-16) is predicted to be met within approximately 1.2 miles (1.9 km) (Figure 4-5). As shown in Table 4-11, the typical L_{eq} noise levels of the plant are predicted to be less than the 50 dBA nighttime residential noise limit of the Great Falls Municipal Code for residences (Table 3-13) at all of the receptor locations, and the typical L_{dn} noise levels are predicted to be less than the L_{dn} 55 dBA EPA guideline at all the receptor locations (Table 4-15).

4.7.4 Conclusion

The No Action Alternative would not result in any direct noise impacts on either the Salem or Industrial Park sites, though it would contribute indirectly to noise impacts at those power plants from which SME would purchase electricity.

While noise contours expected at the two alternate sites would be similar, because of the presence of the NHL, HGS would entail a significant, adverse effect on the acoustic environment while the Industrial Park site would result in minor adverse, non-significant impacts.

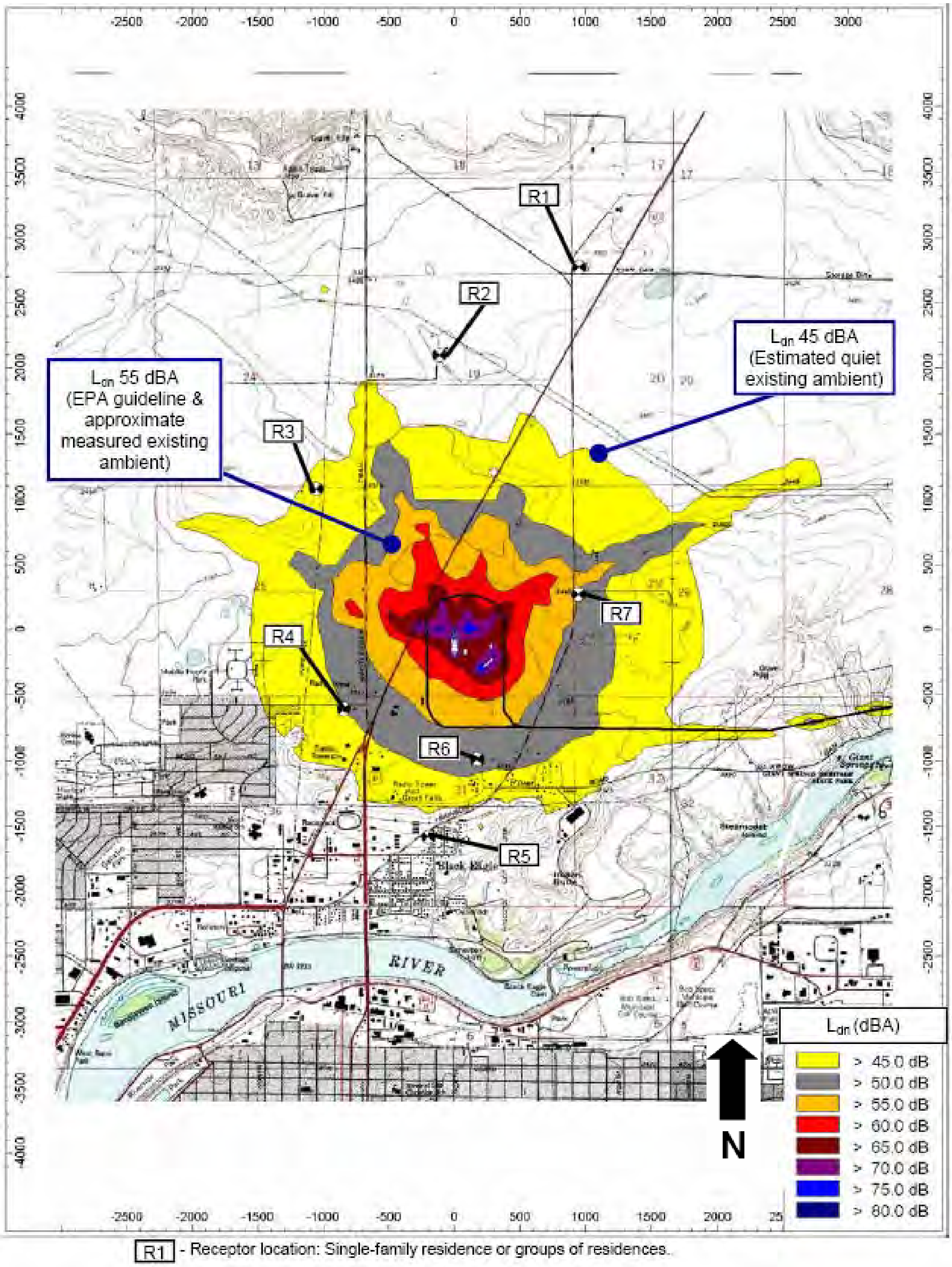


Figure 4-5. HGS L_{dn} Noise Contours at Industrial Park Site
Source: BSA, 2005

Table 4-15. Predicted Noise Levels at Nearby Receptors – Industrial Park Site

Receptor Locations	Type of Receptor	Noise Level L_{eq} (dBA)	Noise Level L_{dn} (dBA)
R1	Single-family residence	34	41
R2	Single-family residence	35	42
R3	Group of single-family residences	39	46
R4	Group of single-family residences	43	50
R5	Group of single-family residences	36	42
R6	Group of single-family residences	45	52
R7	Group of single-family residences	47	54

Source: BSA, 2005

Noise levels associated with the daily operation of a typical 250-MW coal-fired power plant would be primarily determined by the Induced Draft fans, Primary Air fans, Secondary Air fans, transformers, cooling tower, turbine, boiler, coal crusher and trains for coal delivery. Intermittent noise sources associated with the power plant that would not significantly affect the daily operation L_{dn} but could be audible for several miles from the site, including steam line cleaning, start-up steam vents, tonal noise produced by the ID fans, and locomotives used to deliver coal.

The noise levels of typical daily plant operations are not predicted to exceed the EPA guideline of L_{dn} 55 dBA beyond 0.6 mile (1 km) from the Salem site and 0.7 mile (1.1 km) from the Industrial Park site. The predicted noise levels are equal to or less than the EPA guideline at the receptor locations around each site, but do not radiate equally in all directions.

Noise levels are predicted to be approximately equal to the existing ambient noise levels during quiet periods at approximately 3.1 miles (5 km) from the Salem site and 1.2 miles (1.9 km) from the Industrial Park site. However, because the predicted power plant noise is typically a low-frequency hum and the measured existing ambient levels around both sites were influenced by high-frequency insect noise, the plant may still be audible during quiet periods beyond the location of the estimated quiet ambient noise contours shown on the figures.

At all of the receptor locations as defined in of this report, the power plant noise levels are predicted to be less than the 50 dBA nighttime noise limit of the Great Falls Municipal Code for residences, and less than or equal to the EPA L_{dn} 55 dBA guideline. Employee vehicle traffic and delivery truck noise is predicted to be less than MDT's L_{eq}(h) 66 dBA impact criteria at 50 feet (15 m) from the road. Therefore, the overall results indicate that the noise levels associated with a typical 250-MW coal-fired power plant are predicted to be within applicable noise guidelines and ordinances at the receptor locations near the Salem and Industrial Park sites.

Using the impact significance definitions described at the beginning of Chapter 4 and presented for Noise Impacts in Appendix J, acoustic impacts of the proposed HGS and wind turbines at the Salem site would be considered of minor magnitude, long-term duration, and small extent, and have a probable likelihood of occurring. However, because of NPS policies to preserve the environment of the areas it administers, such as the surrounding Great Falls Portage NHL at the Salem site, any degradation of the existing natural (or rural) ambient soundscape, such as that represented by HGS construction and operation, would be considered significantly adverse.

Using the impact significance definitions described at the beginning of Chapter 4 and presented for Noise Impacts in Appendix J, acoustic impacts of building and operating a 250-MW power plant at the Industrial Park site would be of minor magnitude, long-term duration, and small extent, and have a probable likelihood of occurring. Overall then, the rating for noise impacts at the alternative Industrial Park would be adverse, but while impacts would most likely be non-significant, there is some potential for the impacts to become significant. As shown in Table 4-13, predicted noise levels at residential receptors near the Industrial Park site are greater than those predicted for the Salem site, but probably not enough to cause a significant adverse impact.

4.7.5 MITIGATION

While one significant, adverse noise impact is anticipated on the acoustic environment of the NHL, no mitigation measures are planned or proposed for either of the action alternatives.

4.8 RECREATION

4.8.1 NO ACTION ALTERNATIVE

Under the No Action Alternative, no CFB coal-fired generating station would be constructed at either the Salem or Industrial Park sites. In addition, no 230-kV electrical transmission line interconnections would be developed in the Great Falls area. Thus, there would be no direct impacts on recreation from the No Action Alternative. That is, there would be no direct impacts on recreational facilities, recreational opportunities, or the quality of recreational experiences in the Great Falls area.

However, SME would need to purchase power from another generation source within the Western System Coordination Council (WSCC) to meet its projected baseload needs beginning in 2008. If generation and transmission capacity have to be expanded to meet a general growth in load to which SME would contribute, SME could be contributing indirectly and incrementally to the impacts on recreation that occur at other locations in the Rocky Mountain West and Pacific Northwest. Depending on the type of generation (e.g., hydro, coal, natural gas, wind, solar, nuclear, geothermal) as well as the specific location of that generation and related transmission, a wide variety of impacts could occur on recreation facilities, opportunities, and recreational quality, ranging from effects on fishing, hunting, hiking, camping, access, visual resources, and cultural resources. Most but not all of these impacts would be adverse.

4.8.2 PROPOSED ACTION – HGS AT THE SALEM SITE

Construction and operation of the HGS at the preferred Salem site would entail negligible to at most minor impacts on recreation in the immediate project vicinity and wider Great Falls area. As indicated in Section 3.7, there are no recreational facilities or activities present on the Salem site itself. There is one recreational/cultural/educational site in the immediate vicinity that would be impacted by the Proposed Action: the Lewis and Clark staging area historic site. This is a site for heritage recreation/tourism. It appears to receive relatively little visitation or public use at present. While the Proposed Action would not restrict access to it, during construction such access might be made more difficult because of heavy construction traffic.

The presence of the power plant 1.75 miles (2.8 km) to the south of the Lewis and Clark interpretive site would degrade the recreational experience there to some extent for the few visitors the site receives. The open vista and relatively empty landscape would no longer appear so open and empty, at least looking toward the south, with the prominent presence of the power plant (discussed both under visual resources and cultural resources sections) and additional transmission lines in the area. In addition, noise levels at the staging area historic site would be slightly elevated over background levels (see Section 4.8.2). However, neither the staging area historic site, nor access to it, nor the educational message it conveys about the important historic event that occurred nearby two centuries ago, would be adversely affected by the Proposed Action.

Potential impacts of the Proposed Action to the quality of distant recreation opportunities in Class I national park and wilderness areas, as a result of its impacts on air quality and visibility, are discussed under air quality, Section 4.5.2.2.3. Potential impacts on recreational fisheries as a result of HGS's incremental contributions to mercury deposition in the state, and subsequent bioaccumulation in sport fish (and the need to limit human consumption), are anticipated to be negligible. Mercury is discussed at greater length in Section 4.5.2.2.4.

4.8.3 ALTERNATIVE SITE – INDUSTRIAL PARK SITE

Construction and operation of the HGS at the alternative Industrial Park site would entail negligible to at most minor impacts on recreation in the immediate project vicinity and wider Great Falls area. As indicated in Section 3.7, there are no recreational facilities or activities present on the Industrial Park site itself; the site is an undeveloped, previously farmed portion of a designated industrial park.

The closest recreational facilities to the Industrial Park site that support high levels of recreation are several parks along the Missouri River, specifically, Giant Springs State Park, Lewis and Clark National Historic Trail Interpretive Center, and Elks Riverside Park, operated by the state, federal, and city governments, respectively. In addition, the River's Edge Trail, managed by a group of agencies and an NGO, runs along the Missouri, approaching within approximately a mile (1.6 km) of the proposed plant. As discussed in Section 4.11.3, upper portions of the proposed generating station would be visible to park visitors and recreationists along the river. However, given the already urban setting and the absence of a scenic background, the view of which the power plant could potentially detract from, its visual impact would be low.

4.8.4 CONCLUSION

The No Action Alternative would not result in any direct impacts on recreation facilities or opportunities at either the Salem or Industrial Park sites, though it would contribute indirectly to recreation impacts associated with those generating stations from which SME would purchase electricity.

Construction and operation of the HGS at the preferred Salem site would entail negligible to at most minor impacts on recreation in the immediate project vicinity and wider Great Falls area. There is one recreational site in the immediate vicinity that would be impacted by the Proposed Action: the Lewis and Clark staging area interpretive site. The Proposed Action would not restrict access to either of these facilities, which appear to receive relatively little visitation or public use. The presence of the power plant 1.75 miles (2.8 km) to the south of the Lewis and Clark interpretive site would degrade the recreational experience there to some extent for the few visitors the site receives. Overall, the rating for recreation impacts from the Proposed Action would be adverse but non-significant.

Similarly, construction and operation of the SME power plant at the alternate Industrial Park site would entail negligible to at most minor impacts on recreation in the immediate project vicinity and wider Great Falls area. There are no recreational facilities or activities present on the Industrial Park site itself, which is an undeveloped, previously farmed portion of a designated industrial park. Upper portions of the proposed generating station would be visible to park users and recreationists along the Missouri River in Great Falls. However, given the already urban setting and the absence of a scenic background, the view of which the power plant could potentially detract from, its visual impact for recreationists would be low. Overall then, while the rating for recreation impacts from the alternate Industrial Park site would be adverse, it would be non-significant.

Using the impact significance definitions described at the beginning of Chapter 4 and presented for “Recreation Degradation” in Appendix J, the recreation impacts of the Proposed Action would be of minor magnitude, long-term duration, and small extent, and the likelihood would be probable. Overall then, the rating for recreation impacts from the Proposed Action would be adverse and non-significant.

The alternative Industrial Park site would be unlikely to cause other adverse impacts on local recreation in the Great Falls area. Using the impact significance definitions described at the beginning of Chapter 4 and presented for “Recreation Degradation” in Appendix J, the recreation impacts of the Industrial Park alternative would be of minor magnitude, long-term duration, and small extent, and the likelihood would be probable. Overall then, the rating for recreation impacts from the alternative Industrial Park site would be adverse and non-significant.

4.8.5 MITIGATION

At the Salem site, during construction, SME would attempt to accommodate ongoing access by motorists and visitors to the Lewis and Clark staging area historic site and the National Historic Landmark more generally.

Over the long term, after construction has been completed, SME would cooperate with the SHPO and local historic preservation interests to enhance the Lewis and Clark staging area interpretive site and Great Falls Portage NHL experience, as discussed further under Cultural Resources. Such enhancements may include those mitigation measures listed in Section 4.9.5 under Cultural Resources. At the Industrial Park site, no measures to mitigate recreation impacts would be necessary.

4.9 CULTURAL RESOURCES

4.9.1 NO ACTION ALTERNATIVE

Under the No Action Alternative, no CFB coal-fired generating station would be constructed at either the Salem or Industrial Park sites. In addition, no 230-kV electrical transmission line interconnections would be developed in the Great Falls area. Thus, there would be no direct impacts on cultural resources, including Traditional Cultural Properties, from the No Action Alternative.

However, SME would need to purchase power from another generation source within the WSCC to meet its projected baseload needs beginning in 2008. If generation and transmission capacity have to be expanded to meet a general growth in load to which SME would contribute, SME could be contributing indirectly and incrementally to the impacts on cultural resources that occur at other locations in the Rocky Mountain West and Pacific Northwest. Depending on the type of generation (e.g., hydro, coal, natural gas, wind, solar, nuclear, geothermal) as well as the specific location of that generation and related transmission, a wide range of adverse impacts of varying intensity could occur on cultural resources.

4.9.2 PROPOSED ACTION – HGS AT THE SALEM SITE

The proposed project is an undertaking as defined by 36 CFR 800, Protection of Historic Properties. Construction, maintaining, and operation of facilities in an area that contains historic properties could constitute an adverse effect on those properties. An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the NRHP in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association.

An archaeological site consists of a definable spatial arrangement of cultural features, artifacts, or both, and can be either prehistoric or historic. Isolated finds are locations where few artifacts are noted or recovered, but which could not be defined as an archaeological site using the criteria defined by the Montana SHPO. For the purposes of Section 106/110 consultation and evaluations of eligibility for listing on the National Register of Historic Places (NRHP), a site must of sufficient age (50 years or older) to be considered an cultural resource property.

The potential impacts on cultural resources were derived from surveying the project area and Area of Potential Effect to determine whether any such cultural resources exist in these areas.

As stated previously, the cultural resource survey conducted in support of this EIS was a preliminary inventory and evaluation. It was conducted to identify historic properties within the surveyed portions of the proposed project areas and to determine the potential for significant historic properties to be located within the proposed project areas. In the event that a site discovered during the survey is considered potentially eligible for inclusion in the NRHP, Phase

II testing would be recommended for that site. Phase II testing is a more in-depth evaluation of identified cultural resources. Such a study would consist of the excavation of selected test units or areas to examine and evaluate on a more comprehensive basis the cultural property documented during the preliminary survey. The excavation would determine the possibility of intact, subsurface cultural deposits and/or features.

Additional archaeological work beyond the Phase II level would depend on the results of the Phase II excavations. If no intact buried deposits and/or features were identified, no additional work would be recommended. If such deposits were encountered, then additional work would be recommended prior to impacting or damaging the site by the project.

If the procedures implementing Section 106 of the NHPA, and other relevant Federal statutes are followed correctly, then the adverse effects on cultural resources could be mitigated. If the procedures were not followed, significant environmental consequences could occur. If potential historical properties were discovered during construction of the project, construction would be halted and the Montana SHPO would be contacted. Construction would not continue until proper investigation of the artifacts and resources could be conducted. In some cases where construction would occur in the immediate vicinity of known cultural resources, a planned cultural resource monitoring program would be prearranged. Such a stipulation would allow a qualified cultural resource professional to be on-site to deal with any inadvertent discoveries of cultural remains.

As described in Chapter 3 (Section 3.7), 10 cultural properties lie within the APE of SME's HGS Salem site. The ten include five previously recorded sites, and five discovered and recorded as part of investigations supporting this EIS. Of these 10 properties (listed in Table 3-17), only one would be impacted by the Proposed Action, the Great Falls Portage NHL (24CA238).

This NHL's integrity is based predominantly on the visual landscape qualities that are similar to that which existed during the early 19th century when the Corps of Discovery traveled through the area. While portions of the visual landscape qualities of the Great Falls Portage NHL are indeed similar to those which existed at the time of the Lewis and Clark expedition, other portions are not. In the vicinity of the NHL the visual landscape is quite changed, including damming of the Great Falls of the Missouri, development of the City of Great Falls, development of Malmstrom Air Force Base, development of numerous farmsteads and accompanying facilities, and installation of numerous transmission lines across the Missouri River.

Because of the specific situation of this NHL site, most of the facilities planned for the HGS at the Salem site present a high likelihood of negatively impacting the significant historic scene of the property (Figure 4-6). Mitigation of such impacts to the views of a relatively undeveloped landscape can be potentially addressed with creative design to assure the preservation of key resource and landscape views. Figure 4-6 is an artist's rendition of the HGS power plant superimposed on the landscape within the NHL while Figure 4-7 shows an existing view within the NHL that would remain unaffected by the construction of the power plant and wind turbines. As a result of concerns expressed by the historic preservation community after the release of the DEIS, and during the Section 106 consultation process – and as noted in Section 2.2.2 of this FEIS – the location of the HGS has been shifted about one-half mile toward the south to a

Figure 4-6. Artist's Rendition of HGS within Great Falls Portage NHL looking east toward Highwood Mountains

Figure 4-7. View of Open Landscape within NHL north of Proposed HGS, Looking North toward Missouri River; this view would remain unaffected by Proposed Action

location just outside the NHL boundary in an effort to reduce cultural resource impacts. The four wind turbines, however, would remain within the NHL because of space constraints within the property to be purchased by SME.

At the present time, it appears that no Traditional Cultural Properties at the Salem site would be impacted by the Proposed Action, as none have been identified.

4.9.3 ALTERNATIVE SITE – INDUSTRIAL PARK SITE

Since no cultural resource properties or TCPs have been identified within the alternate site area, there would be no effects (adverse or otherwise) to cultural sites for construction, maintenance or operation of a plant in that specific location. However, connection lines for water, wastewater, railroad transport, and electric transmission lines to connect the plant site could adversely affect cultural resources, including the Great Falls Portage National Historic Landmark, although any such effects would not be as pronounced as in the case of the Proposed Action.

4.9.4 CONCLUSION

The following table lists the impacts on cultural resources resulting from the site preparation, construction, operation, and connected actions of the project, including the No Action Alternative.

Table 4-16. Impacts on Cultural Resources

Alternative	Impacts	Rating of Impacts
No Action	· No impacts	· No impacts
HGS and wind turbines with connecting lines at Salem site	· Adversely affect NHL and, possibly, other undiscovered cultural resources from site preparation, staging, construction, maintenance, operations, and connected actions associate with power plant, water lines, transmission lines, rail supply lines.	· Insignificant, through mitigation · Adverse impacts to Great Falls Portage NHL would be reduced through mitigation efforts (siting, landscaping, etc.), but would still be significant.
Industrial Park Alternate Site	· No effect to cultural resources within alternate site. · Connecting lines to GFIP alternate site would have same adverse effects as above.	· No impacts · Insignificant, through mitigation

The No Action Alternative would have no direct impacts on cultural resources at either the Salem or Industrial Park sites.

The Proposed Action would adversely affect cultural resources from site preparation, staging, construction, maintenance, operations, and connected actions associate with power plant, water lines, transmission lines, rail supply lines. Using the impact significance definitions described at the beginning of Chapter 4 and presented for “Cultural/Archeological Resources Degradation” in Appendix J, cultural resource impacts of the HGS at the Salem site would be of major magnitude (“Disturbance of a site listed on or eligible for listing on the National Register of Historic Places or National Historic Landmark diminishes the significance or integrity of the site”), long-term duration (“Cultural resources are non-renewable; any adverse effect is permanent/long-term”), and medium or localized extent (“Part of a cultural resource or site is affected [5 to 50%]”), and the likelihood is probable. Overall then, the rating for cultural resources impacts from the Proposed Action would be significantly adverse. While representing an important commitment to minimize cultural resources impacts to the extent feasible, the proposed mitigation measures below would not be able to reduce them to below the threshold of significance.

At the alternative Industrial Park location, there would likely be no effect on cultural resources due to their apparent absence from the site. Connecting pipelines and power lines to the alternate site would likely have the same adverse effects as above for the Salem site.

4.9.5 MITIGATION

If the procedures implementing Section 106 of the NHPA and other relevant federal statutes are followed correctly, then adverse effects on cultural resources can be mitigated. The Great Falls Portage National Historic Landmark exhibits extremely high levels of historic significance, mostly related to the natural landscape and views that remain very similar to those apparent in 1805. To this end, care should be taken to utilize creative design and facility siting techniques to assure the preservation of this unique resource. RUS and SME would work with the Montana SHPO, ACHP, and NPS to reduce impacts on the historic landscape and viewshed.

The additional nine historic sites recorded within the project area have been evaluated for their historic significance and integrity, resulting in recommendations for determinations of eligibility for listing on the NRHP. Prior to further design work for this project, the recommendations for eligibility, or determination of non-eligibility, should be presented to the Montana SHPO for consultation and possible consensus determinations.

Due to the potential for buried archaeological deposits in the various locations of the project area, and the potential that these deposits could be eligible for inclusion on the NRHP, it is recommended that a cultural resources monitoring program be established for all preparation, staging, and construction phases of the project. Similarly, an emergency discovery plan would be developed prior to commencing construction. Such a plan would address protocols and procedures for dealing with the inadvertent discovery of archaeological or buried human remains. The development of such a plan would be conducted in consultation with the Montana SHPO and interested Tribal representatives.

Given the documented pre-historic and historic presence of Blackfeet Indians in the general area, in the event that any cultural materials are discovered during excavation and construction for the HGS, SME and/or its contractors would immediately notify the Blackfeet Tribal Historic Preservation Office. Alternatively, a monitor from the tribe would be present during construction at SME's cost.

With regard to the specific issue of mitigating impacts on the NHL, the following proposed measures are under active consideration by SME, RUS, DEQ and the Section 106 consulting parties. Final commitments would be made at the time the Record of Decision is issued.

On-Site Avoidance, Minimization, and Mitigation:

SME would agree to perform all of the following measures, subject to a reasonable cap on expenditures that is the subject of the MOA attached to this EIS:

- Shift the footprint of the SME HGS outside of the NHL's designated boundaries. Because of space limitations, the wind turbines and certain aspects of HGS infrastructure (i.e., raw water line, transmission lines, possibly small part of rail or potable/waste water lines) would be placed on or cross the NHL.
- Maximize the use of downward directional lighting where appropriate and safety measures allow.
- Where feasible use of earth tone colors on any facilities.
- Evaluate whether it is feasible to utilize landscaping around the facility. SME has engaged a landscape architect to evaluate the feasibility of a variety of landscaping options and generate associated cost options. The options would be evaluated to determine whether landscaping is feasible, and cost effective in relation to other mitigation measures. (This is not a high priority in comparison to a focus on improving the viewshed of the Lewis and Clark Interpretative Center alongside the Missouri River.
- Construct HGS infrastructure using materials and techniques to lessen impacts on the NHL, such as use of self-weathering (Corten) steel transmission poles, burying pipelines and re-vegetating the disturbed area, and constructing new access roads in a manner similar to existing roads.

Off-Site Mitigation:

SME would agree to fund one or more of the following projects, as agreed to by the consulting parties, up to a reasonable cap on expenditures that is the subject of the MOA (Appendix K):

- The following proposals are designed to offset the negative visual impacts on the NHL by improving the viewshed of another Lewis and Clark related activity. SME will agree to fund one or more of these projects, as agreed to by the consulting parties, up to the total amount agreed upon by SME.
    - Assist in funding the acquisition of the property surrounding the staging area location and plant or allow the property to revert back to native vegetation. This will give visitors a sense of the conditions or setting present during the time of the portage.

- Assist in funding the acquisition of available properties (directly across from the Center and the former Wilhelm house) across the Missouri River from the Lewis and Clark Interpretative Center to create and preserve in perpetuity a more natural unencumbered landscape for an increased visitor experience.
- Assist in funding (amount to be determined) the renovation of the Lewis and Clark Interpretative Center library and Lewis and Clark Trail Heritage Foundation Headquarters located in the Interpretative Center.
- Assist in and set up an annual contribution to assist in furthering and maintaining educational programs related to or part of the Interpretative Center's activities.
- Provide in-kind energy services to the L & C Interpretive Center if they can be accepted.

4.10 VISUAL RESOURCES

The extent of impacts to visual resources can be determined qualitatively by comparing the visual quality of the existing landscapes at the proposed Salem, Industrial Park, and transmission line interconnection routes with the expected visual quality of the areas upon completion of the Proposed Action. In Section 3-8 of this EIS, the Bureau of Land Management's Visual Resource Management (BLM VRM) system was used to conduct an abbreviated Visual Resource Inventory (VRI) of both alternative power plant sites. While a VRI was not performed on the potential transmission line corridors, these areas were described in words and illustrated with photos. In this section, VRM's Visual Resource Contrast Rating is used to determine the significance of aesthetic impacts at both sites and along the interconnection routes. The BLM VRM Visual Resource Contrast Rating classifications are shown in Table 4-17 below:

Table 4-17. BLM VRM Visual Resource Contrast Rating Classifications

Class	Dominance	Description
I	Not noticeable	The change would generally be overlooked.
II	Noticeable	Visually subordinate; change is subtle but noticed by most without being pointed out.
III	Distracting	Visually co-dominant; change competes strongly for attention and is equally conspicuous with other features.
IV	Dominant	Demands attention; change to landscape is the focus of attention and becomes the primary focus of the viewer.

4.10.1 NO ACTION ALTERNATIVE

Under the No Action Alternative, no CFB coal-fired power plant would be constructed at either the Salem or Industrial Park sites. In addition, no 230-kV electrical transmission line interconnections would be developed in the Great Falls area. Thus, there would be no direct impacts on visual resources from the No Action Alternative.

However, SME would need to purchase power from another generation source within the Western System Coordination Council (WSCC) to meet its projected baseload needs beginning in 2008. If generation and transmission capacity have to be expanded to meet a general growth in load to which SME would contribute, SME would be contributing indirectly and incrementally to the impacts on scenic resources that occur at other locations in the Rocky Mountain West and Pacific Northwest.

4.10.2 Proposed Action – HGS at the Salem Site

In Section 3.9.2, BLM's VRM Visual Resource Inventory classified the aesthetic resources at the Salem site as III. Class III visual resources are considered to have moderate scenic values. Figures 4-8 and 4-9 are rough photo-simulations of the Salem site before and after the HGS is placed on the site. From these, it is evident that the Visual Resource Contrast Rating would be Class IV – dominant (demands attention; change to landscape is the focus of attention and becomes the primary focus of the viewer). An additional adverse visual impact would occur from HGS-induced "light pollution" that would decrease the area's natural dark skies.

Figure 4-8. View of Salem site Looking South without HGS

Figure 4-9. View of Salem site Looking South with HGS power plant (proposed wind turbines not visible in this photo-simulation)

Thus, at the Salem site itself, the Proposed Action would entail a large visual change to a scenic setting of moderate value. Figure 4-10 depicts the viewshed of the HGS at the Salem site; that is, it shows those areas from which the 400-ft. high power plant stack and wind turbines would be visible. This figure shows that the power plant would be visible from most, but not all, of the Great Falls Portage National Historic Landmark. It would not be visible from the south and east banks of the Missouri River, nor from stream and creek corridors and coulees. Figure 4-11 represents the HGS and wind turbines, to scale, as shown in their original location within the NHL and in the context of other major landscape features, such as Belt Creek, the Missouri River, and the Highwood Mountains. This figure was also used in the DEIS. In contrast, Figure 4-12 depicts the current modified location of the HGS and wind turbines, as a result of the Section 106 consultation process. The footprint of the power plant has been moved off the NHL in response to concerns expressed by a number of the consulting parties, but space constraints within the property preclude shifting the wind turbines to a location outside the NHL boundary.

Figure 4-13 is a photo-simulation of the HGS and wind turbines, once again to scale, from the staging area interpretive site approximately 1.25 miles north of the proposed plant. As is evident in the photo-simulation, the proposed facilities would be visible from the staging area; however, as Figure 4-14 shows, the existing view from this vantage point is not pristine. In particular, power poles are much in evidence. Finally, Figure 4-15 is the existing view north from the staging area toward the confluence of Belt Creek and the Missouri River; however, this existing view would remain the future view as well, even after implementation of the Proposed Action. In other words, the view north towards the Missouri – arguably a more important view than the view south across a rolling, cultivated plateau, because of the historic portage from the river commemorated by the NHL – would not be impinged upon by the Proposed Action. Likewise, at the northeastern end of the NHL (Figure 4-10), views of the Missouri River itself and of Belt Creek (Figures 4-16 and 4-17), from which the portage began, would remain largely unaffected.

The VRM methodology and criteria can also be applied to the two transmission interconnections that would also be constructed to carry electricity to the grid from the HGS. The electrical wires would be supported by monopoles, which are less visually obtrusive to most people than multiple-pole (usually two and three-pole structures with 230-kV lines) transmission towers. In the less developed eastern areas (closer to the Salem site), which the interconnections would traverse, scenic values are somewhat higher because the landscape is relatively open and less cluttered with existing transmission lines, communications towers, and other conspicuous structures. As the proposed interconnections continue west and approach the Great Falls-Broadview Tap Switchyard and the Great Falls Switchyard, respectively, they would converge with other existing transmission lines and enter an area in which the scenic value is already compromised by the presence of numerous, prominent structures, primarily existing power lines.

Thus, in the eastern portion of the proposed transmission routes, the impact would consist of a noticeable (Class II) change to a scenic setting of moderate value. In the westernmost portions of the proposed transmission routes, impacts would consist of a noticeable (Class II) change to a scenic setting of low value.

In deference to concerns expressed during ongoing Section 106 consultation by historic preservation parties about the potential impact of the HGS on the aesthetics of the Great Falls Portage National Historic Landmark, SME has offered to move the footprint of the power plant itself, as well as related structures, to a site about one-half mile south of its original proposed location. This action would help reduce, but not eliminate, visual resources impacts, because the HGS and its transmission lines would still be evident and the change would be dominant (in other words, Class IV) according to the Visual Resource Contrast Rating (Table 4-17).

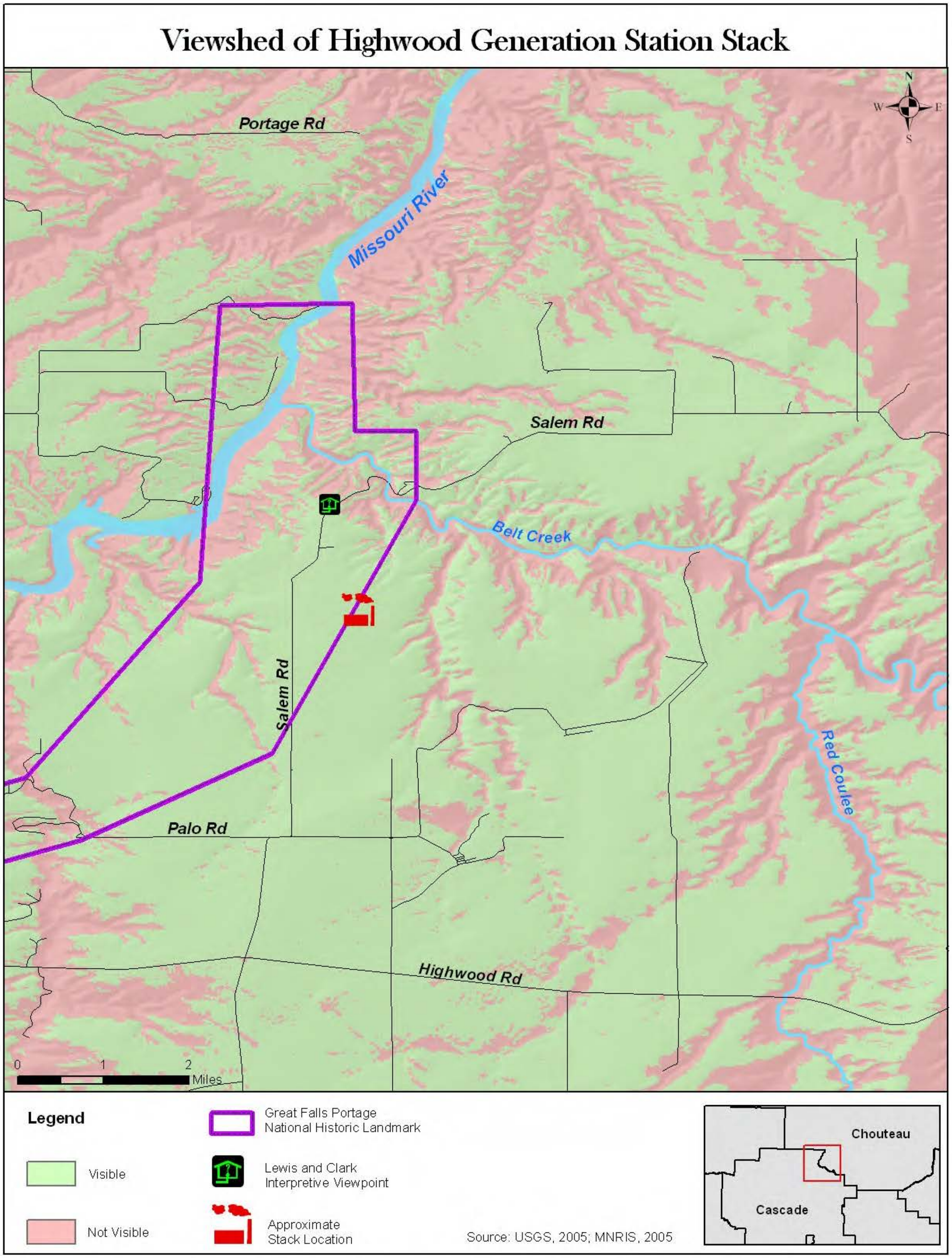


Figure 4-10. Viewshed of the HGS at the Salem Site

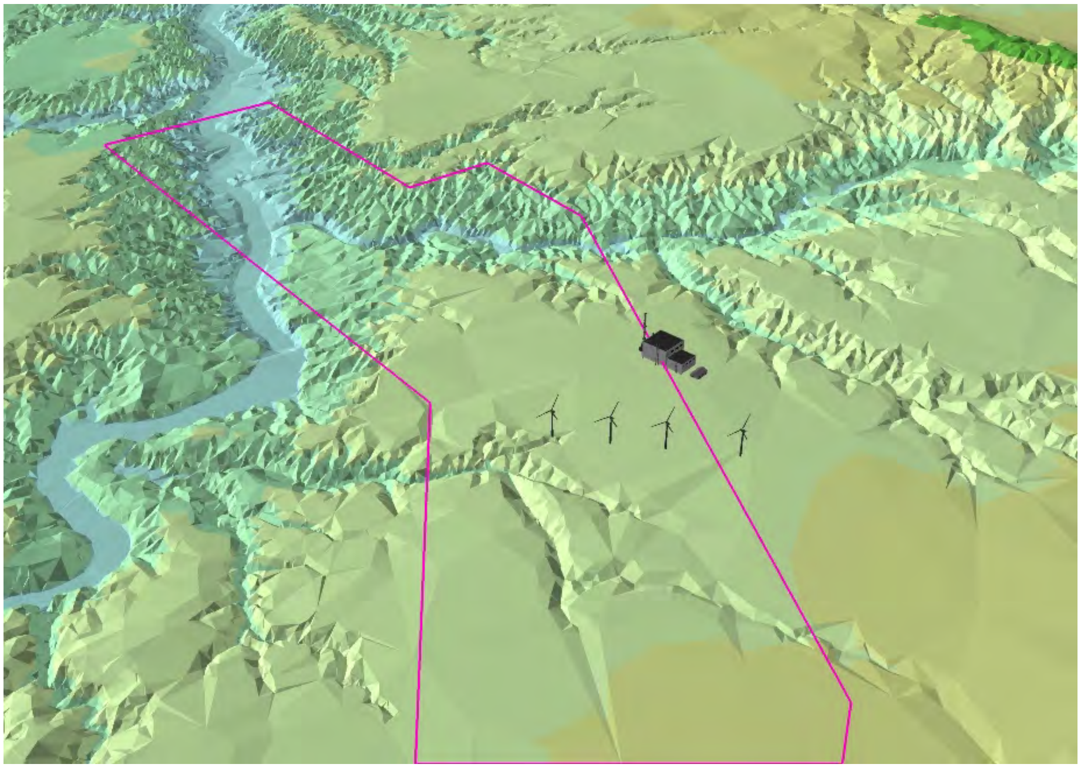


Figure 4-11. View Northeast toward Great Falls Portage NHL depicting original location of HGS and other Landscape Features to Scale, including Missouri River and Belt Creek

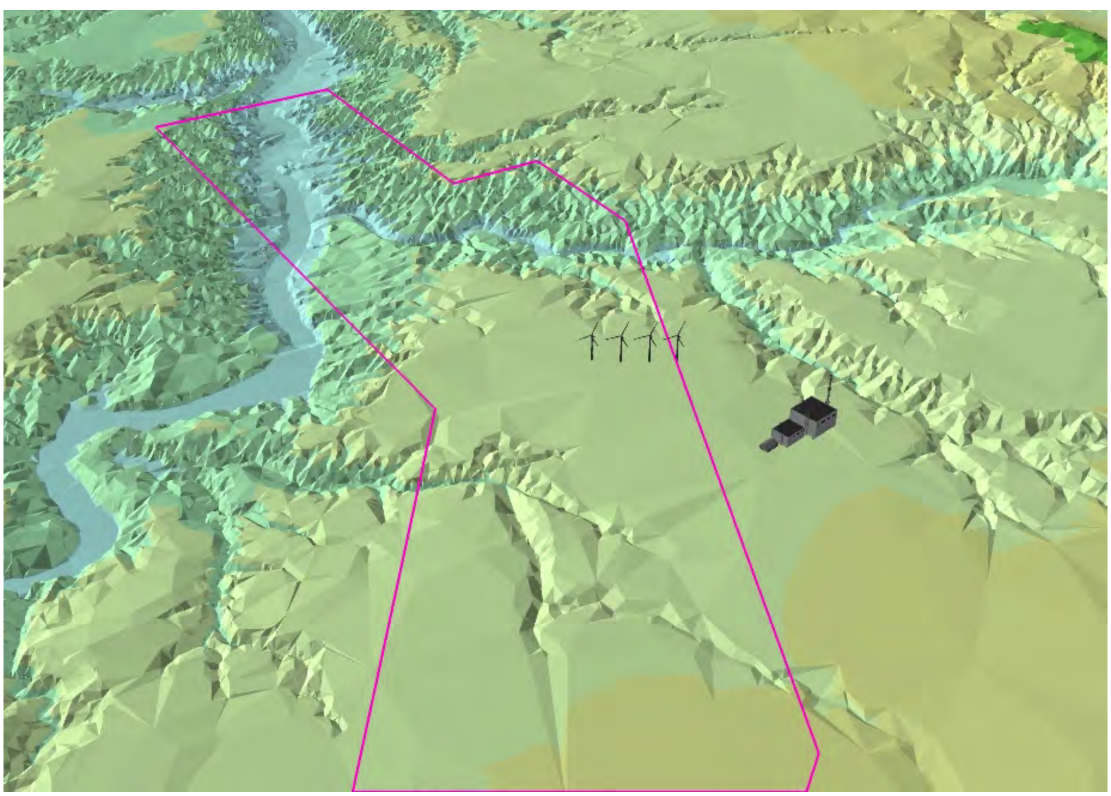


Figure 4-12. View Northeast toward Great Falls Portage NHL depicting current, modified location of HGS and other Features to Scale, including Missouri River, Belt Creek and Highwood Mtns.

Figure 4-13. Photo-Simulation of View Toward HGS and Wind Turbines from Great Falls Portage Staging Area – wind turbines are prominent but not dominant and stack of HGS is barely visible above horizon in right-center

Figure 4-14. December 2005 View from Great Falls Portage Staging Area looking south toward proposed HGS Site (Salem site)

Figure 4-15. View from Great Falls Portage Staging Area looking north toward Confluence of Missouri River and Belt Creek (December, 2005)

Figure 4-16. Confluence of Missouri River and Belt Creek (July, 2006), which Corps of Discovery ascended to begin portage, a view that would be unaffected by the HGS

Figure 4-17. View looking downstream along Missouri River from west bank (July, 2006), downstream of confluence with Belt Creek and still within Great Falls Portage NHL; this view would be unaffected by the HGS

4.10.3 ALTERNATIVE SITE – INDUSTRIAL PARK SITE

In Section 3.9.2, BLM's VRM Visual Resource Inventory classified the aesthetic resources at the Salem site as IV. Class IV visual resources are rated as having low scenic values. While no photo-simulation has been made of the Industrial Park site, the Visual Resource Contrast Rating would likely be Class III – distracting (visually co-dominant; change competes strongly for attention and is equally conspicuous with other features). The generating station would be co-dominant rather than dominant because of the existing presence of the large IMC malt plant and other development nearby. Thus, at the alternative Industrial Park site, the proposed generating station would entail a moderate visual change to a scenic setting of low value.

The taller structures within the generating station, especially the 400-ft. high stack, would be visible from much of the Great Falls area (Figure 4-18), including from certain scenic overlooks above the Missouri River, such as along the River's Edge Trail and the Lewis and Clark Interpretive Center. The IMC malt facility is conspicuous at present, as are other structures in the vicinity to the north of the river. The generating station, if built and operated, would be visible to the left (west) of the IMC plant. It would become one of the two dominant manmade features north of the river.

The same methodology and criteria can be applied to the two transmission interconnections that would also be constructed to carry electricity to the grid from the Industrial Park site. As in the case of the Proposed Action, the electrical wires would be supported by monopoles. As described previously, in the vicinity of the Industrial Park site and Great Falls Switchyard, the proposed interconnections would be built in an area in which the scenic value is already compromised by the presence of numerous, prominent structures, especially existing power lines. Thus, impacts would consist of a noticeable (Class II) change to a scenic setting of low value.

Because the Industrial Park site is already bordered by development and large manmade structures, and zoned for more of the same, whereas the Salem site rests in a rural setting within a National Historic Landmark, siting the power plant at the Industrial Park would have less of an adverse impact on visual resources than at the Salem site.

4.10.4 CONCLUSION

There would be no direct impacts on visual resources from the No Action Alternative. However, by making power purchase, SME may contribute indirectly and incrementally to the impacts on scenic resources that occur at other locations in the Rocky Mountain West and Pacific Northwest.

Using the impact significance definitions described at the beginning of Chapter 4 and presented for "Alter Scenic Quality" in Appendix J, the visual impacts of the Proposed Action would be of major magnitude, long-term duration, and small extent, and with a probable likelihood of occurring. Overall then, the rating for visual impacts from the Proposed Action would be significant and adverse. These impacts could be substantially lessened by the mitigation measures proposed – including moving the HGS location to just off the NHL, landscaping, and use of earth tone colors to reduce visual contrast – but they would remain significantly adverse.

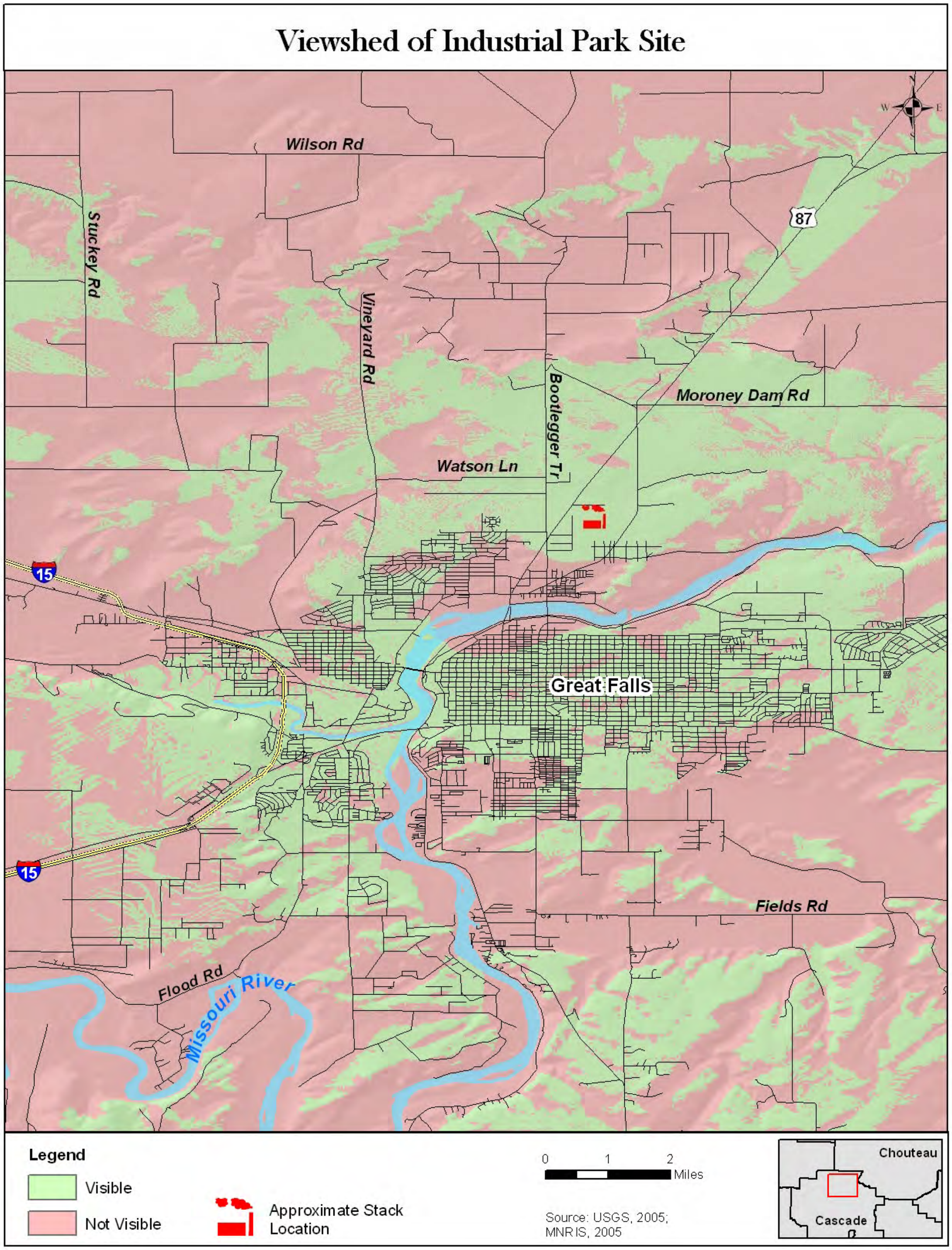


Figure 4-18. Viewshed of the SME Generating Plant at the Industrial Park Site*

- viewshed does not take into account the buildings in Great Falls, which would obstruct the views of the stack from town

The alternative Industrial Park site would have scenic impacts of moderate magnitude, long-term duration, and medium or localized extent, and have a probable likelihood of occurring. The overall rating for visual impacts from the alternative Industrial Park site would be adverse, and these impacts would be non-significant.

4.10.5 MITIGATION

Implementing mitigation measures to reduce visual resource impacts would be more important at the Salem site than the Industrial Park site, because the former has scenic resources of greater value. The following measures are examples of steps that can be taken to diminish visual impacts from constructing a generation station, appurtenant facilities, and transmission line interconnections at either site (BLM, no date-b):

1. Minimize the Number of Visible Structures.
2. Minimize Structure Contrast. Consider:
   a. using earth-tone paints and stains.
   b. using Corten steel (self-weathering).
   c. selecting paint finishes with low levels of reflectivity (i.e., flat or semi-gloss).
3. Redesign Structures that do not Blend/Fit. Consider:
   a. using rustic designs and native building materials.
   b. using natural appearing forms to complement landscape character (use special designs only as a last resort).
   c. relocating structure.
4. Minimize Impact of Utility Crossings of Roads.* Consider:
   a. making crossings at right angles.
   b. setting back structures at a maximum distance from the crossing.
   c. leaving vegetation along the roadside.
   d. minimizing viewing time.
   e. utilizing natural screening
5. Recognize the Value and Limitations of Color. Consider:
   a. that color (hue) is most effective within 1,000 feet (305 m). Beyond that point color becomes more difficult to distinguish and tone or value determines visibility and resulting visual contrast.
   b. that using color has limited effectiveness (in the background distance zone) in reducing visual impacts on structures that are silhouetted against the sky.
   c. painting structures somewhat darker than the adjacent landscape to compensate for the effects of shade and shadow.
   d. selecting color to blend with the land and not the sky.

* Most of this set is more applicable in areas covered with forest rather than the open range and prairie characteristic of the Great Falls area.

In addition, the selective planting of trees and shrubs in certain locations may help screen views of the facility. Finally, SME would endeavor to use the minimum exterior lighting necessary for safety purposes while trying to minimize adverse impacts to the natural dark skies of the area from diffuse, upward and outward facing lights that can cause “light pollution.”

4.11 TRANSPORTATION

Impacts from the proposed HGS at the Salem or Industrial Park sites on transportation and traffic could potentially occur during both the construction and operational phases of the Proposed Action. These impacts would be related to the transport of materials, supplies and equipment to the site during the construction phase, long-term transport of raw materials, primarily coal and limestone, during operation of the generating station, and the commutes of workers to and from the site both during construction and operation.

Both roads and railroad would be used to transport materials and equipment during construction. While the total number of truck or train trips needed to import materials to either the preferred or the alternative site over a period of 2-3 years is not known, in general the potential problems presented by construction traffic would not be the sheer volume, but slower speeds than normal traffic, road damage from heavy loads, and materials dropping onto roads, typically dirt being removed from construction sites in dump trucks, and road damage from heavy loads. Though somewhat lengthy in duration, these factors could still be considered localized, minor impacts at either site.

During construction, an average of 300 to 400 workers at any one time (with an estimated peak of 550) would be working in the area of the site and a number of these would be commuting to it. In addition, an undetermined percentage of workers would car-pool with fellow employees in their commute. For the purpose of this analysis, the worst case scenario of 550 vehicles each making two trips per day (or 1,100 ADT) is assumed. Around the country, the construction workday typically starts at 7 a.m., earlier than the average start time for most workers. This would have the effect of distributing total daily trips along routes traversed to construction sites across a wider number of hours and thus would reduce traffic flows, and therefore traffic congestion, during peak commuting times.

Over the long term, during the decades-long operation of the facility, approximately 50-60 workers would commute there on a daily basis. Two trainloads a week of coal would be delivered to the plant along the proposed rail spur from one of the BNSF railways in the Great Falls area.

Transportation of ash at the Salem site would be done on internal roadways in 50 ton trucks at about 5 truckloads per day. Transportation to an off-site disposal facility required at the Industrial Park site would require the use of road-worthy trucks. These trucks typically carry no more than 30 tons each. Ash transportation would require approximately 8 round trips per day to the selected disposal site.

4.11.1 NO ACTION ALTERNATIVE

Under the No Action Alternative, no power plant or wind turbines would be constructed at either the Salem or Industrial Park sites to meet SME's projected base load needs. Rather, SME would purchase electricity from existing generation sources in the Northern Rockies or Pacific Northwest, which could be a mix of large-scale hydro, natural gas, coal, nuclear, and to a smaller extent, wind, solar, and other renewables. Under this alternative, during the immediate future, traffic volumes and road conditions in the vicinity of both the Salem and Industrial Park sites would be expected to remain much as they are at present. Over time, if current demographic and growth trends hold into the future, traffic volumes at the Industrial Park site would be expected to increase gradually.

The No Action Alternative would not contribute directly to transportation impacts at either the Salem or Industrial Park sites. However, by purchasing an equivalent amount of power from generation sources elsewhere, SME would be contributing indirectly to ongoing transportation impacts at existing generating stations in the region. To the extent that expanding demand for electricity in the wider region drives construction of new generating facilities elsewhere, SME would thus be contributing indirectly to any transportation impacts associated with construction and operation of those facilities.

4.11.2 Proposed Action – HGS at the Salem site

4.11.2.1 Construction

Under the Proposed Action, SME and its contractors would maintain existing aggregate roadways to be used for construction access. They would regrade and place additional aggregate on the existing roadways at the end of the construction period. A 1,800-ft (545 m) long paved access road into the site would be constructed and maintained from the existing Cascade County road, Salem Road. SME and its contractors would also construct and maintain an additional 6,600 feet (2,000 m) of paved internal roadways to facilitate plant construction and operations. These on-site, paved roads would be aggregate-based during construction and would be paved upon completion of heavy construction. This internal road construction would take six months and would require 100 to 150 workers, including heavy equipment operators and mechanics, laborers, concrete finishers, surveyors and others. Construction equipment to be used would consist of bulldozers, backhoes, earth scrapers, motor graders, heavy haul trucks, large tractors, concrete trucks, asphalt pavers, concrete pavers, rollers, compactors and others.

Whichever specific alignment it takes, the railroad spur connecting the BNSF tracks to the south would have to cross Secondary Highway 228. MDT requires the highest level of railroad crossing safety be provided in the development of all projects and strongly recommends a grade separated crossing and specifically that S-228 be designed to go over the top of the BNSF spur. This route is used by overheight loads because of height restricted railroad overpasses on the other routes into Belt. Therefore, a grade separated bridge for the S-228 crossing over the BNRR spur is being considered as a mitigation to the Salem site. Following federal and state Right of Way acquisition regulations, SME would be responsible for acquiring the necessary Right of Way in the name of MDT.

From Great Falls, plant access would be from southbound U.S. Route 87/89 to eastbound S-228 to northbound Salem Road, thence to the site. Under this alternative, over the short term, during the 2-3 year busiest construction period, the combined ADT of Salem Road would increase considerably, jumping from 36 to a peak of about 1,340. Most of the traffic would occur early in the morning and mid- to late afternoon when workers are arriving at and departing the construction site. At other times – most of the morning, mid-day, evening, and nighttime – traffic would be relatively minimal, except for occasional truck traffic. Thus, during both the morning and afternoon commutes, a peak of approximately 550 vehicles per hour could be entering and exiting the construction site for a short duration. According to the *Highway Capacity Manual* of the Transportation Research Board of the National Research Council, this traffic volume would represent an LOS of B (see Table 3-26 in Section 3.9.1 for a description of LOS B). That is, there would be “stable flow, but presence of the users in [the] traffic stream becomes noticeable.” Both commuters to the project and existing residents who venture out during busiest traffic periods could potentially face generally minor delays and inconvenience. The greatly increased flow of traffic on the aggregate Salem Road would create plumes of fugitive dust, which could potentially constitute a minor annoyance or inconvenience for the few nearby residents and local motorists.

On S-228, the ADT would go from 549 to potential maximum of approximately 1850. Unlike the Salem Road, SR-228 is paved, so that even though both are one-lane each direction, it can accommodate greater traffic flow. Traffic impacts on the subject segment of S-228 would be comparable to those along the Salem Road: LOS should not degrade to below B or C even during early morning and mid-afternoon commute times.

Concerns over congestion and related safety issues arise at two intersections along the anticipated commuting route to the Salem site from Great Falls: 1) the intersection of US 87/89 and S-228 (eastbound US 87/89 traffic turning left onto SR-228 in the morning and westbound traffic turning right onto US 87/89 from S-228 in the afternoon) and, 2) the intersection of 10th Ave South and 57th Street. Similar traffic volumes would be expected at both intersections. A short-term increase in traffic of approximately 550 vehicles per hour (estimated maximum) on the operations of these intersections during HGS construction for the morning and afternoon commuting times could result in an LOS of D, which would be a short-term significant, adverse impact on traffic congestion.

Secondary Highway 228 was constructed in 1957 with a 24 to 26 foot-wide typical section and has vertical and horizontal alignments that do not meet today’s Safety and Design standards. Unless it is upgraded, the increased traffic and weight of the vehicles that would be using this road during HGS construction is likely to result in damage to this roadway, including cracks, potholes, and/or crumbling edges, and an increase in risks to the safety of motorists.

Prior to commencing construction of the HGS, and following MDT’s procedures, SME would prepare a traffic mitigation plan that would state specifically how S-228 would accommodate the increased traffic and load from HGS construction. The plan would indicate whether improvements would be made to S-228, or if another means would be adopted, such as placing load and/or speed limits on S-228 until the Salem Road intersection. Load and/or speed limits would impact loads to the HGS and would also impact local farmers and other agricultural interests who use S-228 for access. The traffic mitigation plan would address the current road condition and economic impact of reduced loads and/or lower speeds. It would determine whether vertical and horizontal safety concerns need to be evaluated and mitigated.

As stated above, the intersection of Salem Road and S-228 would have a high volume of turning traffic. During construction of the HGS, the entering and exiting vehicles would include many trucks, with slower speeds and longer acceleration distances. Under MDT supervision, SME would construct a Left Turn Lane, a Right Turn Lane and an acceleration lane before HGS construction begins. Details on how these improvements would be completed and funded would be addressed in the traffic mitigation plan.

Construction of the rail spur line to the Salem site from the existing BNSF rail line approximately 6.2 miles south of the project site near Fife would have a minor, short-term impact on existing rail and road facilities. At the intersection with SR-228, the State of Montana would require that the railroad be grade-separated from the existing highway. To do so would require construction of a new roadway bridge, and reconstruction of approximately 5000 feet (almost a mile) of highway pavement. Roadway construction and maintenance as required, providing site access is controlled in part by the route selected for the railroad spur. The minimum width of the Right of Way for the construction and operation of the rail spur is 160 feet (50 m) on level terrain and could extend to 400 feet (123 m) depending on the depth of cut or fill in the terrain.

Development and operation of this overpass would be a substantial project in its own right, requiring close cooperation on planning, construction, operation and maintenance between SME, MDT, BNSF, and possibly other county, state and federal agencies. Provisions would have to be made for detouring S-228 traffic around the construction site with a minimum of delay and disruption over a period of several months. Localized, short-term impacts would be expected on soils and geology, landform, storm runoff, air quality (fugitive dust and tailpipe emissions from operating heavy equipment), flora and fauna, visual resources, noise, and human health and safety. These impacts would be managed under MDT requirements, and thus would likely be negligible to minor in magnitude. Impacts on all resources from operation of the grade separated bridge crossing would be mostly negligible.

4.11.2.2 Operation

During the long-term operation of the HGS, traffic impacts from 50-60 commuting workers would be negligible to minimal. The main bulk material – coal – would be transported to the site using rail, so that impacts on road systems would be non-existent to negligible.

When tall structures like the stack or stacks associated with a coal-burning power plant, or the proposed wind turbines, are located in close proximity to an airport and might interfere with aviation, the FAA would require a study of the project’s impact on navigable airspace. During the project proposal stage, the FAA requires the filing of FAA Form 7460-1, Notice of Proposed Construction or Alteration with the Air Traffic Division to the FAA’s Central Regional Office. Before actual construction occurs, the FAA requires the filing of FAA form 7460-2, Notice of Actual Construction or Alteration to the regional office (FAA, 2004). However, because the HGS at the Salem site would be located approximately 12-13 miles from the Great Falls International Airport, this would be unnecessary. Both the stack and the wind turbines may require the placement of lights for aviation safety.

The requirements for this notice may be found in Federal Aviation Regulations (FAR) Part 77, Objects Affecting Navigable Airspace. This regulation is contained under Subchapter E, Airspace of Title 14 of the Code of Federal Regulations. If any part of the projects exceeds notification criteria under FAR Part 77, notice should be filed at least 30 days prior to the proposed construction date.

Potential impacts of the Proposed Action on rail transport could hypothetically include congestion and the concomitant need for expanded capacity to accommodate delivery of coal by rail to the HGS. On behalf of SME, Stanley Consultants inquired with BNSF Railway, owner/operator of the nearest tracks to the Salem site. During these conversations, BNSF commented positively about the proposed route and was not concerned that the HGS could cause congestion on existing railways that it would use (Walters, 2006).

The new delivery route would transport coal northwest from the Spring Creek – Decker area to the Great Falls area. BNSF stated that current congestion is south and east from the Powder River Basin. Therefore, the approximate two train loads of coal per week from the Spring Creek – Decker area to HGS would not contribute to current or future projected congestion and would actually help BNSF (i.e., revenues would grow and no infrastructure investments would be needed for this delivery).

4.11.3 Alternative Site – Industrial Park Site

4.11.3.1 Construction

If the alternative site were to be used, SME and its contractors would maintain existing aggregate roadways to be used for construction access across the Industrial Park. They would regrade and place additional aggregate on these existing roadways at the end of the construction period. SME and its contractors would also construct and maintain all paved internal roadways to facilitate plant construction and operations. These on-site, paved roads would be aggregate-based during construction and would be paved upon completion of heavy construction. As with the Salem site, this internal road construction would take approximately six months and would require 100 to 150 workers, including heavy equipment operators and mechanics, laborers, concrete finishers, surveyors and others. Construction equipment would consist of bulldozers, backhoes, earth scrapers, motor graders, heavy haul trucks, large tractors, concrete trucks, asphalt pavers, concrete pavers, rollers, compactors and others.

From Great Falls, plant access would be from northbound U.S. Route 87. (MDT plans to widen US 87 north of Great Falls in the next few years.) Under this alternative, over the short term, during the several year construction period, the combined ADT of the US 87 would increase notably, going from 7,718 to a peak of just over 9,000. Most of the project-related traffic would occur early in the morning and mid- to late afternoon when workers are arriving at and departing the construction site, largely avoiding typical morning and evening rush hours for Great Falls. At other times – most of the morning, mid-day, evening, and nighttime – construction-related traffic would be relatively minimal, except for occasional truck traffic. Thus, during both the morning and afternoon commutes, a peak of approximately 550 vehicles per hour could be entering and exiting the construction site. The volume of traffic on U.S. 87 between the off-peak hours of 6 and 7 a.m. and 3 and 5 p.m. is unknown (Combs, 2006), but assuming it is five percent of the ADT for each of these hourly periods, then about 400 vehicles in both directions would be transiting this segment during each of these hours without the power plant construction traffic. Adding 550 vehicles of construction-related traffic would represent a total of approximately 950 vehicles per hour.

According to the Highway Capacity Manual of the Transportation Research Board of the National Research Council, 1,050 vehicles per hour would represent an LOS of between B and C (see Table 3-23 in Section 3.9.1 for a description of LOS B). That is, traffic movement would be somewhere between "stable flow, but presence of the users in [the] traffic stream becomes noticeable" (LOS B) and, "stable flow, but operation of single users becomes affected by interactions with others in traffic stream" (LOS C). Both commuters to the project and existing residents who venture out during busiest traffic periods could potentially face generally minor delays and inconvenience.

Traffic delays at the intersection of US 87 and the access road to the Industrial Park construction site could occur during morning and afternoon rush hours as a result of adding 550 vehicles per hour to this intersection. This would constitute a significant but short-term, localized impact on traffic. Improvements at this intersection might prove necessary to prevent motorist safety from being compromised.

For this alternative, SME would likely extend the existing rail spur to the IMC malt plant to accommodate the arrangement at the Industrial Park site. No specific route for the possible construction of a rail spur extension to the Industrial Park site from the existing spur to the IMC plant has been identified. However, based on what is known of transportation infrastructure in the surrounding area and the nature of such construction, it would likely have a minor, short-term impact on existing rail and road facilities.

4.11.3.2 Operation

During the long-term operation of the HGS, traffic impacts from 50-60 commuting workers along the U.S. 87 corridor would be negligible to minimal. Up to eight truckloads of ash may have to be hauled on the highway daily, depending on the disposal site selected.

The main bulk material – coal – would be transported to the site using rail, so that impacts on road systems would be non-existent to negligible. There would be some potential for an increase in rail traffic in Great Falls causing minor traffic delays at street crossings, but two trains per week would constitute a minor impact at most. Still, whenever a long unit car coal train used the Malting Barley Railroad access spur, this would result in lengthy delays on the NE Bypass near 38th street because of long trains. Currently most of the trains passing through Great Falls move at a slow speed and several crossings would be impacted simultaneously because of the length and slow speed of HGS trains. This would seriously impact public safety when emergency vehicles are held up.

As stated above in Section 4.11.2.2, when tall structures like the stack or stacks associated with a coal-burning power plant are located in close proximity to an airport, the FAA would require a study of the project's impact on navigable airspace. However, because the Industrial Park site is located approximately four miles from the Great Falls International Airport, this would probably not be necessary. The stack would likely require aviation safety lights, however.

Potential impacts of the alternative site on rail transport would essentially be the same as with the Proposed Action. These could hypothetically include congestion and the concomitant need for expanded capacity to accommodate delivery of coal by rail to the HGS. However, as noted in the case of the Proposed Action, Stanley Consultants' inquiry with BNSF indicated that the railroad owner/operator was not concerned that this project could cause congestion on existing rail routes that it would use (Walters, 2006).

4.11.4 CONCLUSION

The No Action Alternative would not contribute directly to transportation impacts at either the Salem or Industrial Park sites. However, by purchasing an equivalent amount of power from generation sources elsewhere, SME would be contributing indirectly to ongoing transportation impacts at existing generating stations in the region. To the extent that expanding demand for electricity in the wider region drives construction of new generating facilities elsewhere, SME would thus be contributing indirectly to any transportation impacts associated with construction and operation of those facilities.

Using the impact significance definitions described at the beginning of Chapter 4 and presented for "Traffic Congestion" in Appendix J, construction-related impacts on traffic from the Proposed Action would be of moderate magnitude, medium-term duration, and small extent, and have a probable likelihood of occurring. The overall rating for impacts on traffic congestion from the Proposed Action during the construction phase would be adverse and significant. There would be no appreciable construction-related impacts on air transportation in the Great Falls area from construction at the Salem site. There would be minor, temporary construction-related impacts on rail transport on the BNSF line to which a rail spur would connect; coordination between SME and BNSF would minimize any disruption of service or transport. In addition, there would be minor short-term impacts on traffic and on natural resources from construction of an overpass at the crossing of the rail spur and S-228. Over the long term, during operation of the proposed HGS, its impacts on road, rail and air transportation would be generally negligible.

Construction-related impacts of the alternate site – the Industrial Park site – would be comparable to those of the Proposed Action. Temporary construction-related impacts on roads, traffic and rail would be greater than long-term operational impacts, and they would be adverse, and significant, though only over the short-term, during construction.

4.11.5 MITIGATION

Mitigation would consist of standard measures used to minimize traffic congestion and damage to public roads during large construction projects. This would include appropriate signage to alert motorists approaching turnoffs to the construction site from both directions at distances of approximately 200 to 400 yards. If temporary detours and/or street closures would be necessary at any location, road crews and signs would safely and efficiently redirect oncoming traffic to the detour. Any material, such as dirt, falling from trucks would be removed promptly so as not to present a traffic hazard. Any damage to road surfaces from heavy equipment movement would also be repaired promptly.

As discussed above, for the Salem site, SME would cooperate with MDT, BNSF Railway, and county transportation officials with regard to planning and construction of a separated grade crossing of S-228 and the proposed rail spur to the HGS. Additionally, in consultation with MDT, SME would prepare a traffic mitigation plan prior to construction. This plan would address specific measures for improvements or other actions to reduce congestion and protect motorists' safety at several key intersections along the commuting route between Great Falls and the Salem site – namely US 87/98 and S-228, S-228 and Salem Road, and 10th Avenue South and 57th Street.

4.12 FARMLAND AND LAND USE

4.12.1 NO ACTION ALTERNATIVE

The No Action Alternative would not adversely affect or alter existing land uses at or near the Salem site or the Industrial Park site. The Salem site would continue to be maintained in agricultural production and the Industrial Park site would continue to be open space.

Insofar as SME would need to meet energy supply needs in the service area by purchasing power from existing generation wholesale suppliers located elsewhere, SME could potentially be contributing indirectly to ongoing farmland and land use impacts where other suppliers have developed highly valued farmland and converted it to industrial uses at different generating stations in the region or at potentially new generating stations located outside of the region.

4.12.2 PROPOSED ACTION – HGS AT THE SALEM SITE

Impacts to farmland and land use can either be direct or indirect. Direct impacts include the actual conversion or alteration of land use in a specific area caused by physical changes in the land, and indirect impacts include those that can change or alter land uses on adjoining properties or in the region, and are caused by social, economical, or ecological changes associated with the power plant. Direct impacts, the actual physical conversion or alteration of land in order to make the plant operation-ready, would be captured under the construction subsection. Indirect impacts, those caused by the influence the power plant could have on adjacent area land uses, would be captured under the operation subsection.

4.12.2.1 Construction

The area of land that would be directly impacted and/or altered by the construction of the power plant at the Salem site includes the footprint of the power plant, and the roadways, rail lines, and utility corridor zones required to make the plant operation-ready. Specifically, the power plant would require the construction of the following elements:

- The power plant and associated facilities on a total footprint of approximately 545 acres (221 ha);
- A 1,800-foot long paved access road from the existing Cascade County road (Salem Road) into the site;
- A 6.3-mile railroad spur, extending south from the plant and tying into an existing main line track that is located three miles south of the city of Great Falls;
- Two short segments of electrical transmission line with new 100-foot rights-of-way; the first line would be approximately 4.1 miles long and would extend from the plant site to a new switchyard site proposed for a location south and west of the Salem site, while the second line would be approximately 9.21 miles in length and would extend south and west from the plant site, across the Missouri River north and east of Cochrane Dam;
- A raw water supply system which would include a collector well extending into the Morony Reservoir and associated water intake pipelines extending approximately two miles to the plant site;
- 55,000 feet (16,800 m) feet of fresh potable water supply and waste water pipelines from the power plant to the City of Great Falls water and sewer lines; and
- The installation of four nearly 400-ft (121-m) tall wind turbines that would be used to supplement power from the generating station.

The footprint of the power plant and all lands adjacent where construction would take place are currently agricultural lands. No homesteads would be moved as a result of activities, and the only structure that would be moved would be Secondary Highway 228, which would need to be raised in order to the accommodate the new railroad spur. The conversion of agricultural lands in and of themselves, to an industrial plant with supporting facilities and infrastructure, would be considered only a minor impact, though the impact would be permanent. Because the agricultural land that would be converted is not protected farmland and does not have a significant productivity rating, the conversion of this land in context to the amount and quality of farmland in other areas of Cascade County is not considered significant.

SME would negotiate the purchase of easements with other property owners in the vicinity whose land may be required for transmission line and/or pipeline rights-of-way. Although the easements would be likely held in perpetuity, various activities would be allowed to continue in the electrical transmission right-of ways. The right-of-ways would be approximately 100 feet (30 m) across in total width, with the poles being centered at around the 50-foot (15-m) mark. Activities that would probably be able to continue in the rights-of-way include agricultural activities, grazing, and most types of recreation. The location and presence of the right-of ways is not anticipated to affect land use in the area.

In the event that an easement or sale in fee simple cannot be obtained for a specific right-of-way, the land may be taken by eminent domain. This would involve condemning the piece of property for the “public use”. In condemning the property, the landowner would be fairly compensated for the land, and the land would become publicly owned. Any activities determined to be compatible with the presence of the transmission lines can continue in condemned rights-of-way, including most types of recreation.

Construction activities could potentially cause some moderate to major indirect nuisance impacts to adjacent land owners, especially to the residents of the home located northwest of the site near where the raw water intake pipeline would be installed. Impacts such as noise, dust, and increased traffic would be moderate to major, short-term, small extent, and probable. While these nuisance impacts would affect the quality of life for nearby residents, they would not have an effect on the actual uses of adjacent land. Insulation and other noise reducing equipment, dust abatement, and restrictions on the timing of construction activities, whenever possible, would help reduce the potential construction associated impacts to area residents.

Minimal impacts would be anticipated to the farmstead located northwest of the facility, where the railroad spur line and fresh- and waste-water pipelines would be installed, as it is currently unoccupied. However, if the farmstead owners were to establish residency in the home, they could potentially be exposed to the same construction-associated impacts as described above. Impacts to residents and area visitors from facility operations, including increased traffic, railcars, noise, and light, are all discussed in their respective impact topics. The effect that all of these impacts may have on the changes in land use are discussed below, in the operations section.

If the Salem site were to remain unincorporated county land, the county could issue a special use permit for the plant in order to allow it to operate on agriculturally zoned land. In order to issue the permit, the county would hold a pre-application meeting, generate a staff report where it identifies potentially contentious issues, and then hold public hearings on the project. At the end of the hearing, a final decision would be made. If the decision were made to allow the project to operate on agriculturally zoned lands, and the permit would be issued, potentially with conditions. These conditions could involve requirements for such mitigations as additional landscape buffers, road maintenance/upgrades, noise abatement, and security fencing (Clifton, 2006). Even if the site remained as county land, it would still be eligible to hook up to the City of Great Falls municipal water and sewer systems with the approval of the city.

If the Salem site were to become annexed into the city, in addition to annexing the Salem site, a corridor extending out to the site from current city land would have to be annexed. This corridor would include the location of city's utility lines, which would be installed from the west side of Malmstrom Air Force Base, where the city utility lines currently end, out to the site (Walters, 2006).

The preferred method of annexation is to annex the land in question prior to the application of any city/county permits, so that the responsible local governing body has jurisdiction over the site's permits. Thus, if the Salem site were to be incorporated, it would apply for annexation prior to the commencement of construction activities. The steps for annexing county land into the city are outlined in the box below and contained at the Great Falls City Planning Department website at: http://www.ci.great-falls.mt.us/people_offices/planning/procanexsub.htm .

Once annexed into the city, the city would establish zoning on the land. Zoning for a coal burning power plant would most likely be category I-2: heavy industry, which permits the operation of major electrical installations (Walters, 2006).

GENERAL PROCEDURES FOR LAND ANNEXATION

1. Potential applicant discusses feasibility of annexation, annexation requirements, City zoning, general procedures and time frame with Planning staff followed by a pre-application conference, if appropriate.
2. Applicant is encouraged to visit with surrounding property owners and representatives of the neighborhood council in which the annexation is located to present the project and solicit input.
3. Applicant submits formal annexation and zoning petitions, initial fees and preliminary site plans and engineering documents to Planning Office.
4. Planning staff transmits necessary materials and information to review officials.
5. "Zoning Notice of Public Hearing before Planning Board" is published in Tribune at least 15 days prior to hearing.
6. Planning staff mails copy of public hearing notice to all property owners within 150 feet radius of area requested to be annexed and zoned.
7. Planning staff works with applicant and review officials to develop final annexation requirements and prepares report and recommendation to Planning Board.
8. Planning staff posts public hearing notice sign on property requested to be annexed and zoned.
9. Planning Board holds public hearing and arrives at a recommendation.
10. Applicant submits:
    - Final engineering drawings;
    - Agreement containing terms and conditions for annexation;
    - Payment of applicable fees;
    - Financial guarantee;
    - Any other documents required as a condition of approval.
11. Planning staff provides final documents to appropriate officials for review and approval.
12. Planning staff prepares a resolution of intent to annex and a zoning ordinance, and submits them to City Commission.
13. City Commission adopts resolution of intent to annex and accepts zoning ordinance on first reading and sets date for public hearing.
14. Notice of public hearing is published in *Tribune* for two successive weeks with first publication at least 20 days prior to hearing.
15. Planning staff submits Board recommendation, annexation agreement, and related documents to City Commission.
16. City Commission conducts public hearing for final annexation resolution and zoning ordinance, acting on each separately, together with the annexation agreement and any related documents.

Source: Great Falls City Planning Department

It is possible that objections could be raised to the annexation of the Salem site and its utility corridors, especially from the county. A main concern is anticipated to be the potential changes in land use surrounding the plant area, due to the city's infrastructure extending six miles east of the city, and the heavy industry zoning that would be established at the plant. These impacts are all associated, indirect impacts caused by the influence of the power plant and will be discussed in the operation subsection below.

On November 29, 2006, Cascade County Commissioners voted 2-1 to rezone the 840 acres SME proposes to purchase as heavy industrial. On December 23, 2006 a group of plaintiffs including nearby residents and farmers and the Montana Environmental Information Center filed a lawsuit in Montana District Court challenging the rezoning. Plaintiffs alleged that County officials violated state law and county policies when they approved the rezoning of this land (AP, 2006b).

4.12.2.2 Operation

The operation of the power plant would cause no additional direct impacts to land use or farmland. No additional amounts of land would be developed for the plant once the construction phase is completed. However, the presence, influence, and impacts of the power plant and its associated support facilities could all indirectly influence land uses on adjoining or nearby properties in the vicinity of the site.

The power plant at the Salem site would be an industrial facility situated amidst agricultural lands. The siting of the plant, and the reliable infrastructure and possible cogeneration energy that would be available in this area once the plant is operational, could well attract additional business to the surrounding area, particularly those industries requiring high energy inputs or power plant byproducts as inputs. The possibility of cogeneration, using waste heat from the power plant, is attractive to certain kinds of industries. Ethanol refineries, concrete manufacturers, and wallboard companies are examples of firms that would benefit from being located immediately adjacent to a power plant.

Additionally, impacts associated with air quality, noise, visual resources, and traffic would all potentially decrease the quality of life for area residents downwind of the facility or adjacent to transportation routes. Though these impacts are all discussed in their respective sections, they could potentially cumulatively affect one particular area and be perceived as adverse enough to residents that they would choose to relocate. While the relocation of any residents would not cause a land use change in of itself, land put up for sale in the area may be attractive to an industrial developer. The addition of any industry would perpetuate the impacts of decreasing the quality of life for residents of this rural agricultural area, and over time this cycle could continue and the predominant land use in the area could change from being primarily farmland to being primarily industrial land.

While increased industrialization of the area in the vicinity of the Salem site is a possibility, it is a possibility fraught with many uncertainties. It is also a trend that could either be perpetuated or stopped by both the county and city Planning Boards. Regardless of whether or not the Salem site stays as county land or becomes annexed into the city, all adjacent and surrounding lands would remain zoned for agriculture. Any new industry would have to obtain either a land use permit or a zoning change for the area of interest, which would involve public hearings and planning board approval. Notwithstanding that, the development of the Salem site in and of itself may reduce the property values of nearby rural, agricultural land, with repercussions on land assessments and property taxes. If they occur, these impacts would be very localized and the actual land uses of surrounding properties are not anticipated to be significantly affected.

4.12.3 ALTERNATIVE SITE – INDUSTRIAL PARK SITE

4.12.3.1 Construction

The area of land that would be directly impacted and/or altered by the construction of the power plant at the Industrial Park site includes the footprint of the power plant, and the roadways, rail lines, and utility corridor zones required to make the plant operation-ready. Specifically, the power plant would require the construction of the following elements:

- The power plant and associated facilities on a total footprint of roughly 300 acres (121 ha);
- A 5-mile railroad spur, beginning north of the Missouri River and extending west to the plant site;
- At least one short segment of electrical transmission line with new 100-foot rights-of-way, extending from the site one mile east to the Great Falls switchyard site;
- A raw water supply system which would include a collector well extending into the Morony Reservoir and associated water intake pipelines extending approximately 17 miles to the plant site; and
- Fresh potable water supply and waste water pipelines of undetermined length from the power plant to the City of Great Falls water and sewer lines.

The footprint of the power plant and many of the lands adjacent to the areas where construction would take place are currently agricultural or open space lands. Some adjacent areas are industrial, and to the southwest and southeast of the site there are low-density residential lands. No homesteads or structures would be moved as a result of construction activities. The conversion of agricultural lands in of themselves, to an industrial plant with supporting facilities and infrastructure, would be considered a minor impact. Land that would be developed includes a minor amount of land that is classified as agricultural land of statewide importance, an additional minor amount of land with no designation, and a majority of land that is protected as prime farmland only if it is irrigated cropland. Much of this land is generally of good quality for agricultural uses according to the land evaluation productivity rating. However, the development and conversion of this land is considered not significant because the area is not actively irrigated or cultivated, is located next to several industrial developments, and is a very small amount of farmland in context with other areas of Cascade County.

Most activities in the area would be allowed to continue in the electrical transmission right-of ways, as described under the Salem site. Construction activities could potentially cause some moderate indirect nuisance impacts to adjacent land owners. However, these nuisance impacts would not have an effect on the actual uses of adjacent land. Because the site would be situated next to another major industrial facility, the IMC plant, these impacts would be considered an adverse incremental impact to the quality of life for residents, but one that is not significant.

The Industrial Park site is currently located on unincorporated county land, but there is an almost certain probability that it would be annexed into the city if the plant were to be constructed on the site (Clifton, 2006). The IMC plant, located approximately one half mile southwest of the site, is located on annexed, or incorporated, city land. The city municipal sewer and water lines currently run to the IMC plant.

The preferred method of annexation is to annex the land in question prior to the application of any city/county permits, so that the responsible local governing body has jurisdiction of the site's permits. The Industrial Park site would follow the same steps for applying for annexation into the city as outlined for the Salem site. Once annexed into the city, the city would establish zoning on the land. The zoning for the coal burning power plant would most likely be category I-2: heavy industry, which permits the operation of major electrical installations (Walters, 2006).

It is anticipated that there may be fewer objections raised to the annexation of the Industrial Park site than to the Salem site. The Industrial Park site is located closer to the current city boundaries (about a half-mile compared to six miles for the Salem site), and adjacent land is already industrialized. However, because of the proximity of the Industrial Park site to the city and to a greater amount of residential and developed areas, there exists a greater potential for user conflicts and impacts from the plant, as discussed in the operation subsection below.

4.12.3.2 Operation

The operation of the power plant would cause no additional direct impacts to land use or farmland. No additional amounts of land would be developed for the plant once the construction phase is completed. However, the presence, influence, and impacts of the power plant and its associated support facilities could all indirectly influence land uses on adjoining or nearby properties in the vicinity of the site.

The greater proximity of residential areas and other businesses to the Industrial Park site could potentially create more conflicts than at the Salem site. And while there may be more competing interests, and many more receptors for potential impacts from plant operations, the actual influence that a power plant could exert on nearby land development would be less at the Industrial Park site than at the Salem site. Because there is much more land in the vicinity of the Industrial Park site that has been developed, additional industrial growth would be under greater public scrutiny, pressures, and land constraints.

The development of the Industrial Park site in and of itself may reduce the property values of nearby agricultural or residential land, with repercussions on land assessments and property taxes. These impacts will be localized and the actual land uses of surrounding properties are not anticipated to be significantly affected.

4.12.4 CONCLUSION

The No Action Alternative would not adversely affect or alter existing land uses at or near the Salem site or the Industrial Park site. The Salem site would continue to be maintained in agricultural production and the Industrial Site would continue to be open space. Insofar as SME would need to meet energy supply needs in the service area by purchasing power from existing generation wholesale suppliers located elsewhere, SME could potentially be contributing indirectly to ongoing farmland and land use impacts where other suppliers have developed highly valued farmland and converted it to industrial uses at different generating stations in the region or at potentially new generating stations located outside of the region.

The construction of a power plant at either the Salem or the Industrial Park site would involve the direct conversion of agricultural lands to an industrialized facility with supporting infrastructure. No homesteads or residences would be moved under either alternative. In the context of the amount of quality farmland in other areas of Cascade County, the actual conversion, or development, of the land required for the plant, impacts would be of minor magnitude, long-term duration, medium extent, and have a probable likelihood of occurring. The overall rating for impacts on land use from the construction phase of the power plant would be adverse, and while impacts would most likely be non-significant; there is some potential for impacts to become significant at both sites.

The operation of the power plant at the Salem site would cause no additional direct impacts to land use or farmland. However, the influence and impacts of the power plant and its associated support facilities could indirectly influence land uses on adjoining or nearby properties in the vicinity of the site. The impacts associated with operating the plant could potentially cumulatively affect one particular area and be perceived as adverse enough to residents that they would choose to relocate. Over time this cycle could continue and the predominant land use in the area could change from being primarily farmland to being primarily industrial land.

Additionally, the development of the Salem site in and of itself may reduce the property values of nearby rural, agricultural land, with repercussions on land assessments and property taxes. These impacts would be localized and the actual land uses of surrounding properties are not anticipated to be significantly affected. The impacts on land use from the operation of a power plant at Salem would be of moderate magnitude, long-term duration, and medium extent, and have a possible likelihood of occurring. Overall, the rating for impacts at the Salem site would be adverse, and while impacts would most likely be non-significant, there is some potential for impacts to become significant.

Similar to the Salem site, the operation of the power plant at the Industrial Park site would cause no additional direct impacts to land use or farmland. Indirectly, however, the greater proximity of residential areas and other businesses to the Industrial Park site could potentially create more land use conflicts than at the Salem site. These conflicts would place greater public scrutiny, pressures, and land constraints on development at the Industrial site, reducing the influence or impact of the power plant on nearby properties when compared to the Salem site. That said, the development of the Industrial Park site in and of itself may reduce the property values of nearby agricultural or residential land, with repercussions on land assessments and property taxes. The impacts on land use from the operation of a power plant at the Industrial Park site would be of minor magnitude, long-term duration, medium extent, and have a possible likelihood of occurring. Overall, the rating for impacts at the Industrial Park site would also be adverse and non-significant; however, with this alternative as with the Proposed Action, there is some potential for impacts to become significant.

4.12.5 MITIGATION

While there are no significant impacts from the action alternatives on the actual physical land development at the sites, there are somewhat significant adverse impacts on land use from the influence and impacts of the power plant. Measures to control the impact of the plant on surrounding land uses include ensuring that adjacent lands remain zoned as agricultural lands. Any new industry interested in the area would then be required to individually obtain either a land use permit or a zoning change, in addition to all other applicable permits.

Additionally, mitigation measures taken to minimize construction and operation impacts to other resource areas (e.g. reduction in noise, visibility, and air quality impacts) would also directly lessen the impacts that could potentially decrease the quality of life for area residents to the point that residents would choose to relocate. Stemming residential relocations as much as possible by the extensive use of other mitigation measures would help prevent land use changes and conversions.

4.13 WASTE MANAGEMENT

4.13.1 NO ACTION ALTERNATIVE

Under the No Action Alternative, no site development would occur, no waste would be generated from the sites, and no waste management would be needed at the sites. However, by purchasing power from generation sources elsewhere, SME would be contributing indirectly to ongoing waste management needs at different generating stations in the region or at potentially new generating stations located outside of the region.

4.13.2 PROPOSED ACTION – HGS AT THE SALEM SITE

The Montana DEQ’s Waste and Underground Tank Management Bureau (WUTMB) regulates solid waste facilities and hazardous waste generators in Montana. WUTMB responsibilities include conducting inspections at businesses that generate hazardous waste and used oil, and at solid waste management facilities, to ensure compliance with management standards. Additionally, the WUTMB provides technical assistance for those businesses and waste management facilities to promote and maintain federal and state compliance. Tools to achieve compliance include technical reviews, licensing, certifications, and compliance monitoring programs.

Electrical generating facilities that dispose of solid wastes on-site are specifically exempted from the requirements of the Montana Solid Waste Management Act in § 75-10-214(1)(b), MCA. This was done because the facilities were formerly regulated under the Major Facilities Siting Act and the exemption was granted to prevent double regulation of a single waste management unit. DEQ will be proposing to repeal the exemption provided to electric generating facilities to the 2007 Montana Legislature since electrical generating facilities were removed from regulation under the Major Facility Siting Act in 2001. SME has voluntarily agreed to license the monofill and be subject to the requirements of the Solid Waste laws and rules. The license conditions would include installing a clay liner, appropriately managing the wastes, and installing a groundwater monitoring system in the vicinity of the monofill. DEQ would review and, if adequate, approve each element of the waste management and proposed monitoring system.

4.13.2.1 Construction

The construction of the potential power plant would generate large quantities of construction debris waste, which would require proper disposal or reuse. Construction is estimated to take approximately 2 ½ years, and would begin with site preparation, foundations, and underground utilities, while design of the above-ground mechanical, piping, buildings, structures, and electrical systems is being finalized.

Any non-hazardous construction debris that could not be reused/recycled would be disposed of at the High Plains Sanitary Landfill and Recycle Center (HPSL). This landfill is licensed Class II landfill. The construction contractor would be responsible for ensuring that the waste material generated was properly disposed. Portable restrooms for employee use during the construction period would be provided by a private contractor. Portable toilets would be serviced by a septic tank pumper licensed by the DEQ to perform these services.

4.13.2.2 Operation

The operation of the potential 250 MW coal-fired power plant would produce large amounts of waste that would have to be disposed of or recycled in an environmentally acceptable manner. Proper maintenance and plant management should minimize any possible negative impacts associated with the production of large quantities of solid waste.

Ash and Water Treatment System Byproducts

The majority of solid waste generated from power plant operations would be ash. At full generation capacity, the plant would produce approximately 220 tons of ash and three tons of activated carbon per day. The ash would have a compacted density of approximately 75 pounds per cubic foot.

Ash is a coal combustion byproduct which can be recycled in some instances, or managed as a waste. Coal combustion wastes include large volume wastes, consisting of coal combustion products (CCPs), and low volume wastes. In 2002, approximately 117 million metric tons per year of large-volume wastes, consisting primarily of ash, were generated by coal burning power plants (Kelly and van Oss, 2004).

Federal regulations encourage the beneficial reuse of coal combustion byproducts, and currently, about one-quarter of all coal combustion wastes are reused in beneficial uses (EPA, 2000b). CCPs are classified as non-hazardous solid waste (EPA, 2000b); however, CCPs that are disposed of in off site landfills, surface impoundments, or used as mine backfill, are regulated under RCRA subtitle D, regulation for the disposal of certain non-hazardous solid wastes, and are thus subject to stricter federal regulation than reused CCPs. In Montana, CCPs disposed of in off-site landfills are subject to Montana solid waste laws and rules and are licensed and regulated by the DEQ as Class II landfills (ARM 17.50.508 and 509).

In general, CCPs, and specifically ash material, can be given away or sold. The material is often reused as a component of cement, road base, waste stabilization, soil stabilization, and other various construction materials. Two other general byproducts of coal-combustion air-pollution control technologies are flue-gas desulfurization (FGD) wastes (from pulverized coal-fired plants only) and fluidized-bed combustion wastes. In 2002, fly ash represented the major component (59 percent) of CCPs produced, followed by FGD material (23 percent), bottom ash (16 percent), and boiler slag (2 percent – from PC plants only). All CCPs have potential for beneficial reuse, and the amount of material being reused has been steadily increasing since the mid-1960s. More than 80 percent of the boiler slag produced in 2002 was reused, followed by fly ash, of which 35 percent was reused (Kelly and van Oss, 2004). CFB boilers produce only fly ash and bed drain ash.

Because fly ash is the main component of CCPs, approximately 65 percent of all CCPs are not currently reused. By reusing the CCPs as much as possible in concrete, production of road base materials, manufactured aggregates, flowable fills, structural fills, embankments, waste stabilization, wallboard manufacturing, roofing tiles and shingles, snow and ice control, and soil modification, the power plant would be able to minimize the volume of solid waste. There are no current plans to recycle the ash from the HGS, but a beneficial use may be developed in the future.

Large volume wastes are categorized by the process in which they are generated in the coal plant and their application. Ash is the incombustible inorganic matter of coal, and on average, the ash content of coal is 10 percent (USEPA, 2004). The ash is composed primarily of metal oxides and alkali. Coarser ash material settles to the bottom of the combustion chamber, while the fine portion, fly ash, is removed from the flue gas.

Specifically, a hydrated ash reinjection system would convert SO_2 and other gases in the flue gas to a particulate to be captured in the baghouse (fabric filter) installed at the proposed power plant "downstream" of the boiler. The baghouse would collect the fly ash for disposal. Flue gas would enter the baghouse through an inlet plenum, and the particulate matter would be collected on the outside surface of the bags. Pulsating air would be used to remove the ash from the filter media and discharge the ash to the baghouse hoppers. The fly ash would be removed from the baghouse and transported to a filter separator and then to a storage silo. Bed ash would be removed from the fluidized bed and cooled in bed ash coolers. Cooled bed ash would be discharged into a storage silo, which would be sized for 3-day storage. From the silos, the fly ash and bed ash would be mixed with wastewater to control dust and then trucked to an ash storage landfill, where the wet ash would solidify (SME, 2004b). The total daily solid waste byproduct of the combustion process at the HGS would be approximately 223 tons of fly and bed ash.

In addition to the ash, the plant would produce approximately 2.8 tons per day of other solid waste byproducts from the water treatment system. This material would consist predominantly of particles suspended in the river water. This material would be dewatered to a thick slurry consistency and would be disposed of along with the ash or in an off-site licensed landfill.

Based on consultations with DEQ about solid waste management, SME plans to dispose of the ash that cannot be reused and/or recycled and water treatment system byproducts onsite within a constructed monofill located within the confines of the railroad loop, immediately southeast of the boiler. A design and application for the proposed ash monofil has been submitted to the DEQ. The licensing information contains all of the elements required of a Class II landfill in Montana. The design submitted consists of a recompacted clay lined cells with ET caps and appropriate revegetation and will be discussed in detail below. Once the area is properly zoned to allow for the operation of the plant and the monofill, the DEQ could issue a license for the operation of the monofill.

The monofill area within the rail loop would be laid out in a rectangular grid consisting of approximately 100 acres (40 ha). The monofill would be constructed as twelve cells in a 3 by 4 grid. Each cell would be an excavated pit approximately 36 feet (11 m) deep. Each cell would be sized to accommodate the ash produced during three years of facility operation. Once filled and covered, the monofill grid would have a height of roughly 22 feet (7 m) above grade and would have an overall footprint, at the perimeter, of roughly 1,700 feet by 2,600 feet (100 acres (40 ha)). Excavated material would be predominantly fat clays. These clays would be used to construct a compacted clay liner and perimeter containment berms with the balance stockpiled for use as final cover. Both liner and berms would be constructed in moisture controlled and compacted lifts.

Each cell would be designed as a self-contained unit. During initial construction, only one cell with the associated containment berms would be constructed. The cell would be used for ash and disposal. Toward the end of the first three year period, the second ash disposal cell would be constructed. Cover material and topsoil for the first cell would be obtained from the excavation for the next adjacent cell. Cover material for this second cell would be obtained from the excavation for the third cell. This process would continue until all cells have been constructed. As each cell was filled, final cover and topsoil would be placed, and the cell would be vegetated. The monofill facility would have a storage capacity for solid waste byproducts commensurate with the estimated life of the HGS – in excess of 35 years.

The monofill would be encircled by a raised perimeter containment berm constructed from on-site fat clays. This berm would ensure that surface waters do not drain into the monofill. Any storm water that fell within the berm would be contained within the monofill, where it would evaporate.

The monofill would operate continuously, as solid waste was produced by the plant. Ash and, if appropriate, filter slurry would be conveyed to the monofill by truck and would be dumped within the active storage cell. On a scheduled basis, tracked machinery would distribute and spread the solid waste. The material would have sufficient moisture to allow workability by tracked equipment. As the ash dries, it would form a hard lightweight cover similar to concrete. In this form, the ash would not be subject to wind erosion. If erosion should occur, an onsite water wagon would be used to moisten the ash and regenerate the hard cover.

As each cell is filled, a gravel layer 12 inches thick would be placed to provide a capillary break for the final cover. This would be followed by 48 inches of the material excavated from the adjacent cell and placed as final cover. This cover would be topsoiled with stockpiled material and seeded to minimize water and wind erosion. The seeded areas would be maintained along with the balance of the site landscaping for the life of the plant. Upon closure of the final cell, the site would be seeded and can be reused as appropriate. This design creates what is known as an ET cap. ET caps are designed to mimic natural soils and provide for the in-cap storage of all precipitation that does not run off. This storage and capillary action allows the plants to use the moisture throughout the growing season and promotes good vegetative cover. ET caps have been tested in Polson and Helena, Montana, as part of a national study. They are rapidly becoming the design standard for landfills due to their low maintenance and high performance in the Montana climate. The DEQ has approved several designs of this type at Class II landfills across Montana. Designs of this type have also been used at other waste repositories in Montana.

Coal, like soil, rocks and other natural materials found in the earth's crust, does contain trace amounts of heavy metal elements. The burning of coal results in the release of heavy metals such as arsenic, boron, cadmium, chromium, copper, lead, mercury, selenium and zinc. Despite the large volumes of ash produced, the total quantity of heavy metals contained within the ash is relatively small, and an even smaller amount of these elements has potential for release to the environment.

The U.S. EPA has extensively studied the risk that coal ash presents to the environment and published reports in February 1998, March 1999, and May 2000 stating that ash resulting from the combustion of fossils fuels was not hazardous and did not need to be regulated as a hazardous waste under Subtitle C of the Resource Conservation and Recovery Act (RCRA) (USEPA, 2004).

Studies conducted by the University of North Dakota indicate that for most heavy metals, even if released directly into groundwater, the concentrations are low enough that they would not adversely affect drinking water quality. A U.S. Geological Survey (USGS) fact sheet states that a "standardized test of the leachability of toxic trace elements such as arsenic, selenium, lead and mercury from fly ash shows that the amounts dissolved are sufficiently low to justify regulatory classification of fly ash as non-hazardous solid waste." However, it is important to note that despite these relatively low concentrations, if improperly managed, coal combustion products can have a negative impact on the environment and pose a risk for groundwater and/or soils contamination (ACAA, no date).

As part of its license application, SME has submitted a No Migration Demonstration for the monofill to the DEQ. Waste management units have the potential to impact groundwater and SME has addressed the issue in the No Migration Demonstration submitted to the DEQ Solid Waste Program. The information submitted demonstrates that based on the unit design, the nature of the ash, and the soils and hydrogeology of the site, there would be no migration of contaminants from the waste management unit to the underlying aquifers. (PBSJ, 2006a) Class II landfills that meet the requirements of the No Migration Demonstration found in ARM 17.50.723 are exempt from liner and groundwater monitoring requirements. SME has voluntarily agreed to construct recompacted clay liners in the waste management cells and to monitor the underlying aquifer as part of an ongoing demonstration.

Other Wastes

Additional wastes generated from operations of the power plant include routine office and non-hazardous facilities wastes that would be disposed of at the HPSL. Wastes of potential concerns from the potential power plant operation include waste heat emitted into the atmosphere, and the buildup and release of low-volume wastes. Low-volume wastes from coal combustion would be generally aqueous and include boiler blowdown waste, cooler blowdown waste, coal pile runoff waste, demineralizer regenerant, and boiler chemical cleaning wastes. Water would comprise a substantial portion of these wastes.

The characteristics of low-volume wastes are extremely variable and can contain various hazardous materials such as strong acids or bases, cadmium, chromium, lead, mercury, and silver (EPA, 2000). Unless properly managed, these wastes have the potential to oxidize and generate acids that could contaminate nearby water resources. The boiler blow down wastes and cooling tower blow down waste (both liquid wastes) would be discharged into the waste water stream which would be pumped to the City of Great Falls wastewater treatment facility. As noted above, the demineralizer regenerate waste would be used to reduce dusting by utilizing the slurry material in the bed ash and fly ash pug mills when loading the ash haul trucks. Finally, the boiler chemical cleaning waste would be captured in special containers to be tested for metal content. The level of metal concentration would determine the disposal method. If allowable, the slurry would be admitted into the wastewater stream and discharged to the City of Great Falls wastewater treatment facility. A dedicated, zero outflow evaporation pond would be constructed onsite to capture and manage all runoff from stored coal.

Other potentially hazardous wastes generated from the routine maintenance of a power plant could include waste oils containing solvent residuals, waste paint and paint thinner, and solvents and degreasers. Hazardous wastes would be disposed of off site at a licensed facility. The state of Montana does not have any permitted hazardous waste disposal sites, and any waste regulated as hazardous would have to be transported out of state by a DOT certified hazardous waste contractor to an appropriate facility. Hazardous waste disposal facilities are located in Salt Lake City, Utah, and Columbia Ridge, Oregon. Alternatively, some hazardous waste such as solvents may be cleaned and recycled onsite by a permitted handler such as Safety-Kleen.

The Waste Management Unit of DEQ's WUTMB is responsible for regulating storage, treatment, and transport of hazardous waste and used oil for all hazardous waste generators in the State of Montana. The existence of hazardous waste and hazardous materials at the power plant would require a hazardous materials management plan and associated emergency and contingency plans. These plans would include training and handling guidelines for staff, procedures to follow in the event of a hazardous waste or hazardous materials spill or release, and a list of measures to mitigate such a spill or release.

The power plant would most likely be regulated as a "conditionally exempt small quantity generator" of hazardous waste. Conditionally exempt small generators must determine which of the wastes they generate are hazardous; keep records of any test results, waste analysis or other determinations used to characterize hazardous waste for at least three years from the date of final disposition of the waste. They may dispose of hazardous waste at a legitimate recycling facility, a permitted hazardous waste treatment, storage, or disposal facility, or a Class II municipal solid waste landfill. Either of the first two options would be used for disposing HGS's regulated hazardous wastes.

4.13.3 ALTERNATIVE SITE – INDUSTRIAL PARK SITE

4.13.3.1 Construction

The construction of the potential power plant would generate large quantities of construction debris waste, similar to construction at the Salem site. Any non-hazardous construction debris that cannot be reused/recycled would be disposed of at the High Plains Sanitary Landfill and Recycle Center (HPSL). The construction contractor would be responsible for ensuring that the waste material generated is properly disposed.

4.13.3.2 Operation

Disposal of fly and bed ash would not take place onsite at the Industrial Park site, because of the smaller footprint area. Instead, ash would be routinely disposed of at an off-site waste disposal facility and/or reused as an industrial byproduct. Disposal would have to be done at a solid waste management facility licensed by the DEQ.

Additional wastes generated from operations of the power plant at the Industrial Park site would be the same as those generated under the Proposed Action, the Salem site. All non-hazardous wastes that could not be reused/recycled would be disposed of at the HPSL and all hazardous waste that could not be cleaned and reused would be disposed of out of state at a permitted hazardous waste disposal facility. As a result of accepting the ash from HGS, HPSL would fill up faster than anticipated and would be either required to request an expansion of its facilities or shut down and decommission its facilities. In the later case, a new landfill would need to be developed for the Great Falls area. These impacts would not directly affect the Industrial Park site, but could have potentially significant impacts to HPSL and other users of that facility.

4.13.4 CONCLUSION

The No Action Alternative would not create any waste management issues at either the Salem or Industrial Park site, as no waste would be generated at the sites. However, by purchasing an equivalent amount of power from generation sources elsewhere, SME would be contributing indirectly to ongoing waste management impacts at existing generating stations in the region or at potentially new generating stations located outside of the region.

Construction-related impacts on waste management at the Salem site and Industrial Park site would be comparable to one another. Impacts would be of minor magnitude, medium-term duration, and small extent, and with a probable likelihood of occurring. The HPSL, which would accept all non-hazardous construction debris, has more than sufficient capacity to accept all the waste without impact to other waste generators within Cascade County. The overall rating for impacts on waste management from the construction phase of the power plant would be adverse and non-significant.

Operation-related impacts on waste management for the Salem site would be of moderate magnitude, long-term duration, and medium extent, and have a probable likelihood of occurring. Ash and water treatment system byproducts would be disposed of in an onsite monofill which would be managed with appropriate environmental controls, including groundwater monitoring. SME has submitted a No Migration Petition to DEQ, demonstrating that no waste or leachate would migrate off-site or infiltrate to groundwater. Other non-hazardous waste that would be generated during operation of the power plant would be disposed of at the HPSL. Hazardous waste generated at the site would either be recycled by a certified waste handler or transported out of state by a certified contractor to a hazardous waste disposal facility. The overall rating for impacts on waste management from the operational phase of the power plant at the Salem site would be adverse; these adverse impacts are most likely to be non-significant.

Operation-related impacts on waste management for the Industrial Park site would be of minor to moderate magnitude, long-term duration, and small extent, and have a probable likelihood of occurring. All non-hazardous waste generated during operation of the power plant, including ash, would be disposed of offsite. Hazardous waste generated at the site would either be recycled by a certified waste handler or transported out of state by a certified contractor to a hazardous waste disposal facility. The overall rating for impacts on waste management from the operational phase of the power plant at the Salem site would be adverse; and while impacts might likely be non-significant, there is some potential for impacts to become significant .

Waste management related impacts during the operation phase of the power plant would be slightly less for the alternative Industrial site than for the Salem site, as all waste generated from the Industrial Park site would be disposed of off-site. Overall, however, even given the volume, duration of impacts, and potential of contaminants, waste management impacts would likely be non-significant at both sites due to the Waste Management Plan, facilities and procedures which have been developed to handle wastes.

4.13.5 MITIGATION

Mitigation measures would include entering into and establishing a binding voluntary agreement with DEQ for the licensing and regulation of any onsite waste disposal at the Salem site. This agreement would include the installation of a groundwater monitoring system and management of the monofill ash disposal site in accordance with DEQ rules. Issuance of the solid waste license requires certification from the city or county that the site is zoned appropriately. Until that happens, DEQ cannot issue a license even if all other permitting requirements are satisfied.

Additional measures consist of seeking out recycling opportunities for construction debris and the coal combustion products, including ash, generated by the power plant. These beneficial uses of ash have the potential to reduce the operating costs by limiting use of on-site heavy equipment and by reducing the amount of impounded material which could extend the life of the monofill. Any ash disposed of through alternate methods can be collected directly from the plant. If the volume and production rate of ash required is greater than the production capabilities of the plant at the Salem site, ash could be reclaimed from individual storage cells of the monofill.

4.14 HUMAN HEALTH AND SAFETY

4.14.1 NO ACTION ALTERNATIVE

Under the No Action Alternative, the sites would continue to be maintained as agricultural land and no notable risks to human health and safety would occur at, or because of, the sites. However, by purchasing power from generation sources elsewhere, SME would be contributing indirectly to ongoing human health and safety impacts at different generating stations in the region or potentially at new generating stations located outside of the region. To the extent that other generation sources may be preexisting and under the purview of older, less stringent safety and emissions regulations, the No Action alternative could potentially be contributing to greater regional impacts on human health and safety. However, it is also possible that power purchases would be made from other recently-constructed or yet-to-be constructed generating facilities and/or non-fossil fuel facilities that equal or exceed HGS's health and safety performance.

4.14.2 PROPOSED ACTION – HGS AT THE SALEM SITE

An environmental site assessment of the Salem site determined that there were no recognized environmental conditions or concerns identified within a one mile radius of the site. Additionally, the Salem site is located a considerable distance away from the two National Priorities List (NPL) sites located within Cascade County. However, there are documented impacts from mining waste to soil, surface water and stream sediments in Belt Creek, which flows northeast of the site. Belt Creek, and the Missouri River north of the site, are listed as impaired water bodies which do not support the beneficial uses of aquatic life, coldwater fishery, and drinking water. Because human activities associated with the power plant at the Salem site would not conflict with any of these uses, the site itself is not considered to pose any risk to site workers and visitors.

4.14.2.1 Construction

The construction of a potential coal burning power plant would involve direct health and safety issues for workers. The National Institute for Occupational Safety and Health (NIOSH) considers construction to be a high-risk industrial sector. In 2001, approximately 9.6 million persons were employed in the construction industry. Fatal occupational injury rates in this industry ranged from 75.6 for ironworkers per 100,000 full-time workers to 6.0 for drywall installers, more than a 12-fold difference. Following ironworkers, the highest occupational injury rates for construction workers occurred in roofers, welders and cutters, construction laborers, and truck drivers (BLS, 2004). All construction activities on the power plant and associated facilities would be considered routine.

From Great Falls, plant access would be from southbound U.S. Route 87/89 to eastbound State Route 228 (Highwood Road) to northbound Salem Road. Under this alternative the combined Average Daily Traffic (ADT) of the Salem Road would increase considerably during the construction period, jumping from 36 vehicles in a day to a peak of about 1,340. On the

Highwood Road (SR 228), the ADT would go from 549 vehicles in a day to potential maximum of approximately 1850. Unlike the Salem Road, the Highwood Road is paved, so that even though both are one-lane each direction, it can accommodate greater traffic flow. Because of the increase in traffic, and the operation of heavy construction equipment on the roads, these areas could potentially face a negligible to minor increase in vehicular accidents during the construction phase.

4.14.2.2 Operation

During power plant operations, there would be no public access to the power plant and associated facilities. The entire plant site would be fenced as a part of the overall plant security plan. While specific site security arrangements have not yet been determined, vehicular and pedestrian access to the plant would be limited and controlled by some means.

The primary concern regarding human health and safety risks, as they relate to the operation of power plants, is the effect of air emissions, and in particular, mercury. A detailed description and analysis of the types, effects, and anticipated locations, of air emissions from the proposed plant can be found under air quality, Section 4.5. Emissions and air quality modeling conducted for this DEIS and DEQ's draft air quality permit indicate that modeled concentrations of pollutants from HGS are well below standards set by EPA and DEQ to protect public health and safety.

Like many naturally occurring materials, coal contains traces of radioactive uranium and thorium: an average of about 1 part per million (ppm) of uranium and 3 ppm of thorium. By comparison, the average brick contains about 8 ppm uranium and 11 ppm of thorium (NCRP, 1988). When coal burns, less than one percent of its radioactive contents are released into the atmosphere. The rest remains in the ash (USGS, 1997). Accordingly, there is relatively little accumulation of uranium and thorium deposited in the soil surrounding a coal fired power plant. Instead, the ash from coal burning retains most of the radioactive material, so it is somewhat more concentrated in the ash than it was in the original volume of coal. The concentration of uranium in fly ash is in the range of 10-20 ppm. By comparison, naturally occurring black shale rocks have uranium concentrations ranging from 11-18 ppm and commonly found phosphate rocks range from 17 to 120 ppm of uranium (USGS, 1997).

Because the concentrations of radioactive elements in coal and coal ash are roughly comparable to those in common materials such as bricks, exposure to coal ash would be roughly comparable to the radiation exposure from living or working in a brick building. That exposure provides a very small fraction of the average annual background radiation exposure experienced by a typical American (i.e. about 7 millirem/yr from brick as compared to about 360 millirem/yr on an overall average from all sources) (NCRP, 1988).

In regard to the small proportion of radioactive material that is released into the atmosphere, there are very little available data on the resulting exposure risk. EPA, however, cites a figure of 0.03 millrem/yr radiation exposure within 50 miles of a coal plant (EPA, 2006f). Given the overall average background exposure of 360 millirem/yr for the average person, this EPA figure would suggest that living near a coal plant is not likely to increase a person's radiation exposure by more than a very small amount.

In addition to air emissions, the large quantities of solid wastes that are generated from coal combustion activities can pose a risk to human health and safety if improperly analyzed and disposed of. In 1999, EPA conducted a risk assessment that found a lack of potential human health risk for virtually all coal combustion waste constituents. Arsenic was the one constituent for which EPA identified potential human health risks (EPA, 1999a). Arsenic was found to pose a potential human health risk via two pathways: 1) via the groundwater pathway where these wastes are managed in unlined landfills and surface impoundments, and 2) via non-groundwater pathways where these wastes are used as soil amendments for agricultural purposes. The identified risks in both these pathways are based on high-risk scenarios in EPA's risk modeling analysis for either the ingestion of wastewater influenced by releases from the waste management unit or from direct human ingestion exposure routes.

Transmission Line Corridor(s)

In the recent past, concerns have been raised about the health effects of powerful Electro-Magnetic Fields (EMF) emanating from high-voltage power lines that pass through populated residential areas. However, scientific studies appear inconclusive, with no consistent, significant link detected between EMF and cancer (Hafemeister, 1996). The generally low population density of Montana suggests that fewer people may be exposed to EMF from a new power line than in more populous areas of the country. Furthermore, the proposed transmission interconnectors from the HGS would not be routed near any residences.

4.14.3 ALTERNATIVE SITE – INDUSTRIAL PARK SITE

The alternative site is located in a historically and actively developed industrial siting area. During an environmental site assessment of the Industrial Park site, two Resource Conservation Recovery Information System (RCRIS) small quantity hazardous waste generators and a Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) – No Further Remedial Action site, were identified within a ¾ mile radius of the site. Additionally, the ESA identified one State hazardous waste (CECRA) site and one State Leaking Underground Storage Tank (LUST) within one mile of the Industrial Park site. None of these locations, however, were determined to pose an environmental threat to the proposed Industrial Park site, and no recognized environmental conditions or concerns were identified within a one-mile radius of the site.

The Industrial Park site is also located a substantial distance away from the two NPL sites located within Cascade County, and there are no impacts from mining in the water bodies adjacent to the site. The Missouri River flows south and east of the site and is listed as an impaired water body which does not support the beneficial uses of aquatic life, coldwater fishery, warm water fishery, and drinking water. Because human activities associated with the power plant at the Industrial Park site would not conflict with any of these uses, the site itself is not considered to pose any risk to site workers and visitors.

4.14.3.1 Construction

The construction of a potential coal burning power plant would involve similar direct health and safety issues for workers as described above under construction of the Salem site. All construction activities on the power plant and associated facilities would be considered routine.

From Great Falls, plant access would be from northbound U.S. Route 87. Under this alternative the combined ADT of the U.S. 87 would increase notably, going from 7,718 vehicles in a day to a peak of just over 9,000. Most of the project-related traffic would occur during both the morning and afternoon commutes, when a peak of approximately 550 vehicles per hour (estimated maximum) could be entering and exiting the construction site. This amount of traffic is believed to more than double the amount of vehicles accessing Route 87 between the hours of 6 and 7 a.m. and 3 and 5 p.m. Because of the increase in traffic, and the operation of heavy construction equipment, this area of U.S. Route 87 could potentially face a negligible to minor increase in vehicular accidents during the construction phase.

4.14.3.2 Operation

Impacts of the operation of the power plant to human health and safety at the Industrial Park site would be similar to those discussed under the Salem site. During power plant operations, there will be no public access to the power plant and associated facilities, and the entire plant site would be fenced as a part of the overall plant security plan.

The quantity and quality of air emissions would be the same as under the Proposed Action. A detailed write-up on the types, effects, and anticipated locations, of air emissions (including mercury) from the plant at the Industrial Park site can be found under air quality, Section 4.5. Because the area surrounding the Industrial Park site has a greater concentration of residential areas than the Salem site, there could be some amount of additional exposure of local residents to air emissions.

4.14.4 CONCLUSION

The No Action Alternative would not create any notable risks to human health and safety at, or because of, the sites. However, by purchasing power from generation sources elsewhere, SME would be contributing indirectly to ongoing human health and safety impacts at different generating stations in the region or at potentially new generating stations located outside of the region. To the extent that other generation sources may be preexisting and under the purview of older, less stringent safety and emissions regulations, the No Action alternative could potentially be contributing to greater regional impacts on human health and safety.

Construction-related impacts on human health and safety at the Salem site and Industrial Park site would be relatively comparable to one another. Impacts would be of minor magnitude, medium-term duration, and small extent, and with a probable likelihood of occurring. Construction of heavy industrial facilities would expose construction workers to short-term health and safety risks typically faced in the construction industry, considered high-risk by the National Institute for Occupational Safety and Health (NIOSH). Additionally, traffic volumes and the presence of heavy construction equipment on site access roads could potentially cause a negligible to minor increase in vehicular accidents. The overall rating for impacts on human health and safety from the construction phase of the power plant would be adverse and non-significant.

Operation-related impacts on human health and safety for the Salem site and the Industrial Park site would be of minor magnitude, long-term duration, and medium extent, and have a probable likelihood of occurring. A coal-fired power plant would emit an additional minor increment of mercury to the environment, thereby contributing incrementally to this cumulative problem; however, as discussed in more detail under Air Quality, these emissions are not likely to cause any health problems locally. The overall rating for impacts on human health and safety from the construction phase of the power plant would be adverse and most likely non-significant.

Impacts to human health and safety at the Industrial Park site are potentially a little greater than at the Salem site, due to its proximity to a greater number of residential areas. This distinction, however, is not large enough to classify the impacts from the power plant sited at the Industrial Park as being major or even moderate. Direct and indirect impacts to human health and safety in the local Great Falls area itself would probably be minor. Overall, the operation of a new, well-controlled CFB power plant at either the Industrial Park site or the Salem site represents negligible to minor human health and safety concerns, by contributing a tangible but small increment to several widespread, chronic, cumulative environmental problems. The contribution of the power plant's operation to widespread, regional, national, and global concerns is minor and incremental, but the problems to which it would contribute are serious ones. Impacts of the plant at either site would be adverse and most likely non-significant.

4.14.5 MITIGATION

Mitigation measures during operation of the power plant include installing and operating all BACT methods of reducing air pollutants, including non-criteria pollutants such as mercury. Implementation of proper waste management procedures and water pollution control would further reduce any impacts from the plant at either location.

4.15 SOCIOECONOMIC ENVIRONMENT

4.15.1 NO ACTION ALTERNATIVE

Under the No Action Alternative, no CFB coal-fired power plant would be constructed at either the Salem or Industrial Park sites. The direct and indirect economic benefits from a nearly half-billion dollar investment in the local economy and short-term (construction) and long-term (operation) job creation would be forgone under this alternative. However, this is not an adverse impact, but rather a lost opportunity to realize economic benefits to the local community from the Proposed Action.

Under the No Action scenario, by about 2012, SME would meet approximately 80 percent of its future base load electricity needs by means of a power purchase agreement(s) with one or more wholesale electricity provider in the WSCC and approximately 20 percent through its ongoing contract with WAPA.

Under this alternative, SME's member cooperatives and consumers would be unprotected from future increases in the price of electricity on the open market. Given the volatility of this market, and particularly that of natural gas prices – natural gas being one of the major fuels used to generate electricity in the northern Rocky Mountain West and Pacific Northwest, geographic areas covered by the WSCC – consumers could be paying substantially higher electric rates, although it is not possible to quantify precisely how much higher. It is not unreasonable to suppose that rates could be 20 percent to 100 percent higher. The higher electric rates for residential, commercial, and industrial consumers of electricity in the SME service area could potentially induce several direct and indirect effects.

Assuming a residential consumer decides to maintain pre-price-increase electricity consumption levels and pay more for the same electric service, potential direct effects for residential consumers of higher electricity bills would include less disposable income for other household expenditures. Thus, spending on goods and services in the local economy and therefore contributions to local economic activity would be reduced. The magnitude of this reduction would not be expected to be large (more than a few percent), in that a typical household's expenditures on electricity would constitute only a small percentage of its annual expenses. Nevertheless, in aggregate, reduced spending would ripple through the local economy, inducing effects such as modest job and income losses in the retail trade, arts, entertainment, recreation, accommodation and food services industries.

If the residential consumer decides to conserve electricity and/or use it more efficiently in response to higher rates, this could take the form of "doing without" or deprivation (e.g. reducing lighting levels, lowering the thermostat in winter and raising it in the summer) and/or installing more energy-efficient appliances such as refrigerators, compact fluorescent light bulbs, systems such as geothermal heat pumps and insulation, and more effective home insulation. Residential consumers could potentially feel less comfortable in their homes and possibly could be exposed to conditions that pose risks to their health and safety. This adverse effect would fall harder on lower-income residents, especially the 10 percent or more of households below the poverty line in the counties within SME's service area. Furthermore, this population would be least able to afford additional insulation, newer, more energy-efficient refrigerators, washers, dryers, and so forth, much less the more technically sophisticated energy conservation/efficiency devices.

With regard to SME members' commercial and industrial customers, higher electricity prices, by raising production costs (industry) and the cost of doing business (commercial businesses) could also have a variety of potential effects. For any given firm or institution, the magnitude of these effects would depend on how large the relative cost of electricity is compared to other factors of production. Higher electricity rates could influence decisions on whether to locate or expand activities within SME's service area; some firms that are power intensive may choose to locate in other regions where electricity costs less. Higher rates could spur increased investment in energy efficiency and conservation technologies among commercial and industrial customers. They could also lead to structural changes in the economy within SME's service area; less energy intensive industries would be favored while more energy intensive industries would be disadvantaged.

4.15.2 PROPOSED ACTION – HGS AT THE SALEM SITE

4.15.2.1 Construction

SME and Stanley Consultants estimate that construction of the HGS at the Salem site would take approximately 4 ¼ years (51 months) from the start of ground breaking to commercial operation of the plant. Construction would begin with site preparation, foundations, and underground utilities, while design of the above-ground mechanical, piping, buildings, structures, and electrical systems is being developed. Construction would take approximately four years and three months in all and would employ an average of 300 to 400 workers at any one time with an estimated peak construction workforce approaching 550.

During different phases of construction different categories of workers would rotate in and out of the site, with a small percentage of supervisors, engineers, and operations staff remaining onsite throughout the entire construction period. The first part of the construction process would involve civil and structural engineering work, and site preparation, including grading, and laying building foundations. The next phase would include steel work and rigging that would require the use of heavy machinery. After the setting of large structural components, welders, pipe fitters, machinists, and electricians would be on site to finish the project.

Wage rates for construction workers would vary from approximately $20/hr to close to approximately $40/hr. Most of the construction and engineering jobs would be highly-skilled, specialized, well-paying positions. The total cost of the 51-month project is estimated at approximately $515 million, of which approximately $100 million is construction labor (SME, 2005j).

Because of the specialized expertise required, the construction workforce is expected to be primarily drawn from outside the region. Based on a rough estimate that 75 percent of the power plant construction workers required would come from outside the region (SME, 2005j; Warren, 2004), the Great Falls area would see an increased demand on rental housing. These construction workers may rent apartments for the duration of their work, share hotel rooms with other workers, or drive a recreational vehicle (RV) to the area and stay at available sites during the week. Because many workers would live in their own RVs, the impact on the regional housing market would be minimized.

In the 2000 Census, Cascade County had 11,252 renter-occupied units (USCB, 2000b); given the county's overall vacancy rate of 8%, there would be roughly 900 vacant rental units in Cascade County. These vacant units, along with the more than 1,300 hotel rooms in Great Falls, could in all likelihood meet the housing demand for a majority of the temporary workers. With a large number of workers living in RVs during peak times or commuting from out of the region, the current housing stock could meet the demands of temporary workers. However, during special events in Great Falls, hotel rooms might not be available. Those workers who do not find housing in the Great Falls area could commute from other parts of the county and other nearby counties.

Most of the workers would be living in the area temporarily and would therefore not bring their families. However, a relatively small fraction of the workers associated with the construction of the plant would stay for the duration of the project and could potentially relocate their families, becoming permanent residents of the Great Falls area. In an area with a population of over 55,000, this increase would be expected to have a small economic impact and little impact on public services such as public schools.

The construction of a $515-million power plant would also create a number of jobs indirectly from project-related spending and the spending decisions of workers. This effect, known as the employment multiplier effect, takes the impacts from project-related spending into account to determine the number of indirect or induced jobs created in the local economy by an action. With an estimated employment multiplier of 1.5 (GOEO, 2006), the 400 jobs created during construction of the plant could potentially result in the creation of as many as 200 additional indirect or induced jobs, for a total of 600 jobs created by the project. However, these jobs would be temporary and would last only for the duration of the construction phase of the project.

The construction and operation of a power plant has the potential to create both temporary and permanent jobs, generating additional wages and benefits to be spent in the local economy. Local commercial entities in the community might expect to see some short-term, increase in activity related to expenditures by the project workforce.

Businesses in the project area might see some beneficial economic effects from per diem expenditures (meals, incidentals, etc.) by workers during the time they are in the local area. Current per diem levels for the region are about $60 for lodging and $39 for meals and incidental expenses, for a total of nearly $100/day.

Overall, the construction of the HGS at the Salem site would have a primarily positive or moderately beneficial effect on the socioeconomic environment of the local and regional area, including increases in employment opportunities, total purchases of goods and services, and an increase in the tax base. The creation of up to 400 construction jobs on average and the payment of approximately $100 million in wages to construction workers would be expected to result in a total, temporary economic stimulus for the Great Falls area from direct, indirect and induced effects of 600 jobs and $150 million in spending.

The Employment Multiplier

A "multiplier" is a number used by economists to determine the impact of a project on the economy. It is the ratio of total change in output or employment to the initial change (or direct change). For example, if an industry were to create 100 new jobs it would require materials and services from its supplying industries. If this increase in demand created 30 new jobs in the supplying industries, the employment multiplier would be 1.3 [i.e., 100 (direct) + 30 (indirect and induced)].

4.15.2.2 Operation

The operation of the HGS would require approximately 65 permanent employees with average salaries of $60,000 a year. The total annual payroll would be almost $4 million. These positions include plant operations, maintenance personnel, and engineering staff. Although the operations phase would not officially start until after the completion of construction, most of the staff would start working at the halfway point of the construction process in order to become familiar with the plant. The plant would be fully staffed six months prior to the end of construction.

The addition of 65 well-paying, technical and professional jobs to the Great Falls region would create a minor, beneficial economic impact for the region. With a labor force of 35,000 in Cascade County as a whole, the addition of 65 new, permanent jobs plus the potential creation of approximately 105 additional jobs through indirect or induced employment from the employment multiplier effect of 2.6 for the "power generation and supply" sector in Cascade County. This would result in the addition of about 170 jobs in total, or 0.5 percent of total employment in the area. This would represent a modest beneficial effect on the local economy, but would not be significantly beneficial. The long-term, total economic stimulus to the Great Falls/Cascade County area would be about $10.4 million (2.6 x $4 million) annually.

Many of the workers holding the approximately 170 new jobs created directly, indirectly, or induced by the HGS would have families associated with them. Using the relationship between 2000 Census figures for total Cascade County population and total employment, each new worker would be associated with an additional 1.3 persons in each household. Thus, the 170 new jobs would result in total population growth of almost 400 residents. Using the same assumption used in estimating the impact of construction – that 75 percent of the new jobs would go to new residents (former non-residents who would settle in the area) and 25 percent to existing residents of the Great Falls/Cascade County area, then the total net, permanent population gain from proceeding with the HGS would be approximately 300, in comparison with 2004 populations for Great Falls of approximately 56,000 and for Cascade County of approximately 80,000. These are minor demographic changes.

An additional economic benefit of the project is the property taxes that SME would pay to the

The Employment Multiplier II

The Montana Governor's Office of Economic Opportunity ran an IMPLAN model for the "Power Generation and Supply" sector for Cascade County. They got a "Type 1" multiplier of 1.6 and a "Type 2" multiplier of 2.6. The "Type 1" multiplier includes the jobs at the plant and the jobs created as a result of the plant doing business with other businesses in the county. The "Type 2" multiplier adds jobs created as a result of individual plant employees spending in the local community. The 2.6 multiplier is rather high compared to most industries, which is expected given that the utility industry pays very well compared to most Montana industries (GOEO, 2005).

Direct, indirect and induced spending/labor is the "total economic stimulus." What this represents is the total effect of multiple rounds of spending once an initial capital infusion is made. A dollar enters the local economy, in this case in the form of wages or purchases made by the plant. In each successive round of spending some portion of the original dollar "leaks" out of the local economy for payments like taxes, or purchases from outside the local economy - cars, major appliances, or contracts with outside firms, etc.

The remainder stays in the local economy and gets re-spent again and again until all of the original dollar eventually leaks out of the economy. When all of the original dollar has leaked out, the total stimulus associated with that dollar is complete.

The difference between "Type 1" and "Type 2" is the question of how far analysts want to track the original spending. Both types capture the entire stimulus, but the Type II is more comprehensive. The distinction is more based on where one stops the calculation. For the sake of simplicity this analysis uses the 2.6 multiplier. It includes the total direct, indirect and induced stimulus to the local economy.

state, county, city, and school district. Assuming the taxable value runs close to the estimated construction value, and assuming a factor of 3% on all portions of the project (cooperative and city), the estimated 2005 property taxes would be as follows: to the state, $2,282,067; county, $1,664,338; city, $2,131,606; and school district, $3,075,079. The total annual property tax levy would be $9,153,090 (SME, 2005j).

Although no social surveys have been conducted for this EIS, based on widespread experience with similar large industrial projects elsewhere in the state and country, it is possible that some neighbors or nearby residents of the HGS would generally oppose the project on certain grounds, or find some aspects of such a large, new industrial facility in an area that has always been rural to be objectionable, even while supporting the project generally. However, the Proposed Action, at least for the plant site itself, would not bring about any residential relocation, and would not require the use of eminent domain or condemnation. The sellers of the property on which the HGS would be sited are willing sellers. It is unlikely to affect property values, assessments, and property taxes of surrounding rural, agricultural properties, which could continue to be used as farmland and rural residences.

SME would negotiate the purchase of easements with other property owners in the vicinity whose land may be required for transmission line and/or pipeline rights-of-way. When an easement is obtained, it is added to the title of the property, and it travels with the title through ownership transfers, forever restricting its use. Easements can be bought, donated, or negotiated on a specific piece of property. They are usually valid for an indefinite period of time; however, certain easements protecting natural environmental features have been valid for a specific timeframe, such as 30 years. It is most common for easements to be valid *in perpetuity*, and the entity holding it determines the period of time most suitable to its needs and goals. In the event that neither party could agree on mutually acceptable price for an easement or sale in fee simple, SME, working with the state or county, would have the option of resorting to eminent domain.

> **Easement**: The right of a person, government agency, or public utility company to use or restrict public or private land owned by another for a specific purpose.

Eminent domain is a power reserved by a government agency, usually at the state or local level, to use their legislatively-granted police power to condemn a piece of property for the "public use". "Public use" can include anything furthering the health, safety, and welfare of the general public. In condemning the property, the entity must provide "just compensation" for the property, or pay the market value of the land or structure at the time of condemnation. It is required that the exercise of the eminent domain power be rationally related to a conceivable public purpose (Callies et al., 1994), although a closely watched, very controversial 2005 U.S. Supreme Court decision based on Kelo v. City of New London, 545 U.S. 469 (2005) gave local governments the right to condemn private property on behalf of private developers whose actions are purportedly fostering broad economic development aims in an area (Anon., 2005). If eminent domain were to be used by local or state government on behalf of an entity like SME, the land would then be fully owned by that entity.

> **Eminent Domain**: A power reserved by a government agency, usually at the state or local level, to use its legislatively-granted police power to condemn a piece of property for the public use.

4.15.3 ALTERNATIVE SITE – INDUSTRIAL PARK SITE

4.15.3.1 Construction

With one possible exception, the construction-related socioeconomic impacts of the Industrial Park site would be virtually identical to those of the Salem site or Proposed Action. Overall, the construction of SME's proposed generating station at the Industrial Park site would have a primarily positive or moderately beneficial effect on the socioeconomic environment of the local and regional area, including increases in employment opportunities, total purchases of goods and services, and an increase in the tax base.

The exception relates to the greater proximity of residential development to the site. Approximately seven groups of residences are located within one mile of the Industrial Park site, primarily along Black Eagle Road, Rainbow Dam Road, and Bootlegger Trail. The combination of increased worker and heavy equipment traffic, noise, and fugitive dust associated with a large construction project could prove a distinct inconvenience or annoyance for those individuals with less tolerance for these short-term environmental stresses.

4.15.3.2 Operation

As with construction, during its operational phase, the Industrial Park Alternative would have virtually identical socioeconomic impacts to those of the Proposed Action (HGS at the Salem site). Operation of the CFB coal-fired power plant would require approximately 65 permanent employees with average salaries of $60,000 a year. The total annual payroll would be almost $4 million. Approximately 105 additional indirect and induced jobs would be created via the employment multiplier effect for a grand total of approximately 170 new permanent jobs. The 170 new jobs would result in total population growth in the Great Falls and Cascade County of approximately 400 of which approximately 300 would be new residents in a county with a population of about 80,000.

Figure 4-19. New Homes Within 1 mile of Industrial Park site

The greater proximity of certain residents to the Industrial Park site could potentially expose them to various environmental stressors, including noise, air emissions and occasional fugitive dust, traffic, and views of industrial facilities rather than open space. While none of these impacts, which are covered in other sections, are significantly adverse in and of themselves, in combination they may degrade the quality of life for more sensitive nearby residents. However, residents close to a designated industrial park may not have expectations that it would resemble a natural park or even remain as empty lots and unused open space. For this reason, while the property values of the nearest residents could possibly decline, the magnitude of this decline is unlikely to be significant. As with the Salem site, there would be no residential relocations associated with the Industrial Park site, as the City of Great Falls owns the land.

4.15.4 CONCLUSION

Due to the higher electric rates it would likely lead to for SME's members and consumers, the socioeconomic impacts from the No Action Alternative would be somewhat significant and adverse. Other aspects of the socioeconomic environment, such as changes in employment, changes in the tax base and residential relocation, would not be affected by the No Action Alternative. Since no construction and operation of a coal-burning power plant would take place at either the Salem or Industrial Park sites, the No Action Alternative would not result in any adverse impacts at either of these sites.

Summarizing socioeconomic impacts (in particular, on income) of the No Action Alternative using the impact significance definitions described at the beginning of Chapter 4 and presented for Socioeconomic Impacts ("Changes in Income") in Appendix J, the magnitude would be "minor", the duration would be "long-term", the extent would be "medium", and the likelihood is "probable". Overall then, the rating for socioeconomic impacts (income) from the No Action Alternative would be somewhat significant and adverse. Other aspects of the socioeconomic environment, such as direct or indirect changes in employment, changes in the tax base and residential relocation, would be minimal under the No Action Alternative.

Overall, the construction of the HGS at the Salem site would have a moderately beneficial effect on the socioeconomic environment of the local and regional area, including increases in employment opportunities, total purchases of goods and services, and an increase in the tax base. Over the long term, during the operation of the HGS for 30 or more years, it would yield beneficial and potentially significant socioeconomic impacts on aggregate income, employment, and population in the City of Great Falls and Cascade County. It would also provide reliable electricity at reduced rates for SME's customer base.

Using the impact significance definitions described at the beginning of Chapter 4 and presented for Socioeconomic Impacts ("Changes in Income") in Appendix J, socioeconomic impacts on income, employment, and population of the Proposed Action would be of minor magnitude, long-term duration, medium extent, and the likelihood is probable. Overall then, the rating for socioeconomic impacts on income, employment, and population from the Proposed Action would be potentially significant and beneficial.

The rating for socioeconomic impacts on income, employment, and population from the Industrial Park Alternative would be same as for the Proposed Action, potentially significant and beneficial. The caveat is that the Industrial Park Alternative could have greater adverse impacts, though not likely significant ones, on the quality of life of nearby residents.

4.15.5 MITIGATION

Since most of the socioeconomic effects from both action alternatives are beneficial, and the adverse effects are not significantly adverse, no mitigation measures are planned or proposed.

4.16 ENVIRONMENTAL JUSTICE/PROTECTION OF CHILDREN

4.16.1 NO ACTION ALTERNATIVE

Under the No Action Alternative, there would be no construction or operation of a power plant at either the Salem or Industrial Park sites. As a result there would be no direct impact or effect from a plant on disproportionate numbers of minorities, persons living in poverty, or children at the sites.

However, insofar as SME would need to meet energy supply needs in the service area by purchasing power from existing generation wholesale suppliers located elsewhere, SME's member cooperatives and consumers would be unprotected from future increases in the price of electricity on the open market. Given the volatility of this market, consumers could be paying substantially higher electric rates in the future under the No Action Alternative. Although it is not possible to quantify precisely how much higher, it is not unreasonable to suppose that rates could be 20 percent to 100 percent higher.

The No Action Alternative then, would preclude building a new power plant which would provide a consistent and reliable energy source for the service area. This could lead to indirect economic effects on commercial and residential populations within SME's service area.

Low-income residential consumers would be the most affected population group from increased electrical rates and higher electricity bills. This population group would be least able to afford to upgrade their homes with energy-saving measures, such as installing additional insulation or more energy-efficient appliances and heating systems, in order to lower their energy bills. As a result, low-income residents would potentially have to reduce their electrical usage and could be susceptible to insufficient energy and heating conditions in their homes. This could expose this population group to conditions that would pose risks to their health and safety.

4.16.2 PROPOSED ACTION – HGS AT THE SALEM SITE

4.16.2.1 Construction

The construction of the power plant at the Salem site, and the installation of its infrastructure, would have a negligible effect on disproportionate numbers of minorities, persons living in poverty, or children, as these population groups are not generally present at or near the Salem site.

There are only eight scattered rural residences located within three miles of the site. The closest residence is located approximately 0.5 mile northwest of the site and is owned by the current property owner of the Salem site. Though there would be nuisances such as noise, dust, and traffic associated with construction activities, these impacts would not cause an environmental justice or protection of children concern due to the lack of these affected population groups in disproportionate numbers in the areas impacted by construction activities.

4.16.2.2 Operation

The operation of the plant at the Salem site would create emission of air pollutants, noise, increased rail and road traffic, and visual impacts on adjacent lands. Additionally, the site would be an industrial facility situated amidst agricultural lands. The siting of the plant, and the reliable infrastructure and possible cogeneration energy that would be available in this area once the plant is operational, could potentially influence land uses in the greater vicinity of the site to become more industrialized. These impacts would have a negligible effect on disproportionate numbers of minorities, persons living in poverty, and children, for the same reasons as discussed above under construction impacts. Simply, these population groups are not generally present in disproportionate numbers at the Salem site or the areas affected by the Salem plant's emissions and other operational impacts.

4.16.3 ALTERNATIVE SITE – INDUSTRIAL PARK SITE

4.16.3.1 Construction

The construction of the power plant at the Industrial Park site, and the installation of its infrastructure, would have a negligible to minor effect on disproportionate numbers of minorities, persons living in poverty, or children, as the impacts associated with construction would generally be limited to the construction areas which are agricultural or industrial zoned areas. However, there would be nuisances such as increased noise, dust, and traffic associated with construction activities, and these impacts could have the potential to cause an environmental justice or protection of children concern due if these affected population groups are located in the areas impacted by construction activities.

There is a greater proximity of residential development to the Industrial Park Site compared to the Salem site, though it is by no means a highly populated area. Approximately seven groups of residences are located within one mile of the Industrial Park site, primarily along Black Eagle Road, Rainbow Dam Road, and Bootlegger Trail. These areas are primarily low-density single family home areas and have no known disproportionate number of minorities. Additionally, these residential areas have no known disproportionate number of persons living below the poverty level. In fact, several of the homes located nearest to the Industrial Park Site are newly constructed, relatively large and high-cost single family homes.

Although there would be no environmental justice issues associated with construction activities at the Salem site, children may be presumed to live in several of the residencies near the site. Mitigation measures taken to minimize construction impacts (e.g. employing the use of noise reduction equipment, dust suppression, limitation in the timing of construction), would decrease these impacts below the threshold of significance and should provide adequate protection to children living in the area.

4.16.3.2 Operation

The operation of a power plant at the Industrial Park Site would have the same air pollutant, noise, increased rail and road traffic, visual, and land use impacts as would operating the plant at the Salem site. The Industrial Park Site, however, has the potential to cause a slightly increased risk of impacting children and persons living in poverty, due to the fact that the site is located in closer proximity to higher population areas and additional industrial sites. No impacts are anticipated to a disproportionate number of minorities, as Cascade County does not have disproportionate numbers of minority groups.

The current burden from existing facilities emitting criteria air pollutants to residents and children living below the poverty line in Cascade County is approximately twice that of the burden to families and children above the poverty line (Scorecard, 2005). Though there are no known concentrated areas of poverty within the areas of impact from the proposed plant's air emissions, consideration was given to not exacerbating the emissions of existing facilities located within the area of impact with additional emissions from the plant. In other words, hypothetically the emissions from the proposed plant could be compounded by other industrial emissions in the vicinity which could potentially place an undue burden of air pollutants on residents downwind of the facilities, particularly children, and if present, low-income residents. The air quality permit analysis looked at the potential of HGS emissions to add to other industrial facility emissions. No additive impacts were found in this modeling of cumulative impacts.

4.16.4 CONCLUSION

There is not a disproportionate number of minorities in Cascade County, and none of the alternatives are expected to have an impact on a minority population group. Further, there is no evidence that siting of the proposed SME facility has targeted areas with disproportionately high levels of racial minorities or impoverished populations. Moreover, there has been no regulatory discrimination of enforcement standards where projects may affect those groups. Finally, there is no inequitable distribution of benefits, primarily economic, with project impacts such as increased pollution to those groups.

The No Action Alternative would involve no direct impact or effect from a power plant on persons living in poverty or children at either the Salem or Industrial Park sites. However, insofar as SME would need to meet energy supply needs in the service area by purchasing power from existing generation wholesale suppliers located elsewhere, SME's member cooperatives and consumers would be unprotected from future increases in the price of electricity on the open market. This could lead to indirect economic effects on commercial and residential populations within SME's service area, which could disproportionately affect low-income residential consumers. Low-income residential energy consumers would potentially have to reduce their electrical usage and could be susceptible to insufficient energy and heating conditions in their homes. These impacts would be moderate magnitude, intermittent-term duration, small extent, and possible likelihood.

The Proposed Action, construction and operation of a power plant at the Salem site, would have a negligible effect on children or persons living in poverty, as these population groups are not generally present at or near the Salem site. The Salem site and its adjacent land is low-density agricultural land, and though nuisances associated with construction and impacts from plant operations would affect areas within this land, there are no particularly susceptible population groups present in significant numbers within the area to cause concerns regarding environmental justice or protection of children.

Construction and operation of the power plant at the Industrial Park site would involve the same impacts as at the Salem site, however, there is some potential of a slightly increased risk of impacting children and persons living in poverty from this site, due to the fact that it is located in closer proximity to higher population areas and additional industrial sites. The emissions from the proposed plant hypothetically could be compounded by other industrial emissions in the vicinity which could potentially place an undue burden of air pollutants on residents downwind of the facilities, particularly children, and if present, low-income residents. However, during modeling of cumulative air quality impacts conducted as part of the air permitting process, this hypothesis was largely discounted. It is currently considered an impact of minor magnitude, long-term duration, medium extent, and having an improbable likelihood of occurring. Overall impacts would be adverse but non-significant.

4.16.5 MITIGATION

Since there are no significant, adverse impacts from the action alternatives anticipated on disproportionate numbers of minorities, persons living in poverty, or children, no mitigation measures specific to Environmental Justice issues are planned or proposed for either of the action alternatives. However, mitigation measures taken to minimize construction and operation impacts to other resource areas (e.g. reduction in noise, visibility, and air quality impacts) would also directly lessen the impacts to any sensitive or susceptible receptors in the impact areas, including children, minorities, or persons living below the poverty level.

4.17 EVALUATION OF RESTRICTIONS ON PRIVATE PROPERTY

MEPA provides that a state agency is required to prepare a regulatory restriction analysis that analyzes alternatives to reduce, minimize, or eliminate regulatory impacts on private property. Alternatives and mitigation measures designed to make the project meet minimum environmental standards specifically required by federal or state laws and regulations are not required to be evaluated as a regulatory restriction if the agencies have no discretion to alter or waive them. Components of the alternatives that are taken from permit applications, such as the MPDES, Air Quality, and 404(b)(1) permits, are also considered non-discretionary. However, if DEQ does not have the authority to impose mitigation, it is considered discretionary, and the impact of the cost of that mitigation must be disclosed.

Were DEQ to deny the air quality application under the No Action Alternative, SME would be required to make other arrangements for provision of electricity to its customers, which could increase its cost. Were DEQ to require the location of the power plant at the Industrial Park Site as described in Section 2.2.3, there would be increased costs because fly ash would need to be hauled off site. Also, there would be the loss of 6 MW of wind power should the Industrial Park Site be selected. However, no discretionary regulatory restrictions would be imposed under either of these alternatives.

For the Salem Site as described under the Proposed Action in Section 2.2.2, DEQ is not proposing any requirements that are not required by state law or rule. Because DEQ does not have authority to modify the requirements at the Salem Site, there are no alternatives that would reduce regulatory impacts on private property.

During the Section 106 consultation process, a number of mitigations to reduce impacts to the NHL from locating the power plant at the Salem Site were discussed. A mixture of mitigations that would directly affect the Salem Site as well as other off-site mitigations associated with the Lewis and Clark Trail were developed. This resulted in $480,000 of on-site mitigations which included relocating the power plant footprint outside the NHL boundary. That mitigation has already been incorporated into the Proposed Action in the final EIS. Off-site mitigations include property acquisitions and a variety of assistance to programs at the Lewis and Clark Interpretive Center and Library including $16,000/year for 30 years plus an initial $75,000 payment. These cultural mitigations would total $1,035,000 over the estimated 30-year life of the power plant (see Table 4-18), subject to agreement of the agencies involved in the consultation process, including RUS. However, DEQ has no authority to impose these cultural mitigations should the Salem Site be selected and is therefore not proposing to impose them.

4.18 UNAVOIDABLE ADVERSE IMPACTS

The Proposed Action analyzed in this EIS is the construction and operation of the proposed HGS and wind turbines at the Salem site and the associated connected actions. The connected actions of the Proposed Action include the construction and operation of power transmission lines, a rail spur, and potable, raw water and wastewater lines. The construction and operation of the proposed HGS and the connected actions would result in some unavoidable adverse environmental impacts in the Montana and the United States. This section describes these impacts.

Soils, Topography, and Geology

Under the Proposed Action, the total area of disturbance for construction and operation activities would include the total footprint of the power plant, approximately 545 acres, and additional roadway, rail spur, and utility corridor zones. The wind turbines would require approximately 4.5 acres. The construction and operation of a power plant and its associated infrastructure would involve extensive site grading and excavation activities that would compact and displace a considerable amount of soil and alter the topographic contours of the Salem site and its vicinity. Removal of vegetation and compaction would occur in the work areas, with potential impacts on erosion. Soil displacement and compaction would occur during site grading and use of access roads. Though the impacts associated with topography are considered negligible, because the site is generally evenly contoured already, the impacts to soil resources would be adverse and moderate in magnitude.

Table 4-18. Regulatory Restriction Costs on Private Property

On-Site and Off-Site Cultural Avoidance, Minimization, and Mitigation Measures for the SME HGS Cost Estimate Summary			
	Est. One Time Cost ($)	**Annual Cost ($)**	**Comments**
On-Site Avoidance, Minimization and Mitigation Measures:			
Shift the footprint of HGS outside NHL boundary	200,000		Air modeling $20,000; Geotech eval. $78,000; Additional engineering cost and support $96,000
Maximize use of downward directional lighting	50,000		Incremental cost for additional yard lighting
Use earth tone colors on HGS facilities	200,000		Stack and Coal Silo colored a sky blue
Evaluate use of landscaping around HGS	30,000		Upfront costs for design and options proposal
Total On-Site Avoidance, Minimization and Mitigation Measures:	*480,000*		
Off-Site Mitigation Measures:			
Attempt to acquire property at L&C Staging Interpretive Site - plant native vegetation	75,000		Estimated cost of approx. 40 acres
Assist in acquisition of properties near L&C Interpretive Center		2,500	
Assist in funding L&C Interpretive Center Library and Heritage Foundation HQ		2,500	
Set up annual contributions to L&C educational programs at Interpretive Center		5,000	
Provide in-kind electrical service to L&C Interpretive Center		6,000	
Total Off-Site Mitigation Measures:	*75,000*	*16,000*	
Total SME Avoidance, Minimization and Mitigation Costs:	***555,000***	***16,000***	
Total Life of Plant Cost:	***$1,035,000.00***		Assumed 30 year economic life for HGS

Water Resources

Construction and operation of the power plant at the Salem site would have adverse impacts on water resources from the increase in the amount of storm water runoff carrying sediment and contamination loads into surface water from the site, from the risk of contamination to ground water and surface waters in the vicinity of the site, and from the water withdrawals from the Missouri River and subsequent municipal water discharges. The water withdrawals from the Missouri River could reduce the river flows by 0.31 percent, representing an adverse but less than significant impact to the Missouri River flows downstream of the site. The subsequent discharge of wastewater into the City of Great Falls for treatment at its existing wastewater treatment facility would result in adverse but insignificant impacts.

Direct loss of wetlands and floodplains adjacent to the Missouri River would result from the construction and operation of the water intake structure in the Morony Reservoir and the installation of transmission line and pipeline within the River corridor. These impacts would be temporary, adverse and insignificant.

Air Quality

Impacts from the Proposed Action would result in adverse but not significant impacts on air quality. Impacts specifically related to construction activities would include exhaust and fugitive dust emissions generated by the operation of construction vehicles, which would cause adverse and moderate impacts to degradation of local air quality in the short term.

The Proposed Action would also cause a number of on-site and off-site impacts on air quality from operation activities. The emission of criteria pollutants and/or trace element deposition would cause adverse and moderate impacts to degradation of local air quality in the long term. Additionally, operation of SME's generating station would cause off-site impacts on PSD Class I increments and several AQRVs (visual plume, regional haze, and acid deposition), that would be adverse and of minor to moderate magnitude. None of these impacts would be significant in and of themselves, though they would contribute small changes to identified environmental resources that are affected by air quality impacts. Releases of greenhouse gases and mercury would be adverse and represent a minor incremental contribution to other air quality impacts.

Biological Resources

The Proposed Action would result in several adverse and moderate in magnitude impacts from construction and operation activities related to the plant and its associated facilities. Specifically, adverse impacts would result from the short-term harm to aquatic biota from degraded water quality; the long-term increase in mortality of terrestrial mammals by rail strikes and increased traffic on the plant access roads; the increase in mortality to birds and bats from blade strikes on wind turbines; and the disturbance of wetland habitats during installation and operation of the water intake structure. These impacts combined would result in adverse though non-significant impacts on biological resources.

Acoustic Environment

Impacts of the Proposed Action would result adverse impacts on the acoustic environment. Noise levels associated with the daily operation of a typical 250-MW coal-fired power plant would be caused primarily by the Induced Draft fans, Primary Air fans, Secondary Air fans, transformers, cooling tower, turbine, boiler, coal crusher and trains for coal delivery. Intermittent noise sources associated with the power plant that would not significantly affect the daily operation L_{dn} but could be audible for several miles from the site, including steam line cleaning, start-up steam vents, tonal noise produced by the ID fans, and locomotives used to deliver coal.

The noise levels of typical daily plant operations are not predicted to exceed the EPA guideline of L_{dn} 55 dBA beyond 0.6 mile from the Salem site and are predicted to be approximately equal to the existing ambient noise levels during quiet periods at approximately 3.1 miles from the Salem site. The HGS power plant noise levels are predicted to be less than the 50 dBA nighttime noise limit of the Great Falls Municipal Code for residences, and less than or equal to the EPA L_{dn} 55 dBA guideline, at all of the receptor locations in the study area. Employee vehicle traffic and delivery truck noise is predicted to be less than MDT's L_{eq}(h) 66 dBA impact criteria at 50 feet from the plant access road.

Were it not for the presence of the National Historic Landmark, these noise impacts on Great Falls and the surrounding countryside and rural residents of the Salem site would not be considered significant. However, because of National Park Service Policy to avoid any degradation to natural ambient "soundscapes" in areas administered by NPS, construction and operation of the HGS would represent a significant long term adverse impact on the acoustical environment of the NHL.

Recreation

Construction and operation of the HGS and wind turbines at the preferred Salem site would result in adverse and minor impacts on recreation in the immediate project vicinity and wider Great Falls area. Though the Proposed Action would not restrict access to the recreational site in the immediate vicinity of the project area, the Lewis and Clark staging area historic site (part of the Great Falls Portage National Historic Landmark), the presence of the power plant 1.75 miles (2.8 km) to the south of the Lewis and Clark historic site would degrade the recreational experience there to some extent for the few visitors the site receives.

Cultural Resources

The Proposed Action would result in adverse and significant impacts on cultural resources from site preparation, staging, construction, maintenance, operations, and connected actions associate with the power plant, wind turbines water lines, transmission lines, rail supply lines. Specifically, the adverse and significant impacts on cultural resources would be a result of the effect that the visual presence of the power plant and its associated facilities would have on the historic scene and the visual landscape qualities of the Great Falls Portage National Historic

Landmark. While these impacts could be mitigated, they could not entirely be eliminated by proceeding with the Proposed Action at the Salem site.

Visual Resources

The Proposed Action, including the construction and operation of wind turbines and the proposed transmission line interconnections, would result in adverse and potentially significant impacts on visual resources. The primary reason for these adverse impacts is the large visual change the power plant, wind turbines, and the transmission lines would have on the scenic setting in the project area, and the effect the power plant power plant and its associated facilities would have on the scenic quality of the Great Falls Portage National Historic Landmark.

Transportation

The Proposed Action would result in minor, adverse impacts on traffic congestion from activities related to construction of the power plant and its associated facilities. Specifically, the combined average daily trips (ADT) of vehicles using Salem Road would increase considerably during the construction phase of the project.

Farmland and Land Use

Impacts from the Proposed Action would result in adverse, non-significant impacts on farmland and land use in the vicinity of Salem site. In the context of the amount of quality farmland in other areas of Cascade County, the actual conversion, or development, of the land required for the plant would be adverse and only a minor in magnitude impact. However, the influence and impacts of the power plant and its associated support facilities could indirectly influence land uses on adjoining or nearby properties in the vicinity of the site. The impacts associated with operating the plant could potentially cumulatively affect one particular area and be perceived as adverse enough to residents that they would choose to relocate. Over time this cycle could continue and the predominant land use in the area could change from being primarily farmland to being primarily industrial land. Additionally, the development of the Salem site in of itself may reduce market values of nearby rural, agricultural land. If property values were affected, there would be repercussions on land assessments and property taxes.

Waste Management

Construction and operation of the power plant at the Salem site would result in adverse and moderate in magnitude impacts on waste management. The impacts would primarily be a result of the large amount of debris generated from construction of the plant and its associated facilities, from the risk of leaching associated with the onsite disposal of ash and water treatment system, and from the risk of runoff from any waste piles temporarily stored on site.

Human Health and Safety

The Proposed Action would result in adverse and minor in magnitude impacts on human health and safety. Construction of the power plant and associated facilities would expose construction workers to short-term health and safety risks typically faced in the construction industry. Traffic volumes and the presence of heavy construction equipment on site access roads could potentially cause a negligible to minor increase in vehicular accidents. The emission of an additional minor increment of mercury to the environment during plant operations would contribute incrementally to the problem of mercury accumulation in the biosphere, wildlife, and humans.

4.19 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

NEPA and MEPA require that environmental analysis include identification of "…any irreversible and irretrievable commitments of resources which would be involved in the Proposed Action should it be implemented." This section thus describes irreversible and irretrievable commitments of resources associated with the implementation of the Proposed Action, as described in Chapter 2 of this EIS.

Irreversible resource commitments are related to the use of nonrenewable resources, such as soils, wetlands and visual resources, and the effects that the uses of these resources would have on future generations. Such actions are considered irreversible because their implementation would affect a resource that has deteriorated to the point that renewal can occur only over a long period of time or at great expense, or because they would cause the resource to be destroyed or removed.

Irretrievable resource commitment of natural resources means loss of production or use of resources as a result of a decision. It represents opportunities forgone for the period of time that a resource cannot be used. Irretrievable refers to the permanent loss of a resource including extinction of a threatened or endangered species, disturbance of a cultural site, loss of land production, or use of natural resources (including minerals and coal). For example, production or loss of agricultural lands can be irretrievable, while the action itself may not be irreversible.

Topography, Soils, and Land Use

The construction and operation of the proposed power plant, and its associated facilities and infrastructure, plus the wind turbines would require the commitment of approximately 550 acres of land for the plant footprint and additional land for roadway, rail spur, and utility corridor zones; and the excavation and/or grading of extensive amount of soil within this land. This commitment would be irreversible for the life of the power plant and the wind turbines. While it is possible that these structures, roads, rail spurs, and utility corridor zones could be removed and the natural landscape renewed, this is unlikely in the foreseeable future.

Water Resources

The consumptive use of 80 to 85 percent of the water diverted from the Missouri River during operation of the plant (which would range from 3,000 to 3,500 gallons of water per minute) would represent an irretrievable commitment of water resources. The diversion of surface water would result in a reduction of the Missouri River flow downstream of the Morony dam by 0.31 percent. Additionally, there could be direct disturbance of a negligible amount of floodplains and wetlands as a result of the construction and operation of the water intake structure in the Morony Reservoir and the installation of transmission line and pipeline within floodplain and wetland areas of the Missouri River. The loss and/or degradation of floodplain and wetland areas could represent an irreversible commitment of water resources.

Biological Resources

The construction and operation of the power plant, wind turbines, and their associated facilities and infrastructure would result in limited irreversible and irretrievable commitments of natural and cultural resources. Vegetation would be irretrievably removed from the footprint of the plant and the additional land dedicated for roadway, rail spur, and utility corridor zone development. The areas occupied by structures as well as the access roads and maintained grounds, would be irreversibly removed from natural habitat for the duration of the existence of the plant. Although some sensitive species might be affected by construction, it is unlikely that threatened or endangered species or their habitat would be harmed.

Cultural and Visual Resources

The presence of the power plant, wind turbines, and their associated facilities would impact the visual and cultural resources of the Great Falls Portage NHL. This commitment of the Great Falls Portage NHL viewshed would be irreversible for the duration of the presence of the power plant and its facilities. While it is possible that the plant, wind turbines and associated facilities could be removed someday and the natural landscape of the area renewed, this is unlikely in the foreseeable future.

Construction Materials

Construction of the HGS and its secondary actions would result in both the irreversible and irretrievable use of construction materials. Many of the materials used for constructing the plant, transmission poles, and wind turbines, in particular the steel and other metals that would have to be committed, are ultimately recyclable but would remain an irreversible commitment of resources for the life of the project. Other construction materials, such as insulation materials, plastics, concrete, siding, piping, and so forth, would in large part likely represent an irretrievable use of materials, as upon any demolition of structures at the end of the project life, these materials would be ultimately disposed of at a landfill.

Moderate quantities of fossils fuels would be irretrievably consumed during the construction of the power plant, wind turbines, and their associated facilities. Diesel fuel and gasoline would be consumed by construction equipment such as bulldozers, backhoes, earth scrapers, motor graders, heavy haul trucks, large tractors, concrete trucks, asphalt pavers, concrete pavers, rollers, and compactors, and cranes, during the four years and seven months (51 months) estimated for completion of construction activities. Aviation fuel would be consumed by helicopters assisting in construction related activities. The consumption use of fuel during construction activities would not constitute a long-term drain on local resources.

Operation Materials

Operation of the power plant at the Salem site would result in the irretrievable commitment of several resources, including coal, limestone, ammonia, fuels, and processing chemicals. Coal consumption is estimated to be 259,300 lb/hr, or 1,135,800 tons/yr. Limestone and ammonia would be purchased and used to reduce air pollutants. Limestone would be consumed at a rate of approximately 5,780 lb/hr or 25,300 tons/yr. Ammonia would be consumed at 50 lb/hr (220 tons/yr).

Processing chemicals and maintenance chemicals such as oils, paint and paint thinner, and solvents and degreasers, would also be consumed during plant operations. In addition, all of the energy, fuels, and other materials, such as processing chemicals and maintenance chemicals, including oils, paint, paint thinner, solvents and degreasers, would also be consumed during plant operations and would represent irretrievable commitments of resources to the Proposed Action.

4.20 RELATIONSHIP BETWEEN SHORT-TERM USE OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

NEPA and MEPA require consideration of the relationship between short-term uses of the environment and long-term productivity associated with a Proposed Action. This involves the consideration of whether a Proposed Action is sacrificing a resource value that might benefit the environment in the long term, for some short-term value to the sponsor or the public.

In the context of the short-term uses of the environment associated with the operation of the HGS and the long-term impairment of environmental resources as they have been analyzed in this EIS, short-term refers to the that period of time encompassing the life span of the power plant and its associated facilities to the period of time encompassing the disassembly of the plant and subsequent restoration and rehabilitation activities. Long-term refers to that period of time following restoration and rehabilitation activities, during which consequent impacts from the Proposed Action still affect the environment.

The proposed short-term uses of the environment associated with the Proposed Action are the development of 545 acres of land for the footprint of the power plant and additional land for roadway, rail spur, and utility corridor zones; the consumptive use of 2,400 to 3,000 gallons of water per minute of Missouri River water; the direct loss of farmland, vegetation, wildlife habitat corridors, and floodplains and wetlands; and the consumptive use of coal, limestone, ammonia, and other nonrenewable resources.

Upon retirement and disassembly of the power plant and its associated facilities, the developed land would be returned to uses similar to the currently existing use of predominantly low to moderate valued farmland. The projected period before natural conditions return to an approximate pre-project status within the project area is expected to exceed several decades following completion of restoration activities. Organic content, biological activity, and horizon development in the replaced soil surface layers of the project area would be expected to take an especially long time to approach background conditions. On the other hand, the long-term loss of productivity in the soils may eventually be greater than pre-project conditions, due to the continued loss of topsoil and organic constituents from current agricultural practices.

Water withdrawals from the Missouri River would cease immediately and concurrently with retirement of the power plant. As a result, flows in the Missouri River would recover the amount of water withdrawn for plant operations immediately following plant retirement. This may result in a temporary increase in erosion of the river banks as the velocity and volume of water flowing downstream of Morony dam could experience a negligible to extremely minor increase. River flow conditions would adapt and recover after several years at the most. Floodplains and wetlands restored following equipment removal and rehabilitation efforts would take several decades to recover pre-development characteristics. However, if restoration were to implement efforts to enhance riparian zones along the Missouri River, long-term productivity could eventually increase as compared to current conditions, which are characterized by limited productivity of area floodplains and wetlands.

Immediately following the disassembly of the power plant and its associated facilities, and regrading and revegetation of the project site, the viewshed associated with the Great Falls Portage National Historic Landmark could be restored, and the associated visual and cultural resource impacts could be mitigated.

To the extent that operation of the power plant contributes incrementally to the long-term forcing of climate change and global warming due to its air emissions including greenhouse gases, or contributes to the long-term increase in pollutant and trace metal deposition, this project could contribute in a minute but non-trivial way to potentially significant potential impacts on long-term productivity of terrestrial and aquatic ecosystems dependent on the climate system. The relative emissions from this facility, compared to national and global emissions, are discussed in this EIS.

The short-term social gains associated with the Proposed Action would result in beneficial long-term socioeconomic productivity in the vicinity of the project site. The Proposed Action would generate net socioeconomic benefits for the local and regional economy over the anticipated time of the project life and for several decades thereafter. Between 300 and 400 temporary construction jobs at any given time, and approximately 65 full-time jobs, would be created by the Proposed Action. Total payroll for the construction workers is anticipated to be approximately $100 million, and the total annual payroll for full-time employees is anticipated to be approximately $4 million.

The total economic stimulus to the Great Falls/Cascade County area during the life of the project would be about $10.4 million (2.6 x $4 million) annually. An additional economic benefit of the project is the property taxes that SME would pay to the state, county, city, and school district. Assuming the taxable value runs close to the estimated construction value, and assuming a factor of 3% an all portions of the project (cooperative and city), the estimated 2005 property taxes would be as follows: to the state, $2,282,067; county, $1,664,338; city, $2,131,606; and school district, $3,075,079. The total annual property tax levy would be $9,153,090.

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5.0 CUMULATIVE IMPACTS

In response to public comments, RD and DEQ have made several edits to the text of Chapter 5. Any additions or changed text in the FEIS from the DEIS as a result of public comments are shown in double underlining. Deletions are not shown.

5.1 INTRODUCTION

The mile-deep Grand Canyon of the Colorado River in Arizona is a dramatic illustration of cumulative impacts, although in this case from natural forces (erosion occurring over six million years) rather than human causes.

In the context of the NEPA and EISs, the Council on Environmental Quality's (CEQ) Regulations (40 CFR 1500-1508) implementing the procedural provisions of NEPA, as amended (42 USC 4321 et seq.), define cumulative effects as:

> the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other action.
> (40 CFR 1508.7)

Cumulative effects may be adverse, beneficial, or both.

Incorporating the principles of cumulative effects analysis into the environmental impact assessment of a proposed action should address the following:

- Past, present, and future actions;
- Other Federal, non-Federal, and private actions;
- Impacts on each affected resource, ecosystem, and human community; and
- Truly meaningful effects.

MEPA has a somewhat narrower requirement for considering cumulative impacts of proposed actions, as stated in Section 75-1-208, MCA:

> (11) An agency shall, when appropriate, consider the cumulative impacts of a proposed project. However, related future actions may only be considered when these actions are under concurrent consideration by any agency through preimpact statement studies, separate impact statement evaluations, or permit processing procedures.

Because the federal requirement for analyzing cumulative impacts is broader, this EIS will follow those guidelines, which call for the inclusion of future non-Federal and private actions in the cumulative impacts analysis, and not only those actions currently under consideration by an agency in permitting procedures or other environmental reviews.

In analyzing cumulative impacts, spatial and temporal boundaries must be selected. These form the context of the cumulative analysis. Judgment should be used in choosing the most appropriate boundaries to meaningfully assess the role of the proposed action, secondary actions and connected actions in comparison with overall effects from all past, present and future actions. If spatial and temporal boundaries are set too narrow, this will tend to overstate the relative importance of the proposed action compared with others, but perhaps reduce the overall cumulative scale of impacts to a misleadingly small magnitude. For example, with regard to some aspects of air quality (e.g. long range atmospheric transport of the acid rain precursors sulfur dioxide and nitrogen oxides), using the subject county's or even state's boundaries could amplify the role of a given project's emissions, while simultaneously diminishing the overall scale of the acid rain issue by artificially confining it to an area where it is not especially problematic.

In contrast, if spatial and temporal boundaries are set too broad, the contribution of the proposed action to cumulative impacts will be unduly small in comparison with the contributions of all other actions, but the overall scale of cumulative effects may be enormous and exaggerated. Consider the example of a proposed action that in conjunction with all others was predicted to lead cumulatively to the extinction of a given species. If a cumulative impacts analysis considered this phenomenon in the context of a geologic time scale measured in millions of years, during which time a number of species could disappear while new ones evolved, such an analysis would improperly diminish the significance of cumulative impacts leading to the permanent extinction of the species in question.

Ideally, natural boundaries should be used, but sometimes institutional or geographic boundaries are relevant as well, especially when certain key impacts weigh as much on the human environment as the natural environment. Spatial boundaries may also vary by resource topic. In the present cumulative analysis, Cascade County's boundaries may be the most appropriate for some resource topics, the state of Montana's the most appropriate for others, and the nearest reaches of the Missouri River for still others. However, a number of impacts to which the proposed action and secondary and connected actions contribute incrementally are much further away, much larger, or widely dispersed: the entire downstream length and watershed of the Missouri River, airsheds over the Rocky Mountains and Northern Midwest, the earth's atmosphere, and so forth.

In terms of temporal bounds for the cumulative analysis, a case can be made for starting with the post-World War II era, especially the 1950s, when the Great Falls area experienced substantial growth and development concurrent with the expansion of Malmstrom Air Force Base. Montana's population grew rapidly in the 1950s as well. The endpoint for the cumulative analysis could be set at 2040 – toward the end of the approximate design lifetime (thirty years plus) of the proposed HGS. However, any such fixed temporal boundary cannot help but be arbitrary, and thus the future boundary of cumulative impacts likewise varies by resource. The time frame of at least one potential cumulative impact – possible global climate change from anthropogenic (human) emissions of greenhouse gases like carbon dioxide and nitrous oxide and their accumulation in the earth's atmosphere – could extend centuries into the future.

Chapters 3 and 4 examined the affected environment and environmental consequences of the no action, proposed action, and alternate site alternatives with regard to 15 resource areas. Of these, only those resource areas impacted by one or more of these alternatives to a more than negligible extent, and other past, present, and reasonably foreseeable future actions, are included in the cumulative analysis.

Those resource topics for which the No Action alternative, Proposed Action, and/or alternate site were considered to have more than a negligible beneficial or adverse, direct or indirect, impact (and therefore possible additive effects with other actions) are shown in the following table. The alternative (#1 – No Action, #2 – Proposed Action, #3 – Alternate Site) or alternatives that are responsible for an identified adverse or beneficial impact are shown in parentheses.

Table 5-1. Summary of Direct and Indirect Impacts from No Action (#1), Proposed Action (#2), and/or Alternate Site (#3) Alternatives

Resource topic	Adverse impacts	Beneficial impacts
Soils, Topography, and Geology	• Negligible to minor, long-term adverse impacts (primarily erosion and loss of soil fertility) would continue from existing land use practices such as from grazing, tilling, disking, plowing, and movement of farm machinery (#1). • Extensive site grading and excavation activities that would disturb a considerable amount of soil and alter topographic contours (#2 & #3). • Soil resource impacts from construction activities would have a moderate magnitude, medium-term duration, and medium extent (#2 & #3). • Due to the operation of the waste monofill for the duration of the plant's life, operation-related impacts on soil resources would be minor magnitude, long-term duration, and small extent (#2). • Permanent increase in impermeable surface area and the risk associated with soil contamination from site runoff or leachate (#2 & #3).	

Water Resources	• Negligible to minor, long-term adverse impacts on receiving water quality would continue from existing land uses – runoff from agricultural lands can carry sediments, nutrients and other pollutants (#1). • Site construction would involve negligible to minor impacts on receiving water quality from increased storm water runoff and possible contamination (#2 & #3). • Negligible to minor impacts on Missouri River flows from water withdrawals and consumptive use (#2 & #3).	
Air Quality	• Exhaust emissions from equipment used in construction, coupled with likely fugitive dust emissions, could cause minor to moderate, short-term, localized degradation of local air quality (#2 & #3). • Coal-fired power plant would release nitrogen oxides, sulfur dioxide, particulate matter, carbon monoxide, volatile organic compounds, carbon dioxide, lead, and mercury (all). • Long-term minor to moderate degradation of local air quality from operations (all). • Long-term minor impacts on sensitive species from criteria pollutant emissions and/or trace element deposition (#2 & #3). • Short-term/long-term direct minor adverse impact on applicable PSD Class I increments (all). • Direct minor adverse impact on visual plume (#2 & #3) • Direct long-term minor adverse impact on acid deposition (all) • Direct short-term <u>moderate</u>	

	adverse impact on regional haze (all) • Emissions of mercury (all) • Emissions of greenhouses gases (mainly carbon dioxide) (all)	
Biological Resources	• Short-term impact to wildlife/vegetation by degrading air quality (#2 & #3). • Short-term impact to aquatic biota from degraded water quality (#2 and #3). • Long-term increase in mortality of terrestrial mammals by rail strikes and increased traffic on access road (#2 & #3).	
Noise	• Minor to moderate, short-term adverse impacts from intermittent noise during construction, both from equipment at site and transit of city and county streets by workers and equipment (#2 & #3). • Minor long-term impacts from increased noise along route of train carrying coal to power plant (#2 & #3). • Long-term impact of noise from coal plant operation on receptors would be negligible to minor (#2 & #3). • Noise impacts on the NHL would be significant because of the degradation to natural ambient sounds.	
Recreation	• Negligible to at most minor impacts on recreation in the immediate project vicinity and wider Great Falls area (#2 & #3).	

Cultural Resources	• Major, long-term impact on existing Great Falls Portage National Historic Landmark because of large, salient facility inserted into landscape relatively unchanged since 1980s listing and reminiscent of that which Corps of Discovery observed (#2).	
Visual Resources	• Scenic impacts on NHL of major magnitude, long-term duration, and small extent (#2). • Scenic impacts of moderate magnitude, long-term duration, medium or localized extent (#3).	
Transportation	• Construction-related impacts on road traffic would be of moderate magnitude, medium-term duration, and small extent (#2 & #3). • Minor, temporary construction-related impacts on rail transport on the BNSF line to which a rail spur would connect (#2 & #3).	
Farmland and Land Use	• Conversion of farmland would have impacts of minor magnitude, long-term (permanent) duration, and medium extent (#2 & #3). • Impact on land use (property values) from the operation of a power plant at Salem would be of moderate magnitude, long-term duration, medium to large extent, and possible likelihood (#2). • Impacts on land use from the operation of a power plant at the Industrial Park Site would be minor magnitude, long-term duration, medium extent, and possible likelihood (#3).	

Waste Management	• Construction impacts on waste management would be of minor magnitude, medium-term duration, and small extent (#2 & #3). • Operation-related impacts on waste management for the Salem Site would be of moderate magnitude, long-term duration, and medium extent (#2). • Operation-related impacts on waste management for the Industrial Site would be of minor to moderate magnitude, long-term duration, and small extent (#3).	
Human Health and Safety	• Construction-related impacts on human health and safety would be of minor magnitude, medium-term duration, and small extent (#2 & #3). • Operation-related impacts on human health and safety would be of minor magnitude, long-term duration, and medium extent (#2 & #3).	
Socioeconomics	• Socioeconomic impacts from potentially higher electric rates would be of minor magnitude, long-term duration, and medium extent (#1).	• During construction phase, moderately beneficial effect on the socioeconomic environment of the local and regional area, including increases in employment opportunities, total purchases of goods and services, and an increase in the tax base (#2 & #3). • During operation phase, beneficial socioeconomic impacts would be of minor magnitude, long-term duration and medium extent (#2).

Environmental Justice and Protection of Children	• Impact on low-income residents of potentially higher electrical rates would be of moderate magnitude, intermittent-term duration, small extent, and possible likelihood (#1). • Impacts of plant operation on low income residents would be of minor to moderate magnitude, long-term duration, medium extent, and unlikely likelihood (#3).	

5.2 PAST, PRESENT, AND "REASONABLY FORESEEABLE" FUTURE ACTIONS

This section reviews relevant actions and trends that have already occurred, are underway at present, or may possibly occur in the future that may cumulatively interact with the No Action, Proposed Action (Salem site), and Alternate Site Alternatives (Industrial Park site).

5.2.1 PAST AND PRESENT ACTIONS AND TRENDS

- Montana Pollutant Discharge Elimination System (MPDES) Permits: A total of 35 MDPES permits have been issued by DEQ within a 10-mi radius of Great Falls, MT. Three of these are municipal permits for Great Falls and Sun Prairie Village wastewater treatment, one is an industrial permit, two are concentrated animal feeding operations (livestock feedlots), and the rest cover storm water discharges. In most instances, the receiving water is the Missouri River (DEQ, 2005b).

  These discharges, plus numerous other point and non-point discharges upstream, have led to the "impaired" status of the Missouri River discussed in Section 3.2.4 of this EIS. The river is listed as not supporting the beneficial uses of aquatic life, coldwater fishery, warm water fishery, and drinking water. Probable causes of the river impairment include PCBs, metals, siltation, turbidity, and thermal modifications. Probable sources of the impairment are listed as being industrial point sources, dam construction, hydro-modification, and agriculture.

- Great Falls Industrial Park Development: In September 2005, the International Malting Company (IMC) began production at a $60-75 million malt plant with 35 employees and an annual payroll more than $2.3 million in the Industrial Park ("Agri-Business Park") north of Great Falls (Larcombe, 2005). Touted as the most automated malting plant in the world (GFDA, no date), the IMC plant is to have an annual malt production of 12 million bushels, which would require 11 million bushels of malting barley from producers each year (Kramer and Owen, 2003). The City of Great Falls has extended sewer service to the IMC plant and plans to co-generate electricity at its existing wastewater treatment plant (Wilmot, 2005a). In addition, the City will sell 432,033 gallons per day of untreated Missouri River water to the IMC plant (Wilmot, 2005b).

- Coal-fired Power Plants: As of August 2004, Montana had five large generating stations using sub-bituminous coal as a fuel source: J.E. Corette in Yellowstone County (163 MW; opened 1968) and the four Colstrip plants in Rosebud County (348 MW, 358 MW, 778 MW, 778 MW; opened in 1975, 1976, 1984, and 1986, respectively). Each of these plants is a pulverized coal facility, and as such, emits criteria pollutants and other contaminants such as HAPs like mercury in amounts controlled by air pollution control technologies installed under authority of the federal Clean Air Act and the Montana SIP.

- Acid Deposition Effects on pH: In the latter half of the 20th century, acid deposition has impaired water quality and damaged aquatic life in thousands of small and large water bodies in North America – including ponds, lakes, streams and rivers – particularly in the Eastern and Upper Midwestern United States and Canada (EPA, 2003e). Especially vulnerable have been regions underlain by the poorly-buffered, ancient rocks of the Canadian Shield, or by other rock formations low in buffering capacity, that is, the ability to neutralize acidic inputs from rainfall and snowmelt. As the pH of these water bodies fell below 5.0 (neutral pH is 7.0, and 5.0 is 100 times as acidic as 7.0), populations of aquatic invertebrates and fish declined in tandem, disappearing almost entirely in the lowest pH systems and suffering severe reductions in others. In the West, acidification of water bodies has been much less problematic than in the East and Upper Midwest, due to several factors such as better buffered parent rocks and fewer overall SO_2 emissions.

  The Clean Air Act Amendments of 1990 and subsequent regulations addressed emissions of sulfur dioxide that are the major cause of acid rain and began the process of reducing these emissions nationally. They set a goal of cutting sulfur dioxide emissions in half. Emissions of both sulfur dioxide and nitrogen oxides have begun to decline, as has acid deposition in watersheds, but recovery of aquatic ecosystems is still in its incipient stages and may well take decades.

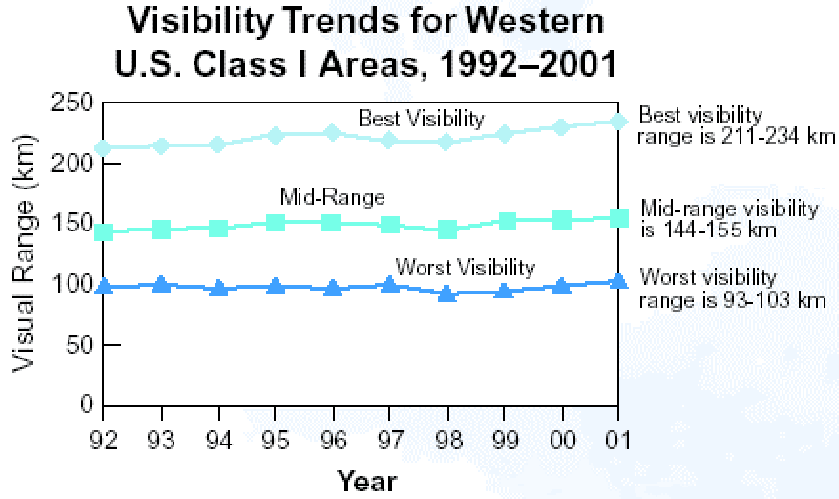
- Acid Precipitation and Forests: Acid rain can cause slower growth, injury, and in worst cases, the death of forests. It has been implicated in forest and soil degradation in many areas of the eastern U.S., especially in high elevation forests of the Appalachian Mountains from Maine to Georgia. In most cases, it appears that the combination of acid rain and other environmental stressors is responsible for declining forest health (EPA, 2003k).

- Acid Precipitation and Manmade Structures: Acid rain can also damage materials such as bronze, marble and limestone, leading to deterioration of cultural artifacts like statues made of these materials (EPA, 2003l). This problem has been documented in the East and in Europe much more than in the American West.

- Fossil Fuel Emissions and Visibility Reduction: In the latter half of the 20th century, as the U.S. population and economy grew to unprecedented levels, overall fossil fuel combustion roughly tripled to meet the rising energy consumption this growth entailed. Coal consumption alone quadrupled from 1950 to 2000 (EIA, 2001). Particulates and sulfur dioxide emitted to the air from burning coal are a dominant factor in the regional haze and associated visibility reduction that have compromised scenery in extensive areas of the country (NPS, 1997; Malm, 1999; EPA, 2003j). In Shenandoah National Park for example, located in Virginia's picturesque Blue Ridge Mountains, scientists estimate that the average visibility within the park has decreased from about 65 miles at the beginning of the 20th century to 15 miles toward the end of the 20th century (Connors, 1988). Sulfur dioxide particles or aerosols are not the sole cause of this, but they are the principal one, especially in the East, where SO_2 is estimated to cause some 60-90 percent of visibility reduction (Malm, 1999). In the West, sulfates are estimated to cause 25-50 percent of the problem (EPA, 2005g). EPA concludes that overall, the visual range in our nation's scenic areas has been substantially reduced by air pollution. In eastern parks, average visual range has decreased from 90 miles to 15-25 miles, while in the West, visual range has decreased from 140 miles to 35-90 miles (EPA, 2005e).

  Montana's Glacier National Park has been monitoring visibility since 1982 as part of a continuous nationwide monitoring program network called IMPROVE (Interagency Monitoring of Protected Visual Environments). At Glacier NP, visibility is greater than 200 miles less than 1% of the time, between 135-220 miles 10-25% of the time, 80-105 miles 40-60% of the time, 40-60 miles 10-25% of the time, and less than 10 miles less than 1% of the time (GNP, no date). In 1997, on the worst visibility days in the national park, the contributions to visibility reduction from various pollutants were as follows: sulfates (37%), organic carbon (32%), crustal material (11%), elemental carbon (10%) and nitrates (10%) (EPA, 2005f). The percentages of pollutants impairing views at Yellowstone National Park are fairly similar. According to visibility monitoring, the visual range at both these parks improved slightly during the decade of measurements between 1988 and 1997 (EPA, 2005f). In the West as a whole, visibility in Class I areas remained relatively unchanged between 1992 and 2001 (Figure 5-1) (EPA, 2005g).

Figure 5-1



Source: EPA, 2005g

- Mercury Contamination: An extensive discussion of mercury emissions, deposition, pathways, transformation into methylmercury, neurotoxicity and potential ecological effects is contained in Chapter 3 of this EIS (Section 3.3.4) and will not be repeated here. To briefly summarize, mercury levels in the biosphere have increased by several factors in the past few centuries over natural background levels as a result of increasing industrial and domestic use of this versatile liquid metal, burning coal in power plants, and incinerating medical and municipal waste. As elemental mercury vapor, this toxin is transported through the atmosphere all over the world, so that it is truly a global problem. U.S. emissions, which were reduced roughly in half (from 221 to 112 tons) between 1990 and 1999 now comprise an estimated three percent of global mercury emissions. Coal-burning power plants are now the single largest remaining source of anthropogenic mercury emissions in the U.S. (see Figure 3-22; EPA, 2006b). A majority of the mercury deposition in much of the U.S. is believed by scientists to originate outside of North America, mostly in Asia. However, the nature and extent of local deposition creating possible "hot spots" of mercury from coal-burning power plants continues to be studied.

  The main concern about mercury's health effects on humans and wildlife revolves around the consumption of fish that contain the compound methylmercury. Montana is one of a number of states with consumption advisories on fish containing methylmercury and other toxins caught in certain water bodies in the state. The advisories are designed to protect especially vulnerable segments of the public (in particular, pregnant women and young children) from the potentially toxic effects of excessive mercury ingestion through eating fish. While the number of fish consumption advisories has been increasing throughout the country in recent years, this may reflect more an increasing awareness and documentation of the widespread extent of mercury contamination rather than an actual increase in the level of contamination.

- Global Climate Change: Rising fossil fuel combustion and clearing of forests worldwide have released CO_2, the main "greenhouse gas," at a rate greater than the biosphere's ability to fix or sequester this gas. As a result, carbon dioxide concentrations in the atmosphere have risen from 316 parts per million (ppm) in 1959, when measurements began in Hawaii, to 376 ppm by the year 2003 (Keeling and Whorf, 2004). These concentrations continue to climb in spite of tentative initial international efforts to address the issue begun in Kyoto, Japan in 1997. Although there is uncertainty and disagreement about the details, there is broad consensus among climatologists and atmospheric scientists at the Intergovernmental Panel on Climate Change (IPCC) that rising concentrations of CO_2 will generally warm and change the climate globally. Some scientists dissent from this majority view.

  Global temperatures are rising even now: global mean surface temperatures have increased 0.5-1.0° F since the late 19th century (EPA, 2000c). Among the predictions (with varying degrees of confidence) are substantial variation in the degree of warming from the poles (most warming) to the tropics (least warming), altered precipitation patterns, and an increase in the intensity, if not the frequency, of extreme weather events such as storms, floods, hurricanes, and tornadoes. If Global Circulation Models are correct, global climate change also poses many ramifications for natural ecosystems, agriculture, and human health, and societies and economies generally.

- Missouri River Flows: Like many Western rivers, controversy surrounds management of flows in the Missouri River, in this case by the Army Corps of Engineers. In the case of the Missouri, unlike the Rio Grande, Colorado, and Platte rivers, this controversy has less to do with overall flow depletions from consumptive water use within the basin than with the seasonal regulation of discharge through the dams and reservoirs along the river in Montana, North Dakota and South Dakota and the different, competing needs of navigation, recreation, and wildlife interests. Figure 5-2 shows Missouri River annual runoff downstream of Montana (at Sioux City, Iowa) during the 20th century.

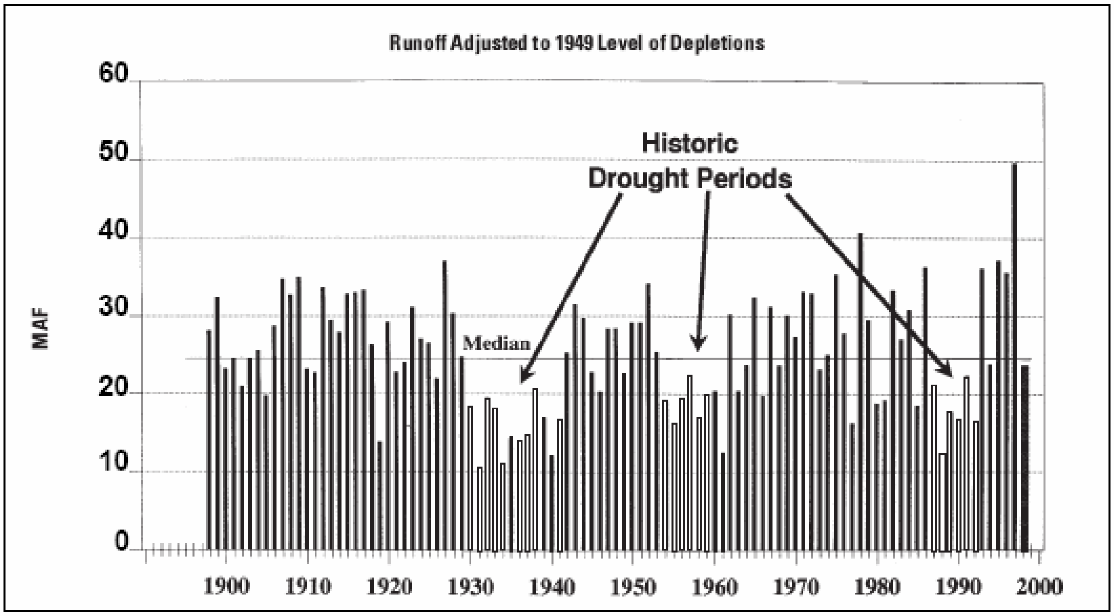


Figure 5-2. Missouri River – Annual Runoff (Million Acre-Feet) at Sioux City, Iowa
Source: USACE, 2004b

5.2.2 REASONABLY FORESEEABLE FUTURE ACTIONS AND TRENDS

- Proposed Transmission Line to Great Falls: The Montana Alberta Tie Ltd. (MATL) is proposing to construct, operate and maintain a 230-kilovolt electric transmission line on private land and State of Montana School Trust Lands between Lethbridge, Alberta and Great Falls, Montana (DEQ, 2005c). This approximately 190-mile line would connect the Alberta Interconnected Electrical System operated by the Alberta Electric System Operator (AESO), and Northwestern Energy's (NWE's) transmission system at the 230-kV substation just north of Great Falls (MATL, 2005).

  This project would be the first power transmission interconnection between the U.S. and Alberta; it is expected to facilitate development of additional generation sources (e.g., wind farms both in northern Montana and southern Alberta), as well as improve transmission system reliability in Montana, Alberta, and on a regional basis in both the United States and Canada.

MATL's Major Facilities Siting Act (MFSA) application predicts impacts to physical resources such as geology and soils, air, and water, biological resources such as vegetation, wetlands, wildlife and fisheries, and sensitive (listed and proposed) species, and social resources such as socioeconomics, land use, utilities and transportation, visual resources, human health, recreation, cultural resources, and environmental justice. Most adverse effects identified are expected to be minor. The application also identifies potential cumulative impacts in the general Alberta-Montana corridor through which the proposed 230 kV transmission line would pass. Two of the highlighted biological cumulative impacts include the dispersion of noxious weeds along pipeline and transmission line right-of-ways and the potential for increased mortality of birds and/or bats from the growth of wind turbine facilities (MATL, 2005).

Missouri River Flows: In the basin as a whole, depletions from diversions for water supply and irrigation have become a factor in overall basin runoff and will be even more so in the future, especially as American Indian Tribes in the Missouri River basin begin to exercise their Tribal water rights (USACE, 2004).

- Proposed Coal-fired Power Plants: At present, at least four other coal-fired power plants in Montana are conceptualized or proposed, have received permits, or are under construction. These include the Roundup Power Project near Roundup (780 MW – a conventional pulverized coal plant), Rocky Mountain Power near Hardin (113 MW – pulverized coal), the Great Northern Power Nelson Creek Project near Circle (560 MW – CFB plus wind power), and the Otter Creek Power Project near Decker (3,000 MW – type undetermined) (WRA, no date). Thompson River Cogeneration near Thompson Falls (16.5 MW – coal and wood waste) has been constructed and operated for a short time but was not operating as of January 2007. Potential air quality impacts (especially reduced visibility) of the proposed Roundup plant in particular have generated concerns among the federal land managers, particularly the National Park Service and U.S. Fish and Wildlife Service, and have led to legal actions by environmental groups and initiation of a Clean Air Act dispute resolution process by the Northern Cheyenne Tribe. DEQ conducted an EIS on the Roundup plant, issued a Record of Decision in January 2003, and issued an air quality permit (DEQ, 2003). This permit is being challenged in administrative and judicial legal actions by environmental groups.

- Emissions and Visibility: While visibility impairment from sulfur dioxide aerosols and particulates remains a serious problem in scenic areas across much of the country, the fact that SO_2 emissions have now begun to decline promises that in the coming years the situation will improve (EPA, 2003j). For example, EPA estimates that its Acid Rain Program will improve the visual range (how far a viewer can see) in the eastern U.S. by 30 percent. This will be an especially welcome benefit for visitors to national parks and other natural areas celebrated for their scenic grandeur.

In Section 4.5.2.2.3, the regional haze analyses for both the proposed source only and the cumulative sources indicated that the HGS would not cause an adverse regional haze impact in any mandatory federal Class I areas and that the impacts would be minor to moderate. P. 82 of the draft air quality permit (Appendix I of this EIS) states that modeling predicts four days over 10 percent cumulative impact. However, this cumulative analysis includes only the existing emissions sources along with the HGS, not all potential future sources such as the coal-fired power plants cited above, as well as others that may follow over the longer term (but still within the likely 30-50 year project life of the HGS) if demand for electricity continues to grow in the West and lower-emission generation options like natural gas become more expensive, scarce, and less viable. At the same time, newer and future coal-fired thermal electric plants, some of which are replacing older, dirtier units, are being subjected to ever more stringent air pollution controls to comply with federal and state regulations. These two contradictory trends – increasing combustion of fossil fuels and tighter pollution controls – will certainly offset one another, but it is difficult to predict the net changes in total emissions and air quality that will occur in the Northern Rockies.

- "Clean Coal" Technology: The State of Montana offers tax breaks and loan guarantees to private-sector partners which would develop coal gasification technology and build one or more plants in Montana to convert the state's coal reserves into liquid fuel and diesel (Montana Governor's Office, no date).

- Mercury Emissions: Mercury emissions from coal-burning power plants are in the process of being regulated both federally (e.g. Clean Air Mercury Rule of 2005) and in Montana under rules established by the Board of Environmental Review. EPA's Utility Mercury Reductions would reduce total coal-fired power plant mercury emissions by nearly 70 percent if fully implemented (EPA, 2004f). Montana's mercury rules are in the same range. Montana's mercury rules are more stringent than the CAMR, eventually limiting coal-fired generating stations with the capacity to generate more than 25 MW to no more than 0.9 pound of mercury per trillion Btu heat input.

- Montana Farmland: Between 1982 and 1997, total cropland acreage in Montana declined from approximately 17.2 million acres to 15.2 million acres, a decline of nearly 12 percent. However, much of this acreage was marginal cropland at least temporarily retired under the federal Conservation Reserve Program (CRP), which rose from zero acres to 2.7 million acres in Montana over the same period. Over the same 15-year interval, pastureland increased from 3.1 to 3.4 million acres and rangeland decreased slightly from 37.8 to 36.7 million acres (NRCS, 2000). Thus total agricultural lands including CRP lands decreased marginally from 58,098,000 acres to 58,085,000 acres between 1982 and 1997, an insignificant change. Developed land in the state increased slightly from 878,600 acres to 1,032,300 acres, which would have converted land from both agricultural and forested land uses to built-up (residential, commercial, agricultural, transportation) uses.

- Carbon Dioxide Emissions and Global Climate Change: The United States Senate declined to ratify and the current administration formally withdrew from the Kyoto climate change pact that the U.S. and many other countries signed in 1997 in Japan. That would have committed the United States to reducing its aggregate CO_2 emissions to nine percent below its 1990 emissions by the year 2012. Instead, national emissions continue to grow unabated – greenhouse gas emissions in 2002 were 11.5 percent higher than 1990 emissions (EIA, 2003). Globally, the rate of CO_2 accumulation in the atmosphere appears to be accelerating. While there is still some uncertainty and scientific dissent, most scientists anticipate that average global surface temperature could rise 1 to 4.5° F (0.6 to 2.5° C) over the next fifty years, and 2.2 to10° F (1.4 to 5.8° C) in the coming century, with significant regional variation (EPA, 2000c). Strong economic growth in populous developing countries like China and India, which were exempted from making any cuts in national emissions at the Kyoto negotiations because of their poverty and low per capita CO_2 emissions, dims the prospects for reducing combined international emissions of the main greenhouse gas anytime soon. Nevertheless, over the 30 to 50-year lifetime of the proposed HGS coal-fired power plant, it could well be subjected to requirements aimed at regulating its carbon dioxide output.

The two unit coal trains per week that would provide fuel for HGS's boilers would emit carbon dioxide to the atmosphere from burning diesel fuel. Although this EIS does not attempt to quantify these emissions, they would only be a small fraction of HGS GHG emissions of about 2.8 million tons of CO_2 equivalent annually. Likewise, coal surface mining and reclamation consume fossil fuels, releasing additional CO_2. Emissions from these two connected actions would need to be added to a power plant stack's emissions in any comprehensive tally of coal-to-electricity's entire life cycle greenhouse gas emissions.

- Growth of Wind Energy: As discussed in Chapter 2 of this EIS, projects to capture wind energy with turbines and generate electricity are expanding rapidly throughout the United States. Montana itself has several recently completed or proposed wind projects. While newer, larger wind turbine designs with more slowly rotating blades have reduced mortality of wildlife principally in the form of collision by birds and bats, some mortality still occurs. Because wind turbine farms are still relatively new, the science of evaluating bird and bat strikes and devising avoidance and mitigation measures is still advancing. In its 2003 guidance, the U.S. Fish and Wildlife Service stated that it was still too early to reach definitive conclusions on the potential extent of cumulative impacts on given bird and bat species and populations around the country.

5.3 NO ACTION ALTERNATIVE

Under this alternative, no HGS would be constructed at either the Salem or Industrial Park sites. As its contract with BPA begins to be phased out, it is assumed that SME would purchase the electricity it needs to supply its member systems on the open, deregulated power market. In purchasing electrical energy from a possible variety of wholesale electricity suppliers in the region, SME would be contributing indirectly and incrementally to cumulative environmental impacts associated with the generation of electricity from various fuel/energy sources, possibly including natural gas, coal, nuclear, hydro, and to a smaller extent, wind and other renewables.

Thus, while there would be no contribution to cumulative impacts at the local and regional scales from construction and operation of a facility at either site, SME's contribution to cumulative impacts at the regional, national, and global scales – while impossible to isolate and quantify – would not be trivial. If the major source of generation were other coal-fired power plants, SME's contributions to cumulative impacts would be roughly on a par, or greater in the case of older facilities, with those from construction of HGS. Given power generation trends in the region, coal would likely become the dominant energy source as the decades proceed.

Table 5-2 summarizes cumulative impacts from the No Action Alternative.

Table 5-2. Summary of the Potential Long-term Cumulative Impacts from the No Action Alternative

Resource topic	No Action Alternative	Other Past, Present and Future Actions	Cumulative Impacts
Soils, Topography, and Geology	*	*	*
Water Resources	*	**	**
Air Quality	*	**	**
Socioeconomics	**	*	*
Environmental Justice	**	*	*

Key:
Adverse: * Minor Impact ** Moderate Impact *** Major Impact
Beneficial: + Minor Impact ++ Moderate Impact +++ Major Impact
No Impact: 0

Impact Intensity Definitions:
Minor – Change in a resource area occurs, but no substantial resource impact results.
Moderate – Noticeable change in a resource occurs, but the integrity of the resource remains intact.
Major – Substantial impact/change in a resource area that is easily defined, noticeable & measurable.

5.4 PROPOSED ACTION – HGS AT THE SALEM SITE

The Proposed Action would contribute to certain cumulative impacts, which are discussed briefly below and presented in Table 5-3.

Soils, Topography, and Geology – Extensive site grading and excavation activities would disturb a considerable amount of soil and alter topographic contours at the Salem site, and overall, soil resource impacts from construction activities would have a moderate magnitude, medium-term duration, and medium extent. Impacts from operation of the waste monofill for the duration of the plant's life on soil resources would be minor magnitude, long-term duration, and small extent. Combined with other construction activities in the Great Falls area and Cascade County, plus general long-term degradation of agricultural lands from water and wind erosion (offset somewhat by setting aside CRP lands) and gradual loss of soil fertility, there would be an overall minor adverse cumulative impacts on soils from the Proposed Action and connected actions like pipeline and transmission line construction.

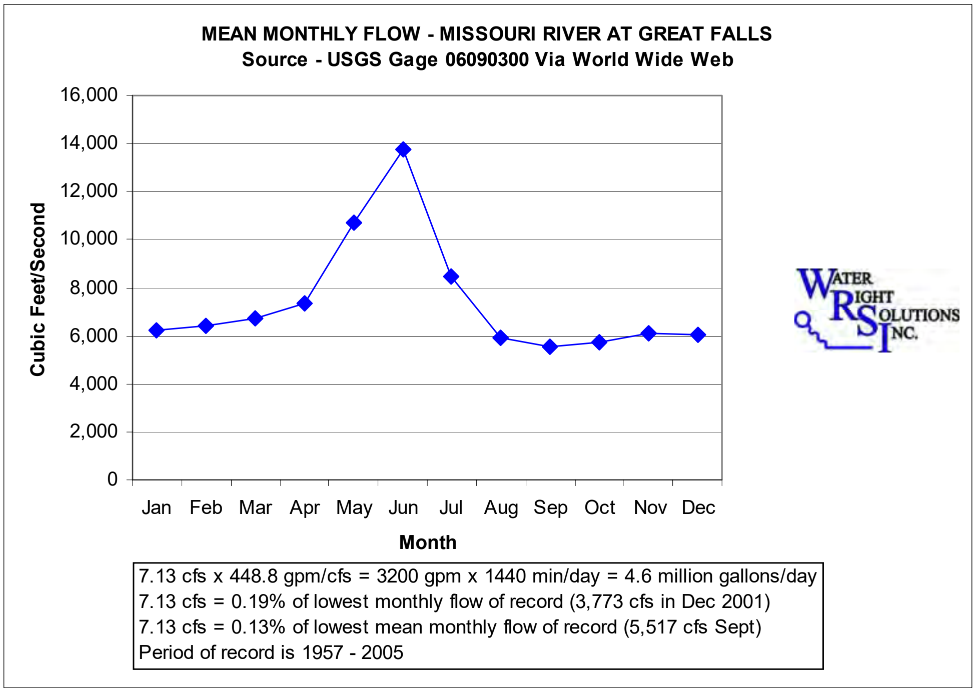
Table 5-3. Summary of the Potential Long-term Cumulative Impacts to which the Proposed Action would Contribute Incrementally

Resource topic	Proposed Action	Other Past, Present and Future Actions	Cumulative Impacts
Soils, Topography, and Geology	*	*	*
Water Resources	*	**	**
Air Quality	*	**	**
Biological Resources	*	*	*
Noise	*	*	*
Recreation	*	*	*
Cultural Resources	***	*	***
Visual Resources	***	**	***
Transportation	**	*	**
Farmland and Land Use	*	*	*
Waste Management	**	*	**
Human Health & Safety	*	*	*
Socioeconomics	++	+	+

Key:
Adverse: * Minor Impact ** Moderate Impact *** Major Impact
Beneficial: + Minor Impact ++ Moderate Impact +++ Major Impact
No Impact: 0

Impact Intensity Definitions:
Minor – Change in a resource area occurs, but no substantial resource impact results.
Moderate – Noticeable change in a resource occurs, but the integrity of the resource remains intact.
Major – Substantial impact/change in a resource area that is easily defined, noticeable & measurable.

Figure 5-3. Average Flows of the Missouri River at Great Falls, 1957-2005



Source: WRSI, 2006

Water Resources – Site construction would involve negligible to minor impacts on receiving water quality from increased storm water runoff and possible contamination. Over the long term, there would be negligible to minor impacts on Missouri River flows from water withdrawals and consumptive use. Basin-wide water quality and quantity (seasonal flows downstream) on the Missouri will likely continue to be problems in the future, and by using water consumptively, the Proposed Action would contribute incrementally to a negligible to minor degree toward these continuing, cumulative adverse effects. Figure 5-3 shows that HGS water withdrawals would amount to 0.13 percent of the lowest mean monthly flow of record (September).

By releasing some quantity of sulfur dioxide to the atmosphere, any new coal-fired power plant would also contribute incrementally to total national SO_2 emissions, and possibly, significant cumulative impacts on the water quality of the nation's water bodies from acid deposition. However, the distance of HGS from areas of the country and continent where acidification is a serious problem, primarily poorly buffered Canadian Shield parent rocks/soils of the Upper Midwest and Northeast – may mean that its SO_2 emissions have limited or negligible impacts on these vulnerable areas. While innovative regulatory tools (cap and trade program) and control technology under the Clean Air Act Amendments of 1990 have made substantial strides in reducing SO_2 emissions nationwide, the significant impacts (e.g. acidified lakes and streams and stressed or eliminated aquatic life, including fish) largely continue to this day and will probably continue for some years to come.

Air Quality – CFB technology and BACT controls would reduce potential air emissions of all criteria pollutants and HAPs, so that the HGS would not, in and of itself, generate significantly adverse impacts on local and regional air quality. DEQ Air Quality Permit conditions would be set so as to prevent the region from being pushed into non-attainment of the NAAQS and MAAQS. Nevertheless, some minor to moderate degradation of ambient air quality would likely occur, and with increasing overall emissions in Montana and neighboring states from a variety of sources, including new and proposed coal-burning power stations, cumulative impacts over the coming decades could become significant.

With air quality more than any other individual resource topic covered in this EIS, potential cumulative impacts from a large number of mobile and stationary sources across a wide geographic domain are the major issue. An HGS plant would contribute incrementally to a minor or moderate extent toward cumulative impacts related to regional haze, visibility impairment in Class I areas, mercury dispersion and bioaccumulation, and global climate change.

Biological Resources – The Proposed Action would likely lead to short-term impacts to wildlife and vegetation by degrading air quality as well as to aquatic biota from degraded water quality. There would also likely be a long-term increase in mortality of terrestrial mammals by rail strikes and increased traffic on the access road. In a cumulative context, these would be considered minor incremental adverse impacts on biological resources. If wind turbines are erected at the Salem site, there would be some, still unquantifiable, potential for mortality to birds (primarily raptors) and bats. However, it appears that most bird and bat mortality to date has been from smaller turbines with faster-rotating (higher RPM) blades; larger turbines with larger, lower RPM blades tend to be less problematic. Overall cumulative impacts would likely be adverse but minor. However, given the rapid growth of the wind industry in this region of the country, long-term monitoring will be necessary to gauge its cumulative impact on bird and bat populations, if any.

Noise – The HGS would cause minor to moderate, short-term adverse impacts from intermittent noise during construction, both from equipment at site and transit of city and county streets by workers and equipment. The HGS would also entail minor long-term impacts from increased noise along route of train carrying coal to power plant. The overall, long-term impact of noise from coal plant operation on receptors would be negligible to minor. There are no other planned, proposed, or likely facilities in the vicinity of the Salem site that would add to noise from the Proposed Action; therefore, cumulative impacts would be equal to the direct and indirect impacts from the HGS, which are at most minor.

Recreation – The Proposed Action would cause negligible to at most minor impacts on recreation in the immediate project vicinity and wider Great Falls area. There are no other past, present, or future planned projects in the area that would adversely impact recreation, so that cumulative impacts would be equal to the direct and indirect impacts from the HGS, which are at most minor.

Cultural Resources – There would be a major long-term impact on the existing Great Falls Portage National Historic Landmark because of the salience or visual incongruity of this large industrial facility – both the power plant and the wind turbines – being inserted into a predominantly rural landscape with historic significance. However, not all of the viewshed would be adversely affected, and proposed mitigation measures may offset impacts. In addition, other parts of the NHL have already been encroached upon by modern developments, including the City of Great Falls itself and a major U.S. Air Force Base. Even the immediate vicinity at the Salem site now includes gas lines, transmission, distribution, and phone lines, rural homesteads. The Lewis and Clark Interpretive Center in Great Falls, a U.S. Forest Service interpretive facility, commemorates the entire expedition, and particularly the Great Falls portage. No other large, visually obtrusive facilities are known to be proposed for construction in or close to the NHL. Overall, the cumulative impact on cultural resources would be the same as that of the Proposed Action alone – adverse and significant.

Visual Resources – The proposed HGS and wind turbines would entail scenic impacts on the NHL of major magnitude, long-term duration, and small extent, because of the placement of a visually incongruous, industrial element into a rural landscape dominated not by human structures but by natural landforms and vegetation (both natural and cultivated). Overall, the cumulative impact on visual resources would equal that of the Proposed Action alone – adverse and moderately significant.

Transportation – Short-term construction-related impacts on road traffic would be of moderate magnitude, medium-term duration, and small extent, and rated as significant by MDT. There would also be minor, temporary construction-related impacts on rail transport on the BNSF line to which a rail spur would connect. No other projects, actions, or trends are known that would affect transportation locally, and thus, cumulative impacts would be equal to the direct and indirect impacts from the HGS, which are at most minor.

Farmland and Land Use – Conversion of farmland to industrial land use would have impacts of minor magnitude, long-term (permanent) duration, and medium extent. Impact on land use (property values) from the operation of a power plant at Salem would be of moderate magnitude, long-term duration, medium to large extent, and possible likelihood. The likelihood that the siting of an industrial facility eight miles from Great Falls would attract further development to this area, leading to greater farmland conversion and loss, is not considered great, given the availability of other sites closer to town. Cumulative adverse impacts on farmland and land use would thus be equal to direct and indirect impacts from the HGS, and are deemed to be minor.

Waste Management – Construction impacts on waste management would likely be of minor magnitude, medium-term duration, and small extent. Operation-related impacts on waste management for the Salem Site would be of moderate magnitude, long-term duration, and medium extent. No other projects, actions, or trends are known that would affect waste management locally, and thus, cumulative impacts would be equal to the direct and indirect impacts from the HGS, which would be moderately adverse.

Human Health and Safety – Construction-related impacts on human health and safety would be of minor magnitude, medium-term duration, and small extent. Operation-related impacts on human health and safety would be of minor magnitude, long-term duration, and medium extent. Several other facilities in the area are major sources of air emissions, and modeling presented in Chapter 4 determined that the HGS would not cause or contribute to any exceedances of the NAAQS or the MAAQS. No other projects, actions, or trends are known that would affect

human health and safety locally. Thus, cumulative impacts would be equal to the direct and indirect impacts from the HGS, which are at most minor.
Socioeconomics – During the construction phase of the HGS, there would be a moderately beneficial effect on the socioeconomic environment of the local and regional area, including increases in employment opportunities, total purchases of goods and services, and an increase in the tax base. During long-term operational phase, beneficial socioeconomic impacts would be of minor magnitude, long-term duration and medium extent. Overall long-term cumulative impacts from the HGS and other recent projects in the area would be of minor magnitude and economically beneficial.

5.5 ALTERNATIVE SITE – INDUSTRIAL PARK

The Alternative Site would also contribute to certain cumulative impacts, which are discussed briefly below and presented in Table 5-4.

Soils, Topography, and Geology – Cumulative impacts would be similar to those related to the Proposed Action. Extensive site grading and excavation activities would disturb a considerable amount of soil and lightly alter topographic contours at the alternate site, and overall, soil resource impacts from construction activities would have a moderate magnitude, medium-term duration, and medium extent. Combined with other construction activities in the Great Falls area and Cascade County, plus general long-term degradation of agricultural lands from water and wind erosion (offset somewhat by setting aside CRP lands) and gradual loss of soil fertility, there would be an overall minor adverse cumulative impact on soils from the Alternate Site and connected actions like pipeline and transmission line construction.

Water Resources – Cumulative impacts would be very similar to those related to the Proposed Action. Site construction would involve negligible to minor impacts on receiving water quality from increased storm water runoff and possible contamination. Over the long term, there would be negligible to minor impacts on Missouri River flows from water withdrawals and consumptive use. Basin-wide water quality and quantity (seasonal flows downstream) on the Missouri will likely continue to be problems in the future, and by using water consumptively, the Proposed Action would contribute incrementally to a negligible to minor degree toward these continuing, cumulative adverse effects.

By releasing some quantity of sulfur dioxide to the atmosphere, any new coal-fired power plant would also contribute incrementally to significant cumulative impacts on the water quality of the nation's water bodies from acid deposition. However, the distance of HGS from areas of the country and continent where acidification is a serious problem, primarily poorly buffered Canadian Shield parent rocks/soils of the Upper Midwest and Northeast – may mean that its SO_2 emissions have limited or negligible impacts on these vulnerable areas. While innovative regulatory tools (cap and trade program) and control technology under the Clean Air Act Amendments of 1990 have made substantial strides in reducing SO_2 emissions nationwide, the significant impacts (e.g. acidified lakes and streams and stressed or eliminated aquatic life, including fish) largely continue to this day and will probably continue for some years to come.

Table 5-4. Summary of the Potential Long-term Cumulative Impacts to which the Alternative Site for SME's Power Plant would Contribute Incrementally

Resource topic	Proposed Action	Other Past, Present and Future Actions	Cumulative Impacts
Soils, Topography, and Geology	*	*	*
Water Resources	*	**	**
Air Quality	*	**	**
Biological Resources	*	*	*
Noise	*	*	**
Recreation	*	*	*
Visual Resources	*	*	*
Transportation	**	*	**
Farmland and Land Use	*	*	*
Waste Management	**	*	**
Human Health & Safety	*	*	*
Socioeconomics	++	+	+
Environmental Justice/Protection of Children	*	*	**

Key:
Adverse: * Minor Impact ** Moderate Impact *** Major Impact
Beneficial: + Minor Impact ++ Moderate Impact +++ Major Impact
No Impact: 0

Impact Intensity Definitions:
Minor – Change in a resource area occurs, but no substantial resource impact results.
Moderate – Noticeable change in a resource occurs, but the integrity of the resource remains intact.
Major – Substantial impact/change in a resource area that is easily defined, noticeable & measurable.

Air Quality – Cumulative impacts would be very similar to those associated with the Proposed Action. In the short-term, there may be slightly greater cumulative air quality effects on local residents from combined emissions and fugitive dust, in conjunction with other ongoing and future development near the Industrial Park. Over the long run, CFB technology and BACT controls would reduce potential power plant air emissions of all criteria pollutants and HAPs, so that SME's plant would not, in and of itself, generate significantly adverse impacts on local and regional air quality. DEQ Air Quality Permit conditions would be set so as to prevent the region from being pushed into non-attainment of the NAAQS and MAAQS. Nevertheless, some minor to moderate degradation of ambient air quality would likely occur, and with increasing overall emissions in Montana and neighboring states from a variety of sources, including new and proposed coal-burning power stations, cumulative impacts over the coming decades could become significant.

With air quality more than any other individual resource topic covered in this EIS, potential cumulative impacts from a large number of mobile and stationary sources across a wide geographic domain are the major issue. The Alternative Site, to the same extent as the Salem site, would contribute incrementally to a minor or moderate extent toward cumulative impacts related to regional haze, visibility impairment in Class I areas, mercury dispersion and bioaccumulation, and global climate change.

Noise – Cumulative impacts may be somewhat greater than those related to the Proposed Action. The proposed power plant would cause minor to moderate, short-term adverse impacts from intermittent noise during construction, both from equipment at site and transit of city and county streets by workers and equipment. The power plant would also entail minor long-term impacts from increased noise along route of train carrying coal to power plant. The overall, long-term impact of noise from coal plant operation on receptors would be negligible to minor. Increased traffic, possible widening of U.S.-87, the new IMC plant and possible others at the Industrial Park, and possible continuing residential and commercial development locally would all increase noise. Overall cumulative impacts would likely be moderately adverse but not significant.
Recreation – Cumulative impacts would be similar to those related to the Proposed Action. The Alternative Site would cause negligible to at most minor impacts on recreation in the immediate project vicinity and wider Great Falls area. There are no other past, present, or future planned projects in the area that would adversely impact recreation, so that cumulative impacts would be equal to the direct and indirect impacts from the power plant itself, which are at most minor.

Visual Resources – The Alternative Site would likely result in scenic impacts of moderate magnitude, long-term duration, medium or localized extent. No other projects, actions, or trends are known that would affect visual resources locally, and thus, cumulative impacts would be equal to the minor direct and indirect impacts from the construction and operation of SME's plant at the Industrial Park.

Transportation – Construction-related impacts on road traffic would be of minor magnitude, medium-term duration, and small extent. There would also be minor, temporary construction-related impacts on rail transport on the BNSF line to which a rail spur would connect. The long-term increase of traffic volumes on U.S.-87 running near the Industrial Park site – related to general development in the area, not the proposed SME plant, may be offset by proposed widening of this road. No short-term cumulative impacts are expected, but there could be long-term, minor adverse cumulative impacts on traffic.

Farmland and Land Use – Conversion of farmland soils would have impacts of minor magnitude, long-term (permanent) duration, and medium extent at the Industrial Park site. Impacts on adjacent land uses (especially residential) from the operation of a power plant at the Industrial Park Site would be minor magnitude, long-term duration, medium extent, and possible likelihood. The combination of the IMC plant, SME's plant, and possible future industrial facilities at the Industrial Park site would represent the realization of this site's intended uses, but could have minor adverse cumulative impact on nearby land uses.

Waste Management – Construction impacts on waste management at the Industrial Park would be of minor magnitude, medium-term duration, and small extent. Operation-related impacts on waste management for the Industrial Site would be of minor to moderate magnitude, long-term duration, and small extent. No other projects, actions, or trends are known that would affect waste management locally, and thus, cumulative impacts would be equal to the direct and indirect impacts from the Alternative Site, which would be moderately adverse.

Human Health and Safety – Construction-related impacts on human health and safety would be of minor magnitude, medium-term duration, and small extent. Operation-related impacts on human health and safety would be of minor magnitude, long-term duration, and medium extent. Several other facilities in the area are major sources of air emissions, and modeling presented in Chapter 4 determined that the HGS would not cause or contribute to exceedances of the NAAQS or the MAAQS. No other projects, actions, or trends are known that would affect human health and safety locally. Thus, cumulative impacts would be equal to the direct and indirect impacts from the HGS, which are at most minor.

Socioeconomics – Cumulative socioeconomic impacts would be very similar to those related to the Proposed Action. During the construction phase of the power plant, there would be moderately beneficial effect on the socioeconomic environment of the local and regional area, including increases in employment opportunities, total purchases of goods and services, and an increase in the tax base. During the long-term operational phase, beneficial socioeconomic impacts would be of minor magnitude, long-term duration and medium extent. Overall long-term cumulative impacts from the SME power plant and other recent projects in the area would be of minor magnitude and economically beneficial.

Environmental Justice and Protection of Children – Impacts of plant operation at the Industrial Park site on low-income residents would be of minor to moderate magnitude, long-term duration, medium extent, and unlikely likelihood. Emissions from the proposed plant could be compounded by other industrial emissions in the vicinity, if the Industrial Park further develops, which could potentially place an undue burden of air pollutants on residents downwind of the facilities, particularly children, and if present, low-income residents. Additional air modeling would be required in order to determine if this risk does actually exist. Thus, cumulative impacts could be minor to moderately adverse.

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Exhibit E

Montana Department of Environmental Quality's Draft Environmental Impact Statement for Bull Mountain Development Company, LLC's Roundup Power Project (Nov. 2002)

Montana Department of
ENVIRONMENTAL QUALITY

Judy Martz, Governor

P.O. Box 200901 • Helena, MT 59620-0901 • (406) 444-2544 • Website: www.deq.state.mt.us

November 2002

Dear Reader:

Enclosed for your review and comment is the Draft Environmental Impact Statement (EIS) for the proposed Roundup Power Project.

Bull Mountain Development Company, LLC, is seeking an air quality permit from the Montana Department of Environmental Quality (DEQ) for its proposed coal-fired electric generation plant near Roundup, Montana. The Draft EIS analyzes the potential impacts of the proposal, as well as potential impacts of alternatives: 1) No Action; 2) Landfill Alternative; and 3) 230kV Transmission System Alternative. The Draft EIS addresses issues and concerns raised during a scoping meeting in Roundup on April 4, 2002, and written comments received between March 20 and April 19, 2002. Application materials are available for review in the DEQ offices in Helena and Billings.

DEQ has selected the Proposed Action as modified by the Landfill Alternative as its preliminary preferred alternative. **This is not a final decision.** The preferred alternative could change in response to public comment on the Draft EIS, new information, or analysis that might be needed in preparing the Final EIS.

Public comments concerning the adequacy and accuracy of the Draft EIS will be accepted until December 18, 2002. Written comments may be sent, postmarked no later than December 18, 2002, to the Montana Department of Environmental Quality, P.O. Box 200901, Helena, MT 59620-0901, Attn: Greg Hallsten. Comments may be sent via e-mail to ghallsten@state.mt.us.

A public hearing will be held to receive oral or written comments in Roundup on December 5, 2002, at 7:00 p.m. in the Roundup Community Center.

Since the Final EIS might only contain public comments and responses, and changes to the Draft EIS, please keep this Draft EIS for future reference.

Sincerely,

Jan P. Sensibaugh
Director

State of Montana
Department of Environmental Quality
Permitting and Compliance Division

November 2002

Roundup Power Project

Draft Environmental Impact Statement

EXECUTIVE SUMMARY

Introduction

The Roundup Power Project (Project) is a proposed coal-fired electric Generation Plant located on private property about 35 miles north of Billings and 13 miles south-southeast of Roundup, Montana. A map of the proposed Project Area is shown in Figure ES-1. The Bull Mountain Development Company (proponent) submitted an application for an air quality permit to the Montana Department of Environmental Quality (DEQ) on January 14, 2002. The application, which had to meet the requirements of the Montana Clean Air Act (75-2-201 et seq., MCA and ARM 17.8.701 et seq.), was found to be adequate on July 22, 2002. This started a mandatory 180-day time frame for the environmental review under the Montana Environmental Policy Act (MEPA). The DEQ is the lead agency and is responsible for completing the Environmental Impact Statement (EIS) before issuing the Final Air Quality Permit (75-1-201, MCA).

The Project is designed to be a mine-mouth generating facility using coal from the existing Bull Mountains Mine (Mine) located adjacent to the Project. To meet its coal supply needs, the Project proponent has entered into contractual agreements with the Mine to purchase approximately 2.7 million tons of coal per year. Coal would be delivered from the Mine to the Generation Plant by a 4,000-foot-conveyeor system.

A new 161 kilovolt (kV) transmission system, approximately 28.2 miles long, would be built from the Generation Plant to NorthWestern Energy's Broadview Substation, interconnecting with the northwest transmission network. Power generated by this facility would be sold to all classes of electricity consumers (residential, municipal, cooperative, commercial, and industrial customers). The route for the transmission lines would be within or immediately adjacent to the Mine's rail corridor.

Two electric generating units, each with a pulverized coal-fired boiler and a steam turbine generator, are proposed. Each unit would be designed to generate a nominal 390 megawatts (MW) gross (350MW net) electrical capacity year-round on a 24-hour-per-day basis, except during planned maintenance periods and occasional repair outages when one unit would normally remain operating. Four to six groundwater wells, approximately 8,500 feet deep, are proposed as the Project's water supply.

Air pollution emissions, wastewater discharges, solid waste disposal, and other significant aspects of the Project would comply with applicable permits and environmental requirements.

Purpose and Need for the Action

The primary needs for the Project are to serve population growth, load growth, and the need for new base load electrical generation. That population and electrical demand growth, together with the retirement of older, less efficient electrical generating units, requires the continued development of new and cleaner generation sources. The Project would fill a portion of this need.

The Project would be built specifically to burn coal. The mine-mouth fuel source of the Project would provide stable pricing and reliability for base load power that is needed by the utilities to reliably serve industrial, commercial, and residential customers.

The Project would also increase the opportunity for competition in the regional energy market by increasing the total amount of electricity that could be transmitted reliably within the grid. Competition in the power marketplace is viewed as the best means in a market economy to keep power pricing in line with customer demand and need and competitive pricing of industrial production and output. Some of the electricity could be consumed by industrial, commercial, and residential customers in Montana. NorthWestern Energy currently is evaluating the interconnection of the Project with their transmission system at the Broadview Substation.

Issues Identified During Scoping

Before preparation of this Draft EIS, DEQ invited the participation of affected federal, state, and local government agencies, Indian tribes, the Project sponsors, and interested persons and groups to discuss issues, concerns, and opportunities, and to help identify the scope of the EIS. During this scoping process DEQ also identified possible alternatives to the Proposed Action.

On April 4, 2002, a public scoping meeting was held by the DEQ in the City of Roundup to identify issues and concerns. Comments were also accepted by mail. In addition, the Project proponent has sought public participation by making three presentations to the Legislature's Transition Advisory Committee, by participating in the Governor's Conference on Economic Development on March 7, 2002, in Billings, and by making a presentation to the executive board of the Big Sky Economic Development Authority in Billings.

The issues of concern raised during the public and agency scoping process include:

- Socioeconomic Effects - impacts on schools, law enforcement, and other public services due to in-migration of Generation Plant workers, changes in social setting and attitudes due to in-migration of Generation Plant workers, impacts associated with increased traffic, and infrastructure impacts.
- Air Quality - impacts due to pollution emissions during Generation Plant operation, global climate impacts due to greenhouse gas emissions during Generation Plant operation, and cumulative visibility impacts.
- Water Resources - impacts on surface water or groundwater quality due to solid waste disposal and other Generation Plant activities, and impacts on groundwater levels and supplies due to withdrawals during Generation Plant operation.
- Noise - disturbance of nearby residents by noise from Generation Plant construction and operation.
- Infrastructure - adequacy of existing transmission system to carry the Generation Plant output.
- DEQ Regulatory Actions and Response - evaluation/regulation for combined impacts of the Generation Plant and other industrial developments in the region, monitoring of the

Generation Plant construction process, including depth of groundwater wells, and response to Generation Plant emissions exceedances of permitted levels, accidents during Generation Plant operations and issues involving the proposed landfill.

Alternatives Considered and Eliminated

The Project proponent identified numerous alternatives to the Project, including:

- Fuel Sources
- Water Supplies
- Cooling Systems
- Combustion Systems
- Solid Waste Systems
- Wastewater Discharge Systems
- Emission Control Systems
- Generation Sites

The alternatives described in this section were eliminated from further consideration because they did not meet the stated purpose and need for the Proposed Action or were found to be economically unreasonable. A summary comparison of the alternatives considered and eliminated is provided in Table ES-1.

Alternatives Analyzed in Detail

There are two alternatives to components of the Proposed Action:

- Waste disposal from the Generation Plant
- Transmission of electricity into the interconnected grid in the western United States

In addition, a No-Action Alternative was analyzed in detail.

Landfill Alternative

Over the life of the Project, construction and operation of additional landfill cells on the Generation Plant site is proposed as an alternative to moving most of the solid waste to the Mine for disposal. The landfill would be a state-of-the-art facility designed with two cells, providing 60 acres for solid waste storage. The disposal area would be lined for the protection of groundwater and provided with a leachate collection system not to exceed 10 acres to remove leachate and storm water that collects on top of the lining.

230kV Transmission System Alternative

Each generating unit would be designed to generate nominally 390MW gross (350MW net) electrical capacity year round on a 24-hour per day basis. As an alternative to the three circuits of 161kV transmission lines from the Generation Plant to the Broadview Substation, two single-circuit 230kV lines on wood pole H-frame structures in the same corridor as the Proposed Action would be constructed. This would require a different transformer and associated equipment to support connection to a higher voltage transmission line. Equipment and construction would be similar to the 161kV Transmission System. Constructing the 230kV Transmission System Alternative would need a certificate under the Montana Major Facility Siting Act.

NorthWestern Energy's Broadview Substation is connected to the transmission grid in the northwest and coordinated by the Western Electricity Coordinating Council (WECC). Improvements are planned for the system to allow approximately 500MW to flow west towards Bonneville Power Administration's (BPA) Garrison Substation and approximately 200MW to flow south to PacifiCorp's Yellowtail Substation. Studies performed by these transmission providers have identified upgrades that are proposed and underway to support this flow.

No-Action Alternative

Under the No-Action alternative, the Generation Plant and the 161kV Transmission System to the Broadview Substation would not be constructed. The State of Montana would not issue the Final Air Permit for the Project. The purpose and need for the Project would not be met under the no-action alternative.

Preferred Alternative

The DEQ Preferred Alternative is the Proposed Action, with the addition of the Landfill Alternative for long-term solid waste disposal instead of long-term disposal in the mine. In this alternative, solid waste would be stored in landfill cells adjacent to the Generation Plant site for the life of the Project.

The alternative of disposing waste in the off-site landfill is preferred over the Proposed Action of long-term disposal of waste in the adjacent Mine, because it would result in the least impacts to environmental resources. The uncertainties associated with in-mine storage of waste make the Proposed Action a higher risk for causing impacts and possible contamination to soils, water bearing geological zones, and groundwater resources. In comparison, the use of lined and monitored landfill cells would minimize the risk of these impacts in the future. More information is needed to fully understand impacts from in-mine storage. Therefore, the Landfill Alternative is preferred.

With the construction and operation of the Proposed Action or the two alternatives (i.e., Landfill and 230kV Transmission), all resource areas, with the exception of fisheries, would experience some adverse environmental impacts (refer to Table E-2). Impacts that would result to vegetation and wildlife would include the loss of approximately 208 acres of grass/shrubland habitat for the Proposed Action or the action alternatives. However, this habitat is common and widespread in this portion of Montana, so impacts would be low. No federally listed or state sensitive species are known to exist in the Project study areas.

Air quality impacts was not a factor in selecting the Preferred Alternative, as impacts would not be measurably different under the Proposed Action or with selection of either of the action alternatives. Air resources were identified as having the highest Project-related impacts with most impacts ranging from low to moderate. A high impact to three Class 1 Areas (i.e., Yellowstone National Park, North Absaroka Wilderness, and Northern Cheyenne Reservation) was identified from Project operations impairing visibility in these areas during specific periods of time each year.

Finally, the socioeconomic benefits of preferring the Proposed Action and the Landfill Alternative (i.e., the Preferred Alternative), as well as the benefits of adding the base load generation at this location and using the proposed fuel source, would outweigh the potential environmental consequences of constructing and operating the Project as the Preferred Alternative.

DEQ's preference for this alternative could change in response to public comments on the Draft EIS, new information, or analysis completed as part of the Final EIS.

Affected Environment

The Project would be located approximately 35 miles north of Billings and 13 miles south-southeast of the City of Roundup. The affected environment considered for the Generation Plant Study Area encompassed all of the land in Section 15, Township 6 North, Range 26 East in Musselshell County, Montana. Approximately 208 acres would be devoted to the Generation Plant. The Landfill Alternative would occupy an additional 70 acres of land adjacent to the Generation Plant. The proposed Transmission System and 230kV Alternative would be 28.2 miles in length, crossing Musselshell and Yellowstone Counties from the Generation Plant to Broadview Substation to the west.

The air quality in the Project study area is well within the applicable ambient air quality standards for all criteria pollutants. The Generation Plant would be located along the crest of the drainage divide between the Musselshell and Yellowstone rivers. There are no surface water bodies within the Generation Plant Study Area. There are two main aquifers: the shallow sandstone aquifers and the Madison aquifer, which is the proposed water source for the Project.

From on-site soils and vegetation surveys, it has been determined that there are no identified wetland resources within the Generation Plant Study Area. No federal or state-listed plant or wildlife species of concern are known to occur within the vicinity of the Project. The Bull Mountains surrounding the Project support a good diversity of wildlife. Many of these species, particularly non-game species, could occur at least seasonally on or adjacent to the proposed Project site.

A total of 65 cultural resources have been identified within the area of potential effect for the Project. Overall, the Project site contains visual resources such as Signal Mountain and The Bull Mountains. Foothills, ephemeral drainages, riparian vegetation, annual grasslands, and large expanses of ponderosa pine influence the natural visual setting. Human built features include: U.S. Highway 87, dispersed rural residential housing and agricultural fields along with grazing areas. No BLM or U.S. Forest Service (FS) lands occur within or near the Project site.

Environmental Consequences

Where potential impacts to a resource were identified, an evaluation was conducted to determine if one or more actions would be effective in avoiding or reducing (e.g. intensity and/or duration) the potential impact.

Proposed Action

The Project was assessed for compliance with MAAQS, NAAQS, and PSD increment levels as part of the air resources analysis. The area of impact included surrounding Class I areas (Yellowstone National Park, UL Bend Wilderness Area, North Absaroka Wilderness, and Northern Cheyenne Indian Reservation). The Project, by itself, was above the PSD modeling significance levels.

The proposed Generation Plant would directly impact approximately 208 acres of mostly grass/shrubland habitat with some ponderosa pine. Due to the widespread, common nature of this habitat, and because no federally-listed threatened and endangered species are known to occur in these areas, the loss to wildlife habitat, cattle grazing and agricultural practices would result in a low impact to these resources.

Impacts to ground water from in-mine storage of waste is unknown. More studies would be required to assess impacts. Zero discharge would cause low impacts on ground water resources from wastewater ponds and a solid waste landfill.

Soil erosion impacts would be low due to control of runoff from the Generation Plant.

Archaeological sites within three miles of the Generation Plant site would be impacted, of which eight are considered visually sensitive. The Generation Plant chimneys would visually impact residents and travelers.

Full economic benefits realized from implementation of the Proposed Action include tax benefits to Musselshell County and the State of Montana. Jobs would also be a benefit during construction and during the life of the Project.

Portions of a 28.2-mile long and 300-foot wide right-of-way would result in ground disturbance caused by transmission structures and access roads associated with the Project. The transmission right-of-way would remain available for wildlife habitat, cattle grazing and agricultural practices. Due to the widespread, common nature of this habitat, and because no federally-listed threatened and endangered species are known to occur in these areas, the loss to wildlife habitat, cattle grazing and agricultural practices would result in a low impact to these resources.

If cultural or paleontological resource are discovered during Project construction and cannot be avoided, recovery of these resources would ensure no irreversible and irretrievable loss to cultural resources. Visual impacts would occur at road crossings and from scattered residences along the transmission line corridor.

The Project operations would result in the consumption of approximately 8,000 tons of coal per day from the adjacent Mine, which would be irreversibly replaced by the generation of electricity. The loss of these coal reserves would be offset by the benefit of electricity generation by the Project.

Landfill Alternative

Approximately 70 additional acres would be disturbed to develop the waste disposal landfill and associated ditches and access road. Impacts would be similar to Proposed Action with minor soil erosion caused by the transport of waste from the Generating Plant to the expanded landfill site.

The Landfill Alternative would have no impacts on T&E species. The expansion of the landfill would be more noticeable than the Proposed Action, but would result in only low visual resource impacts. As with the Proposed Action, socioeconomic benefits would result from construction jobs, taxes for government agencies and social services, and long-term jobs from operation and maintenance of the facility.

230kV Transmission System Alternative

The 230kV alternative would require fewer circuits and larger conductors, taller poles but wider spans between poles, and different hardware than a lower voltage system to transport the Project's 750MW. During construction, existing roads would be used where feasible but some new roads and upgrades to existing roads would likely be needed. Ground disturbance on the right-of-way would result in permanent loss of acreage for the pole footings and any new access roads. Temporary disturbance at work areas could be returned to pre-project use following construction. No impacts would result to T&E species.

As with the Proposed Action, socioeconomic benefits would result from construction jobs, taxes for government agencies and social services, and improved transmission infrastructure.

Visual impacts would occur at road crossings and from scattered residences along the transmission line corridor.

Recommended Mitigation

Mitigation measures cannot be required by DEQ without a request from the Project proponent that they be placed in a permit (75-1-201(5)(b), MCA). The Project proponent may request that any or all of the mitigation measures that pertain to expected impacts from their proposed activities be placed in the permits. In those instances when the proponent chooses not to include a mitigation measure in a state permit, the Project proponent may decide to perform the proposed mitigation voluntarily.

Mitigation measures designed to avoid, reduce, or eliminate potential impacts were developed. They would generally consist of reducing ground disturbance effects, minimizing road crossing impacts to surface waters, measures to reduce the risk of groundwater impacts from waste disposal, minimize habitat loss, reclaim disturbed lands, reduce the impacts of soil erosion, span or avoid sensitive features, reduce visual contrast, minimize health and safety risks, minimize noise impacts, and reduce land use impacts.

Cumulative Impacts

Cumulative impacts result from the incremental impact of the Proposed Action when added to other past and present actions and future actions under state review.

Residential and Commercial Development

Currently residential and commercial developments are few in the Project study area and surrounding county. Eight rural residences are located within a mile of the Project. The City of Roundup, located approximately 13 miles to the north, is the closest urban development.

According to county records, no new residential developments are planned for the Project study area. However, given the amount of recent residential development, and the amount of land in the Project study area that is subdivided, it is reasonable to assume that a small level of development would occur in the future.

The nearest commercial establishment is the Brandin' Iron Saloon, which is located along U.S. Route 87, approximately two miles north-northwest of the Project study area. A convenience store and a log furniture store are proposed along U.S Route 87, approximately two miles northwest of the Project study area. Other plans for the area include a recreational vehicle park and golf course.

Industrial Development

The PM Mine, an underground coal mining operation, was located partially in Section 14, east of the Project study area. The PM Mine ceased operation in the 1990s, but the Bull Mountains Mine No. 1 plans to resume mining of the same area. No new coal mines or other industrial developments are known to be proposed for the Project study area.

Infrastructure Development

Roads

Portions of U.S. Route 87 between Roundup and Billings were upgraded during the 1990s. The only known proposed future upgrades are the construction of acceleration-deceleration lanes where Old Divide Road (the proposed access road to the Project study area) intersects Route 87.

Transmission

The major backbone of the Montana transmission system is the two 500kV lines that run east to west across the state and through the Broadview Substation (the Project connection point). The 500kV lines connect to the Bonneville Power Administration (BPA) system at Garrison Substation, west of Broadview Substation. Additionally, 230kV transmission connects Broadview Substation to the PacifiCorp system at Yellowtail Substation southwest of the Project study area.

According to BPA, major transmission improvements to the BPA system are planned. These improvements would include substation upgrades and transmission line additions between Montana and the Pacific Northwest.

The transmission lines from the Project would be inside the existing railroad right-of-way for the Mine railroad to Broadview Substation, where the lines would connect to the NorthWestern Energy system. No additional land would be disturbed.

Consultation and Coordination

In addition to the public and agency scoping process, federal, state, and local agencies with an interest in the Project or the Project study area were contacted and asked to provide comments about the Project, identify issues that would need to be addressed, and supply data, information, and/or mapping. On April 4, 2002, a public scoping meeting was held by the DEQ in the City of Roundup. Public comments were also accepted by mail during the scoping period from March 20 to April 19, 2002. On October 18, 2002, a letter was sent to the Project mailing list stating that an EIS was being prepared. The letter also asked that EIS reviewers contact DEQ to request a copy of either a compact disk (CD) or hardcopy of the EIS, or just this Executive Summary.

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CHAPTER 1
PURPOSE AND NEED

1.1 Introduction

This chapter describes the proposed agency action and a brief description of the purpose, need, and benefits of the proposed Roundup Power Project (Project). All necessary permits, licenses, and authorizations associated with the Proposed Action are also identified. In addition, the public participation process and issues of concern raised during the scoping process are summarized.

The Project is a proposed coal-fired electric generation facility located on private property about 35 miles north of Billings and 13 miles south-southeast of Roundup, Montana. A map of the proposed Project Area is shown in Figure 1-1. The Project is designed to be a mine-mouth facility using coal from the existing Bull Mountains Mine (Mine) located adjacent to the Project. To meet its coal supply needs, the Project proponent has entered into contractual agreements with the Mine to purchase approximately 2.7 million tons of coal per year. Coal would be delivered from the Mine to the Generation Plant by a conveyer system. A new 161 kilovolt (kV) transmission system, approximately 30 miles long, would be built from the Generation Plant to NorthWestern Energy's Broadview Substation, interconnecting with the northwest transmission network. Power generated by this facility would be sold to all classes of electricity consumers (residential, municipal, cooperative, commercial, and industrial customers).

1.2 Proposed Agency Action

The action required by the Montana Department of Environmental Quality (DEQ) is to make a decision to issue or deny the necessary DEQ-authorized permits to construct and operate the Project. The primary DEQ authorization is granting a Final Air Quality Permit to the Project proponent. This permit action is required under the Montana Clean Air Act 75-2-201 et seq., Montana Code Annotated (MCA), and Administrative Rules of Montana (ARM) 17.8.701 et seq. All necessary permits, licenses, and authorizations required for the Project by the DEQ and other state, federal, and local authorities are listed in Table 1-1. This environmental impact statement (EIS) is being prepared to comply with the Montana Environmental Policy Act of 1971 (MEPA), as modified by subsequent legislation. The EIS focuses on major actions resulting from the Proposed Action that may have significant impacts on the human environment.

1.3 Purpose and Need for the Action

The primary needs for the Project are to serve population growth, load growth, and the need for new base load electrical generation. The population of the United States is growing by several million households per year through internal population growth and immigration. Recent (2000) census data indicate that the population of the western United States grew approximately 1.6 percent from 1990 to 1999, outstripping the growth averaged over the United States.

The Project would provide a new source of electricity in a region where energy supplies have not kept up with the growth of demand. The Western Electric Coordinating Council (WECC; formerly the Western System Coordinating Council or WSCC) produces an annual report on the reliability and adequacy of the power system in the western United States (WECC, 2002). Montana is part of an area identified by WECC as the Northwest Power Pool Area (NWPP), which includes most of Montana and Nevada and all of Idaho, Oregon, Washington, and Utah, as well as parts of western Colorado, northern California, and western Canada. The current ten-year projections have indicated the demand for electricity for the NWPP will grow from the approximately 50,000MW of demand recorded in 2001 to as much as 65,000MW in 2011. That population and electrical demand growth, together with the retirement of older, less efficient electrical generating units, requires the continued development of new and cleaner generation sources. The Project would fill a portion of this need.

Power output would be used by the owners for their internal use. A small portion may be sold into the wholesale power market within the interconnected grid of the WECC when not needed by the owners. The WECC projects that peak demand within the western United States will increase from the approximately 120,000MW recorded in 2001 to approximately 165,000MW in 2011. While the demand for electricity has weakened somewhat since the economic downturn starting in late 2000, the demand for power will likely continue its upward trend following economic recovery. This Project fits into the expected future economic growth and need for new sources of clean, economical power.

The recent downturn in the economy followed a period of unprecedented expansion in the economy of the United States and rapid growth in the demand for electricity to support industrial and technological expansion. Expansion of the power generation and transmission infrastructure in the United States is supported by government energy agencies, as this is thought to be the only means to avoid crisis and shortfalls for the next period of economic expansion. Continual reliance on a sagging and aging infrastructure is a concern and may be a problem in the future unless positive action is taken with infrastructure expansion, such as that proposed by the Project.

The power industry has been under intense restructuring starting with the approval of the Public Utility Regulatory Policies Act of 1978, which introduced the concept of private generators to be a part of the wholesale power market. To reduce the effects of the regulated monopolies that had historically been the utilities, this act required utilities to purchase power from “qualified facilities.” A number of other Federal Energy Regulatory Commission (FERC) Orders and Congressional actions have followed in an attempt over the past decade to examine restructuring transmission and further encourage private development in the power generation market.

The generation market is presently restructured to a large degree with most power plants owned by unregulated power companies. Many developers of gas-fired generation facilities have proposed projects in various parts of the western United States, and some of these projects have been or are being constructed. Uncertainties for fuel sources, intense gas price fluctuation, and intense competition have limited the number of power plants that have gone into commercial operation. Coal-fired power plants have many advantages over gas-fired combustion turbine projects such as having stable fuel supplies and prices. Other electrical energy needs are filled by renewable fuel sources, hydroelectric and nuclear generation, and through conservation and demand-side management techniques. All of these sources play an important role in meeting the energy demands of the United States.

Figure 1-1 Vicinity Map

The Project would be built specifically to burn coal. The mine-mouth fuel source of the Project would provide stable pricing and reliability for base load power that is needed by the utilities to reliably serve industrial, commercial, and residential customers. Coal is currently the fuel for more than 50 percent of the electricity generated in the United States and 37 percent of the world, although new coal-fired power plants have not been constructed for nearly two decades in the United States.

The Project also would increase the opportunity for competition in the regional energy market by increasing the total amount of electricity that could be transmitted reliably within the grid. Competition in the power marketplace is viewed as the best means in a market economy to keep power pricing in line with customer demand and need and competitive pricing of industrial production and output. Competition in the marketplace is also expected to result in system redundancy and reliability that was formerly found and maintained in the regulated industry.

Utilities are facing increased electricity demands and changes in electricity suppliers because of regulatory changes that have occurred in the United States over the past few years. The Project would supply electricity for wholesale use by the Project owner utilities (private, municipal, and cooperative) for sale to the utilities’ industrial, commercial, and residential electricity consumers. It is possible that excess power could be sold from time to time by the owners into the wholesale spot market, however, it is the primary intent of the Project owners to obtain base load energy for their own power supply portfolios.

The purpose of the Project in the proposed location is to take advantage of a reliable, cost-effective, and high-quality coal source to fuel the Project. The purpose of the associated transmission line to the Broadview Substation is to provide a reliable interconnection to the interconnected transmission grid in the western United States. Some of the electricity could be consumed by industrial, commercial, and residential customers in Montana. NorthWestern Energy currently is evaluating the interconnection of the Project with their transmission system.

1.3.1 Benefits of the Project

The benefit of the Project would be a stable, reliable, low-cost supply of electricity in a region that has had uncertain supply and prices in recent years. The Project would have a low-cost, stable, and high-quality fuel source (i.e., coal with high heating value and low sulfur content) for the life of the Generation Plant in the form of the Mine, located within a mile of the Generation Plant Study Area. The Project would not be subject to the uncertainties and recent water supply issues that have affected hydroelectric generation, and the swings in fuel prices and supply that have occurred for natural-gas-fueled plants.

This known and stable electricity source could allow Montana to attract business and to develop its economy. Business is attracted by stable and assured operating costs and conditions. For many businesses, electricity is a major concern and expense.

The Project would be an industrial facility that would convert a raw material (coal) to a higher value product (electricity). The coal from the adjacent Mine would ultimately be converted to electricity and is, therefore, a benefit to Montana to receive the investment, the tax-base increases, and the jobs that would be created by the construction, long-term operation of the facility, and the support systems and economic development. In this respect, this facility would not be any different from other industrial facilities. An automobile assembly plant or a computer manufacturing facility also would create jobs, attract investment, and generate taxes, with the products being both consumed in the state and exported.

1.4 Authorizing Actions, Statutes, and Consultations

MEPA requires an environmental review whenever a state agency intends to issue a lease, permit, license, certificate, or other entitlement for use or permission to act by the agency, either singly or in combination with other state agencies (75-1-201, MCA). On January 14, 2002, a formal application for an Air Quality Permit was submitted by the Project proponent with the DEQ to meet requirements of the Montana Clean Air Act (75-2-201 et seq., MCA and ARM 17.8.701 et seq.). The application was deemed "filed" on July 22, 2002, starting the 180-day time frame for the associated MEPA process with DEQ as the lead agency.

Additional permit requirements associated with the Project are included in Table 1-1. The Project proponent, because of its desire to be responsive to the concerns of the public and to be proactive in addressing any potential concerns, voluntarily elected to have the Project fully evaluated and assessed pursuant to a comprehensive EIS under MEPA. DEQ has determined that an EIS is the appropriate form of environmental review due to the potential for significant impacts from agency actions and resultant Project-sponsored activities.

Table 1-1 Federal, State, Local Permits, Approvals, and Authorizing Actions

Issuing Agency	Permit/ Approval Name	Nature of Permit	Authority
Federal Government			
Federal Aviation Administration	Notice of Proposed Construction or Alteration	Tower location and height relative to air traffic corridors	49 USC 1501; 13 CFR 77, Objects affecting navigable air space
U.S. Army Corps of Engineers	Section 404 Permit (Clean Water Act) Nationwide Permit/Individual Permit	Controls discharge of dredged or fill materials in wetlands and other waters of the U.S.	Section 404 of the Clean Water Act (33 CFR 323.1)
State Government			
Montana DEQ	Section 401 Water Quality Certification	Provides a review of potential adverse water quality impacts potentially associated with discharges of dredged or fill materials in wetlands and other waters of the U.S.	Montana Water Quality Act (75-5-401 et seq., MCA)

Issuing Agency	Permit/ Approval Name	Nature of Permit	Authority
Montana DEQ	General Permit for Storm Water Discharges Associated with Construction Activity	Submit Notice of Intent for coverage under General Permit to authorize storm water discharges to surface waters of the state associated with the construction activities	Montana Water Quality Act (75-5-101 et seq., MCA)Montana Water Quality Act (75-5-401 et seq., MCA)
	General Permit for Storm Water Discharges Associated with Industrial Activity	Apply for coverage under General Permit in order to authorize storm water discharges to surface waters of the state associated with the operation of the Generation Plant	Montana Water Quality Act (75-5-101 et seq., MCA) Montana Water Quality Act (75-5-401 et seq., MCA)
	Montana Ground Water Pollution Control System (MGWPCS)	Permit to discharge sewage effluent into the groundwater system via a permitted wastewater system	75-5-101, MCA 17.30.1341 ARM 17.30.1042 ARM
	Air Quality Preconstruction Permit	Permit for the construction, installation and operation of equipment or facilities that may directly or indirectly cause or contribute to air pollution	75-2-211, MCA: Pre-construction permit
	Air Quality Operating Permit	Permit for the construction, installation and operation of major equipment or major facilities that may directly or indirectly cause or contribute to air pollution	75-2-217, MCA: Operating permit
Montana Department of Natural Resources and Conservation	Beneficial Water Use Permit	Would allow use of groundwater for the Generation Plant and related facilities	85-2-311 MCA Water Right Permit
Montana Department of Transportation	Utility Crossing Permit	Grant state highway utility crossing permits for transmission line and access roads that may encroach on state highway rights-of-way	RW131 and/or RW20
Montana State Historic Preservation Office	Section 106 of the National Historic Preservation Act	Consults with project applicants and state agencies regarding impacts on cultural resources that are either listed or eligible for listing on the National Register of Historic Places	National Historic Preservation Act
Local Government			
County Weed Control Districts	Noxious weed management program	Provides containment, suppression, and eradication of noxious weeds	Title 7 (7-22-2101-2153, MCA)

Issuing Agency	Permit/ Approval Name	Nature of Permit	Authority
Boards of County Commissioners	Easement grants and road-crossing permits	Consider issuance of right-of-way and road-crossing permits for county property and roadways	

1.5 Issues to be Addressed

Before preparation of the EIS, DEQ invited the participation of affected federal, state, and local government agencies, Indian tribes, Project sponsors, and interested persons and groups to discuss issues, concerns, and opportunities, and to help identify the scope of the EIS. During this scoping process, DEQ also identified possible alternatives to the Proposed Action. Government agencies that participated in the scoping process and preparation of the EIS are identified in Chapter 6. Agencies and stakeholders specifically contacted for input are identified in Chapter 5. Alternatives to the Proposed Action are described in Chapter 2.

On April 4, 2002, a public scoping meeting was held by the DEQ in the City of Roundup. The purpose of this meeting was to identify issues and concerns that the public believed needed to be analyzed in the environmental review under MEPA. Comments on the scope of the MEPA review were also accepted by mail. In addition, the owners of the Project have sought public participation by making three presentations to the Legislature’s Transition Advisory Committee, by participating in the Governor’s Conference on Economic Development on March 7, 2002, in Billings, and by making a presentation to the executive board of the Big Sky Economic Development Authority in Billings.

The issues of concern raised during the EIS scoping process and federal and state resource management agencies are listed below.

1.5.1 Socioeconomic Effects

- Impacts on schools, law enforcement, and other public services due to in-migration of Generation Plant workers.
- Changes in social setting and attitudes due to in-migration of Generation Plant workers.
- Impacts associated with increased traffic.
- Infrastructure impacts.

1.5.2 Air Quality

- Air quality impacts due to pollution emissions during Generation Plant operation.
- Global climate impacts due to greenhouse gas emissions during Generation Plant operation.
- Cumulative impacts.

1.5.3 Water Resources

- Impacts on surface water or groundwater quality due to solid waste disposal and other Generation Plant activities.
- Impacts on groundwater levels and supplies due to withdrawals during Generation Plant operation.

1.5.4 Noise

- Disturbance of nearby residents by noise from Generation Plant construction and operation.

1.5.5 Infrastructure

- Adequacy of existing transmission system to carry the Generation Plant output.

1.5.6 DEQ Regulatory Actions and Response

- Evaluation/regulation for combined impacts of the Generation Plant and other industrial developments in the region.
- Monitoring of the Generation Plant construction process, including depth of groundwater wells.
- Response to Generation Plant emissions exceedances of permitted levels, accidents during Generation Plant operations and issues involving the proposed landfill.

CHAPTER 2
DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 Overview

This section describes the process of developing and selecting reasonable alternatives to the Proposed Action. To be considered for further study, each potential alternative had to meet the purpose of and need for the Roundup Power Project (Project) as well as meet technical, environmental, and economic feasibility criteria. A wide range of alternatives were evaluated and placed into the following categories:

- Proposed Action – describes the proposal and the activities needed to implement it.
- Alternatives Considered and Eliminated – describes what alternatives were briefly examined but eliminated from detailed study. Alternatives discussed include fuel sources, water supplies, waste stream treatment, disposal alternatives, and alternative generation sites.
- Alternatives to the Proposed Action including No-Action – identifies alternatives that are reasonable and that would support the purpose and need of the Proposed Action. The alternatives must also be feasible from a technical and economic standpoint.

  The No-Action alternative discusses the current situation by assuming the air quality permit would not be issued and the Generation Plant would not exist at this or any other location.

2.2 Proposed Action

The Proposed Action includes the granting of DEQ permits and licenses described in Chapter 1, Table 1-1 and the resultant construction and operation of the Project as it has been proposed. The following sections summarize the Proposed Action.

The Project is located in Musselshell County, approximately 35 miles north of Billings and 13 miles south of Roundup, Montana. The site is east of U.S. Route 87 and north of Old Divide Road. Approximately 167 acres of private land would be located within the plant fence. An additional 40 acres of private land would be utilized outside the fenced area for additional Project facilities. Figure 1-1 presents an overview of the Project including the Generation Plant and Transmission System.

The proposed site is located in the NW¼ SE¼ of Section 15, Township 6 North, and Range 26 East. Universal Transverse Mercator (UTM) coordinates for the site center are Zone 12, Easting 696.25 kilometers (432.60 miles), and Northing 5,126.87 kilometers (3,185.69 miles).

Unless otherwise cited, a description of all proposed Project activities can be found in the original Project proponent submittals. The original application for an air quality permit was submitted to DEQ on January 14, 2002, and accepted as filed on July 22, 2002. The draft air quality permit was issued on August 12, 2002. The proponent's Environmental Impact Statement (EIS) Support Document (Bull Mountain Development Company, LLC., 2002a) was submitted to DEQ in May 2002.

2.2.1 Project Facilities

The Project would consist of two electric generating units, each with a pulverized coal-fired boiler and a steam turbine generator. Each unit would be designed to generate a nominal 390 megawatts (MW) gross (350 MW net) electrical capacity year-round on a 24-hour-per-day basis, except during planned maintenance periods and occasional repair outages when one unit would normally remain operating.

In addition to the generating units, the following associated facilities are planned:

- Four to six groundwater wells, approximately 8,500 feet deep, are to be constructed for the plant water supply.
- Three circuits of 161 kilovolt (kV) electrical transmission lines would connect from the generation facility approximately 28.2 miles southwest to NorthWestern Energy's Broadview Substation. The route for the transmission lines would be within or immediately adjacent to the Bull Mountains Mine's (Mine's) rail corridor.
- Coal to fuel the Generation Plant would be delivered by an approximately 4,000-foot-long conveyor belt from the Mine transition point.

Air pollution emissions, wastewater discharges, solid waste disposal, and other significant aspects of the Project would comply with applicable permits and environmental requirements. In addition, the Generation Plant would be constructed in accordance with American Society of Mechanical Engineers (ASME) standards for power plants and the National Boiler Board Rules. American National Standards Institute (ANSI) standards and steel construction standards would be adopted for structural, tank, and concrete work. State and federal building codes and standards and local industrial requirements would also be followed. Fire and safety codes would be adhered to for the affected sections of the National Fire Protection Agency (NFPA) concerned with various fire classifications. Occupational Safety and Health Administration (OSHA) standards would be followed regarding Generation Plant operations. Other regulations and design codes would be followed, as applicable. The Project final design drawings and procurement specifications would be provided by engineering specialists in power generation and transmission projects.

Initial Generation Plant planning and the development of the conceptual design have incorporated a number of enhancements relative to the Project. The selection of the most suitable equipment consisted of balancing the investment, operating characteristics, efficiency, and the type of coal that would combine to give the most economical installation. The conceptual design of the plant also incorporates state-of-art pollution control equipment that achieves low environment impacts and complies with all applicable regulations.

A visual simulation of the proposed Generation Plant is provided in Figure 2-1. The main Generation Plant features shown are the plant building, the air-cooled condensers, and the two chimneys (one for each unit). The colors selected for the structures are intended to blend with the surroundings, except for the chimneys in which the colors selected would meet aviation safety requirements.

Figure 2-1 Visual Simulation Looking North

The Plant Layout depicting all major facilities is shown on Figure 2-2. This drawing shows the two turbine and boiler buildings, flue gas treatment equipment with two chimneys, air-cooled condensers, transformers and other major equipment. The offices, control room, warehouse, shop, and water treatment equipment are also shown. This area would be enclosed with a perimeter fence.

Equipment and systems such as the air-cooled condenser, transformers, switchyard, water and demineralized water storage tanks, water treatment building, storm water detention pond, plant area northwest of power block, plant area south of the power block, coal pile runoff sedimentation pond, wastewater holding pond, and landfill leachate collection pond would be located outside the boiler room and turbine room building power block complex. Administration offices, control room, warehouse, and gatehouse are also located adjacent to the power block complex. Figure 2-3 shows the overall site design and layout.

The boiler, turbine, and most of the other equipment would be located within the main building. The equipment includes the feed water heaters, condensate and boiler feed pumps, boiler coal pulverizers, primary air fans, combustion air heaters, and bottom ash hopper. The equipment would be large compared to most industrial equipment found in an industrial park setting, but the boiler and turbines for this plant would be about one-third the size of the largest boilers and turbines in the power industry. The control room, electronics area, and electrical switching equipment also would be located in the building.

Project Lands

It is estimated that the total area disturbed during construction would be about 208 acres. About three inches of topsoil would be stripped from the entire disturbed area, resulting in approximately 84,700 cubic yards of soil to be stockpiled at a height of 10 feet to 15 feet. Most of the topsoil would be spread on slopes, ditches, and pond dikes as soon as the grading in those areas is completed.

Some of the stored topsoil would be used to cover solid waste landfill cells. The landfill would be designed to hold 10 years of solid waste and because it would not likely receive waste continuously during the first 10 years of plant operation, some of that topsoil could be stored for many years. Topsoil would be spread on the landfill cell vegetation cover layers at a minimum depth of six inches.

Roads and Parking Areas

The Generation Plant access road (approximately 0.2 mile long) would be surfaced with asphalt pavement. Roads around the immediate Generation Plant Study Area also would be surfaced with asphalt concrete. Other service and maintenance roads within the Generation Plant would be surfaced with crushed rock. The road to the solid waste disposal area would be 50 feet wide, surfaced with crushed rock, and would be designed for heavy haul trucks. A 10.6-acre construction parking lot and a 13.5-acre area covered with crushed rock would be provided for construction trailers, tools, vehicles, equipment, and material construction storage and laydown.

Plant Buildings and Structures

Plant buildings and structures include the following:

Main building plan area	200 feet x 260 feet
Turbine room portion of building	120 feet tall
Boiler room portion of building	250 feet tall
Training, control, support facilities (adjacent building attached to main building)	65 feet tall x 100 feet x 70 feet
Water treatment, maintenance shop, parts storage, main locker room	35 feet tall x 120 feet x 265 feet
Air compressor building	20 feet tall x 35 feet x 70 feet
Coal conveyor transfer house	50 feet tall x 30 feet x 30 feet
Coal crusher building	90 feet tall x 50 feet x 80 feet
Lime preparation building	20 feet tall x 70 feet x 100 feet

Figure 2-2 Plant Layout

Figure 2-3 Site Design

Additionally, there would be small buildings for equipment such as the No. 2 fuel oil pump, fire pumps, and emergency diesel generator. These buildings mainly would have mat-and-footing-type foundations, steel structures, and insulated metal siding. The buildings would be provided to protect equipment and provide proper conditions for plant operators during inclement weather and to control equipment noise to the surrounding Generation Plant area.

Each unit would have a 574-foot-tall chimney constructed of a reinforced concrete outer shell and a corrosion resistant liner. Federal Aviation Administration (FAA) lighting and marking requirements would be met.

Mine Mouth Plant

The design of the Project is based on receiving coal from the Mine via conveyors. This design concept is called a mine-mouth plant. It is different from most coal-fired plants that receive coal by train, truck, or river barge. Shipping is often a significant cost of coal production and use in electrical generation.

The Mine would use a popular form of continuous underground mining called longwall mining. Using this technique, a continuous miner moves back and forth across a panel of coal (called a longwall) about 800 feet wide and up to 7,000 feet long. Longwall mining is performed using hydraulic roof supports that are advanced as the seam is cut. The roof behind the supports is allowed to collapse as the mining progresses.

In continuous mining, a specialized cutting machine removes coal from the wall and automatically removes it from the mine using belt conveyors. Using conveyors instead of a train or other coal transport reduces coal handling dust and fuel degradation. The noise, traffic disruption, and cost associated with railroad or other forms of shipment of coal is also eliminated or minimized. Conveyor systems are efficient, reliable, and environmentally desirable.

Operations and Maintenance

Generation Plant staffing initially would require about 100 people for the first unit operation and would increase to about 150 people when the second unit would begin operating. Initial personnel staffing of the Generation Plant would involve an intensive program of advertising, interviews, and training.

The plan would be to operate the Generation Plant 24-hours-per-day to provide its maximum electrical output throughout the year. Generation Plant operations would be monitored for staff safety, meeting environmental requirements, and providing reliable and efficient operations. Operations would focus on meeting the power output objectives and minimizing fuel and other consumables.

Planned maintenance would be coordinated to reduce the impact of having a unit shut down for maintenance and overhauls. Normally, this work would be planned during spring when the need for electricity is reduced. Usually only one of the two units would be shut down. Short maintenance periods of one to two weeks would likely occur once each year or two. Longer maintenance periods of three to five weeks for major steam turbine overhauls would probably need to occur once every six to nine years.

2.2.2 System Design

The system design consists of a boiler, turbine and associated systems, storm water and wastewater ponds, solid material storage areas, solid waste disposal areas, and material handling.

Boiler, Turbine, and Associated Systems

The Generation Plant's major components would include two similar designed units each with one pulverized coal-fired boiler, steam turbine generator, air-cooled condenser, emission control equipment, and chimney. Figure 2-4 illustrates a schematic diagram of the equipment for one of the two units. This is a modern coal plant design that uses the most recent commercially available boiler, turbine, air emission control equipment, and air-cooled condenser.

Coal fuel from the Mine would travel by conveyor to the Generation Plant area and then to storage silos adjacent to the boiler. Combustion would take place in the boiler furnace where water would be converted to steam. The forced draft fans would provide combustion air. Steam would be produced in the boiler furnace area and would be heated in convection sections of the boiler.

Steam at high pressure and temperature (2400 psig, 1005°F) from the boiler would enter the steam turbine. Steam from the high-pressure turbine section would be reheated (to 1005°F) in the boiler reheater for improved cycle efficiency. Steam would continue to flow through the turbine converting steam pressure and temperature energy to mechanical energy for turning the generator to produce electricity. When the steam would reach the lowest practical pressure (i.e., significantly below atmospheric pressure, which would result in higher cycle efficiency), it would leave the turbine and enter the air-cooled condenser.

An air-cooled condenser would be used for reduced plant water consumption. After the steam was condensed, condensate and boiler feed pumps would return the water to the boiler through the feed water heaters.

Feed water heaters would improve the cycle efficiency by heating the water before it would enter the boiler. This often-used regenerative design is called the advanced Rankine Cycle.

Makeup water (new water added to a boiler circuit) would be needed because some water and steam would be lost in the boiler, turbine, and other equipment and systems and because it would be necessary to drain (blow down) a portion of the boiler water to maintain the needed water chemistry. The makeup water would be pumped from the wells and treated in a demineralizing system.

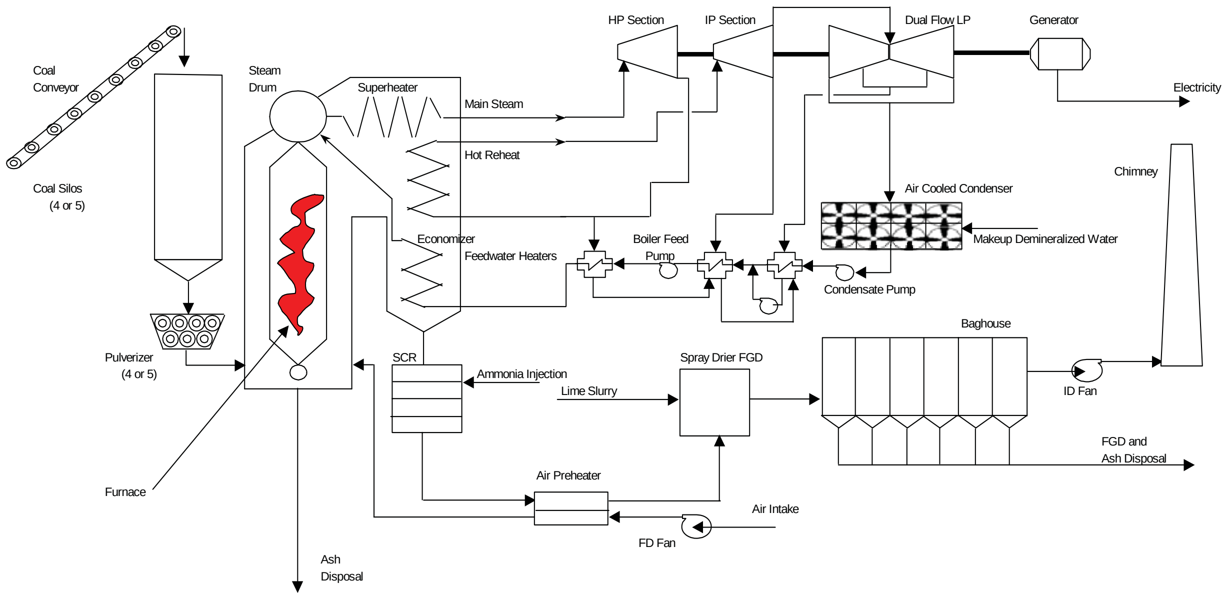

Figure 2-4 Schematic Diagram of the Equipment

Air Emission Control Equipment and Facilities

The main and auxiliary boiler would be specified to have low NO_X burners, which would have staged fuel and air mixing and over-fire air. These burners would reduce the flame temperature, which would result in lower NO_X concentrations in the boiler exhaust flue gas. Equipment for control of boiler emissions would include low-NO_X burners and a selective catalytic reduction (SCR) system, which in combination would provide very efficient NO_X emission control. The suggested operational constraints would specify an hourly limit for operation of auxiliary boilers and emergency generators to maintain overall compliance with emissions. The solids handling systems for coal, ash, and lime would be totally enclosed or would include spray dust suppression and wind break fencing to minimize fugitive emission possibilities.

Low-NO_X burner designs are currently available that generate less than 50 percent NO_X compared to burner designs available 10 to 15 years ago. This reduction is accomplished mainly with staged combustion and with over-fire air. Over-fire air provides the oxygen needed to complete the combustion in the staged concept. Staged combustion mixes air and fuel gradually so burner flame temperatures are lower resulting in lower NO_X.

The boiler flue gas (i.e., combustion exhaust) would enter the SCR unit for NO_X conversion to water and nitrogen. Next, the flue gas would flow through the air heater, which would improve the Generation Plant's plant efficiency by heating the incoming combustion air. SCR equipment would treat the boiler exit gas to reduce NO_X by approximately 80 percent. NO_X is converted by injecting ammonia upstream of a catalyst. In the presence of the catalyst (usually titanium oxide on a ceramic base), NO_X would react with ammonia and produce water and nitrogen. The catalyst would be located downstream of the boiler economizer and before the air heater where boiler exit gas temperature would be at an optimum (about 700^oF). Installation of SCRs on coal plants is a relatively new development, but sufficient experience has been established to have a high confidence in proper operation of this equipment. This equipment is being employed to meet current air emission limits.

The Mine coal, which has a low sulfur content, in combination with a flue gas desulfurization (FGD) spray dryer and fabric filter baghouse, would provide the required SO_X control. SO_2 emissions would be controlled in the spray dryer absorber FGD system. A lime and water mist would be sprayed in the FGD vessel. This lime slurry consisting mainly of calcium oxide would be atomized in the spray dryer chamber. Calcium oxide would react with sulfur in the boiler exhaust gas and would produce calcium sulfur compounds and oxygen. The downstream fabric filter would collect the calcium sulfur compound dust.

The combination of low sulfur fuel and SO_X removal equipment would result in low SO_X emissions. The proposed spray dryer FGD system would minimize water consumption as compared to a wet limestone FGD system (approximately 305 million gallons per year for the proposed FGD system vs. approximately 420 million gallons per year for a wet FGD system.) The proposed FGD system also would generate less solid waste than a wet limestone FGD system (approximately 155,000 tons of waste per year for the proposed system vs. approximately 206,000 tons per year for a wet system). Water needed for this system would be obtained mainly from Generation Plant wastewater flows (Figure 2-5). Existing commercial sources are available to supply the needed lime, which would be delivered to the Generation Plant by railroad car.

The ash particulates generated during the combustion process would be removed by a fabric filter or 'baghouse' system. Most of the boiler fly ash particulate and calcium sulfate from the FGD system entrained in the boiler exhaust gas would be removed in the fabric filter baghouse. The air permit would limit air emissions.

Ash from the bottom of the boiler and baghouse would accumulate in separate hoppers and would be carried by truck to the disposal area or to the Mine. A fan(s) would aid in moving the boiler flue gas through the boiler and emission control equipment with subsequent discharge to the chimney.

Water Supply and Treatment Systems

Water for the Generation Plant systems would be supplied from four to six deep wells, each approximately 8,500 feet deep. The preliminary normal maximum Generation Plant operating water supply and usage rates are shown on the Generation Plant Water Balance Diagram, Figure 2-5. The information provided at this time is preliminary pending the completion of sufficient detailed design information and obtaining complete well water analysis.

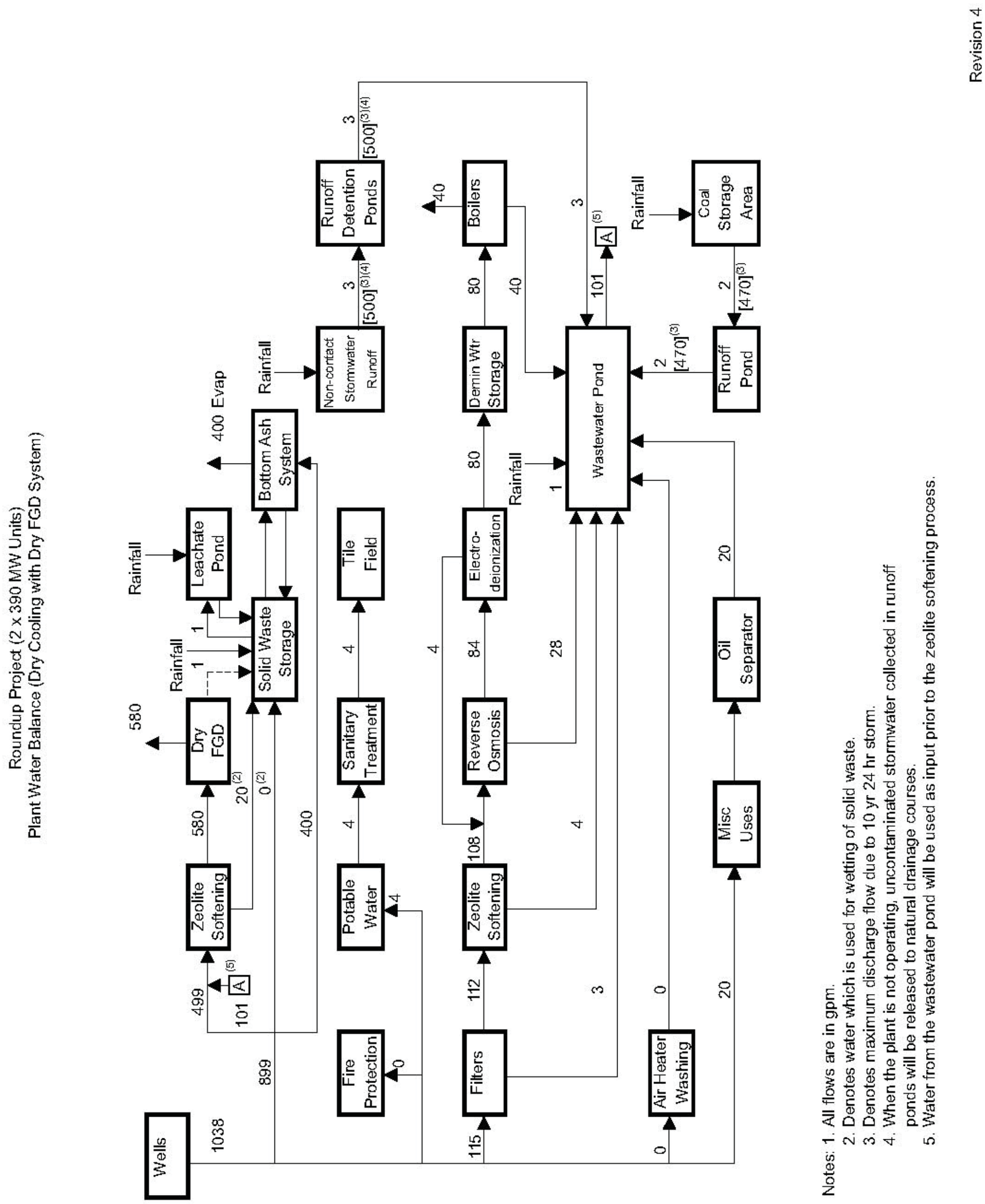

Figure 2-5 Generation Plant Water Balance Diagram

The flows shown in the water balance diagram are in gallons per minute (gpm) for both of the units operating at 100 percent output. Water from the wells would be stored in a vertical-walled tank that would be designed to provide the needed capacity for the Generation Plant based on the well water supply rate, a reasonable amount of storage for Generation Plant requirements, and for emergency fire protection supply.

Expected well-water usage for the two units operating at full load would average approximately 1,000 gpm. There also would be two vertical-wall tanks for demineralized water storage (one for each unit). The size of these tanks would be determined during the detailed design phase of the Generation Plant, but it is estimated that the well water tank would be roughly 250,000 gallons to 500,000 gallons and each of the two demineralized water tanks would be roughly 100,000 gallons to 250,000 gallons. Nearly all makeup of the water to the Generation Plant would be required in the spray dryer FGD system, replacing evaporative losses in the bottom ash handling and the supply of demineralized water to the boiler systems.

Pumps would supply the water from well water storage tanks to the main Generation Plant systems as described below:

1. A zeolite softener or other appropriate treatment would treat the dry FGD system water supply. This water would be used with lime for the slurry used in the spray dryer FGD system. All of this water would be evaporated and discharged to the atmosphere with the boiler flue gas from the chimney.
2. Water directly from the well water storage tank would supply the bottom ash system mainly the drag chain hopper. Most of this water would evaporate and would be carried with the boiler flue gas and discharges from the chimney. Overflow/blow down from the drag chain hopper and other wastewater would be used in the solid waste storage area for compacting and dust control.
3. Water for fire protection would be drawn directly from the untreated well water storage tank by dedicated fire pumps. There would be a jockey pump to supply small usage flows and to maintain water supply pressure. A large motor-driven pump and an emergency diesel-driven pump would be provided for major fire water supply.
4. Potable water would flow treated in a carbon filter and a chlorinator. Sanitary waste would be piped to a sanitary drain field.

The planned demineralized water treatment system would have filters, zeolite softening (or other pretreatment), reverse osmosis (RO), and electrodeionization that discharges to two large tanks (i.e., one for each unit), which would provide adequate reserve margin for the boilers to remain in operation when the water treating system is temporarily out of service, the units are being started, and/or there are leaks in one of the boilers or other equipment.

Water would be needed for the boilers. Treated water, filter backwash, zeolite softening regeneration, RO waste, and other waste flows would be collected in the wastewater pond for use in the dry FGD system.

Ultra-pure demineralized water would be required for the two main boilers. Normally, about half of the main boiler water usage would be water removed as blow down to the wastewater pond to control the boiler water chemistry. Boiler water chemistry would be controlled by chemical feed and possibly an oxygen feed. The other half would be water that is converted to steam and vented as part of the required flows to the atmosphere from the feed water heaters for removal of non-condensable gases, or from the discharge of the condenser vacuum pumps. In addition, some demineralized water would be lost as leakage in pump seals, valve packings, and other miscellaneous places in the large amount of piping and equipment making up the Generation Plant steam and water systems.

This design would result in minimal well-water usage and no plant water discharges to the area surface water flows except for storm water when the plant would not be operating.

Air-Cooled Condenser

The proposed Generation Plant design includes an air-cooled condenser to minimize consumption of water. As shown in Figure 2-4, steam leaving the turbine would enter the air-cooled condenser and would be condensed by the airflow created by fans.

The air-cooled condenser design would be different from the condenser design used at most U.S. generation plants that use a wet cooling system. A wet cooling system condenses steam in a tube-and-shell heat exchanger (a condenser) with water. In these existing systems, cool water enters the condenser where it is warmed by the steam. The warm water is circulated from the condenser through a wet mechanical draft-cooling tower or to a river, lake, or ocean.

In the proposed design, the air-cooled condenser would provide a great reduction in plant water consumption (in the range of 95 percent less[1]) because steam is passed through a continuous network of tubes in constant contact with air eliminating the need for water. This process would cause a somewhat higher steam turbine exhaust pressure that would lower plant efficiency slightly. However, the average ambient temperature in the Project Study Area is relatively cool (about 46°F), which would lessen the loss in efficiency relative to other possible Generation Plant locations with warmer ambient temperatures.

Storm Water and Wastewater Ponds

The storm water flow across undisturbed areas of the site would be maintained with storm water discharging to natural drainage courses. The storm water drainage system for the Generation Plant Study Area would be designed to discharge the peak 10-year, 24-hour runoff without backup of water in the sewer and ditch systems, and the 50-year, 24-hour runoff without flooding roads or equipment areas.

Storm water runoff from the Generation Plant Study Area would be collected in three storm water detention ponds. These ponds would detain the runoff to settle suspended solids and reduce downstream flooding. Each pond would be designed to contain storm water runoff from a 25-year, 24-hour storm event

One pond, which would be located northwest of the power block, would have a total capacity of 12.5 acre feet and would collect runoff from the power block, the construction laydown area, and

[1] Technical Development Document for Final Regulations Addressing Cooling Water Intake Structures for New Facilities, EPA-821-R-01-036.

the construction parking area. A second pond, located south of the power block, would have a total capacity of 3.3 acre feet and would collect runoff from the switchyard area. The third pond, located east of the Generation Plant, would have a total capacity of 21.5 acre feet and would collect coal pile runoff.

Each pond would be provided with both a gravity outlet system and a set of pumps. During Generation Plant operations, all water captured in the ponds would be pumped to the wastewater holding pond and used to wet fabric-filter waste (fly ash and FGD spent reactant). Runoff captured in the ponds when the Generation Plant would not be in operation or would not require water would be released to the natural drainage course at a controlled rate. All storm water discharges would meet the requirements of the facility's storm water Montana Pollutant Discharge Elimination System (MPDES) permit.

The wastewater holding pond would be designed to hold Generation Plant wastewater discharges and have a total capacity of 7.4 acre feet. The pond would hold discharges from the water treatment plant, boiler blow down, air heater wash water, and oil separator effluent. It also would be the collection point for water pumped out of the runoff detention ponds and the coal pile runoff sedimentation pond. Water collected in the wastewater holding pond would be pumped to the solid waste silos and used to wet fly ash and FGD waste before the ash and waste are disposed of. This pond would be designed for a 100-year, 24-hour storm event.

There is a leachate collection pond designed to store storm water from waste disposal cells 1 and 2. The collection pond would be designed for an appropriate storm event and is expected to be less than 10 acre-feet when designed.

Coal and Lime Storage

A conveyor belt would deliver coal from the Mine to the coal storage area. The coal storage area would consist of an active storage pile with a conveyor and an inactive storage pile for long-term storage of coal. Coal from the active storage pile would be used at night and on weekends when the Mine is not operating. Coal from the inactive storage pile would be used when the conveyor from the Mine is being serviced.

The coal storage area would be graded to drain to adjacent ditches. The ditches would discharge into the coal pile runoff sedimentation pond, which is designed to detain the 25-year, 24-hour runoff and to retain a three-year volume of sediment accumulating at the rate of 2,000 cubic feet of sediment per acre of area drained per year. The pond would have a pumping system (to pump storm water to the wastewater holding pond for reuse) and a gravity outlet (to be used when the pond is initially constructed.)

The coal storage area, the storm water ditches, and the sedimentation pond would all be lined with an impervious clay layer to protect groundwater. The pond would be cleaned about every three years. Coal fines from the cleaning operation would be returned to the active storage pile for use in the plant. All drainage discharges would meet the facility's storm water MPDES permit requirements.

Lime for the FGD system would be delivered by tank-type railroad cars or trucks and unloaded into silo(s). There would be no lime stored on the ground. Storm water runoff from the lime unloading area would drain into the coal storage area ditch and would be captured in the coal pile runoff sedimentation pond.

Solid Waste Disposal

Solid waste would consist primarily of bottom ash, fly ash, and spent reactant from the FGD system (i.e., lime). Bottom ash would consist of incombustible coal material that would settle to the bottom of the boiler, where it would be cooled and collected in a water-filled hopper. Fly ash would consist of incombustible coal material entrained in the flue gas exhaust. Fly ash and spent reactant from the FGD system (FGD waste) would be collected in the fabric filter baghouse.

Oxides of silicon, iron, aluminum, and calcium typically compose about 95 percent of the weight of fly ash and bottom ash. Fly ash and bottom ash may also contain trace quantities of other metals and a small amount of unburned carbon from the coal. FGD waste consists primarily of calcium sulfite and calcium sulfate, along with minor quantities of unreacted lime. Based on an analysis of the coal from the Mine, a preliminary list of the major constituents in the fly ash and bottom ash is provided in Table 2-1.

Table 2-1 Preliminary List of Major Constituents in the Fly Ash and Bottom Ash

Constituent	Concentration (percent)
Silica	49.63
Ferric oxide	8.1
Alumina	28.5
Titanic oxide	1.1
Calcium oxide	3.9
Magnesia	0.96
Sulfur trioxide	3.6
Potassium oxide	0.5
Sodium oxide	1.5
Phosphorous pentoxide	0.5
Undetermined trace constituents	1.8
Total	100.0

Over the life of the Project, most of the solid waste would be moved to the Mine for permanent disposal. This would require further permitting and licensing to comply with codes and standards present at the time. A solid waste disposal area would be provided in the Generation Plant Study Area to dispose of waste during periods when the Mine is not ready to accept waste or when access to the Mine is not possible for any reason.

The proposed disposal area would be a state-of-the-art landfill designed with two cells, each providing a five-year volume of storage. The disposal area would be lined for the protection of groundwater and provided with a leachate collection system to remove any water that leaches through the solid waste. The lining would be a single composite liner consisting of a 60-mil high-density polyethylene (HDPE) geomembrane over a 12-inch thick layer of low permeability clay. The leachate collection system would consist of a 12-inch thick layer of coarse sand or coarse bottom ash placed on top of the geomembrane lining, an 8-inch diameter perforated HDPE collection pipe buried in a rock-filled collection trench and placed at the low point in the center of the cell, and a rock filled sump.

The collection pipe would discharge into the lined sump, which would contain a pump. All leachate and storm water entering a cell would be collected in the leachate collection system and pumped to the leachate collection pond. Water collected in the leachate collection pond would be pumped out and used to wet FGD waste or used in the disposal area irrigation system to control dust. Even when the Generation Plant is not operating, these flows could be used to irrigate the disposal area.

The leachate collection pond would be lined with two layers of 60-mil thick HDPE geomembrane, with a leak detection layer installed between the inner and outer geomembrane liners. Leakage through the inner liner would be monitored, and the pond would be repaired if leakage exceeds a preset action leak rate.

When a portion of the disposal area has been filled to the design elevation, a cap would be put in place to prevent infiltration of moisture into the solid waste disposal area. First, a 40-mil-thick low-density polyethylene (LDPE) geomembrane sheet would be placed over the waste material. Second, a geocomposite drainage layer consisting of a geotextile heat-welded to a geonet would be installed. Third, a minimum 30-inch layer of silty-clay soil material would be put into place. Finally, a 6-inch layer of topsoil capable of sustaining vegetation would be placed over the cap. Then the cap would be seeded with native vegetation.

Bottom ash would be loaded into trucks from a silo or hopper and transported to the disposal area, where it would be temporarily stored in a designated part of the Generation Plant Study Area. It would be recovered as needed for use in the 12-inch layer placed over the geomembrane liner for gathering leachate, or for other uses. Bottom ash is an impervious, glassy material.

Fly ash and FGD waste collected by the fabric filter also would be transported to the disposal area by truck. Before being loaded into trucks, this material would be mixed with about 20 percent water, producing a consistency similar to moist silt (e.g., an inert paste-like consistency). After reaching the disposal area, it would be distributed in layers and compacted. Water from the leachate collection pond would be sprinkled over the layers of fly ash/FGD waste to assist in compaction and dust control. The fly ash/FGD waste material would become somewhat hard and stable (i.e., similar to hard clay) as it dries.

Material Handling

Coal Handling System

A single conveyor belt about 4,000 feet long (1.2 acres) would deliver daily supplies of coal from the Mine to a small “active” coal pile. The active pile would be as large as 25,000 tons (i.e., about a three day’s supply). A radial/luffing stacker conveyor belt, which has the capability to swing horizontally and raise and lower, would be used to distribute the coal from the Mine over the active pile reclaim tunnel. The maximum pile size would be about 45 feet high and cover about 53,000 square feet over an arc length of 452 feet.

Normally, coal would be discharged onto the active pile and then flow through the below-grade reclaim hoppers to the plant silos. However, when necessary, large mobile equipment would be used to move coal to the reclaim tunnel openings and to the inactive pile. The inactive pile would provide an 11-day supply (i.e., approximately 92,500 tons) for the Generation Plant in case the Mine supply is interrupted. This pile would be approximately 40 feet high and cover an area of about 320 feet by 420 feet when full. Mobile equipment would be used to move coal from the inactive to the active pile.

The below-grade reclaim hoppers would discharge coal onto two conveyors, which would travel underground initially, then incline upward to the top of the crusher house. In this building, the conveyors would discharge to a surge hopper that would then supply coal to the ring granulators. The ring granulators, which would break the large coal pieces into the smaller sizes needed in the boiler pulverizers, would discharge the coal onto the two conveyors leading to the transfer house. From the transfer house, the coal would incline upward to the boiler building conveyor floor that would be above the coal storage silos. There would be two conveyor trippers to fill the boiler building coal storage silos. The silos, which would give about 12 hours of storage for full-load operation, would provide coal to the pulverizers.

Coal dust would be controlled along the entire conveyor and storage path. The operator would be able to control the conveyor height to minimize the vertical drop onto the active pile to reduce dust. A silt and wind fence would be constructed around the coal pile to reduce fugitive dust. Dust suppression sprays would be provided for these two piles. Compaction would be used on the inactive storage pile to provide additional dust control. Enclosed buildings and dust suppression spray systems would provide dust control at conveyor transfer points. Vacuum exhausters and fabric filters would be provided to ventilate the storage silos and to control dust.

Lime Handling

Lime would usually be delivered to the Generation Plant in bottom-dump railroad cars that discharge to a below-grade hopper. Lime would be conveyed from the hopper by a vacuum pneumatic and filter system to a 100-ton, 10-day storage silo. Lime from the storage silo would be conveyed by another pneumatic system to the lime day silo. The pneumatic systems would include air blowers, transfer hoppers, and piping. Lime from the day silo would be fed to slakers and mixed with water to the slurry consistency needed for the spray dryer FGD system. Fabric filters on each of the silos air discharges control dust.

Generally, the railroad cars would be brought in by a main-line locomotive and the empty railroad cars removed once per week in 10- to 15-car groups or about twice per month with more railroad cars. A small railroad car-moving tractor would be used to position the railroad cars for unloading normally on a several-cars-per-day basis during the daylight hours. This activity should be only a minor noise source relative to other overall Generation Plant and the Mine railroad traffic.

Ash Handling

Ash from coal combustion would occur as bottom ash and fly ash. Bottom ash would leave the boiler via a water quench/storage tank located below the boiler to a drag chain conveyor.

Conveyor belts would bring the bottom ash to hoppers for truck transport to the storage area. The bottom ash would be a hard, non-leaching, non-dusty aggregate that can be used for roads and other uses, or disposed in the landfill.

The fabric filter (i.e., baghouse) would collect both fly ash and the reacted lime from the FGD system spray dryer. The material would collect on the outside of the bags and then be dropped into the baghouse hoppers. This dry material would be conveyed by a pneumatic vacuum system from the hoppers to two large storage silos (i.e., one for each unit). Fabric filters on each of the transporting air silos would provide fugitive dust control. Dust from the silos would flow through a mixer where water would be added. Water would control dust during truck transport and to prepare the waste material for compaction in the disposal area for the initial period (i.e., 10 years) of Generation Plant operation. Disposal back to the Mine would take place when permitted and feasible.

Oil Storage

Oil Storage Tank Spill Containment Compound

The oil storage tank spill containment compound would be designed to comply with the requirements of National Fire Protection Association (NFPA) 30. The containment volume provided would be 110 percent of the volume of the tank capacity.

The spill containment compound would be constructed by building above-grade dikes around the tank. The dikes would have a maximum height of six feet, a minimum top width of three feet, and maximum side-slopes of two horizontal to one vertical. In compliance with 40 CFR 112, the interior of the spill containment compound would be lined with a minimum of 1 foot of clay to protect the groundwater from contamination due to an oil spill. The dikes would be protected from erosion with a minimum of six inches of crushed rock surfacing.

The clay in the interior of the compound would be covered with six inches of granular soil to protect the clay from desiccation or cracks due to freezing. The interior of the compound would be sloped away from the tank and toward a catch basin placed at the low point. Interior sloping would be away from the tank so that there cannot be any standing water adjacent to the tank during a rainfall. The drain line from the catch basin would be provided with a valve and connected to the oily water sewer that discharges through an oil separator. The valve normally would be closed and only opened by a trained operator when necessary to drain standing rainwater from the inside of the compound.

The oil truck and/or railroad tank car unloading area for filling the storage tank would have an oil spill containment compound designed to contain 100 percent of the contents of an oil truck plus freeboard. The containment compound would be concrete paved with mountable curbs. It would also have a gravity drain with a normally closed valve, which would also drain to the oil separator.

Other Areas with Potential Oil Contaminated Discharges

Equipment and other areas of the Generation Plant with the potential for oil contaminated discharges would be turbine area equipment and pumps, turbine area floor drains, turbine oil storage tanks, lube oil consoles, and the shops equipment and flood drains. These areas and equipment would be drained via an oily water sewer piping system and discharged into an oil separator. Effluent from the oil separator would discharge into the wastewater holding pond.

All oil collected in oil separators would be removed from the site by a licensed contractor for proper disposal or would be burned in the main boilers.

Transmission Line

Each generating unit would be designed to generate nominally 390MW gross (350MW net) electrical capacity year round on a 24-hour per day basis. Electric power generated by the facility would be transmitted by three 28.2 mile-long 161kV transmission circuits that would extend from the Generation Plant to the Broadview Substation (Figure 2-6). The proposed structure configurations and designs are identified in Table 2-2. Two of the circuits would be supported on one set of wood-pole H-frame transmission structures (i.e., double-circuit line). The third circuit would be a single-circuit H-frame transmission line.

The Broadview Substation is connected to NorthWestern Energy's transmission system and, under the current scenario, 500MW would flow west to the Garrison Substation and 200MW would flow south to the Yellowtail Substation into the PacifiCorp transmission system. Studies performed by both transmission entities have identified upgrades to support this scenario. These upgrades are being planned even without construction of the Project. The potential purchasers of electricity generated by the Project are power distributors (i.e., utilities) and industrial and commercial owners in Montana and the western United States.

The design, construction, operation, and maintenance of the Project would meet or exceed the requirements of the National Electrical Safety Code (NESC), U.S. Department of Labor, Occupational Safety and Health Standards, and the Project proponent's requirements for safety and protection of landowners and their property.

Construction would be appropriately staged, given mitigation and other constraints, over a one-year period (i.e., 2005). The Project owners would complete the line survey, construction documents, environmental compliance and permitting issues to reflect the engineering design and committed mitigation based on a surveyed alignment.

Table 2-2 Electrical Design Characteristics of the Project

Feature	Description
Line Length	28.2 miles
Type of Structure	Wood pole H-frame
Structure Height	50 feet to 90 feet
Span Length	600 feet to 900 feet average ruling span
Number of Structures per Mile	7 to 9
Right-of-Way Width	300 feet
Structure Work Areas	Tangents: 100 feet x 75 feet; Deadends: 150 feet x 75 feet
Pulling/Tensioning Sites	10 feet to 100 feet x 300 feet

Feature	Description
Access Roads	14-foot travel way
Voltage	161,000 volts AC
Capacity	750MW to 800MW (three circuits)
Circuit Configuration	161kV: One double-circuit structure and one single-circuit structure; double-conductor per phase with horizontal configuration.
Conductor Size	161kV: 954 kcmil (1.196 in. diameter- Cardinal) ACSR, 1272 kcmil (1.345 in. diameter- Bittern) ACSR
Maximum Anticipated Electric Field at Edge of Right-of-Way	0.46 kV/m
Maximum Anticipated Magnetic Field at Edge of Right-of-Way	29 milli-Gauss (mG)
Ground Clearance of Conductor	21 feet minimum per NESC 212^{0}F
Pole Foundations	Direct Buried

Structures

The proposed structures for the 161kV transmission lines would be double-circuit wood pole H-frame and single-circuit wood pole H-frame structures. Spacing between structures would be approximately 500 feet to 900 feet. Three-pole, guyed dead-end structures would be used for angles greater than 45 degrees.

Typical pole heights for both the tangent and dead-end structures would range from 85 feet to 120 feet. The wood poles would be direct buried to a depth of approximately 20 feet, depending on terrain.

Work Areas

Work areas of 100 feet by 75 feet per mile of transmission line would be required at each pole site to facilitate the safe operation of equipment and construction operations. The three-pole dead end structures require larger work areas of 150 feet by 75 feet. Within these work areas, the permanent disturbance associated with each pole foundation would be approximately six feet in diameter.

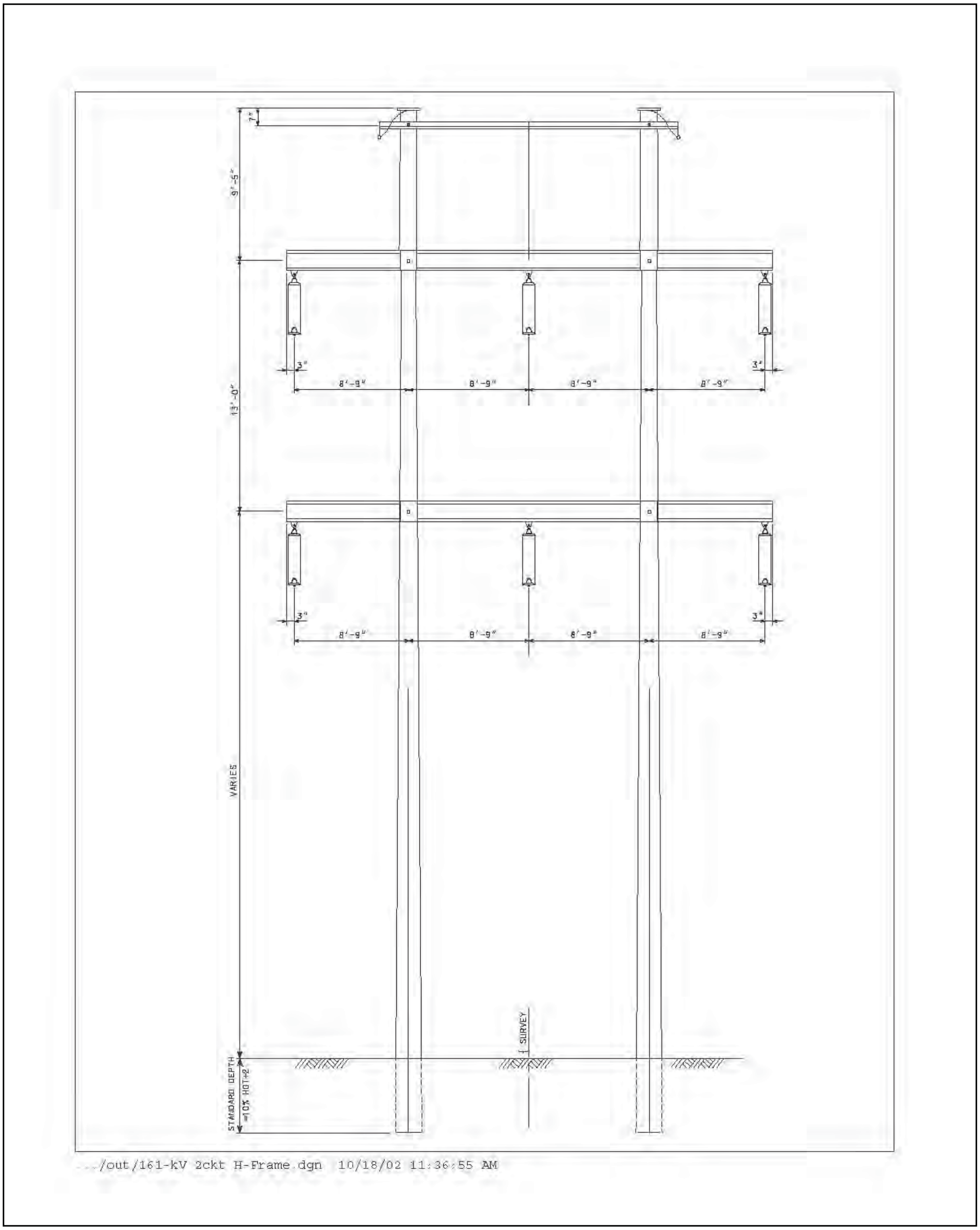

Figure 2-6 Transmission Line Design

Pulling and tensioning sites for stringing the conductor would result in an additional temporary disturbance of 100 feet by 300 feet per site. It is an estimated that five pulling and tensioning sites would be required for the entire transmission line.

The work areas would be cleared of vegetation only to the extent necessary. After line construction, all work areas would be restored according to agreements with the landowners.

Access Roads

The Project would use existing roads and trails wherever feasible for access roads to minimize new disturbance when adverse conditions exist, such as the need to avoid sensitive resources, difficult topography, and/or landowner requirements. Access roads would be constructed with a 14-foot travel way.

Access roads would be used during construction to access work areas and during periodic maintenance of the completed transmission line throughout the life of the Project. After line construction, access roads would be restored according to agreements with the landowners.

Transformer and Switchyard

Each transformer would be an approximately 161kV-rated transformer at approximately 325mVA. Transformers would have a concrete spill containment compound designed to capture 100 percent of the oil contents of the transformer, 10-minutes of fire protection system spray water, and freeboard. Each spill containment compound would have a sump at one end, which would be connected by gravity sewer to an oil separator.

The oil separator would be designed with a flow capacity equal to the largest combination of flows directed to the separator and with an oil storage capacity large enough to contain the volume of oil equal to the contents of the largest transformer. Water from the separator would discharge into the wastewater holding pond. The switchyard would not contain any oil-bearing equipment. The switchyard would be graded for drainage to adjacent ditches, which would discharge into the storm water detention pond at the south side of the Generation Plant.

2.2.3 Additional Auxiliary Equipment

In addition to the main Generation Plant equipment and systems described in the preceding sections, a variety of other important systems, equipment, and Generation Plant facilities would be required for a modern coal-fired generation plant. The following list itemizes key auxiliary equipment:

- Compressors would supply air for valve and other power actuators and for maintenance use.
- Two auxiliary boilers (one per unit) would provide steam for heating the plant when the main boilers would not be operating and for starting one of the main boiler and turbine units.
- Vacuum pumps would remove air that leaks into the condenser and non-condensable gasses that would enter the condenser from the power cycle piping and equipment.

- Chemical feed equipment would be provided for the boiler water to maintain pH, oxygen content, and other parameters within the required ranges.
- Equipment lubricating oil systems would be provided on the main turbine-generator, boiler feed pumps and motors, coal pulverizers, and other equipment. Turbine oil lubricating oil storage tanks and filters would be provided for the turbine-generator for use during maintenance.
- Fire protection systems and pumps would be provided for the major lubricating oil reservoirs and piping on the steam turbine-generators, main transformers, coal handling, and other applicable areas. A diesel-engine-driven fire pump would be provided as a backup to the electric-motor-driven pumps.
- An equipment cooling system would be provided with a small air-cooled condenser or wet mechanical draft tower. This system would provide cooling water to the steam turbine-generator lubricating oil system, the generator hydrogen coolers, air compressor and boiler feed pump lubricating oil heat exchangers, and other Generation Plant equipment cooling requirements.
- Combustion air preheating system would use condensate or steam from the main power cycle or possibly warm water from the wells to heat glycol. The warm glycol would be used in finned tube heat exchangers to warm the air to the boilers in cold weather as required for proper boiler operation.
- Service water would be needed for washing the coal handling and other Generation Plant areas and for supplying other miscellaneous maintenance uses. Pumps supplying water from the well water tanks would provide service water.
- Hydrogen, nitrogen, and carbon dioxide gas storage tanks and piping would be provided for the boiler, turbine, and other equipment requirements.
- Foundations, piping, and supports are needed for all of the equipment.
- Cranes and other maintenance provisions would be needed for the equipment. The turbine-generator would require a large bridge crane.
- Fuel oil (No. 2) would be required for warming the main boilers and igniting the coal fuel during startup, and for the auxiliary boilers. A 400,000-gallon storage tank surrounded by earth berms with an oil separator and a truck and railroad car unloading area would be required.

Electrical Equipment

The major electrical equipment, which is typical for this type of generation plant, is listed below:

- Main power turbine generator step-up transformer.
- Station service transformer.
- Secondary unit transformer(s).
- Switchgear to control electrical power for large motors, electrical systems, and equipment.

- Motor control centers to control electrical power for large motors, electrical systems, and equipment.
- Battery equipment to provide power to the control system, backup-lubricating systems, and other high-priority equipment in case of a loss of electrical power supply to the Generation Plant.
- Two emergency diesel generators (one per unit) for backup to supply power to the battery equipment and other high-priority equipment in case of a loss of electrical power supply to the Generation Plant.

Instrumentation and Controls

The major instrumentation and controls system equipment, which is typical for this type of plant, is listed below:

- Distributed control system (DCS) for centralized operator control from the main control room
- Plant instrumentation to provide data to the DCS
- Local or separate programmable computer systems for water treatment, turbine-generator, coal handling, ash handling, and other equipment
- Continuous emissions monitoring system (CEMS) for monitoring emissions from the two chimneys

Communications

Off-site communication would take place primarily by telephone. However, a radio tower, microwave facility, or other such communication device, may be constructed for the Generation Plant. In addition to off-site communication using a telephone, Internet access and electronic mail would be available using computer network capabilities. Protective relay coordination between the facility and the interconnecting electrical transmission system would be available using fiber optic technology. On-site communication capabilities would include an intercom system, cellular phones, and/or two-way radios.

Storage Tanks

Following is a preliminary list of oil and chemical storage tanks that would be necessary for the Generation Plant.

Oil

- Turbine generator lubricating oil reservoir
- Turbine control system oil
- Generator lubricating and seal oil system
- Generator hydrogen cooling system
- Vacuum pump and motor lubricating oil system

- Air-cooled condenser fan bearings
- Clean and dirty turbine oil storage tanks and oil treatment equipment
- Main and other transformers
- Glycol combustion air preheating system
- Combustion air and boiler exhaust gas fans and motors
- Emergency diesel fuel oil storage day tank
- Emergency engine-driven fire pump fuel oil storage day tank and lubrication system
- Coal handling motors, gear boxes, lubricating systems, and reservoirs
- Boiler feed pump and motor lubricating oil system
- Main boiler and auxiliary boiler ignition oil relief valves
- Pulverizer lubrication equipment
- Air compressor and blower lubrication equipment
- Miscellaneous machine shop equipment
- Oil drain collection sumps, tanks, and separators
- Miscellaneous equipment, pumps, and systems

Chemicals:

- Fire protection foaming agents that may be used for the main transformers and other areas
- Boiler – turbine feed water chemical feed, including hydrazine and ammonia (in drums)
- Acid, anti-scalant, sodium bisulfate (in drums or totes) for the RO system, unless a demineralizer is used, which would result in the need for acid and caustic storage tanks
- Chlorine (chlorine cylinders or hypochloride) for potable water treatment
- Ammonia storage for the SCR
- Small quantities of miscellaneous Generation Plant and shop solvents and chemicals for Generation Plant maintenance and operations
- Small quantities of chemicals (corrosion inhibitors) for the equipment cooling water recirculation system and possibly the air conditioning chilled water system (if this type of HVAC is selected)
- Small quantities of air conditioning refrigerant gas

2.2.4 Construction

Project Schedule

Figure 2-7 shows the Project schedule for permitting, procurement of equipment, construction, and startup of the two units. The current plan is to proceed from the issue of major environmental permits to the commercial operation of Unit 1 in 42 months. Unit 2 would follow Unit 1 by about eight months. The overall Project sequence includes site selection and Project authorization, permitting, construction, and startup and testing. This is a typical schedule for this type of generation plant.

Site Selection and Authorization

Site information was gathered during the four-month period before submission of the air quality permit application, options were studied, and the preliminary site and plant layout was developed. This information provided the basis for the authorization to proceed with the Project and the permitting activities.

Permitting

This permitting schedule includes developing engineering information and submittal of the major permit applications.

Engineering and Procurement

Engineering and procurement work would begin with preparing the major plant equipment specifications for bids. Awards to the successful bidders would follow the evaluation of the bids, negotiations, and preparation of contracts. Information from the major contracts would be used to prepare the remainder of the specifications, which would be followed by the respective evaluations, negotiations, and contracts to the successful bidders. Equipment and system information for the plant would include several thousand drawings from equipment manufacturers and system suppliers.

Detailed design, including drawings and lists, for piping and instrument diagrams (P&IDs), general arrangements (GAs), foundations, building structural steel, electrical wiring, and other areas would be developed as information is received. Construction specifications would be issued for bids, and contracts would be awarded as necessary.

Construction Activities

Site clearing and access would begin shortly after the major permits are issued. The first construction work involves providing initial site access and clearing the building foundation areas of vegetation. Refer to Figure 2-7 for preliminary construction schedule.

Site work would begin by constructing access roads and parking areas for construction personnel. Heavy construction earthmoving equipment including bulldozers, scrapers, graders, trucks, and backhoes would be used to level the site area, by cut and fill, in preparation for constructing foundations, site roadways, and storm drainage. Suitable topsoil material would be retained for final site grading and reseeding. Gravel would be used for temporary roads,

Figure 2-7 Preliminary Roundup Project Schedule

equipment storage and laydown areas, and work areas. Precautions would be taken during these operations to contain erosion runoff and fugitive dust. In addition, connections and distribution systems for temporary construction communications and electrical power would be installed. One or more deep wells with pumps and underground piping would be installed for the construction water supply.

Each contractor would set up trailers and some small temporary buildings for their needs and for the duration of their work. The site construction Project management team would control each contractor's activities.

After completing most of the site preparation, the installation of the substructures (foundations) and structures would begin. This effort would include the power block substructure. Foundation construction would consist of foundation excavation, form erection, reinforcement installation, concrete placement, and foundation backfilling. These activities would require delivery of materials to the site and the use of an onsite concrete plant over about a 10-month period. During this stage, underground piping and electrical conduit would be installed between the building foundations. Major construction equipment used during this stage would consist of medium-sized mobile cranes, backhoes, dump trucks, concrete pumps, and concrete delivery trucks. A major portion of the railroad track would be installed at this time so that heavy material and equipment deliveries can be made by railroad car during the next phase.

Structural steel erection would begin when foundations are sufficiently complete. Large cranes would be provided to unload the steel members and raise them to their final location.

Boiler pressure parts would be shipped to the site over an eight-month period and installed in the building when the structural steel is sufficiently complete. A major construction activity would be raising the boiler drum into its required location near the top of the boiler room. Construction equipment used during this activity and the next few construction activities would consist of large mobile cranes, lowboy trucks, specialized hauling and rigging equipment, and material delivery trucks.

Other major equipment would begin arriving at the Project Study Area for erection during the next construction phase. Major equipment for this Project would consist of two steam turbines, main transformers, fans, condenser, SCR units, fabric filters, spray dryer FGD, air-cooled condenser, and other items. Usually, building siding installation begins at this point. The building would not be enclosed by siding and roofing until the major boiler and other equipment has been moved into place. However, enclosing the building as early as practical would help reduce weather delays.

Major equipment would be interconnected mechanically and electrically during the next stage. Mechanical activities include installing welded piping and supports with associated valves and accessories. Electrical activities would include installing cable trays and supports, and installing and terminating electrical and control cable. These activities would give rise to the peak construction manpower period for the Project. This peak construction manpower period would overlap the equipment erection stage and the startup and testing stage. Major construction equipment used during this stage would consist of medium-sized mobile cranes, flatbed trucks, welding machines, portable power generators and air compressors, and cable pulling equipment.

Startup and Testing

This stage is planned to begin approximately 12 months before commercial operation. It would consist of a systematic process of testing and initial operation of the many Generation Plant systems.

The following major events are included during this period:

- The power back-fed over the transmission lines to provide startup power
- The hydro testing and chemical cleaning of the boiler and various piping systems (chemical cleaning would be a closed process with waste residue removed from the site for proper treatment and disposal)
- Steam blow cleaning of the Generation Plant steam system piping
- Initial firing of the boilers for testing
- Generation Plant equipment testing
- Generation Plant performance testing for power output and environmental requirement conformation

Transmission Line Construction

Sequence of Activities

The construction of the transmission lines would follow the sequence of: 1) survey and stake centerline; 2) build access roads; 3) clear work areas as needed; 4) excavate holes, erect and install structures; 5) install fiber optic or traditional ground wire, conductors, and ground rods, and finally, 6) clean up and reclaim the site. The number of workers and types of equipment required to construct the transmission lines are shown in Table 2-3. Various phases of construction may occur at different locations throughout the construction process. This could require several crews operating at the same time at different locations. The preliminary construction schedule is shown in Table 2-3.

Table 2-3 161kV Transmission Line Construction – Estimated Personnel and Equipment

Activity	People	Quantity of Equipment	
Survey	3	1	Pickup truck
Road Construction	3	2	1 Bulldozers (D-8 Cat), 1 Excavator
		1	Motor graders
		1	Pickup trucks
		1	Water/gas trucks
Foundation Installation	8	1	Hole diggers
			Bulldozers
		2	Trucks

Activity	People	Quantity of Equipment	
		1	Concrete trucks
		2	Pickup trucks
		1	Carryalls
		1	Hydro crane
			Wagon drills
			Water trucks
Wood Pole and Steel Haul	4	1	Wood-pole and steel haul trucks
		1	Pickup trucks
		2	Yard and field cranes
		1	Fork lift
			Water trucks
Structure Assembly Per crew 1 crews total	6	1	Pickup trucks
		1	Carryalls
		1	Cranes (rubber tired)
		1	Trucks (2 ton)
Structure Erection Per crew 1 crews total	5	1	Cranes (200 Ton)
		1	Trucks (2 ton)
		2	Pickup trucks
		1	Carryall
Wire Installation	10	1	Wire reel trailers
		2	Diesel tractors
		2	Cranes (19-Ton, 30-Ton)
		1	Trucks (5 ton)
		2	Pickup trucks
		1	Splicing trucks
		1	3-drum pullers (1 medium, 1 heavy)
		1	Single drum puller (large)
		1	Double bull-wheel tensioner (heavy)
		1	Sagging equipment (D-8 Cat)
			Carryall
		1	Static wire reel trailer
			Water trucks
Wire Clean-Up	3	1	Trucks

Activity	People	Quantity of Equipment	
		1	Pickup trucks
		1	(D-6 Cat)
			Water trucks
Road Rehabilitation (right-of-way restoration)	2		Bulldozers
		1	Motor graders
		1	Pickup trucks
			Water trucks
Maximum total personnel required considering all tasks (actual personnel at any one time would be less)			**44**
* including maintenance			

Note: Depending on schedule requirements, multiple crews may be required.

Access Road Construction

The utility corridor has many existing trails and roads near the transmission line corridor. However, the existing road network would require some upgrading and spur road construction in order to allow access of construction equipment into structure sites. This may involve clearing vegetation and re-grading. Equipment to construct the access roads would include hand tools, bulldozers, graders, and crew-haul vehicles. The road construction work force is anticipated to number no more than 44 individuals at any one time (Table 2-3). Specific actions would be implemented to reduce construction impacts. Standard design techniques such as installing water bars and dips to control erosion would be included. In addition, measures would be taken to minimize impacts in specific locations and during certain periods of the year. Such conditions could arise during heavy rains or high winds.

Pole Installation

Wood-pole H-frame structures and associated hardware would be shipped to each structure work area by truck. Wood-pole H-frame structures would be assembled on the work area (Figure 2-8). Areas need to be large enough to accommodate laying down the entire length of the wood poles while cross arms and insulators are mounted to it. Cross arms would then be installed and rigged with insulator strings and stringing sheaves at each ground wire and conductor position, while the poles would be on the ground. The assembled wood-pole H-frame structures would then be hoisted into place by a large crane (Figure 2-8). Table 2-3 lists the equipment and personnel necessary for pole assembly and erection. Ground rods at each pole probably would be required. Deadend and turning structures would be vertical pole design with guy wires.

Temporary construction yards may be necessary and would be located on existing disturbed areas or other areas on private lands along the line route. The yards would serve as field offices, reporting locations for workers, parking space for vehicles and equipment or sites for temporarily marshalling material. Personal vehicles would be parked in these work areas and not on the Project site

Conductor Installation

Once poles are in place, a pilot line would be pulled (strung) from pole to pole and threaded through the stringing sheaves on each pole. A larger diameter, stronger line would then be attached to the pilot line and strung. This is called the pulling line. This process is repeated until the ground wire and conductor is pulled through all sheaves (Figure 2-9).

Conductor splicing would be required at the end of a conductor spool or if a conductor is damaged during stringing. The work would occur on previously disturbed areas for the poles or pulling/tensioning sites.

The conductor would be strung using powered pulling equipment at one end and powered braking or tensioning equipment at the other end. For public protection during wire installation, guard structures would be erected over roadways, transmission-lines, structures, and other obstacles. Guard structures consist of H-frame poles placed on either side of an obstacle. These structures would prevent ground wire, conductor, or equipment from falling on an obstacle. Equipment for erecting guard structures includes augers, line trucks, pole trailers, and cranes. Guard structures may not be required for small roads. On such occasions, other safety measures such as barriers, flagmen, or other traffic control would be used. Table 2-3 lists the equipment and personnel necessary for pole assembly and erection.

Ground Rod Installation

As a part of standard construction practices, prior to wire installation, resistance along the route would be measured. If the resistance to remote earth for each transmission pole were greater than 25 ohms, counterpoise (grounds) would be installed to lower the resistance to 25 ohms or less. Counterpoise consists of a bare copper-clad or galvanized steel cable buried a minimum of 12 inches deep, extending from the pole.

Operation of Transmission Line

Operational Characteristics

The nominal voltage for the Project's Transmission System would be 161kV alternating current (AC). There could be minor variations of up to five percent above the nominal level, depending upon load flow.

Safety

Safety is a primary concern in the design of this 161kV Transmission System. An AC transmission line would be protected with power circuit breakers and related line relay protection equipment. If conductor failure were to occur, power would be automatically removed from the line. Lightning protection would be provided by overhead ground wires along the line. Electrical equipment and fencing at the switchyards would be grounded

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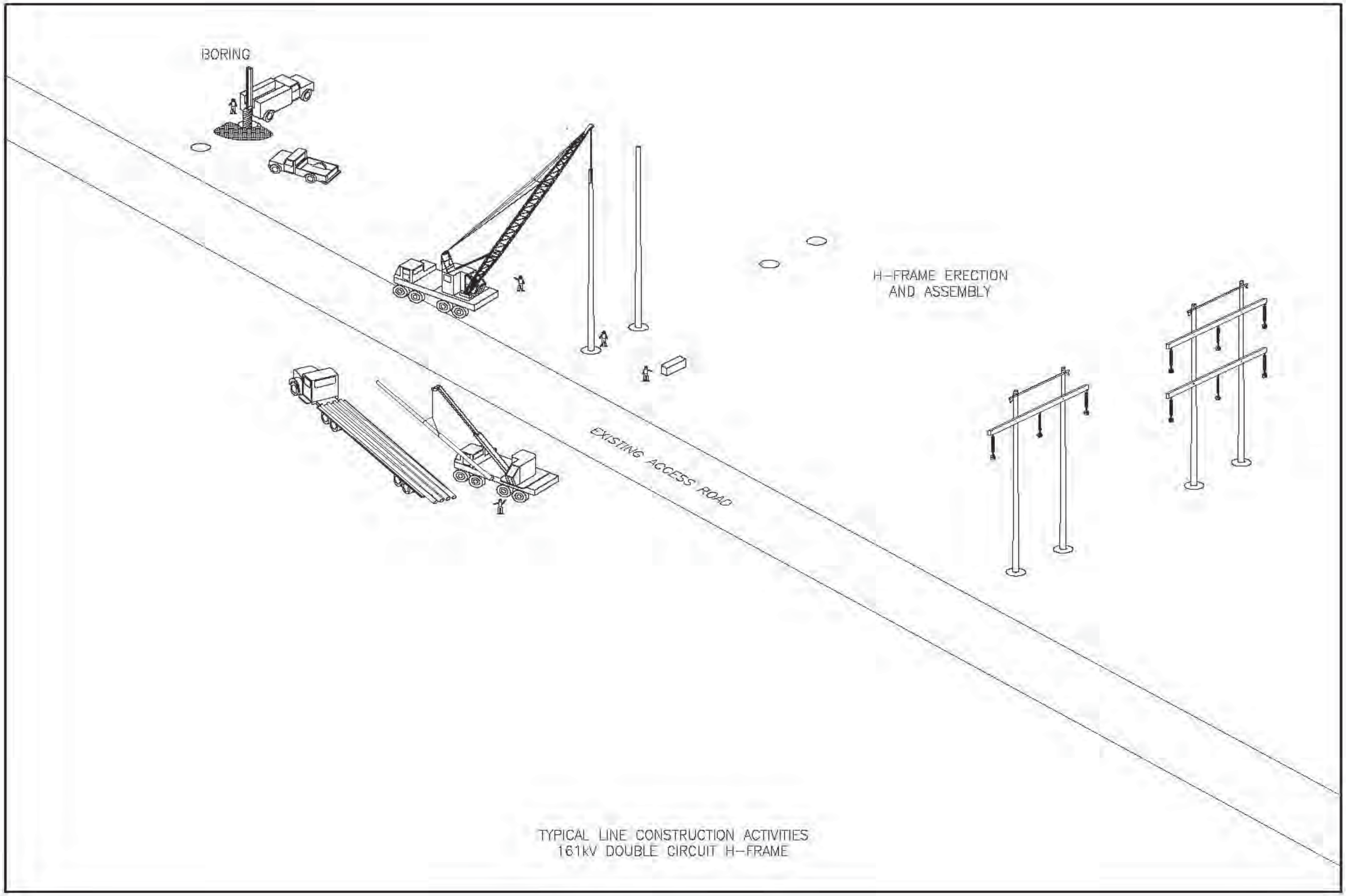

Figure 2-8 H-Frame Transmission Line Structure Assembly

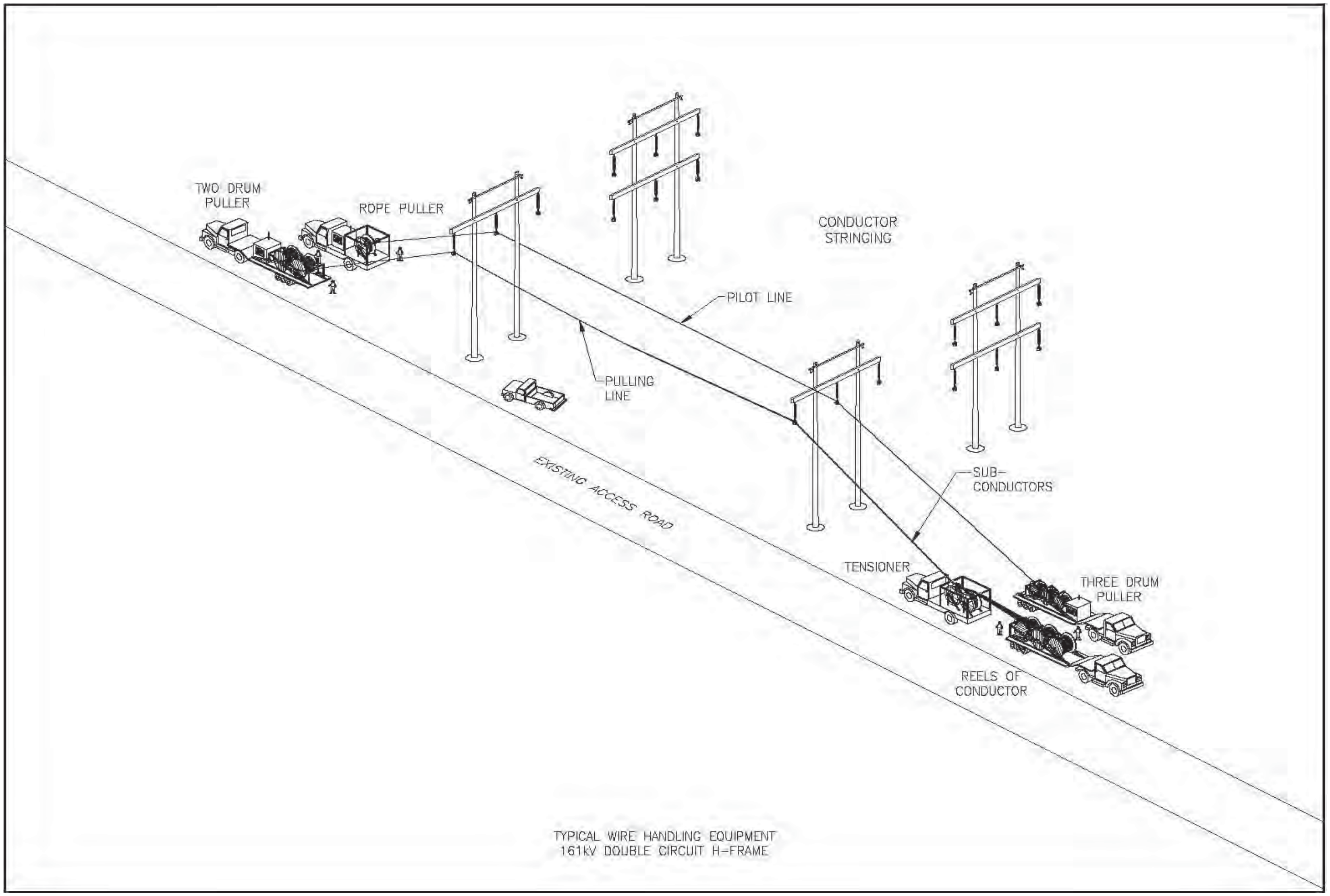

Figure 2-9 Transmission Line Wire Pulling

Maintenance of the Transmission Line

The 161kV transmission lines would be inspected on a regular basis by both ground and air patrols. Maintenance would be performed as needed. When access would be required for non-emergency maintenance and repairs, the maintenance crews would adhere to the same precautions that would have been taken during the original construction.

Emergency maintenance would involve prompt movement of repair crews to repair or replace any damage. Crews would be instructed to protect crops, plants, wildlife, and other resources of significance. Restoration procedures following completion of repair work would be similar to those prescribed for normal construction. The comfort and safety of local residents would be a primary concern during construction and maintenance activities. Noise, dust, and the danger presented by maintenance vehicle traffic would be limited to the extent possible.

2.2.5 Mitigation Measures

A goal of the Project is to minimize effects to the environment during construction and operation. In addition to the measures discussed throughout Section 2.2, above, the following measures or techniques would be employed, as necessary and appropriate, to avoid or minimize impacts as part of the Project design.

The following mitigation measures cannot be required by DEQ without a request from the Project proponent that they be placed in a permit (75-1-201(5)(b), MCA). The Project proponent may request that any or all of the mitigation measures that pertain to expected impacts from their proposed activities be placed in the permits. In those instances when the proponent chooses not to include a mitigation measure in a state permit, the Project proponent may decide to perform the proposed mitigation voluntarily.

Construction and Maintenance Access

CM-1 All construction vehicle movement outside the 300 foot-wide easement would normally be restricted to predesignated access as negotiated with the landowner, contractor-acquired access, or public roads. Construction activities for the transmission lines would be restricted to and confined within the predefined limits.

CM-2 Roads would be built at right angles to the streams and drainages to the extent practicable.

CM-3 Culverts or rock crossings would be installed where needed.

CM-4 Existing roads would be utilized for construction where feasible.

CM-5 No paint or permanent discoloring agents would be applied to rocks or vegetation to indicate limits of survey or construction activity.

CM-6 Prior to construction, all supervisory construction personnel would be instructed on the protection of important cultural, paleontological, and ecological resources.

Air Quality

AQ-1 Suggested design and operation mitigation measures include

- Coal cleaning and/or coal preparation
- NOx control
- Carbon sequestration, such as planting trees

Earth Resources

ER-1 A Landfill Management Plan would be developed to address potential environmental impacts from proposed waste disposal.

Water Resources

WTR-1 Alternate water supplies may be necessary for a small number of wells that are proven to be directly influenced by reduction of recharge due to the plant construction.

WTR-2 Installation of groundwater monitoring wells near the landfill area would serve to identify groundwater impacts from leachate releases. Groundwater monitoring wells should be installed prior to startup of landfill operation in order to establish baseline conditions. A minimum of three groundwater-monitoring wells would be required to characterize groundwater quality and flow direction beneath the landfill area.

Waste and Cleanup

WC-1 No equipment would be refueled or greased within 100 feet of a wetland or perennial stream. In addition, fuels, oils, lubricants, herbicides, or other potentially hazardous materials would not be stored within 300 feet of a wetland or perennial stream.

WC-2 A spill prevention plan would be developed that addresses containment and cleanup of spills affecting surface waters.

Botanical Resources and Wetlands

BW-1 Existing vegetation would only be cleared from areas scheduled for immediate construction work and only for the width needed for active construction activities.

BW-2 All reseeding mixtures used for reclamation would be certified weed-free.

BW-3 Effective soil erosion control and reseeding of disturbed areas not required for permanent access for the transmission line would be implemented to encourage revegetation.

BW-4 Transmission line structures would be located to span streams and drainages.

Wildlife Resources

WR-1 Harassment of wildlife would not be permitted at any time during Project construction activities.

WR-2 Construction timing would be altered in specific identified areas where sharp-tailed and sage grouse leks are identified.

WR-3 Install raptor diverters on transmission structures in specific identified locations to discourage raptor roosting and potential raptor predation on certain terrestrial species (e.g., sage grouse on strutting grounds).

Cultural Resources

CR-1 Each cultural resource potentially affected by the proposed action should be more completely documented and evaluated so that a formal determination of National Register eligibility can be made by the State Historical Preservation Office (SHPO).

CR-2 An assessment of effects should be performed in accordance with Section 106 of the NHPA if a cultural resource is determined eligible to the National Register.

CR-3 Adverse effects should be avoided by project redesign, if feasible, if a considerable cultural resource would be affected by ground disturbance.

CR-4 Appropriate mitigations measures, including data recovery, should be implemented following consultation with the Montana SHPO, Native American tribes, and other interested parties if a National Register-eligible resource cannot be avoided through project redesign.

Visual Resources

VR-1 No paint or permanent discoloring agents would be applied to rocks or vegetation to indicate limits of survey or construction activity.

VR-2 Wood poles or dulled metal surfaces would be used for the transmission line to reduce visual contrast.

VR-3 In construction areas where ground disturbance would be substantial or where recontouring would be required, surface restoration would occur as required by the landowner. The method of restoration could consist of loosening the soil surface, replacing rocks or plants removed during transmission line construction, reseeding, mulching, installing cross drains for erosion control, placing water bars in the road, and filling unnecessary ditches.

VR-4 To minimize ground disturbance over the transmission line route and/or reduce scarring (visual contrast) of the landscape, the alignment of any new access roads or cross-country route would follow the landform contours in designated areas where practicable.

VR-5 Non-specular conductors would be used to reduce visual contrast.

VR-6 Where possible the edges of clearings in forested lands or tree groves would be feathered to avoid abrupt, straight lines.

VR-7 Baffled strobe lights would be installed on Project chimneys to direct light upward rather than outward if strobe lighting is determined to be required by the Federal Aviation Administration (FAA).

Noise

N-1 Careful evaluation of specifications and design selection of typical low-noise design options, equipment specifications, building and wall designs, and enclosure constructions would be made during the design process to ensure that the Generation Plant noise is not excessive.

N-2 The Proponent would implement noise control measures at the Generation Plant, such as silencers for decreasing noise generated during boiler steam blowout for plant start-up and maintenance.

N-3 If measured noise levels exceed L_{dn} 55 dBA at the sensitive receptors, then additional noise control measures would be installed, as necessary, to avoid adverse impacts on the sensitive receptors.

Land Use and Safety

LS-1 Existing improvements, such as fences and gates, would be repaired or replaced to their condition prior to disturbance or as agreed to with the landowner, if they are damaged or destroyed by transmission line construction activities.

LS-2 Temporary gates would be installed only with the permission of the landowner and would be restored to original condition prior to disturbance following transmission line construction.

LS-3 All existing roads would be left in a condition equal to or better than their condition prior to the construction of the transmission line.

LS-4 All new access not required for operations and maintenance of the transmission line would be closed using the most effective and least environmentally damaging methods appropriate to that area with concurrence of the landowner.

LS-5 The Project would comply with any FAA requirements regarding public safety.

LS-6 Warning signs and flag-persons would be used at all roadway crossings during transmission line construction for all state, federal, county, and local roads and highways.

LS-7 To prevent problems with livestock during the transmission line construction, all fences and gates would remain closed at all times throughout construction unless specified otherwise by the agency manager or landowner.

LS-8 The proponent and the construction contractors would coordinate activities with property owners to ensure continued access across the transmission line right-of-way for the use of property by the property owner.

LS-9 Harassment of livestock would not be permitted at any time during Project construction activities.

2.3 Alternatives Considered and Eliminated

The Project proponent identified numerous alternatives to the Project. Alternative designs, locations, pollution control devices, water supplies, fuels, equipment, and facilities were considered. The alternatives described in this section were eliminated from further consideration because they did not meet the stated purpose and need for the Proposed Action or were found to be unreasonable for detailed analysis based on the selection criteria described below. A summary of the alternatives considered and eliminated is provided in Table 2-4.

2.3.1 Alternative Fuel Sources

Several alternative fuel sources, including lower sulfur coal, synthetics, coal bed methane, gases, and fuel cells, were considered. Lower sulfur coals, ranging from hard to soft coal, from outside locations were ruled out due to the mine mouth location and the abundance of fuel at the plant site. Economics of the facility rely upon an abundant supply of coal in the immediate vicinity as a mine-mouth project. No expected changes in regulations, except new emissions would have to be calculated and modeled for any alternative fuel source. This alternative is eliminated and deemed not economically feasible.

Synthetic fuels such as synthetic-gas, coal gas, ethanol, and oil emulsion also were considered for possible import or on-site storage. These were eliminated from consideration due to the lack of transportation methods, dependability problems, and future availability of sufficient quantities. Methane fuel from coal bed production also was eliminated from consideration for those same reasons.

Liquefied natural gas and propane or butane fuels were considered but dismissed as impractical and too expensive because they require extensive storage facilities and would cause a problem with transportation logistics. This alternative was eliminated and not considered economically feasible.

Fuel cells were considered as a potential source but eliminated due to cost and substantial water and hydrogen or gas requirements.

2.3.2 Alternative Water Supplies

Alternative water supplies from both surface water and groundwater sources were evaluated and eliminated. Consideration also was given to using recycled water. Groundwater sources such as shallow aquifers would not supply a sufficient amount of water to operate the plant. In addition, withdrawals for the plant would affect local well water users. The amount of drawdown and eventual lowering of the shallow water table would be a disadvantage to the local populace.

Surface supplies considered included the two nearest rivers – Yellowstone and Musselshell rivers. The Yellowstone River is more than 30 miles away from the proposed Project site at its nearest point. The legal difficulties, environmental impacts, and costs associated with securing water rights, obtaining a right-of-way for a water pipeline, constructing the pipeline, and continuously pumping water more than 30 miles make this alternative economically impractical and unreasonable.

Table 2-4 Summary of Alternatives Considered but Eliminated

The Musselshell River, located 13 miles from the Project site, could not supply the necessary amount of water to operate the plant based on past historical stream gauging data.

All alternatives other than deep water wells are not considered reliable and of sufficient consistency to meet the needs of the Project and were eliminated from further consideration.

2.3.3 Alternative Cooling Systems

Methods to reduce water consumption were considered in the design process when choosing the cooling systems to be used at the Generation Plant. The wet mechanical draft wet cooling tower design circulates cooling water (by pumps) to the condenser (a shell-and-tube heat exchanger) to condense the steam leaving the turbine. Warm water from the condenser flows to the cooling tower and is distributed over heat exchange surface (usually a lattice). Fans draw air over or through the water stream, cooling the water. The water would fall into a collection basin and then would be pumped back to the cooling tower.

A typical wet mechanical draft cooling tower for each of the two units would require about 3,500 gallons per minute (gpm) of makeup water for evaporation, drift, and blowdown during full-load, warm weather operation. This amount of water consumption is significantly beyond the planned usage. Wet cooling towers are technically feasible and less expensive than dry cooling systems, however, wet cooling designs increase water usage. In addition to wet systems, a once-through cooling design was considered and eliminated because there is no large supply of water in the area.

Optimizing the amount of necessary makeup water required (i.e., water conservation) is important. The facility design chosen for the Proposed Action uses much less water for producing electricity than other available technologies.

2.3.4 Alternative Combustion Systems

The four combustion systems considered include the following: stoker, integrated gasification combine cycle (IGCC), boilers, and gas turbines / combined cycle facilities. These systems are described below.

Because of the size of available stoker boilers, a stoker is not a practical design for the Project. Current stoker designs are limited to 50 to 75 MW equivalent capacities, which would mean the installation of at least five or six boilers. The large number of boilers would add significant cost and complexity of design. In addition, stoker boilers have usually been designed for lower pressure and temperature steam, which results in a lower overall plant efficiency that would increase electrical costs and produce relatively more air pollution and solid waste. Cost per megawatt output would be expected to increase slightly.

There would be no expected changes in regulations except that new emission rates would have to be calculated and modeled. Air, solids, water, and waste requirements would be completely different. This alternative was eliminated because it would not substantially accomplish the proponent’s goals.

IGCC is a developing technology with limited operating experience. IGCC and circulating fluidized bed (CFB) boilers are alternative power plant technologies, and they could not be used without redefining the Project. Current IGCC systems, such as Pinon Pine, have not demonstrated reasonable availability (due to component failures) nor have their emission levels (as reported by the EPA Emissions Scorecard) been any lower than conventional plants. Fluidized bed boilers cannot achieve the same degree of sulfur dioxide capture that would be accomplished by a dry scrubbing system. If either technology were used, the entire Generation Plant design, including turbine-generators and material handling equipment, would have to change. These technologies would require a redefinition of the plant emission source, and they are not within the scope of a best available control technology (BACT) determination. In summary, normal BACT determinations are based on control technologies not on alternative source technologies (e.g., alternative boilers). Redefining the facility is not in the scope of a normal BACT analysis.

CFB boilers are typically used to combust low-grade fuels that may be difficult to pulverize and fuels having a high sulfur content, high ash content, or variable combustion characteristics. The inherent features of CFB technology make it advantageous for use with low-quality fuels. For high-ash coals, the CFB offers an advantage in fuel preparation over pulverized coal systems. For use with high-quality fuels, such as the coal that the Project would use, pulverized coal firing provides a wider flexibility in operation and higher thermal efficiency. A CFB boiler is a well-established technology and could be designed to achieve an SO_2 emission rate (in lbs/mmBtu) somewhat lower than the emission rate proposed by the proponent. However, the lower emission rate would be largely offset by the additional fuel and fuel preparation for a CFB boiler in order to produce the same net power output.

CFB units require significantly more auxiliary power for proper operation than pulverized coal units require. This increase reduces the efficiency of the CFB boiler. In other words, when compared to pulverized coal boiler, more fuel must be combusted in a CFB boiler to generate the same net power output. The additional fuel is required because CFB boilers require larger air and flue gas fans that consume a higher percentage of the plant gross power output. This process requires larger amounts of coal firing and steam flow and a larger steam turbine and air-cooled condenser to achieve the same net plant power output. CFB boilers are not commercially available in a 390 MW size. Therefore, to provide the same power generated by the two 390 MW pulverized coal-fired boilers; it would be necessary to use three smaller CFB boilers and three turbine-generators.

Constructing three generating units instead of two would significantly increase costs. Based on recent actual CFB project experience and best engineering judgment, the cost of three CFB units would increase the cost of the Project by approximately $78 million to $156 million. Therefore, based on the increase capital costs for three CFB boilers and increased fuel costs, the SO_2 emission rate in lbs/Kw-hr would not provide a significant advantage. In addition, the construction of three units would extend the overall construction schedule of the Project by at least one year. Therefore, based on increased capital costs, extended construction schedule, and lack of significant environmental advantages, this alternative was eliminated because it would not substantially accomplish the proponent’s goals.

Gas turbines used separately (simple cycle applications) are expensive to operate because of the combination of their lower efficiency and higher costs for natural gas fuel. For these reasons, simple cycle gas turbine applications are used primarily for power supply (periods when there is a high demand for electricity.)

This design mixes a gas turbine cycle with a steam turbine cycle to combine in the production of energy. If the steam is used in an industrial application, the result is a "co-generation" combined cycle plant where the low-pressure steam is used for some process function. Neither type of gas turbine plant is as advantageous as pulverized coal for providing the base load power supply planned for the Project, nor would they utilize the high quality coal supply by conveyor from the Mine to the plant (mine mouth plant concept). The IGCC and CFB units were considered for general project planning (not as emission control technologies) and they were found not to be economically suitable for the project. This alternative was eliminated because it would not substantially accomplish the proponent's goals.

2.3.5 Alternative Solid Waste Systems

The principle solid waste streams in coal-fired utility boilers consist of bottom ash, fly ash, and pyrites. In addition to the coal waste streams, there is a calcium-based FGD waste residue, which depends upon the FGD technology selected. The alternative solid waste systems considered and eliminated are described below.

Dewatering, stabilization, and fixation technologies for FGD waste have been eliminated from consideration and further analysis due to the use of a dry scrubbing system.

Two types of systems can be used to transport bottom ash:

- A "wet piping system" where water at high pressure flowing through a nozzle pushes the ash out of the hopper.
- A "drag chain system" where ash is carried from the hopper to a conveyor system.

The "wet piping system" was eliminated from consideration because this system requires more makeup water than the drag chain system.

Placing the solid wastes (ash and FGD waste) within the Mine waste rock depository was considered. This would require the waste to be transported over three miles to the Mine waste rock site, and placed as an engineered lens within the waste rock generated from the mining activity. This alternative was eliminated because of the following reasons:

- Requires a longer haul route
- Increases the size of the waste rock dump
- Requires coordination with the mine operations to stage the dump development
- Exposes groundwater to potential effects from leaching through the waste rock in the unlined dump
- Creates stability issues within the waste rock dump

Transportation to an off-site commercial landfill would require permitting and construction of an on-site transfer, storage and disposal facility (TSDF), transport of the waste to a remote landfill, and payment to a third-party concessionaire. This alternative was considered and eliminated because of the lack of a nearby suitable landfill, and prohibitive transportation and tipping fee costs.

2.3.6 Alternative Wastewater Discharge Systems

Alternative wastewater disposal methods considered included direct discharge to drainage ditches, subsurface injection, evaporative ponds, land application, and piping offsite to the mine. Temporary piping of effluent discharge to a dry gulch and spray discharge of wastewater on croplands in the immediate area were considered and eliminated due to the availability of alternatives that allow reuse of wastewater at the plant site.

Discharge of wastewater to the environment, either to surface water bodies or to groundwater would result in increased water consumption and a greater potential for impacts to water resources. The water balance presented in the Project indicates that there would be zero discharge of wastewater during normal plant operation.

2.3.7 Alternative Emissions Control Systems—Main Boiler

The proposed pollution controls for reducing criteria pollutants would provide reduction in hazardous air pollutant (HAP) emissions as well. Activated carbon injection primarily for mercury control was considered as an additional HAP control technology. However, the EPA is currently studying the effectiveness of activated carbon on different coal and boiler types. Because this technology has not been proven yet for a similar facility, it was not chosen for application to the Project. Other combination of control technologies were considered but rejected as not providing additional HAP control benefits without reducing criteria pollutant efficiency.

The wet flue gas scrubber process (wet FGD) requires dewatering before disposal. Wet FGD systems use significantly more water and have significantly higher capital costs than dry FGD systems. Wet FGD was considered and eliminated based on increased water consumption, increased wastewater production, increased solid waste generation, increased particulate emissions, and increased sulfuric acid mist emissions. The permit submittal from Roundup to the DEQ states that material handling fugitive emissions will increase due to the techniques of limestone handling with a wet FGD as compared to lime handling with a dry FGD. It goes on to state that approximately two tons per hour of limestone would need to be handled as compared to lime. Particulate emissions would increase if a wet ESP is installed rather than a baghouse (from PM_{10} BACT). A dry FGD would reduce sulfuric acid mist emissions by 1,045 tpy when compared to a wet FGD without a wet ESP. A wet FGD combined with a wet ESP would decrease sulfuric acid emissions by 84 tpy when compared to a dry FGD. Visibility impacts on Class I areas would improve only slightly with a wet FGD combined with a wet ESP when compared to a dry FGD, and visibility impacts improve with a dry FGD when compared to a wet FGD without a wet ESP.

A circulating desulfurization system (CDS) or circulating dry scrubber was considered. The initial BACT demonstration included an evaluation of CDS technology. CDS was rejected as BACT because it did not offer significant benefits, had not been demonstrated on a large pulverized coal-fired boiler, and had anticipated difficulties associated with adapting the technology to a large pulverized coal-fired boiler. In DEQ's February 27, 2002, request for additional information, the agency requested a more detailed evaluation of CDS. In response, the proponent submitted additional technical information to DEQ supporting the rejection of CDS as BACT. Among other impacts, using circulating dry scrubbers for SO2 control could necessitate using electrostatic precipitators for PM10 control, and that could require increasing the PM10 emission rate above the limit proposed.

Post combustion controls, such as thermal oxidation and catalytic oxidation, were rejected based on technical infeasibility. Sulfur compounds and particulate matter can foul both systems so that placement of the units would have to be after the baghouse; therefore, reheating the exhaust stream to 600ºF and 1,500ºF for the catalytic oxidizer and thermal oxidizer, respectively, would have to occur. No cost analysis was provided but $/MW output would increase with control equipment costs and operation and maintenance costs (i.e., reheating of the exhaust gas). New emission rates would have to be calculated and modeled.

The need for additional pollution control facilities such as wet precipitators and scrubbers to control pollution were considered and eliminated. The additional water supplies and wastewater that would be required to transport or dispose of collected materials was deemed an unnecessary technological resource and would have created the additional problem of disposing of solid waste. Wet precipitators and scrubbers are used to control SO_x and fine particulates. Since these pollutants are expected to be controlled from the Project, these types of facilities would not be necessary.

Flue Gas Recirculation (FGR) with Selective Non-Catalytic Reduction (SNCR) were considered and eliminated. SNCR units typically are not installed on pulverized coal (PC) coal-fired units but rather on natural gas-fired units. SNCR is technically feasible but typically not installed on PC coal-fired units and does not control NO_x (60 percent as compared to 80 percent) as well as selective catalytic reduction (SCR) for this type of facility.

2.3.8 Alternative Generation Sites

The proposed site is the only site that was considered for the Project. Alternative locations for the facility as well as number of units were viewed as not suitable to the purpose and need of the Project. Alternative sites would not be close enough to major transportation routes (i.e., both interstate highways and railroad systems) to allow for the transport and receipt of materials. The basic concept of the Project is a mine-mouth, twin-unit, coal-fired Generation Plant. There is no consideration given to reduce the number of plants from two units to one unit. A one unit plant was considered but eliminated because of economic and plant reliability option. The economics of the Project are based on the availability of an abundant supply of low-sulfur, high-quality coal in the immediate vicinity. Other locations that were adjacent to the Mine were considered and evaluated. These other sites did not have access to roads, were not as close to the Mine, the topography and drainage were not as good, and they were unavailable for purchase.

As discussed in Section 2.3.1, the mine-mouth concept minimizes both environmental impacts and costs associated with fuel transportation. The proposed site location is the best available option from both an environmental and an economic standpoint.

2.4 Alternatives to the Proposed Action

2.4.1 Landfill Alternative

Over the life of the Project, construction and operation of additional landfill cells on the Generation Plant site is proposed as an alternative to moving most of the solid waste to the Mine for disposal. Disposing of waste in the Mine would require further permitting and licensing to comply with codes and standards now in effect. A solid waste disposal area is indicated on the Generation Plant site layout to provide storage requirements to dispose of waste for the life of the plant (Figure 2-10).

The landfill would be a state-of-the-art facility designed with two cells, providing a 60-acre volume of storage. The disposal area would be lined for the protection of groundwater and provided with a leachate collection system not to exceed 10 acres to remove leachate and storm water that collects on top of the lining. The lining would be a single composite liner consisting of a 60-mil HDPE geomembrane over a 12-inch thick layer of low permeability clay.

The leachate collection system would consist of a 12-inch thick layer of coarse sand or coarse bottom ash placed on top of the geomembrane lining, an eight-inch diameter perforated HDPE collection pipe buried in a rock-filled collection trench and placed at the low point in the center of the cell, and a rock filled sump. The collection pipe would discharge into the lined sump, which contains a pump.

All leachate and storm water entering a cell would be collected in the leachate collection system and pumped to the leachate collection pond. Water collected in the leachate collection pond would be pumped out and used to wet FGD waste or used in the disposal area irrigation system that would be operated during the summer to control dust. Should the Generation Plant be out of operation, these flows could still be used in the irrigation system. The leachate collection pond would be lined with two layers of 60-mil thick HDPE geomembrane, with a leak detection layer installed between the inner and outer geomembrane liners. Leakage through the inner liner would be monitored, and the pond would be repaired if leakage exceeds a preset action leak rate.

When a portion of the disposal area has been filled to the design elevation, a cap would be put in place to prevent infiltration of moisture into the solid waste disposal area. First, a 40-mil-thick LDPE geomembrane sheet would be placed over the waste material. Second, a geocomposite drainage layer consisting of a geotextile heat-welded to a geonet would be installed. Third, a minimum 30-inch layer of silty-clay soil material would be put into place. Finally, a 6-inch layer of topsoil capable of sustaining vegetation would be placed over the cap. Then the cap would be seeded with native vegetation.

Bottom ash would be loaded into trucks from a silo or hopper and transported to the disposal area, where it would be temporarily stored in a designated part of the area. It would be recovered as needed for use in the 12-inch layer placed over the geomembrane liner for gathering leachate, or for other uses. Bottom ash is an impervious, glassy material.

Fly ash and FGD waste collected by the fabric filter also would be transported to the disposal area by truck. Before being loaded into trucks, this material would be mixed with about 20 percent water, producing a consistency similar to moist silt. After reaching the disposal area, it

Figure 2-10 Alternative Solid Waste Disposal Area

would be distributed in layers and compacted. Water from the leachate collection pond would be sprinkled over the layers of fly ash/FGD waste to assist compaction and control dust. The fly ash/FGD waste material would become somewhat hard and stable (similar to hard clay) as it dries.

2.4.2 230kV Transmission System Alternative

As indicated in the Project description above, each generating unit would be designed to generate nominally 390MW gross (350MW net) electrical capacity year round on a 24-hour per day basis. As an alternative to the three circuits of 161kV transmission lines from the Generation Plant to the Broadview Substation described in the Proposed Action (Figure 2-11), two single-circuit 230kV lines on wood pole H-frame structures in the same corridor as the Proposed Action would be constructed. This would require a new transformer and associated equipment to support connection to a higher voltage transmission line. Equipment and construction would be similar to the 161kV Transmission System described in Section 2.2.

NorthWestern Energy's Broadview Substation is connected to the transmission grid in the northwest and the Transmission System coordinated by the Western Electric Coordinating Council (WECC). The Project's proponent expects improvements would be made to the system to allow approximately 500MW to flow west towards Bonneville Power Administration's (BPA) Garrison Substation and approximately 200MW to flow south to PacifiCorp's Yellowtail Substation. Studies performed by both transmission providers have identified upgrades that are proposed and underway to support this flow.

To build the 230kV Transmission System, the Project proponent would need to apply for and receive a certificate under the Major Facility Siting Act.

This alternative most probably would result in slightly lower visual impacts, as there would be fewer conductors and slightly longer spans.

2.4.3 No-Action Alternative

Under the No-Action alternative, the Generation Plant and the 161kV Transmission System to the Broadview Substation would not be constructed. The State of Montana would not issue the Final Air Permit for the Project.

2.5 Comparison of Alternatives

The alternatives to compare are alternatives to specific design and operation components of the Proposed Action. Specifically, the Landfill Alternative is compared with the Proposed Action of placing waste into the mine after the on-site landfill is at capacity in approximately 10 years after the start of Project operations. The second alternative is a double circuit 230kV transmission system, an alternative to the Proposed Action of a three circuit 161kV transmission system.

The 230kV transmission system alternative differs from the Proposed Action 161kV transmission system in the amount of ground disturbance-related impacts and visual impacts. Ground disturbance would be slightly more with the 161kV transmission system because there would be slightly more 161kV structures, and therefore slightly more spur roads and ground disturbance to access and construct at these structure sites. Therefore, slightly more habitat impacts would result from the Proposed Action 161kV system, and the potential to disturb cultural sites would be slighter higher, but would likely be immeasurably so.

Visual impacts would be slightly different between the Proposed Action 161kV and the 230kV transmission system alternative, but there is no visual resource preference between the two. With the Proposed Action 161kV system, there would be slightly more structures and more conductors (i.e., slightly more structure contrast), and slightly more ground disturbance, but these somewhat potentially higher visual impacts would be offset by somewhat smaller structures. Therefore, there is likely not enough difference between the 161kV and 230kV systems to state a preference visually.

There would be no difference between the two transmission systems for land use impacts, socioeconomics, or water resources, or wetlands.

For the waste disposal alternative of constructing an off-site landfill after the 10-year capacity of the on-site is utilized, the impact differences are primarily for land use, wildlife habitat, and potential risks to groundwater resources. There would be lower risks and potential impacts to environmental resources with the off-site Landfill Alternative. There are risks, unknowns, and uncertainties associated with in-mine storage of waste that could result in impacts and possible contamination to soils, water bearing geological zones, and groundwater resources. The use of lined and monitored landfill cells in the Landfill Alternative would result in less risk and less potential impact to these resources in the future.

Land uses and habitats would have slightly higher impacts with the Landfill Alternative due to permanent loss of grazing and dispersed recreation potential if this alternative were selected. This would be the case because of the previously decision and commitment for this area to be mined, and therefore the loss of this area to other land use or habitat is already planned. Other resource impacts would be similar with either the Landfill Alternative or the Proposed Action.

Table 2-5 summarizes and compares the Proposed Action and the alternatives described in Sections 2.2 and 2.4 and analyzed in detail in Chapters 3 and 4. Alternatives to design components of the Proposed Action include a waste disposal alternative and a transmission system alternative.

2.6 Selection of the Preferred Alternative

The DEQ Preferred Alternative is the Proposed Action, with the addition of the Landfill Alternative for long-term solid waste disposal instead of long-term disposal in the mine. In this alternative, solid waste would be stored in landfill cells adjacent to the generation facility site for the life of the Project (also refer to Section 2.4.1 for a description of the Landfill Alternative).

The alternative of disposing waste in the alternative landfill is preferred over the Proposed Action of long-term disposal of waste in the adjacent coalmine because it would result in the least impacts to environmental resources. The uncertainties associated with in-mine storage of waste make the Proposed Action a higher risk for causing impacts and possible contamination to soils, water bearing geological zones, and groundwater resources. In comparison, the use of lined and monitored landfill cells would minimize the risk of these impacts in the future. More information is needed to fully understand impacts from in-mine storage. Therefore, the Landfill Alternative is preferred.

With the construction and operation of the Proposed Action or the two alternatives (i.e., Landfill and 230kV Transmission System), all resource areas, with the exception of fisheries, would experience some adverse environmental impacts (refer to Table 2-5). Impacts that would result to vegetation and wildlife would include the loss of approximately 208 acres of grass/shrubland habitat for the Proposed Action or the action alternatives. However, this habitat is common and widespread in this portion of Montana, so impacts would be low. No federally listed or state sensitive species are known to exist in the Project study areas.

Air quality impacts was not a factor in selecting the Preferred Alternative, as impacts would not be measurably different under the Proposed Action or with selection of either of the action alternatives. Air resources were identified as having the highest Project-related impacts with most impacts ranging from low to moderate. A high impact to three Class 1 Areas (i.e., Yellowstone National Park, North Absaroka Wilderness, and Northern Cheyenne Reservation) was identified from Project operations impairing visibility in these areas during specific periods each year.

Finally, the socioeconomic benefits of preferring the Proposed Action and the Landfill Alternative (i.e., the Preferred Alternative), as well as the benefits of adding the base load generation at this location and using the proposed fuel source, would outweigh the potential environmental consequences of constructing and operating the Project as the Preferred Alternative.

DEQ's preference for this alternative could change in response to public comments on the Draft EIS, new information, or analysis completed as part of the Final EIS.

Figure 2-11 Transmission System

Table 2-5 Alternatives Comparison Summary

CHAPTER 3
AFFECTED ENVIRONMENT

3.1 Introduction

This chapter describes components of the existing environment that could be affected by the Proposed Action or alternatives to the Proposed Action. The proposed Roundup Power Project (Project) consists of the construction and operation of an electricity Generation Plant, Transmission System, and associated facilities. The Project is described in detail in Section 2.2 of Chapter 2. The environmental components described include air, water, geology, soils, wetlands, vegetation, fish and wildlife, cultural, visual, noise, land use and socioeconomics.

The location and extent of the area studied depended on the resource component being evaluated. For most resource components, the Generation Plant Study Area included all of the land in Section 15, Township 6 North, Range 26 East in Musselshell County, Montana, approximately 35 miles north of Billings and 13 miles south-southeast of the City of Roundup. This includes the area needed for the Landfill Alternative. The Project site is immediately east of U.S. Route 87 and immediately north of Old Divide Road (Figure 2-1). Approximately 167 acres of land would be located within the Generation Plant fence. Other Project-related activities would occupy approximately 40 acres outside the Generation Plant fence for an estimated total of approximately 208 acres devoted to the Generation Plant. The Landfill Alternative would occupy an additional 70 acres of land adjacent to the Generation Plant.

The proposed Transmission System and 230kV Alternative were assessed within a 1.5-mile-wide corridor from the Generation Plant to the Broadview Substation for land use and visual resources. This area is 28.2 miles in length, crossing Musselshell and Yellowstone Counties (Figure 2-12). Other resources covered a similar area based on available existing data. The study areas are discussed in the Inventory Methods sections devoted to each resource component.

3.2 Air Resources

For all general purposes, the airshed for both the Generation Plant and Transmission System is considered the same; however, due to terrain features, localized weather patterns do exist but are not significant enough to report as part of the inventory results. Therefore, throughout the following sections, the Generation Plant and Transmission System are referred to as the “Study Area,” and the reader can assume that the inventory results can be used to represent the airshed for the Generation Plant and Transmission System.

3.2.1 Overview

The climate in the Study Area is continental and semiarid in nature and is typical of central and eastern Montana. The area is characterized by cold winters and warm to hot summers. Precipitation is generally light, with May and June being the wettest months. Prevailing winds blow from the southwest.

The air quality in the Study Area is well within the applicable ambient air quality standards for all criteria pollutants.

3.2.2 Inventory Methods

Temperature and precipitation data for the Study Area were obtained from the Western Regional Climate Center (WRCC). These data included monthly normals of temperature and precipitation developed by the National Climatic Data Center (NCDC) for the years 1971 through 2000. This 30-year period is the current standard period for expressing long-term normals of temperature and precipitation in the United States. Wind data were collected at the Billings Logan Airport (SAMSON database, 2002). A surface wind rose for the five-year period of 1986 through 1990 was prepared to graphically illustrate wind patterns in the area. Information obtained from the Supplemental EIS Support Document (Bull Mountain Development Company, LLC, 2002a) was used to create the following inventory results unless otherwise noted.

Sulfur dioxide (SO_2) and nitrogen dioxide (NO_2) data collected at the Project site since January 2002 have been reviewed and analyzed to characterize the current air quality in the Study Area. In addition, summaries of particulate data collected at the Project site during 1989 through 1991 were obtained and presented to characterize particulate concentrations in the area.

3.2.3 Inventory Results

Temperature and Precipitation

General meteorological conditions in the Study Area are represented by data obtained from the WRCC for Roundup and from the Weather Service Office (WSO) at Billings Logan Airport, Montana. The monthly normals of temperature and precipitation for these locations, as developed by the NCDC for the years 1971 through 2000, provide a description of general weather patterns in the region. The Roundup station is approximately 16 miles northwest of the Study Area and the Billings station is approximately 32 miles to the south.

The temperature ranges recorded at the Roundup station vary from a normal daily maximum of 86.5 degrees F in July to a normal daily minimum of 12.5 degrees F in January. At the Billings Airport, the temperature ranges recorded vary from a normal daily maximum of 85.8 degrees F in July to a normal daily minimum of 15.1 degrees F in January. Temperature data for both stations are listed in Table 3-1.

Table 3-1 also shows the normal monthly and annual precipitation data from both stations. At Roundup, the normal monthly precipitation ranges from 0.34 inch in November to 2.35 inches in May. The normal annual precipitation at Roundup is 13.25 inches. At the Billings Airport, the monthly normal precipitation ranges from 0.58 inch in February to 2.48 inches in May. The normal annual precipitation at the Billings Airport is 14.77 inches. At both locations, the heaviest precipitation amounts normally fall as rain, at times mixed with snow, in the months of May and June. Precipitation in the form of snow normally falls from November through March. Summer precipitation occurs mostly as showers and thunderstorms.

Table 3-1 Generation Plant Study Area Temperature and Precipitation

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Roundup, Montana **NCDC 1971-2000 Monthly Normals**													
Mean Max Temp (F)	36.3	42.7	50.7	60.3	69.7	79.0	86.5	86.1	74.8	62.8	45.6	37.7	61.0
Mean Min Temp (F)	12.5	17.3	24.0	32.3	41.6	49.9	54.7	53.1	42.9	33.6	22.4	14.7	33.3
Mean Temp (F)	24.4	30.0	37.4	46.3	55.7	64.5	70.6	69.6	58.9	48.2	34.0	26.2	47.2
Mean Precip (in)	0.43	0.36	0.64	1.28	2.35	2.15	1.65	1.29	1.27	1.03	0.34	0.46	13.25
Billings WSO, Montana **NCDC 1971-2000 Monthly Normals**													
Mean Max Temp (F)	32.8	39.5	47.6	57.5	67.4	78.0	85.8	84.5	71.8	58.9	42.7	34.5	58.4
Mean Min Temp (F)	15.1	20.1	26.4	34.7	44.0	52.5	58.3	57.3	47.1	37.2	25.6	17.7	36.3
Mean Temp (F)	24.0	29.8	37.0	46.1	55.7	65.2	72.0	70.9	59.5	48.1	34.1	26.1	47.4
Mean Precip (in)	0.81	0.58	1.12	1.74	2.48	1.89	1.28	0.85	1.34	1.26	0.75	0.67	14.77

Source: NOAA, Western Regional Climate Center, 2002

A wind rose depicting the average wind conditions for the five-year period of 1986 through 1990 at the Billings Airport is presented in Figure 3-1. This wind rose shows that the most common wind direction in the area is from the southwest, with winds blowing from that direction almost 25 percent of the time. The least common wind directions are from the east-southeast through south-southeast, with these winds blowing less than five percent of the time.

Air Quality

The State of Montana and the federal government have established ambient air quality standards for criteria air pollutants. The criteria pollutants are carbon monoxide (CO), lead (Pb), SO_2, particulate matter with an aerodynamic diameter equal to or less than 10 microns (PM_{10}), ozone (O_3), and NO_2. The federal government has also established a standard for particulate matter with an aerodynamic diameter equal to or less than 2.5 microns ($PM_{2.5}$).

The ambient air quality standards must not be exceeded in areas where the public has access. Table 3-2 lists the federal and Montana air quality standards. National primary standards are the levels of air quality necessary, with an adequate margin of safety, to protect the public health. National secondary standards are the levels of air quality necessary to protect the public welfare from known or anticipated adverse effects of a regulated air pollutant.

Ambient air quality standards based on annual averages must not be exceeded for any year. Compliance with short-term standards allows one exceedance per year for SO_2, PM_{10}, and CO standards (18 exceedances per 12 months for the Montana 1-hour SO_2 standard), one day with exceedances for the 1-hour O_3 standard

Monitoring levels of criteria pollutants determine the attainment status for pollutants within the Study Area. Air quality in this area is classified as attainment for all criteria pollutants. A non-attainment designation means that violations of the federal or Montana standards have been documented in the region. The nearest non-attainment area is the Laurel area to the south of the Project, which is non-attainment for SO_2. The Billings area to the south of the Project was a non-attainment area for CO but is now in attainment and operating under a maintenance plan. In addition, since 1993 the Billings-Laurel area has been the subject of an EPA-mandated revision to Montana's State Implementation Plan (SIP) to establish new emission limits for SO_2 for area industries so that compliance with the federal air quality standards for SO_2 can be demonstrated. Montana has submitted its proposed SIP revision to the EPA, where it is currently being reviewed.

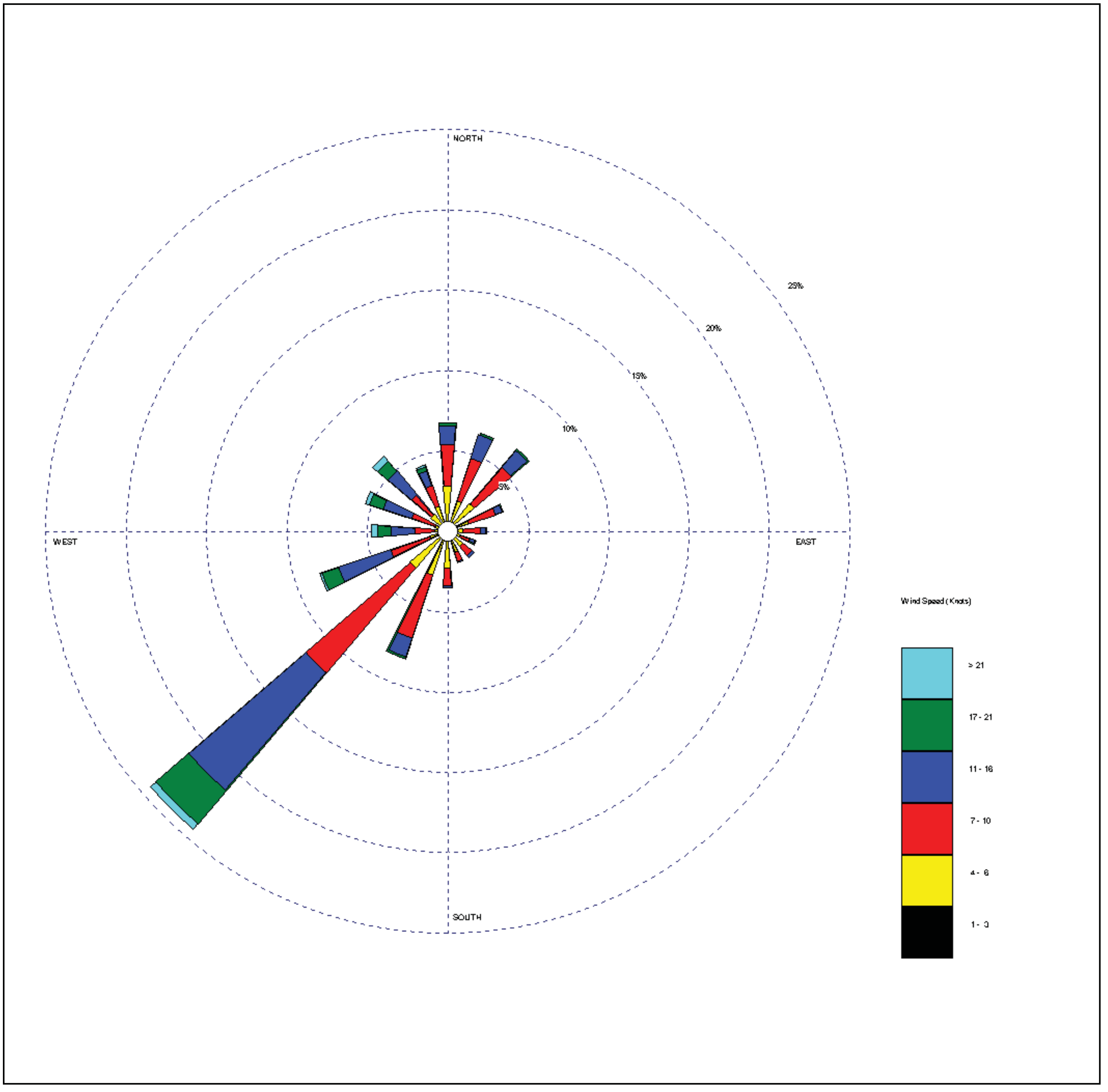

Figure 3-1 Billings WSO, Montana, Wind Rose, 1986-1990

Table 3-2 Ambient Air Quality Standards

Pollutant	Averaging Time	Concentration	Comments
Ozone	8 hours	157 µg/m³ (0.08 ppm)	National Primary and Secondary Standard
	1 hour	235 µg/m³ (0.12 ppm)	National Primary and Secondary Standard
		196 µg/m³ (0.10 ppm)	Montana Standard
Carbon monoxide	8 hours	10,000 µg/m³ (9.0 ppm)	National Primary and Secondary Standard and Montana Standard
	1 hour	40,000 µg/m³ (35 ppm)	National Primary Standard
		26,450 µg/m³ (23 ppm)	Montana Standard
Nitrogen dioxide	Annual arithmetic mean	100 µg/ m³ (0.053 ppm)	National Primary and Secondary Standard
		94 µg/ m³ (0.05 ppm)	Montana Standard
	1 hour	564 µg/ m³ (0.30 ppm)	Montana Standard
Sulfur dioxide	Annual arithmetic mean	80 µg/ m³ (0.03 ppm)	National Primary Standard
		52 µg/ m³ (0.02 ppm)	Montana Standard
	24 hours	365 µg/ m³ (0.14 ppm)	National Primary Standard
		262 µg/ m³ (0.10 ppm)	Montana Standard
	3 hours	1,300 µg/ m³ (0.5 ppm)	National Primary Standard
	1 hour	1,300 µg/ m³ (0.5 ppm)	Montana Standard
Particulate matter as PM10	Annual arithmetic mean	50 µg/ m³	National Primary Standard and Montana Standard

Pollutant	Averaging Time	Concentration	Comments
	24 hours	150 µg/ m^3	National Primary Standard and Montana Standard
Particulate matter as PM2.5	Annual arithmetic mean	15 µg/ m^3	National Primary Standard and Montana Standard
	24 hours	65 µg/ m^3	National Primary Standard and Montana Standard
Lead	Quarterly arithmetic mean	1.5 µg/ m^3	National Primary and Secondary Standard
	90-day average	1.5 µg/ m^3	Montana Standard

Source: Administrative Rules of Montana, Title 17, Chapter 8, Sub-chapter 2, Ambient Air Quality, 1996;Title 40 Code of Federal Regulations

Air Quality Monitoring Data

Ambient air quality data have been collected at the Study Area by McVehil-Monnett Associates for FGS & Associates, LLC. NO_2 and SO_2 levels have been measured at the Project site since January 2002. None of the measured concentrations was above the ambient standards during the monitoring period. Table 3-3 lists the averaged air quality monitoring data from January through mid-July 2002.

Table 3-3 Air Quality Monitoring Data

Month	Pollutant	24-Hour Maximum (ppm)	3-Hour Maximum (ppm)	1-Hour Maximum (ppm)	Monthly Arithmetic Mean (ppm)
Jan 2002	SO_2	---	---	---	---
	NO_2	0.003	0.008	0.008	0.001
Feb 2002	SO_2	0.002	0.002	0.003	0.000
	NO_2	0.002	---	0.003	---
Mar 2002	SO_2	0.003	0.010	0.016	0.001
	NO_2	0.002	0.005	0.006	---
Apr 2002	SO_2	0.002	0.007	0.010	0.000
	NO_2	0.002	0.005	0.007	0.001
May 2002	SO_2	0.000	0.002	0.003	0.000
	NO_2	0.003	0.003	0.004	0.001
Jun 2002	SO_2	0.003	0.005	0.007	0.001
	NO_2	0.002	0.002	0.004	0.000
Jul 1-15, 2002	SO_2	0.001	0.001	0.001	0.000

	NO_2	0.002	0.002	0.003	0.000

Source: McVehil-Monnett Associates, Ambient Air Quality reports, 2002

In addition, background air quality monitoring for particulates was conducted in the Study Area by Meridian Minerals Company) from 1989 through 1992 (Lorenzen, 2002). This monitoring included both total suspended particulates (TSP) and PM_{10}. These data are summarized in Table 3-4. All PM_{10} values are well below the ambient air quality standards.

Table 3-4 Particulate Monitoring Data (µg/m3)

Year	Parameter	Highest Reading	Second-Highest	Annual Average	No. of Samples
1989	TSP	39	33	14	51
	PM_{10}	53*	19	9	51
1990	TSP	59	58	13	59
	PM_{10}	29	27	9	57
1991	TSP	42	39	14	56
	PM_{10}	24	21	9	57

*This high PM10 value was recorded on June 27; no TSP value was recorded on that date.

PSD Classification

The area surrounding the Project site is a designated Class II area as defined by the Federal Prevention of Significant Deterioration of Air Quality (PSD) program. The PSD Class II designation allows for moderate growth or degradation of air quality within certain limits above baseline air quality standards. Industrial sources proposing construction or modifications must demonstrate that the proposed emissions would not cause significant deterioration of air quality in all areas. A Class I designation provides the most protection to pristine lands, limiting the increment above baseline pollution levels. The standards for significant deterioration are much stricter for Class I areas than for Class II areas.

The nearest mandatory federal Class I area to the Project would be the UL Bend Wilderness Area, located approximately 130 kilometers (~81 miles) northeast of the site. Yellowstone National Park (YNP), also a mandatory federal Class I area, is about 180 kilometers (~112 Miles) southwest of the site, and the North Absaroka Wilderness is also approximately 180 kilometers southwest of the site. In addition, the Northern Cheyenne Indian Reservation, located approximately 130 kilometers (~81 miles) to the southeast, is a designated Class I area. Figure 3-2 shows the Class I areas relative to the Project.

The UL Bend Wilderness area comprises 20,819 acres of land characterized by breaks (badlands), steep-sided forested coulees, prairie grasslands, cottonwood river bottoms, and an abundance of wildlife. The UL Bend Wilderness is part of the UL Bend National Wildlife Refuge, which in turn is part of the larger Charles M. Russell National Wildlife Refuge. Elevations in the UL Bend Wilderness are approximately 2,340 feet above sea level.

Yellowstone National Park is the nation's first and oldest national park. Encompassing 2,219,791 acres, the Park is characterized by geothermal features, mountain lakes, abundant wildlife, and rugged mountains with peaks in excess of 10,000 feet.

The North Absaroka Wilderness is located in Wyoming near the northeastern boundary of Yellowstone National Park. Encompassing approximately 350,500 acres, the Wilderness is characterized by mountain lakes, abundant wildlife, and rugged mountains with peaks in excess of 10,000 feet.

The Northern Cheyenne Indian Reservation was established in 1884. With an area of 444,775 acres in south-central Montana, topography of the reservation varies from grass covered rolling hills to moderately high and steep hills and narrow valleys. Elevations range from 3,000 to 4,500 feet above sea level.

Offsite Pollution Sources

The EPA's National Emission Trends (NET) 1999 database contains annual emission estimates from point, area, and mobile sources, with no minimum emission threshold required for listing. In the counties around the Study Area, the NET 1999 database lists 17 stationary sources in Yellowstone County, seven in Rosebud County, three in Big Horn County, three in Stillwater County, two in Carbon County, and one in Musselshell County. Of these 33 sources, 17 are major for criteria pollutants.

Eight of the 33 facilities are also listed on the EPA's 1999 National Toxics Inventory (NTI) database. The NTI is an emission inventory for stationary and mobile sources that emit hazardous air pollutants (HAPs). Four of these facilities are also major for HAPs, emitting more than 10 tons per year of any one HAP or 25 tons per year of two or more HAPs. Both the NET and NTI databases are updated every three years. Table 3-5 presents a list of the major facilities, their location, nature of business, and the pollutant(s) emitted.

In addition to the major sources listed below, a new 113 MW coal-fired generation plant has recently been permitted near Hardin, Montana. By permit, construction of the generation plant must commence before June 12, 2005.

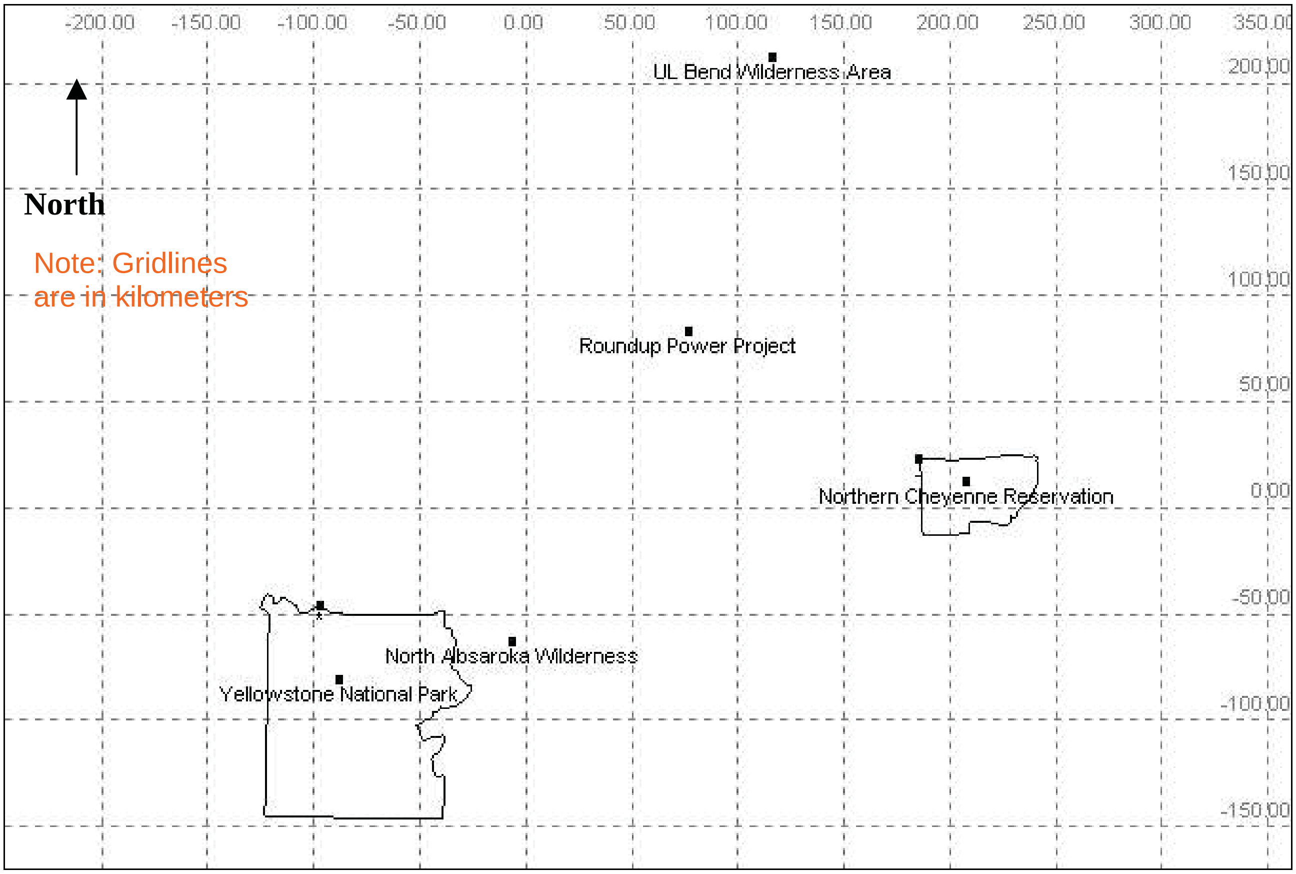

Figure 3-2 Class I Areas of Concern for the Roundup Power Project

Table 3-5 Major Nearby Facilities

Facility Name	Facility Location	Nature of Business	Pollutants Emitted
Montana Sulphur and Chemical	East Frontage Road Billings, Montana	Industrial Organic Chemicals	CO, NO_2, PM_{10}, SO_2, VOC, $PM_{2.5}$
Conoco Phillips	401 23rd Street Billings, Montana	Petroleum Refining	CO, NO_2, PM_{10}, SO_2, VOC, $PM_{2.5}$, HAPs
Cenex Harvest States Co-op.	Highway 212 South Laurel, Montana	Petroleum Refining	CO, NO_2, PM_{10}, SO_2, VOC, $PM_{2.5}$, HAPs
Western Sugar Co.	3020 State Avenue Billings, Montana	Beet Sugar	CO, NO_2, PM_{10}, SO_2, VOC, $PM_{2.5}$
PPL Montana-Corette/Bird	301 Charlene Street Billings, Montana	Electric Services	CO, NO_2, PM_{10}, SO_2, VOC, $PM_{2.5}$, HAPs
PPL Montana-Colstrip Units #1 & #2	P.O. Box 38 Colstrip, MT 59323	Electric Services	CO, NO_2, PM_{10}, SO_2, VOC, $PM_{2.5}$, HAPs
PPL Montana-Colstrip Units #3 & #4	P.O Box 38 Colstrip, MT 59323	Electric Services	CO, NO_2, PM_{10}, SO_2, VOC, $PM_{2.5}$, HAPs

Facility Name	Facility Location	Nature of Business	Pollutants Emitted
Colstrip Energy Ltd. Partnership	Rosebud Power Plant Colstrip, MT 59323	Electric Services	CO, NO_2, PM_{10}, SO_2, VOC, $PM_{2.5}$, HAPs
Western Energy	Rosebud Mine Colstrip, MT 59323	Bituminous Coal and Lignite	CO, NO_2, PM_{10}, SO_2, VOC, $PM_{2.5}$, HAPs
Exxon Mobil	700 Exxon Road Billings, Montana	Petroleum Refining	CO, NO_2, PM_{10}, SO_2, VOC, $PM_{2.5}$, HAPs
Yellowstone Energy Ltd. Partnership	2215 N. Frontage Rd. Billings, Montana	Electric Services	CO, NO_2, PM_{10}, SO_2, VOC, $PM_{2.5}$, HAPs
Decker Coal Company	Decker Mine Decker, MT 59025	Bituminous Coal and Lignite	CO, NO_2, PM_{10}, SO_2, VOC, $PM_{2.5}$
Big Sky Coal Company	P.O. Box 97 Colstrip, MT 59323	Bituminous Coal and Lignite	CO, NO_2, PM_{10}, SO_2, VOC, $PM_{2.5}$
Westmoreland Resources	East of Hardin Hardin, MT 59034	Bituminous Coal and Lignite	CO, NO_2, PM_{10}, SO_2, VOC, $PM_{2.5}$
Spring Creek Coal	Spring Creek Mine Decker, MT 59025	Bituminous Coal and Lignite	CO, NO_2, PM_{10}, SO_2, VOC, $PM_{2.5}$
Williston Basin-Hardin Compressor Sta.	P.O. Box 358 Hardin, MT 59034	Natural Gas Transmission	CO, NO_2, PM_{10}, SO_2, VOC, $PM_{2.5}$
St. Labre Indian School	P.O. Box 48 Ashland, MT 59003	Nonclassifiable Establishments	CO, NO_2, PM_{10}, SO_2, VOC, $PM_{2.5}$

EPA Office of Air and Radiation,2002

3.3 Water Resources

3.3.1 Overview

The Generation Plant would be located along the crest of the drainage divide between the Musselshell and Yellowstone rivers. There are no surface water bodies within the Generation Plant Study Area.

There are two main aquifers of interest in the Generation Plant Study Area. The primary water sources for domestic wells are the shallow sandstone aquifers in the Tongue River member of the Fort Union Formation. These aquifers are often discontinuous, or perched, with limited areal extent. Other aquifers may be present within the underlying Cretaceous sandstone units; however, no production wells have been drilled into these sediments around the Generation Plant Study Area. Deep drilling efforts and production testing performed by oil exploration companies have identified a very productive water-bearing zone in the Madison Group limestone beds. The Madison aquifer is the proposed water source for the Project.

3.3.2 Inventory Methods

The water resources at the site were reviewed through publications by the U.S. Geological Survey (USGS), the Montana Bureau of Mines and Geology (MBMG, 2002), and other sources such as oil company reports. The well inventories and well log records were observed at the Montana Department of Environmental Quality (DEQ), the Montana Department of Natural Resources and Conservation (DNRC), and the USGS. Many of the monitoring well records included water quality information. The surface water inventory was compiled by review of surface maps and aerial photography.

Other various reports and documents including the Supplemental EIS Support Document (Bull Mountain Development Company, LLC, 2002a), Bull Mountains Mine FEIS (Montana Department of State Lands, 1992), and the Railroad Spur Checklist EA (DNRC, Trust Land Management Division, 2002) were also used in evaluating the existing conditions in the Generation Plant Study Area. USGS 7.5 minute topographical maps and aerial photography were also obtained and analyzed to assist in this inventory. On-site observation was used to confirm conditions on the ground.

3.3.3 Inventory Results

Generation Plant

Surface Water

The proposed Generation Plant would be located on a flat ridge separating the upper reaches of Halfbreed Creek and Rehder Creek. The Yellowstone River is located approximately 35 miles south; the Musselshell River is located 15 miles to the north. The closest flowing water is found in Rehder Creek approximately three miles northwest of the site. The average annual precipitation for the area is approximately 14 inches of rainfall and snowmelt (NOAA, 2002). No surface water bodies exist within the Generation Plant Study Area. All of the drainages lack defined bed and banks.

Groundwater

In the Generation Plant Study Area, two main groundwater-bearing aquifers occur within 1,600 feet of the surface. They are the Tongue River member of the Fort Union Formation and the Hell Creek Formation. These aquifers overlie the impermeable shales of the Cretaceous Montana Group. Water production rates from wells screened in these aquifers are reported by the MBMG (MBMG, 2002) to range from 1 to 15 gallons per minute (gpm). The low production rates limit the use of these wells to domestic water and livestock watering.

This Project would not use any water from these shallow aquifers because of the low yield rates demonstrated in surrounding domestic wells. There are presently many shallow domestic and stock groundwater wells that penetrate the Fort Union Formation and a few additional wells in the Hell Creek Formation (MBMG, 2002).

Recharge in these aquifers originates from infiltration of precipitation and minor amounts from upward migration of water from Cretaceous sediments. There is no documented evidence suggesting a hydrologic connection between the Tertiary aquifers and the deeper Madison aquifer. In the Generation Plant Study Area, they are separated by thousands of feet of low permeability shales and siltstones. Water quality from monitoring well samples in the Fort Union aquifer range from 852 to 2,056 parts per million (ppm) total dissolved solids (TDS) (MBMG, 2002).

The proposed Generation Plant water source is from the Madison Group, the top of which lies approximately 7,900 feet below ground surface (bgs) (Feltis, 1984). Approximately four to six 8,600-foot wells drilled near the proposed Generation Plant would penetrate into the Charles and Mission Canyon formations, utilizing the most likely zones of high porosity and permeability that would favor good production.

The Madison Group in Montana constitutes a large regional aquifer. Water within the Madison Group in the Project vicinity occurs under confined conditions. Due to the hydrostatic pressure within the aquifer, wells screened in the Madison Group would likely have water levels that reach above the level of the top of the aquifer. Oil wells screened in this aquifer near the Project have water levels measured within 300 feet of ground surface (Lee Techni-Coal, 1993). Artesian flow is reported in wells drilled to the south in the Billings area.

Groundwater in the Madison flows through solution channels developed along joints and fractures in the limestone, and through interconnected caverns (Feltis, 1993). Well tests in this aquifer regionally produce water flows from 70 gpm to 1,200 gpm (Lee Techni-Coal, 1993, and MBOG, 2002).

The water temperatures in the Madison aquifer are approximately 175°F at a depth of 8,500 feet near the Generation Plant (Lee Techni-Coal, 1993).

The water in this geologic formation contains high concentrations of TDS. Analysis of water from wells in the region varies from 2800 to 6500 ppm TDS. Sulfate and bicarbonate are the dominant anions, with calcium and sodium the dominant cations (Lee Techni-Coal, 1993).

Transmission System

Surface Water

It is anticipated that the Transmission System would connect with the Broadview Substation west of the Generation Plant following the Bull Mountain coal railroad spur right-of-way. The railroad spur right-of-way is primarily located in uplands; however, several small drainages may be crossed. This right-of-way would neither cross nor be adjacent to any perennial stream system. Generally, the corridor is located in high areas where intersecting ephemeral channels drain small catchment areas. The upper Goulding and Dean creeks provide northerly drainage while the upper Razor Creek system provides the only major drainage to the southeast along the proposed corridor. A portion of the proposed transmission line alignment crosses the Hay Basin lakebed east of State Highway 3 approximately 12 miles east of Broadview.

Groundwater

Groundwater was not assessed within the Transmission System Study Area.

3.4 Earth Resources

3.4.1 Overview

The Project would be located in the Bull Mountain Basin of south-central Montana (Stricker, 1999). The Bull Mountain Basin contains marine and near-shore fluvial deposits that mark the retreat of a shallow sea and emergence of a low-gradient coastal plain environment in the Late

Cretaceous and early Tertiary periods. The basin is a positive topographic feature ranging in elevation from approximately 3,200 to 4,000 feet above mean sea level. Topography in the basin is dominated by ponderosa pine covered upland areas underlain by resistant sandstone beds. The upland areas have been dissected by tributary streams of the Musselshell and Yellowstone rivers, resulting in good exposures of basin sediments in these drainages.

3.4.2 Inventory Methods

Data for this section were obtained from review of the Supplemental EIS Support Document (Bull Mountain Development Company, LLC, 2002a), publications from the USGS, the MBMG, and the DNRC's Board of Oil and Gas Conservation (BOGC), and from Meshnick et al (1972). Figure 3-3 illustrates soil classifications in the Generation Plant Study Area.

3.4.3 Inventory Results

Generation Plant

Geology

An overview of the site stratigraphy is provided in Table 3-6. Data for Table 3-6 were obtained from Wilde and Porter (2000), and the BOGC (2002). The table illustrates the time and depth relationships of the rock units present beneath the site. The table is arranged from top to bottom so that the youngest unit appears on top, and the oldest unit on the bottom. Individual rock units are identified in the "Formation" column. The approximate age of the rocks is given in years before present in the "Time" column. The approximate depth to the top of selected units in the table is included in the "Depth" column.

The site is underlain by the Tongue River member of the Paleocene Fort Union Formation. The Tongue River member is comprised of thick- to thin-bedded sandstone, shale, siltstone, and coal. The total thickness of the Tongue River member ranges from 1,600 to greater than 2,050 feet in the Bull Mountains (Stricker, 1999). The Generation Plant would be constructed on interbedded sandstone and shale near the middle of the Tongue River member.

The Mammoth coal bed, ranging from 5 to 16 feet thick, occurs within this unit and is the proposed coal source for the Generation Plant. At least 12 other mappable coal beds occur within the Tongue River member (Stricker, 1999). Where the coal beds outcrop at the surface, they are susceptible to ignition from prairie fires. These coal bed fires advance slowly underground through the coal seams, metamorphosing the overlying siltstone and shale into the distinctive red clinker observed on hillsides and road cuts in the vicinity of the Generation Plant Study Area (Meridian Minerals, 1991).

The Tongue River is the uppermost of three members comprising the Fort Union Formation. In descending order, the other members are the Lebo shale, and the Tullock sandstone. The Tullock is not preserved in the mine area. Aggregate thickness of the Fort Union Formation ranges from 1,800 to greater than 2,350 feet (Stricker, 1999).

The Fort Union Formation is underlain by a thick sequence of interbedded shale and sandstone from various Cretaceous formations (Table 3-6). The sandstone intervals within this and the Fort

Union formations serve as aquifers for the local water wells and springs. A discussion of the area hydrostratigraphy is included in Section 3.3.3.

Rocks older than Cretaceous age do not outcrop near the Project. However, due to the number of oil and gas wells in the area, the subsurface geology is fairly well understood. Records of more than 300 oil and gas wells were reviewed to compile Table 3-6 (BOGC, 2002).

Of interest for this Project is the presence of the Mississippian age Madison Group. These rocks occur over a wide area in Montana, North Dakota, and Wyoming. The Madison Group is comprised of four formations, in descending order the Charles, Mission Canyon, Lodgepole, and Bakken. Madison Group lithologies range from interbedded siltstone and limestone of the Charles, Lodgepole, and Bakken, to massive limestone of the Mission Canyon (Balster, 1971). Because of their brittle nature and propensity to fracture under stress, the Madison Group formations have generally widespread and well-developed porosity and permeability.

These properties allow the formations to collect and transmit liquids, such as petroleum and water, over long distances. The Madison is a significant oil producer in eastern Montana and western North Dakota (Balster, 1971).

Due to its economic importance, the top of the Madison Group has been mapped in the Roundup 1 x 2 quadrangle (Feltis, 1984). In the Generation Plant Study Area, the top of the Madison occurs approximately 7,900 feet bgs (Feltis, 1984). The Madison is the proposed water source for the Generation Plant. Refer to Section 3.3.3 for a discussion of the Madison aquifer.

Rocks of the Bull Mountain Basin are gently folded in a shallow syncline with a northwest-trending axis. Wilde and Porter (2000) indicate the beds locally dipping northeast toward the syncline axis some six miles northeast of the Generation Plant. Based on measurements during the site reconnaissance, outcrops near the Project site dip very gently, generally less than 5 degrees. Good examples of bedding are present in road cuts along Highway 87, and in the drainage ravines near the Project site.

Table 3-6 Site Stratigraphy

Era[1]	Period[1]	Epoch[1]	Time[2]	Depth[3]	Member[4]	Formation[4]	Group[4]
Cenozoic	Quaternary	Holocene	0 to 8,000 years				
		Pleistocene	8,000 years to 1.8 Ma				
	Tertiary	Pliocene	5.3 to 1.8 Ma				
		Miocene	23.8 to 5.3 Ma				
		Oligocene	33.7 to 23.8 Ma				
		Eocene	55.5 to 33.7 Ma				
		Paleocene	65 to 55.5 Ma		Tongue River	Fort Union	
				1,194	Lebo Shale		
Mesozoic	Cretaceous		145 to 65 Ma	1,888		Hell Creek	Montana
						Bearpaw Shale	
						Judith River	
						Claggett Shale	
						Eagle Sandstone	
						Telegraph Creek	
				4,563		Niobrara Shale	Colorado
						Carlile Shale	
						Greenhorn	
						Belle Fourche Shale	
						Mow ry Shale	
						Thermopolis Shale	
				6,498		Muddy Sandstone	
						Skull Creek Shale	
						Dakota Sandstone	
						(1st Cat Creek)	
						Kootenai	
						2nd Cat Creek	
						3rd Cat Creek	
	Jurassic		213 to 145 Ma			Morrison	
				7,260		Sw ift	Ellis
						Rierdon	
						Piper	
	Triassic		248 to 213 Ma			Nesson	
Paleozoic	Permian		286 to 248 Ma			Not Present	
	Pennsylvanian		325 to 286 Ma	7,617		Tyler	Amsden
	Mississippian		360 to 325 Ma			Heath	Big Snowy
						Otter	
						Kibbey	
				7,900		Charles	Madison
						Mission Canyon	
						Lodgepole	
						Bakken	
	Devonian		410 to 360 Ma	9,250		Three Forks	
						Birdbear	Jefferson
						Duperow	
						Souris	
	Silurian		440 to 410 Ma			Interlake	
	Ordovician		505 to 440 Ma			Stony Mountain	Big Horn
						Red River	
						Winnipeg Sandstone	
	Cambrian		544 to 505 Ma			Emerson	
						Flathead	
Precambrian			2500 to 544 Ma			Belt Supergroup	
			3800 to 2500 Ma				

From Montana Department of Natural Resources and Conservation, Board of Oil and Gas Conservation web site http://bogc.dnrc.state.mt.us.

1 Specific time intervals
2 Time expressed in years before present. Ma = million years ago
3 Approximate depth in feet from ground surface
4 Rock unit names

Soils

Soil development is a function of climate, parent material, topography, vegetation, soil organisms, and time (Montagne et al. 1982). Soils in Montana are strongly influenced by parent material and topography. The arid climate, which ranges from very hot to very cold, directly affects vegetation production and soil organism activity.

Soil characteristics pertinent to the construction and operation of the proposed Project are slope, topsoil depth, texture, and depth to the water table. Soil characteristics of less importance to construction, but important to reclamation potential, include permeability, drainage and wind and water erosion hazards. A summary of these properties is included in Table 3-7.

Table 3-7 Soils Engineering Properties and Classifications: Generation Plant Study Area, Musselshell County, Montana

Soil Name and (Number)	Generalized Depth (in)	USCS	Perm (in/hr)	Shrink/Swell Potential	Potential Source of Topsoil	Wind Erodibility	Water Erodiblilty	Foundations for small buildings	Septic Tank Absorption Fields	Sewage Lagoons/ Farm Ponds
Doney-cabba-macar Loams (281D)	10-60	CL-ML	0.6-2	Poor to Fair	Poor to Good	Erodible to Very slightly erodible	Moderately erodible	Very to Somewhat limited	Very to Somewhat limited	Very to Somewhat limited
Cabba-doney Loams (285F)	10-40	CL-ML	0.6-2	Poor to Very limited	Poor	Erodible to Slightly erodible	Moderately erodible	Very limited	Very limited	Very limited
Cabba-barvon Loams (289F)	10-40	CL-ML	0.6-2	Poor to Very limited	Poor	Erodible to Very slightly erodible	Moderately erodible	Very limited	Very limited	Very limited

Source: Lee Techni-Coal. 1991; Meshnick, J.C., F.T. Miller, H. Smith, L. Gray, and W.C. Bourne. 1972

There is no published soil survey for Musselshell County. The Supplemental EIS Support Document (Bull Mountain Development Company, LLC, 2002a), and the US Department of Agriculture Natural Resources and Conservation Service (NRCS) on-line database, were sources of information for this report. Soil surveys for the Mine (Lee Techni-Coal 1991; Montana Department of State Lands [MDSL] 1992a, b) used onsite soil surveys supplemented by information provided by the Soil Conservation Service office in Roundup, and the published soil survey for Yellowstone County (Meshnick et al. 1972).

These studies reported that soils near the Mine are generally well developed, and are predominantly loams, silty loams, or sandy loams, with an occasional increase in fines to silty clay. Soils are more shallow along upper slopes and fans and deeper on lower terraces and drainage bottoms. A similar description would apply to the proposed Project, which is adjacent to the Mine project.

Soils series in the Bull Mountains have been re-named and re-mapped since the earlier studies (Bull Mountain Development Company, LLC., 2002a). The soils series potentially affected by the proposed Project are depicted in Figure 3-3. Descriptions of these series, along with the acreage to be affected by the Project, are given below. These soils are primarily rangeland soils; none are considered to be prime farmland (NRCS designation) or highly productive (MDSL 1992a).

Table 3-8 Soils Series Descriptions, Roundup Power Project Disturbance Area

Mapping Unit	Mapping Unit Name	Approximate Disturbed Acreage[1]
B	Cabba-Barvon loams, 4%-65% slopes	68.2
C	Cabba-Doney loams, 8%-45% slopes	29.3
D	Doney-Cabba-Macar loams, 4%-15% slopes	110.7
Total		208.2

Soils Series

Doney: Consists of moderately deep, well-drained soils found from 2,900 to 5,400 feet in elevation that formed in residuum and colluvium from semi-consolidated interbedded sandy and silty sedimentary beds. The surface layer is a light brownish gray loam, 0-4 inches thick, underlain by very pale brown loams 4-25 inches thick. Depth to bedrock to 20-40 inches. Clay content of the A horizon is 10-35%, permeability is moderate, and runoff is very low to high depending on slope. Used primarily for rangeland.

Cabba: Consists of shallow, well-drained soils found from 1,600 to 6,800 feet in elevation, which formed in residuum and colluvium from semi-consolidated, loamy sedimentary beds. The surface layer is a grayish brown loam, 0-3 inches thick, underlain by a light brownish gray to pale brown loams 3-15 inches thick. EC of the A horizon is 0-4 mmhos/cm, clay content is 10-35%, permeability is moderate, and runoff is very low to high depending on slope. Used primarily for rangeland.

Macar: Consists of very deep, well-drained soils found from 1,900 to 4,700 feet in elevation, that formed in alluvium and colluvium mainly derived from semi-consolidated sandstone and siltstone sedimentary beds. The surface layer is a grayish brown clay loam, 0-7 inches thick, underlain by grayish brown and light olive gray loams 7-38 inches thick. EC of the A horizon is 0-2 mmhos/cm, clay content is 18-35%, and permeability is moderate. Used primarily for rangeland.

Barvon: Consists of moderately deep, well drained soils found from 2,300 to 4,500 feet in elevation, that formed in residuum derived from weakly consolidated interbedded sandy and silty sedimentary beds and semi-consolidated shale. The surface layer is a dark grayish brown clay loam, 0-4 inches thick, underlain by grayish brown, pale brown and light yellowish brown loams 4-34 inches thick. Depth to bedrock to 20-40 inches. Clay content is 20-27%, and permeability is moderate. Used primarily for ponderosa pine forest.

Transmission System

Geology

The Transmission System Study Area is underlain by rocks for the Fort Union Formation until it descends from the timbered upland area of the Bull Mountains to the near-level basin region to the west. Surficial geology of the basin region includes the Recent lake basin sediments, the Tullock member of the Fort Union Formation, the Lance and Fox Hills members of the Hell Creek Formation, and the Bearpaw Formation. The time and depth relationship of these units is illustrated on Table 3-6.

The lake sediments are composed of unconsolidated sand, silt, and clay. They are deposited in a series of lake beds that form during above average precipitation years. These lakes develop because there are no streams that drain this basin area, and during wet years, the water accumulates at the low points in the basin.

The Tullock, Lance and Fox Hills members are composed of interbedded sandstone, siltstone, and clay, and the Bearpaw Formation is composed of shale.

The structural regime changes once the alignment descends to the basin floor. The basin floor rocks are gently folded into a paired sequence of northwest-trending anticlines and synclines. The limbs of these folds generally have dips of less than 5° (Wilde and Porter, 2000).

The alignment crosses a series of old, inactive faults in the basin area. The faults are high angle, normal faults that trend northwest, similar to the folds. Wilde and Porter (2000) do not include an estimation of displacement across these faults.

Soils

Soils data for the Transmission System Study Area were obtained by review of the major soil associations from Meshnick, *et al* (1972) for Yellowstone County, and by projecting the soil units from Yellowstone County into similar topography in the unmapped Musselshell County area.

In Yellowstone County, the alignment traverses two soil associations: the Vananda-McKenzie-Arvada association and the Cushman-Bainville association. The Vananda-McKenzie-Arvada association consists of level to gently sloping deep clays to loams over clay. This association occurs on terraces, fans, and dry lake basins. The Cushman-Bainville association consists of undulating to rolling moderately deep loams that have a clay loam subsoil or are underlain by clay loam and silty loam. This association occurs on shale uplands.

In Musselshell County the alignment traverses the Cushman-Bainville association described above, and the Bainville-Elso-McRae association and the Bainville-Travessilla-Rock land association. The Bainville-Elso-McRae association is composed of undulating to hilly, moderately deep to shallow loams and clay loams underlain by silt loam to silty clay loam, and deep soils that are loam throughout. This association occurs on shale and sandstone uplands. The Bainville-Travessilla-Rock land association consists of moderately steep and steep, moderately deep and shallow loams and fine sandy loams underlain by clay loam to fine sandy loam. This association occurs on sandstone and shale rock lands.

Figure 3-3 Soils

3.5 Botanical and Wetland Resources

3.5.1 Overview

This section presents an overview of the botanical and wetland resources in the Generation Plant and Transmission System study areas. The main purpose of this section is to identify existing vegetation and wetland features in the Generation Plant Study Area that could be affected by construction and operation of the Project.

3.5.2 Inventory Methods

Information contained in the Supplemental EIS Support Document (Bull Mountain Development Company, LLC, 2002a), served as the basis for this inventory. Other various reports and documents including the Bull Mountains Mine FEIS (Montana Department of State Lands, 1992) and the Railroad Spur Checklist EA (DNRC, Trust Land Management Division, 2002) also were used in evaluating the existing conditions in the Generation Plant Study Area. USGS 7.5-minute topographical maps and aerial photography were obtained and analyzed to assist in this inventory. The Montana Natural Heritage Program (Montana Natural Heritage Program, 2002b) provided information on sensitive plant species. On-site observation was used to confirm conditions on the ground. There is no National Wetland Inventory data currently available for the Generation Plant Study Area. Figure 3-4 illustrates vegetation types in the Generation Plant Study Area.

3.5.3 Inventory Results

Generation Plant

From on-site soils and vegetation surveys, it has been determined that there are no identified wetland resources within the Generation Plant Study Area.

Vegetation within the Generation Plant Study Area was qualitatively surveyed January 10 and 11, 2002, to map community types and identify noxious weed populations. For consistency with the adjacent Mine Project, vegetation community type names and mapping symbols used for the baseline mine inventory were used for mapping the Generation Plant Study Area. Table 3-9 depicts vegetation community types within the Generation Plant Study Area. Thirteen community types were identified and mapped, as listed in Table 3-9. Community types are described and cover and production data are presented in the Bull Mountains Mine application and are summarized in the draft and final environmental impact statements for the mine and railroad. A large portion of the Generation Plant Study Area was burned in 1984 when several thousand acres burned in the Bull Mountains. The 1984 fire, in combination with topographic and edaphic diversity, has resulted in a mosaic of community types, with types frequently intergrading with each other. Vegetation types identified within the Generation Plant Study Area are common and widespread in the Bull Mountains and eastern Montana.

A portion of the Generation plant site is located on a broad ridge that previously was plowed and converted to hay meadow or tame pasture. The plowed area has not been maintained for agriculture, and seeded species (probably intermediate wheatgrass and/or crested wheatgrass) have been replaced by two subshrubs, broom snakeweed (*Gutierrezia sarothrae)* and fringed sagewort (*Artemisia frigida*), and several annual forb and annual grass species. Native perennial grasses and forbs are uncommon in this "go-back" field.

The dominant community types on slopes adjacent to the "go-back" field are ponderosa pine/bluebunch wheatgrass (*Pinus ponderosa/Agropyron spicatum*), burned ponderosa pine/bluebunch wheatgrass, and grassland dominated by western wheatgrass (*Agropyron smithii*) and needle-and-thread grass (*Stipa comata*).

Swales draining the broad ridge support a variety of vegetation community types including green needlegrass/western wheatgrass (*Stipa viridula/Agropyron smithii*), western snowberry/Kentucky bluegrass (*Symphoricarpos occidentalis/Poa pratensis*), silver sagebrush/green needlegrass (*Artemisia cana/Stipa viridula*), and burned ponderosa pine/western snowberry (*Pinus ponderosa/Symphoricarpos occidentalis*). The drainage north of the Generation Plant site, where the solid waste disposal site would be located, supports a shrub community dominated by common chokecherry (*Prunus virginiana*) where the drainage is deeply incised.

Four state-listed noxious weeds are present in the Generation Plant Study Area: spotted knapweed (*Centaurea maculosa*), Canada thistle (*Cirsium arvense*), field bindweed (*Convolvulus arvensis*), and houndstongue (*Cynoglossum officinale*). Spotted knapweed was not recorded during the 1991 baseline inventory for the Mine (Western Technology and Engineering, Inc. 1991) and apparently has become established within the past 10 years. Figure 3-4 depicts the extent of spotted knapweed observed during the field survey of the Generation Plant site. The major population is located at the east end of the "go-back" field extending to the north in burned areas that have been logged. Smaller populations are scattered throughout the Generation Plant Study Area.

Canada thistle is common throughout the Generation Plant Study Area, especially in burned pine types and drainage bottoms. Field bindweed is present in the "go-back" field but has not measurably spread into native community types. Houndstongue is present generally in small populations throughout the Generation Plant Study Area.

No federal or state-listed plant species of concern are known to occur within 10 miles of the Generation Plant Study Area (Montana Natural Heritage Program, 2002b), and no species of concern were identified during intensive surveys of the adjacent mine area or of the railroad and Transmission System Study Area. The only reported state listed plant species in Musselshell County, Poison suckleya (*Suckleya suckleyana*), was recorded in 1948, approximately 38 miles north of the Generation Plant Study Area (Montana Natural Heritage Program, 2002b). Poison suckleya is a wetland species and no potential habitat for this species occurs in the Generation Plant Study Area.

Figure 3-4 Vegetation

Table 3-9 Vegetation Community Types

Grassland	
Green needlegrass/Western wheatgrass	*Stipa viridula/Agropyron smithii*
Needle-and-thread/Western wheatgrass	*Stipa comata/Agropyron smithii*
Shrub/Grassland	
Silver sagebrush/Green needlegrass	*Artemisia cana/Stipa viridula*
Western snowberry/Silver sagebrush	*Symphoricarpos occidentalis/Artemisia cana*
Western snowberry/Kentucky bluegrass	*Symphoricarpos occidentalis/Poa pratensis*
Skunkbush sumac/Needle-and-thread	*Rhus aromatica/Stipa comata*
Ponderosa Pine Savannah and Forest	
Ponderosa pine/Bluebunch wheatgrass	*Pinus ponderosa/Agropyron spicatum*
Ponderosa pine/Green needlegrass	*Pinus ponderosa/Stipa viridula*
Ponderosa pine/Western snowberry	*Pinus ponderosa/Symphoricarpos occidentalis*
Burned Ponderosa Pine	
Burned Ponderosa pine/Bluebunch wheatgrass	Burned *Pinus ponderosa/ Agropyron spicatum*
Burned Ponderosa pine/Western snowberry	Burned *Pinus ponderosa/Symphoricarpos occidentalis*
Burned Ponderosa pine/Common chokecherry	Burned *Pinus ponderosa/ Prunus virginiana*
Agricultural Land	
Go-back Hay Meadow	*Gutierrezia sarothrae/Artemisia frigida*

Transmission System

It is proposed that the Transmission System would connect with the Broadview Substation west of the Generation Plant following the Bull Mountain coal railroad spur right-of-way. The railroad spur right-of-way is primarily located in uplands; however, several small drainages may be crossed. Small wetland/riparian areas may be associated with some of these ephemeral drainages. Other wetlands may be located along the corridor generally associated with springs, seeps, and intermittent streams. Wetlands provide watering points for wildlife and livestock and provide habitat diversity. Precipitation dependent wetland sites fluctuate annually, in a range from completely dry to wet, in direct response to seasonal moisture, temperature, and wind.

Vegetation communities along the railroad spur corridor are similar to vegetation communities represented at the Generation Plant site. No federal- or state-listed plant species of concern are known to occur in Musselshell County (Montana Natural Heritage Program, 2002b), and no species of concern were identified during intensive surveys of the adjacent mine area or of the railroad and Transmission System Study Area.

3.6 Wildlife Resources

3.6.1 Overview

The following discussion includes information extracted from the Supplemental EIS Support Document (Bull Mountain Development Company, LLC, 2002a), the Bull Mountains Mine FEIS (Montana Department of State Lands, 1992), and the Railroad Spur Checklist EA (DNRC, Trust Land Management Division, 2002).

Wildlife resources near the proposed Project site have been examined since mine-related studies began in the Bull Mountains in 1972. The Generation Plant site was included within mine-related aerial and vehicle survey study areas monitored regularly by various studies from 1972 through 1978, as well as Montana Fish, Wildlife and Parks (MFWP) game surveys. These studies were summarized in the draft and final environmental impact statements (DEIS and FEIS, respectively) for the Mine (MDSL, 1992a,b) and submitted to the DEQ. Wildlife monitoring for the Mine began again in 1993 and continued through 1996.

3.6.2 Inventory Methods

Geographic Information System (GIS) maps were created using survey control data including topography with contour intervals at two feet. USGS 7.5' topographic maps and aerial photography were obtained and analyzed to verify habitat types, and landscape features. On-site observation was used to verify conditions. The results of a field reconnaissance of the site conducted on January 11, 2002, and contacts with agencies regarding wildlife resources of the area were utilized in the analysis as well.

3.6.3 Inventory Results

Generation Plant

The proposed Generation Plant site is located on a small mesa at the top of the drainage divide that separates the Yellowstone and Musselshell River drainages. The Yellowstone River is located approximately 35 miles to the south while the Musselshell River flows approximately 15 miles to the north. The Generation Plant site is located in the southeast corner of Section 15, T6N, R26E on a flat ridge that separates the upper reaches of Halfbreed Creek and Rehder Creek.

For this analysis, vegetation types and communities identified in the vegetation section are considered synonymous with wildlife habitat types. Five broad vegetation types, comprising 13 vegetation communities, occur on the proposed Project site (see Table 3-9):

- Grassland (green needlegrass/western wheatgrass, needle-and-thread/western wheatgrass),
- Shrub/grassland (silver sagebrush/green needlegrass, western snowberry/silver sagebrush, western snowberry/Kentucky bluegrass, skunkbush sumac/needle-and-thread),
- Ponderosa pine savannah and forest (ponderosa pine/bluebunch wheatgrass, ponderosa pine/green needlegrass, ponderosa pine/western snowberry),

- Burned ponderosa pine (burned ponderosa pine/bluebunch wheatgrass, burned ponderosa pine/western snowberry, burned ponderosa pine/common chokecherry) and
- Agricultural land (go-back hay meadow).

These habitats are common and widespread within the Bull Mountains. No surface water bodies or aquatic habitat exists at the Generation Plant site.

The Bull Mountains surrounding the Generation Plant Study Area support a good diversity of wildlife: 36 mammals, 112 birds, 7 reptiles, and 5 amphibians have been recorded. Many of these species, particularly non-game species, could occur at least seasonally on or adjacent to the proposed Project site. Some species, such as those associated with wetlands, would not be expected to occur, or would occur only in very low numbers, due to the absence of their preferred habitats.

Five big game species are regularly present in the Bull Mountains. The most abundant big game species in the Bull Mountains is mule deer (*Odocoileus hemionus*), which are common and widespread. They are non-migratory and are found year round at or near the proposed Project site.

Elk (*Cervus elaphus*) are the second-most abundant big game species in the Bull Mountains. They are migratory and normally are found in higher elevations or more thickly forested habitat away from human activity. The elk herd in the Bull Mountains has been increasing in numbers in recent years. A complete count of elk in the Bull Mountains, made during the 2001–2002 winter, yielded several hundred animals compared to an estimate of about 100 made during the late 1970s. Despite this increase and the habitat changes resulting from the 1984 fires, elk seasonal distribution has not changed substantially. Portions of upper Rehder Creek are used as summer range; there is no defined winter range at the proposed Project (MDSL 1992a, b), although elk could occur in the area, particularly during mild winters. However, no elk or their evidence (such as tracks, hair, antler sheds, or pellets) was observed during the field reconnaissance of the site. Elk are seen regularly to the north, east, and southeast of the Generation Plant Study Area, but are observed comparatively infrequently within this area.

White-tailed deer (*Odocoileus virginianus*) are uncommon in the Bull Mountains and are seldom observed. The Generation Plant Study Area would be considered marginal pronghorn (*Antilocapra americana*) habitat, with occasional use from spring through autumn but not in winter (MDSL 1992a, b).

Mountain lions (*Puma concolor*) may be widespread in the Bull Mountains, but this secretive species is seldom observed and their numbers are unknown.

A wide variety of non-game mammals is present in the Bull Mountains, including 10 of the 15 species of bats recorded in Montana. Sightings or evidence of coyote (*Canis latrans*), bobcat (*Lynx rufus*), badger (*Taxidea taxus*), porcupine (*Erethizon dorsatum*), Richardson's ground squirrel (*Spermophilus richardsonii*), northern pocket gopher (*Thomomys talpoides*), and mountain cottontail (*Sylvilagus audubonii*) were recorded on the proposed Project site during the field reconnaissance. All these species are considered common in the Bull Mountains. Richardson's ground squirrels were present in comparatively small, somewhat isolated colonies near the Project site before the 1984 fires. Since the fires, this species has proliferated throughout the burned areas and adjacent grassland habitats (Butts, 1997). Its mounds were abundant over much of the proposed Project site.

The wild turkey (*Meleagris gallopavo*), a non-native but widespread and common species, is the most likely upland game bird to occur on the Project site, although no evidence of wild turkeys was observed during the field reconnaissance. Sharp-tailed grouse (*Tympanuchus phasianellus*) is a native species normally associated with shrublands and grasslands. A display site (lek) was located within one mile southeast of the proposed Project, but this lek has been inactive since the mid-1990s (Butts, 1997). Other upland game birds, including ring-necked pheasant (*Phasianus colchicus*), gray partridge (*Perdix perdix*), and sage grouse (*Centrocercus urophasianus*), are uncommon in the Bull Mountains, and would not be expected to occur in large numbers in the habitats of the proposed Project.

Fourteen species of raptors have been observed within the Bull Mountains. The proposed Project site supports a limited variety of potential nest sites for raptors. Live and dead standing ponderosa pine trees are the most common nest site in the area; one stick nest, probably constructed by red-tailed hawks (*Buteo jamaicensis*), was found in a live ponderosa pine about 350 feet southeast of the proposed southeast plant site boundary fence during the field reconnaissance. An unidentified owl, probably either a great horned owl (*Bubo virginianus*) or long-eared owl (*Asio otus*), was flushed from a stand of live ponderosa pine trees within the proposed Project site, but no nest was found in this area. Vertical vegetation structure for ground nesting species such as the northern harrier (*Circus cyaneus*) is very limited. Ground squirrel colonies could provide nest sites for subterranean-nesting species such as the burrowing owl (*Athene cunicularia*); no evidence of this species (such as droppings, feathers, or casts) was observed during the field reconnaissance. No cliffs, banks, or rock outcrops suitable for cliff-nesting raptors were present on or within 0.25 mile of the proposed Project.

Species of Concern

For this discussion, "species of concern" are considered those species so identified by the Montana Natural Heritage Program, (2002a) and include species that are federally listed or proposed as endangered or threatened. The Project and surrounding lands within 1.0 mile are not known to support endemic populations of any wildlife species of concern (Montana Natural Heritage Program, 2002a).

No amphibians and only one reptile are represented on the list of species of concern for Musselshell County (Montana Natural Heritage Program, 2002a). The Musselshell River is considered habitat for the spiny softshell turtle (*Trionyx spiniferus*). The spiny softshell is found along large rivers and their sandy banks, up to 50 meters away from the banks (Montana Natural Heritage Program, 2002a). The spiny softshell has been recorded eight times since 1971 in the Missouri River Drainage, but only one of these sightings was from the Musselshell River. Given the long distance down Halfbreed Creek from the proposed Project to the Musselshell River, and since the spiny softshell is not known to occur in Halfbreed Creek, it is highly unlikely that this species would be found at or near the proposed Generation Plant site.

Four avian species of concern have been recorded in Musselshell County (Montana Natural Heritage Program, 2002a). The bald eagle (*Haliaeetus leucocephalus*), federally listed as threatened, occurs during migration and as a winter resident of the Bull Mountains but is not known to nest anywhere near the proposed Project. The ferruginous hawk (*Buteo regalis*) could nest in trees or on cliffs, outcrops, and bluffs in the Bull Mountains, but has never been observed nesting near the Mine, including the proposed Project site. The peregrine falcon (*Falco peregrinus*) nests on cliffs comparatively near large rivers or lakes, but appropriate nesting requirements are not available at or near the proposed Project site. The mountain plover (*Charadrius montanus*), federally proposed as threatened, could inhabit grasslands with very little vegetative height, such as prairie dog or ground squirrel colonies. Although ground squirrel colonies are present at and near the proposed Project site, this species is not known from the general area.

Two mammals are included on the list of species of concern from Musselshell County (Montana Natural Heritage Program, 2002a). Black-tailed prairie dogs (*Cynomys ludovicianus*) are a colonial species that are usually found in grassland habitat; no colonies are known to occur at or near the proposed Project site. The Townsend's big-eared bat (*Corynorhinus townsendii*) has been observed near the Mine in the past, and could forage at or near the proposed Project site, which does not have suitable habitat for maternity colonies or hibernacula for this species.

Transmission System

It is proposed that the Transmission System would connect the Generation Plant with the Broadview Substation to the west of the Generation Plant site and would follow the Bull Mountain coal railroad spur right-of-way. The railroad spur right-of-way is primarily located in uplands and non-irrigated agricultural lands; however, the eastern portion is located in ponderosa pine (*Pinus ponderosa*) forest. The Transmission System would not cross or travel adjacent to any perennial stream systems.

Vegetation types and communities in the Transmission System Study Area become relatively homogenous after the initial nine miles. The initial nine miles of the Transmission System (from the Generation Plant) are in similar vegetation types and communities as the Generation Plant site. The remaining 20 miles of Transmission System Study Area traverse open low scrub habitat and non-irrigated agricultural lands.

Big game species identified in the Generation Plant portion of this section probably would occur in the initial nine miles of the Transmission System. Additionally, pronghorn probably would occur in the lower reaches of the Transmission System. Sharp-tailed grouse are known in the area, and there probably are leks along the Transmission System Study Area. However, none have been recorded (Newell, 2002).

Avian species identified in the Generation Plant portion of this section probably occur in the initial nine miles of the Transmission System. Raptors may be found in the lower reaches due to the presence of grassland habitat that may provide additional foraging ground and possible nesting opportunities for ground nesting species.

3.7 Fisheries and Aquatic Resources

3.7.1 Overview

The following discussion includes information extracted from the Supplemental EIS Support Document (Bull Mountain Development Company, LLC, 2002a), the Bull Mountains Mine FEIS

(Montana Department of State Lands, 1992a), and the Railroad Spur Checklist EA (DNRC, Trust Land Management Division, 2002).

Fisheries resources near the proposed Project site have been examined since mine-related studies began in the Bull Mountains in 1972. The Generation Plant site was included within mine-related aerial and vehicle survey study areas monitored regularly by various studies from 1972 through 1978, as well as MFWP game surveys. These studies were summarized in the draft and final environmental impact statements (DEIS and FEIS, respectively) for the Mine (MDSL 1992a,b) and submitted to the DEQ. Wildlife monitoring for the Mine began again in 1993 and continued through 1996.

3.7.2 Inventory Methods

GIS maps were created using survey control data including topography with contour intervals at two feet. USGS 7.5' topographic maps and aerial photography were obtained and analyzed to verify habitat types, and landscape features. On-site observation was used to verify conditions. The results of a field reconnaissance of the site conducted on January 11, 2002, and contacts with agencies regarding wildlife resources of the area were utilized in the analysis as well.

3.7.3 Inventory Results

Generation Plant

The proposed Generation Plant site is located on a small mesa at the top of the drainage divide that separates the Yellowstone and Musselshell River drainages. The Yellowstone River is located approximately 35 miles to the south while the Musselshell River flows approximately 15 miles to the north. The Generation Plant site is located in the SE corner of Section 15, T6N, R26E on a flat ridge that separates the upper reaches of Halfbreed Creek and Rehder Creek.

There are no standing or flowing waters on the proposed Project site. Drainage to the west and south from the proposed plant is into ephemeral tributaries approximately 0.5 mile to Halfbreed Creek, which flows over 16 miles north to its confluence with the Musselshell River (MFWP 2001). According to USGS topographic maps, Halfbreed Creek is intermittent from its headwaters west of the proposed plant site downstream about 3.5 miles to its confluence with Rehder Creek, and it is perennial from Rehder Creek to its confluence with the Musselshell River.

Species of Concern

Only one fish species of concern, the northern redbelly X finescale dace (*Phoxinus eos X Phoxinus neogaeus*), has been identified for Musselshell County (Montana Natural Heritage Program, 2002a). This hybrid is a unique species in that nearly all specimens collected are female, they are usually found in the presence of only one parent species, and they are apparently the products of clonal or parthenogenetic reproduction. Northern redbelly dace are common in Montana but finescale dace have never been collected in the state (Holton and Johnson 1996). Neither the northern redbelly dace nor the hybrid has been recorded from Halfbreed Creek (MFWP 2001), and it seems unlikely that either species would be present at or near the proposed Project.

Recreational Fishery

Drainage to the east and north from the Generation Plant site is about 1.5 to 2 miles down ephemeral tributaries to Rehder Creek, which is an intermittent tributary of Halfbreed Creek. No angling-use data were available for Halfbreed Creek and the MFWP (2001) has not sampled Rehder Creek, so, its fishery value is unknown.

MFWP (2001) reported that ingress is limited on Halfbreed Creek, but that some fishing is occurs there. Halfbreed Creek is managed as a trout stream, with a moderate to low Fisheries Resource Value (4 on a scale of 2 to 5, with 5 being lowest value). Given the ephemeral-to-intermittent nature of Halfbreed Creek upstream from Rehder Creek, it is reasonable to assume that fishing (and any game fish) in Halfbreed Creek occurs downstream from Rehder Creek and that there is little or no recreational fishery near the Generation Plant site.

Transmission System

It is proposed that the Transmission System would connect the Generation Plant at Roundup with the Broadview Substation to the west of the Generation Plant site and would follow the Bull Mountain coal railroad spur right-of-way. The Transmission System would not cross nor travel adjacent to any perennial stream systems.

3.8 Cultural Resources

3.8.1 Overview

Cultural resources are sites, buildings, structures, districts, landscapes, or objects that are important to a culture or community for scientific, traditional, religious, or other reasons. Cultural resources can be divided into three major categories: archaeological resources, architectural resources, and Traditional Cultural Properties.

Archaeological resources are locations where human activity has measurably altered the earth or left deposits of physical remains. In Montana, the term "prehistoric" refers to archaeological resources associated with Native Americans, particularly before contact with Euro Americans. The term is also generally understood to mean cultural resources that predate the use of written records. Prehistoric archaeological resources in Montana can range from isolated stone tools to stone circles, rock cairns, village sites, and petroglyphs. The term “historic" is generally meant to include any cultural resource that postdates Euro American contact with Native Americans. Historic archaeological resources include campsites, roads, fences, trash dumps, abandoned mines, and a variety of other features.

Architectural resources are standing buildings, dams, bridges, canals, and other structures. In Montana, architectural resources are all historic.

Traditional Cultural Properties (TCPs) are resources associated with cultural practices and beliefs of a living community that are rooted in its history and are important in maintaining the continuing cultural identity of the community. In Montana, these are usually associated with modern Native Americans. Native American TCPs may include certain archaeological resources, such as cairns and petroglyphs; locations of important events; battlefields; sacred sites; and traditional hunting and gathering areas.

For this EIS, only significant cultural resources warrant consideration with regard to potential impacts. Significant cultural resources are generally those that have been determined eligible for inclusion in the National Register of Historic Places (National Register) or that have been recommended as being eligible. The identification of cultural resources and the evaluation of their significance are performed through procedures specified in Section 106 of the National Historic Preservation Act (NHPA) and its implementing regulations (36 CFR part 800). Evaluation is based on criteria for National Register eligibility (36 CFR 60.4) and on consultation with the State Historic Preservation Officer (SHPO) at the Montana Historical Society (MHS). As a rule, cultural resources must be at least 50 years old to be eligible for the National Register. For this EIS, cultural resources whose National Register eligibility has not been evaluated are assumed potentially eligible. Certain categories of Native American TCPs, such as sacred geographic features, may not meet any National Register eligibility criteria, but may still be significant to a particular tribe.

3.8.2 Inventory Methods

For the Project EIS, the affected environment for cultural resources includes both the area of potential ground disturbance and the area of potential changes in visual setting.

The area of potential ground disturbance includes the locations of the proposed Generation Plant, access roads, Transmission System, conveyor belt, and other facilities.

The area of potential changes in visual setting was not addressed in the Supplemental EIS Support Document (Bull Mountain Development Company, LLC, 2002a). Under Section 106 of the NHPA, adverse effects to cultural resources can include changes in visual setting if the visual characteristics of the resource and its surroundings contribute to its National Register eligibility. In assessing potential visual effects, it is common to select a radius around the proposed action within which visual impacts on cultural resources would be assessed. The Montana State Historic Preservation Office (SHPO) does not have a preferred radius for assessing visual effects (J. Warhank, 2002). However, SHPOs in other states use radii ranging from 0.5 mile to 2.0 miles when assessing the effects of tall (100 to 300-foot) structures such as cellular communications towers. Because the chimneys for the proposed Generation Plant would be 574-feet tall, it was decided that for this EIS the area of potential changes in visual setting would be defined as being within 3.0 miles of the chimneys. This is considered the maximum distance from which the chimneys could potentially degrade the visual setting of cultural resources that are visually sensitive.

The cultural resource data compiled for this analysis resulted from:

- Review of the National Register database for Musselshell and Yellowstone counties;
- File searches by the Cultural Resource Manager of the MHS on November 6, 2001 (Pouley, 2002), February 8, 2002, and October 8, 2002;
- Cultural resource surveys of the proposed plant site (Bull Mountain Development Company, LLC., 2002a; Pouley, 2002), the Mine (MDL, 1992; Rood, 1990); and a proposed rail corridor (Metcalf, 2002; Pool, 1991; Tetra Tech, 1991);
- Consultation or attempted consultation with Native American tribes (Pouley 2002; Tetra Tech, 1991); and

- A brief cultural resource reconnaissance of the Generation Plant Study Area in October 2002.

On October 8, 2002, the Cultural Resources Manager for the MHS performed a file search for all lands within 3.0 miles of the chimneys. Rather than performing an intensive inventory of cultural resources within this large circle (28 square miles), two cultural resource specialists performed a brief field reconnaissance by driving along all accessible roads in the area. They determined which previously recorded historic structures still existed (several had burned during brush fires), identified other properties that appeared to be more than 45 years old, and assessed which properties were likely to contain features or characteristics that were visually sensitive, such as standing structures, petroglyphs, or potential TCPs. Archaeological sites, such as prehistoric lithic scatters and historic trash dumps, were not considered visually sensitive because their National Register eligibility would more likely be related to their information potential rather than to their visual setting.

In 1990, tribal and traditional representatives of the Crow, Northern Cheyenne, Atsina or Gros Ventre, Assiniboine, and Shoshone were contacted regarding potentially sensitive resources along the proposed railroad right-of-way through the Bull Mountains. This consultation included visits to the area by Tribal representatives (R. Bohman, 2002; Tetra Tech 1991). On January 11, 2002, a letter from the proponent’s consultant was sent to the Crow Tribal Cultural representative describing the Project and the results of the survey near the proposed generating plant. Four follow-up phone calls were made the same month, but the Crow Tribe did not respond.

DEQ is in the process of contacting Native American organizations regarding the proposed action. Previously recorded cultural resources in the Project vicinity include some that may be of special concern to Native Americans as potential TCPs.

3.8.3 Inventory Results

Generation Plant

Within three miles of the proposed chimneys, there are 41 previously recorded cultural resources. These include 26 prehistoric lithic scatters, four petroglyph sites, two rockshelters, one rock cairn, six historic trash dumps, three homestead or farmstead sites, one coalmine, and three other historic sites. Seven of the prehistoric sites (i.e., petroglyph sites, rockshelters, and the cairn) may also qualify as TCPs, although Tribal representatives have not confirmed this. The 41 cultural resources do not include isolated artifacts (e.g., chipped stone flakes, tin cans).

The brief reconnaissance performed in October 2002 resulted in the identification of 10 other possible cultural resources within a 3-mile radius. Each of these was historic, and all were either historic structures or the remains of structures. Because of the brief duration of the reconnaissance, these resources were not fully documented on Montana Cultural Resource Information System (CRIS) forms and were not evaluated according to National Register criteria.

Transmission System

According to Metcalf (2002), 15 cultural resources have been identified within or next to the proposed rail corridor. This corridor has been proposed as the route for a Transmission System from the generation facility. The resources along the Transmission System Study Area include eight lithic scatters, two rock cairns, three historic trash scatters, one historic farmstead, and one mine. The two cairns may also be TCPs. One the cairns is also within the 3-mile radius around the proposed generating site.

In summary, 65 cultural resources have been identified within the area of potential effect for the Project.

3.9 Visual Resources

3.9.1 Overview

This chapter describes the existing visual resources within the Generation Plant and Transmission System study areas. This chapter also describes the type and quantity of sensitive viewers located nearby both Project facilities. For issues associated with visibility of atmospheric haze in Class I PSD areas, see section 3.2, Air Resources.

3.9.2 Inventory Methods

There are no formal guidelines for managing visual resources on private, state, or county-owned lands found within the vicinity of the Project site. Therefore, the visual inventory was conducted using principles derived from the Bureau of Land Management (BLM) Visual Resource Management (VRM) System 8400 series manuals and modified to accommodate rural, non-BLM managed landscapes. This method provided a consistent inventory process across the Study Area for public and private lands.

A 1.5-mile wide plan area (0.75 mile each side of the Transmission System Study Area centerline) was inventoried to document existing visual resources and sensitive viewers adjacent the Transmission System Study Area. A 5-mile radius from the center of the Generation Plant was inventoried to document existing visual resources and sensitive viewers. The study process included analysis of recent topographic maps/aerial photography, Musselshell County rural addressing data, contacts with Yellowstone and Musselshell County, field reconnaissance surveys and review of existing literature sources. The result is a consistently inventoried database used to assess visual impacts (see Chapter 4, Environmental Impacts) for the Transmission System and the Generation Plant. The inventory consists of the following three major components:

- Regional Setting/Landscape Character Type Inventory
- Viewer Sensitivity Inventory
- Visibility from Sensitive Viewpoints

The following subsections define visual resource terminology and describe the specific inventory methods used for gathering and completing the visual resource inventory.

Regional Setting/Landscape Character Type Inventory

Analysis of the scenic values of the landscape began with an examination of the region's physiography contained within Fenneman's Physiography of the Western United States (1931). Related literature, interviews with county personnel, and interpretation of recent aerial photography were used to determine the landscape character types for areas crossed by the Transmission System Study Area as well as areas contained within the Generation Plant Study Area.

Physiographic provinces are further divided into sections. These classifications describe the visual character of the landscape at a regional scale. Landscape character types are landscape units of greater detail refined from the regional physiographic province and section classifications. Dominant landform features (e.g., mountains, canyons) typically define landscape character types.

Beyond basic land formations (i.e., vegetation cover, soil color and any untypical features, such as an abundance of rock outcroppings or unique water features) other landscape features were also observed and noted during field visits.

Sensitivity Inventory

The Viewer Sensitivity Inventory documents those areas where viewers could be concerned about changes to the landscape. Three components comprise the viewer sensitivity inventory: views from sensitive viewpoints, visual sensitivity, and seen areas/visibility thresholds.

Views from Sensitive Viewpoints

Potentially sensitive viewpoints were identified and inventoried within the Generation Plant Study Area and Transmission System Study Area. Identification of these viewpoints included recent aerial photos, discussions with county officials, review of land use data, Musselshell County rural addressing data, and field reconnaissance. The inventory includes the following types of viewpoints:

- Residences, including single-family rural residential dwellings
- Travel Routes, including U.S. Highways.
- Cultural Sites, including visually sensitive areas where changes to the landscape could impact the integrity of a cultural site.

Visual Sensitivity

Visual sensitivity is a measure of viewer concern for change to the landscape. Visual sensitivity is evaluated and documented based on public concerns, discussions with county officials, and review of existing agency information. The evaluation borrows from the methods outlined on the BLM VRM 8400 System modified to address privately owned rural-related viewpoints. The visual sensitivity criteria used for the Project's aesthetics impact analysis are shown on Table 3-10.

Table 3-10 Visual Sensitivity Criteria

Criteria	High	Moderate	Low
Use Volume	High level of use	Moderate level of use	Low level of use
User Attitude	High expectations for maintaining scenic quality/visual integrity (i.e. residences)	Users are concerned for scenic quality/visual integrity but are not the primary focus of their experiences (i.e. dispersed recreation areas and general travel routes)	Areas where the public has low expectations for maintaining scenic integrity. Generally commercial or industrial areas where human caused modifications already exist in the landscape
Duration of View	Fixed or contiguous views (e.g. residences)	Intermediate views (e.g., open highway views)	Brief or intermittent views (e.g., highway views in rolling landscapes)

Table 3-11 illustrates the combinations of the above criteria and the resulting visual sensitivity level. Results of the visual sensitivity were reviewed, refined, and carried forward into the visual impacts analysis (refer to Chapter 4—Environmental Impacts).

Table 3-11 Visual Sensitivity Matrix

Use Volume	User Attitude	Duration of View	Total Visual Sensitivity Level
High	High	Long	High
Moderate	High	Moderate	High
Low	High	Moderate	High
High	Low	Short	Moderate
High	Moderate	Moderate	Moderate
Moderate	Moderate	Moderate	Moderate
Moderate	Low	Moderate	Moderate
Low	Moderate	Short	Low
Low	Low	Short	Low

Seen Area/Visibility Thresholds

Visibility thresholds are established zones of visual perception. Essentially, form, line, color, and textures are perceived differently with increasing distance from a viewpoint (Jones and Jones, 1976). With an increase in distance, changes in the landscape become less obvious and perception of detail is diminished. Elements of form and line become more dominant than color or texture.

The visibility thresholds for the Generation Plant Study Area are defined as follows:

- High Visibility Threshold (0 to ½ mile): The zone where fine details are obvious. Texture and color are vivid and clear. New features such as heavy industrial land use would dominate the view.
- Moderate Visibility Threshold (½ to 1 mile): This is the threshold where changes in the landscape might be viewed in less detail. Form and other aesthetic qualities of vegetation are typically perceived in this zone. Fine details diminish. Overall form is vivid and clear.
- Low Visibility Threshold (1 to 5 miles): This zone is where details of foliage and textures cease to be perceptible and features begin to appear as outlines or patterns. Visible form and line are seen with less clarity.
- Seldom Seen Visibility Threshold (beyond 5 miles): Those areas of the landscape where elements are represented as rough outlines. Form and line are barely visible. Colors are diminished in most cases due to atmospheric haze and appear washed out or muted.

These distance zones were established based on the nature and appearance of the Project where new 574-foot-tall chimneys and 250-foot-tall boiler buildings would occur where none currently exist.

The visibility thresholds for the Transmission System are defined as follows:

- High to Moderate Visibility Threshold (0 to 3/4 mile): This is the threshold where changes in the landscape might be viewed in less detail. Form and other aesthetic qualities of vegetation are typically perceived in this zone. Fine details diminish. Overall form is vivid and clear. New features such as the proposed Transmission System would be noticeable in the view.

This distance zone was selected based on the nature and appearance of the Project where new Transmission Systems would occur where none currently exist (with the exception near Broadview Substation). This distance zone also assumes the view of a railroad right-of-way immediately adjacent the Transmission System facilities. Viewpoints located beyond ¾ mile were not inventoried due to the nature and appearance of Project facilities along the Transmission System Study Area.

3.9.3 Inventory Results

Generation Plant

Regional Setting/Landscape Character Types

Regional Setting

Overall, the Generation Plant Study Area contains visual resources such as Signal Mountain and The Bull Mountains. Foothills, ephemeral drainages, riparian vegetation, annual grasslands, and large expanses of ponderosa pine influence the natural visual setting. Human built features that influence the visual setting found in the Generation Plant Study Area include: U.S. Highway 87, dispersed rural residential housing and agricultural fields along with grazing areas. No BLM or U.S. Forest Service (FS) lands occur within or near the Generation Plant Study Area, see Figure 3-5.

The visual characteristics of the Generation Plant Study Area are predominantly rural, with a few notable exceptions. The area is characterized by rolling hills and gently sloping valleys, punctuated occasionally by dramatic rock outcroppings. Some of the hills are vegetated with ponderosa pine, but most of the vegetation consists of grasses and low-growing shrubs. A severe fire burned part of the area in 1984, and some of the hills are covered with dead trees. There are no designated landmarks in the area, but Signal Mountain, a sandstone outcropping that rises about 80 feet above the surrounding land, could be considered a local landmark.

U.S. Route 87, Old Divide Road, and numerous power distribution lines cross the Generation Study Area. Scattered houses and house trailers are visible in most parts of the area. In the some of the subdivided parts of Sections 22 and 23, south of the Project site, houses and trailers are numerous enough to give the impression of a continuous residential development. Storage buildings and junked vehicles also are noticeable in some parts of the area. The PM Coal Mine has introduced industrial activities into the area.

Overall, the visual and aesthetic elements of the Generation Plant Study Area are typical for this part of Montana. The proposed facilities would be located in areas where the natural aesthetic features are common to their physiographic region. Although there are no features of critical or unique scenic significance, there are some features could be considered locally sensitive.

Physiography/Landscape Character Types

The Generation Plant Study Area is located within the Great Plains province, within the unglaciated portion of the Missouri Plateau. “The Missouri Plateau is characterized by isolated mountains scattered throughout the western third of the plateau. These mountains rise 500-1500 feet above the surrounding plains” (Fenneman, 1931). The Bull Mountains are one range that occurs within this portion of the Missouri Plateau.

Viewer Sensitivity Inventory

High to moderate sensitivity viewpoints near the Generation Plant Study Area are shown in Figure3-5 with the exception of cultural sites. Moderate sensitivity viewpoints include U.S. Route 87, which connects Billings with the city of Roundup.

Figure 3-5 Sensitive Views

U.S. Route 87 is a moderate sensitivity viewpoint due to the high use volume, moderate to low duration of view and moderate user attitude. High sensitivity viewpoints include 280 single-family residences within five miles of the Project site (Musselshell County, 2002) and eight cultural sites within three miles of the Project site determined to be visually sensitive to potential changes to their site integrity, see Section 3.8, Cultural Resources. All residences were considered high sensitivity due to the long duration of fixed views, high user attitude, and comparatively moderate use volume (residential density) found within the Generation Plant Study Area.

Visibility from Sensitive Viewpoints

The Viewpoints identified within the Generation Plant Study Area have views that vary from expansive to limited, depending on local topography and the presence or absence of surrounding vegetation. Specifically, one residence has views of the Generation Plant Study Area within the high visibility threshold. Seven residences have views within the moderate visibility threshold.

Ten residences have views of the Generation Plant Study Area within the low visibility threshold, and motorists traveling U.S. Route 87 have views within the moderate visibility threshold (See Figure 3-5).

Transmission System

Regional Setting/Landscape Character Types

Regional Setting

The proposed 28.2-mile Transmission System would run from the east end of the proposed Generation Plant in a southwesterly direction to the Broadview Substation, about two miles south of Broadview, see Figure 2-12. The Transmission System right-of-way varies from 225 to 250 feet wide and traverses lands ranging from Ponderosa Pine forests and grassy valleys with some small, steep-sided canyons on the east end, to gently rolling, open hay and wheat fields (mileposts [MP] 9-20) and lowland on the west end near Broadview Substation (MP 20-28). The east end (MP 0-9) is a mix of some unique visual features with some common to the region, while the west end (MP 9-28) is composed of features that are subtle, with little variety, and common to the region.

State Route 281, Majerus Road, Twenty One Mile Road, and numerous power transmission lines cross the Transmission System Study Area. Scattered houses and house trailers are visible in most parts of the area. Storage buildings and agricultural structures are also noticeable in some parts of the area. Two existing 500kV transmission lines are visible from residences near Twenty One Mile Road, see Figure 2-11. One 12kV distribution line follows Majerus Road and State Route 281 paralleling the proposed Transmission System right-of-way in many places.

Overall, the visual and aesthetic elements of the Transmission System Study Area are typical for this part of Montana. The proposed facilities would be located in areas where the natural aesthetic features are common to their physiographic region. Although there are no features of critical or unique scenic significance, some features that could be considered locally sensitive are located from MP 0-9.

Physiography/Landscape Character Types

The Transmission System Study Area is located within the Great Plains province, within the unglaciated portion of the Missouri Plateau. Fenneman (1931) describes the area containing Hay Basin and Comanche Flat as Interstream Uplands. "The rolling, terrace-like plains here described are the dominant elements of the topography. Erosion has affected them to various degrees, broad valleys sometime connecting higher with lower levels, obscuring locally the real design. Unconsumed remnants rise above all levels."

"There is a good deal of very rough country. Not only in the breaks along the Missouri and Yellowstone is there deep and thorough dissection, in places typical badlands, but in the larger interstream tracts ridges rise in places 500-1,500 feet above the valley bottoms, often with bold cliffs and picturesque tower and pinnacles, especially where the eminences are capped by sandstone" (Fenneman, 1931).

Viewer Sensitivity Inventory

Twenty-five residences were found within the 1.5 mile wide Transmission System Study Area. See Table 3-12 for their locations.

Table 3-12 Transmission System Viewer Inventory

Number of Residences	Section of Transmission System
1	MP 2-3
7	MP 5-10
4	MP 13-14
7	MP 17-19
5	MP 22-25
1	MP 27-28

All residences within the Transmission System Study Area were considered high sensitivity due to the long duration of fixed views, high user attitude, and comparatively low use volume (residential density) found within the Transmission System Study Area. The roads discussed in "Transmission System, Regional Setting" (with the exception of U.S. Route 87), were considered to have low viewer sensitivity due to the low user attitude, low use volume, and short duration of view.

Visibility from Sensitive Viewpoints

Residences have limited views of the proposed Transmission System Study Area within the Bull Mountains (MP 0-9) where local topography varies widely and Ponderosa Pine forests restrict expansive views. Residences have expansive views of the proposed Transmission System Study Area where seasonal agricultural crops and flat to gently rolling terrain occur along MP 9-28.

Public policies pertinent to Visual Resources

The Yellowstone County Comprehensive Plan states it is "the goal of Yellowstone County to protect scenic and visual resources throughout the County" (Yellowstone County, 1990). The policy states–"consider development impacts on scenic and visual resources of Yellowstone County." The methods for achieving visual resource protection or consideration have not been implemented at this time (Beaudry, 2002). Methods proposed for scenic and visual resource protection by Yellowstone County include:

- Establish standards for the identification of scenic and visual resources
- Identify and map scenic and visual resources
- Develop preservation techniques for scenic and visual resources

The proposed Transmission System would traverse Yellowstone County from milepost 14.3 to milepost 28. Musselshell County does not have policies specific to the protection of visual resources (Intermountain Planners, 1973). The proposed Transmission System would occur within the existing right-of-way of the railroad spur already granted across State Trust lands (see Section 3.11, Land Use).

3.10 Noise

This section describes the terminology and the criteria used for the noise impact analysis of the Project. The noise study area included noise-sensitive receptors within approximately 1.5 miles of the proposed Generation Plant. This section also includes information extracted from the following documents: Supplemental EIS Support Document (Bull Mountain Development Company, LLC, 2002a), Bull Mountains Mine FEIS (Montana Department of State Lands, 1992b).

3.10.1 Overview

The word "noise" carries the meaning of *unwanted sound*. This interpretation implies a value judgment of the sound, which in turn generally implies the response of a person to a noise environment. Noise can affect the human environment by interfering with speech, interfering with sleep, causing hearing loss, and causing physical or mental stress. Since a person's response to noise is subjective, it can vary from person to person.

Sound power is expressed in terms of a logarithmic ratio due to the tremendous range of power levels. This logarithmic power ratio has been designated the Bel in honor of Alexander Graham Bell. For practical purposes, a unit, which is one-tenth of a Bel and called a decibel or dB, is used. The level expressed in decibels (dB) always implies a reference quantity (Lord, et al., 1997) The A-weighted sound level has found much use in noise evaluation, since it correlates reasonably well with hearing-damage risk in industry and with subjective annoyance for a wide category of industrial, transportation, and community noises. For example, noise limits are specified in A-weighted (dBA) sound levels in the Occupational Safety and Health Act (OSHA). Humans typically have reduced hearing sensitivity at low frequencies compared with their response at high frequencies, and the A-weighting of noise levels closely correlates to the frequency response of normal human hearing (Elliot, et al., 1997).

Traveling from a noise source to a receptor in an outdoor environment, noise levels decrease with increasing distance between the source and receptor. Noise levels typically decrease by approximately six dBA every time the distance between the source and receptor is doubled depending on the characteristics of the source and the conditions over the path that the noise travels. The reduction in noise levels can be increased if a barrier, such as a man-made wall, a building, or natural topography, is located between the source and receptor.

The ambient noise at a receptor location in a given environment is the all-encompassing sound associated with that environment and is due to the combination of noise sources from many directions, near and far, including the noise source of interest.

For environmental noise studies, ambient noise levels are typically described using A-weighted equivalent noise levels, L_{eq}, during a certain period. The equivalent noise level is defined as the single steady-state noise level that has the same acoustical energy as the actual, time-varying noise signal during the same period. The purpose of L_{eq} is to provide a single number measure of time-varying noise for a predetermined duration of time.

The day-night average noise level, L_{dn}, is a single number descriptor that represents the constantly varying sound level during a continuous 24-hour period. The L_{dn} is typically calculated using 24 consecutive one-hour L_{eq} noise levels. The L_{dn} includes a 10 dBA penalty that is added to noises that occur during the nighttime hours between 10:00 p.m. and 7:00 a.m. to account for people's higher sensitivity to noise at night, when the background noise level is typically low.

An n^{th} percentile-exceeded noise level, L_n, indicates the single noise level that is equal or exceeded for "n" percent of a certain period. For example, an L_{10} noise level indicates the level that was exceeded during 10 percent of a measurement period, and the L_{90} noise level indicates the level that was exceeded during 90 percent of a measurement period. The L_{10} noise level is influenced by discrete events of short duration and high noise levels that occur during a period. The L_{90} noise level typically is considered the residual ambient noise level, and normally does not include the influence of discrete noises.

3.10.1 Noise Level Criteria

Noise Ordinances and Guidelines

There are no state, county, or local noise ordinances or laws to limit to noise created by industrial facilities (State of Montana, 1999, Musselshell County, 2002).

The Federal government has developed guidelines to determine when an increase in noise levels would cause an adverse impact. The U.S. Environmental Protection Agency (EPA) recommends that outdoor L_{dn} values at residences not exceed 55 dBA in order to protect the public health and welfare with an adequate margin of safety (EPA, 1974). Although the EPA guideline is not an enforceable regulation, it has been commonly accepted as a target to prevent significant impacts at residences.

Perception of Increased Noise

Noise impacts to people can be determined by evaluating the increase that a new noise source would have on the existing noise levels at a receptor location, such as a residence, church, school, or park. Table 3-13 indicates the relationship between changes in noise levels and perception of the change (Egan, 1988).

Table 3-13 Changes in Noise Levels Versus Apparent Changes in Loudness

Increase in Sound Level (dBA)	Apparent Change in Loudness
1	Imperceptible
3	Barely audible (i.e., barely noticeable)
6	Clearly audible (i.e., clearly noticeable)
10	New noise appears to be twice as loud as the original
20	New noise appears to be four times as loud as the original

In general, the higher a new noise source is above the existing ambient noise level at a receptor location, the more noticeable the new source would be. Noise impacts are typically considered adverse if the noise levels due to a new noise source exceed the existing ambient levels by 10 dBA or greater.

3.10.3 Noise Inventory Results

Generation Plant

Existing Ambient Noise Levels

To help determine the long-term impact of the noise created by the Project on people, noise-sensitive receptors were identified within approximately one mile of the Generation Plant site. Receptor locations were identified using a map of residences Figure 3-6 and site observations. Residences, a church, and a church retreat facility are located within 1.5 miles (7,920 feet) to the northwest, south, and southeast of the proposed Generation Plant (Figure 3-6). The nearby noise-sensitive receptors are listed in Table 3-14.

Table 3-14 Noise-Sensitive Receptors

Receptor Identifier[1]	Description of Noise-Sensitive Receptor(s)	Approximate Distance and Direction from Power Plant	Approximate Distance and Direction from Coal Piles	Approximate Distance and Direction from U.S. 87
	Represents the nearest residence, Shining Mountain Christian Ranch, and Bull Mountains Community Church.	2,000 feet, south-southeast	1,500 feet, south-southwest	3,700 feet, east
	Residence.	4,300 feet, east-southeast	2,900 feet, east-southeast	6,900 feet, east-southeast

Receptor Identifier[1]	Description of Noise-Sensitive Receptor(s)	Approximate Distance and Direction from Power Plant	Approximate Distance and Direction from Coal Piles	Approximate Distance and Direction from U.S. 87
	Represents six (6) residences located near Cole Road.	5,000 feet, south	5,000 feet, southwest	1,000 feet, east
	Represents 12 residences near intersection of Old Divide Road and Fattig Creek Road.[2]	7,400 feet, southeast	6,000 feet, southeast	8,500 feet, east
	Represents five residences near intersection of U.S. Route 87 and Big Clearing Road.[3]	5,000 feet, northwest	6,000 feet, northwest	2,900 feet, east

Notes:
1. See Figure 3-6 for receptor locations.
2. Five additional residences are located approximately 2,500 feet south of intersection.
3. Additional residences are located north along U.S. Route 87.

Transmission System

The proposed Transmission System would be comprised of a wooden H-frame design with a double circuit 161kV transmission line and a parallel single circuit 161kV transmission line (refer to Figure 2-7 for details) located adjacent to the railroad right-of-way. The three proposed transmission lines would interconnect with the Broadview Substation and follow the permitted railroad right-of-way. Ambient noise measurements along the transmission route were not taken, but are similar to location 2 in Table 3-15 and considered typical for sparsely populated rural areas (ASA, 1998). The Transmission System could generate a small amount of audible noise, typically during an abnormally foul weather event, such as fog or heavy torrential rain, noticeable only if you were underneath in the corridor. The maximum audible noise levels, based upon similar designed transmission lines utilizing single conductors, is projected to be well under the 55 dBA levels at the right-of-way, measured from the center line. The lines are not expected to be audible nor approach the limit of the measured background noise levels. They would not be audible at any of the closest noise sensitive receptors, which were verified to be further than 300 feet from the right-of-way. No noise impact whatever is predicted for this Transmission System.

Mine and Railroad

To help determine the general existing ambient noise levels in the area, before the construction and operation of the Mine and railroad, noise level measurements were conducted in January 2002 during the daytime and nighttime hours at three representative locations near groups of residences (Figure 3-6) but the measurements were not conducted at the specific receptor locations (Table 3-14). When ambient noise levels are low, such as at night, individual noises tend to be more noticeable and, therefore, have a greater potential to adversely affect people by causing annoyance and disturbing sleep.

The noise level measurements were conducted in general accordance with the ASTM Standard E1014-84 (ASTM, 1984). Each measurement was 15 minutes long, and the ground at each measurement location was snow-covered. The equivalent noise level, L_{eq}, and the 90th percentile-exceeded noise level, L_{90}, for each 15-minute period were recorded, and this information was used to estimate the general ambient noise level conditions at the residences. Table 3-15 summarizes the measured ambient noise levels, and the measurement locations are depicted on Figure 3-6.

The measured ambient noise levels are typical for sparsely populated rural areas (ASA, 1998). The measured noise levels were used to estimate the existing ambient noise levels at the five receptor locations before the construction of the mine and railroad (Table 3-15) and used as part of the noise analysis. Since the measured ambient levels are typical for sparsely populated rural areas, the day-night noise level for similar areas is L_{dn} 35 dBA.

Table 3-15 Measured Ambient Noise Levels Near Receptor Locations Before Construction of the Bull Mountains Mine No. 1 and Railroad

Location	Description	Date: 01/22/02 Time	Measured Noise Levels	Notes[4]
1[1]	Approximately 7,000 feet southeast of the Generation Plant site; 180 feet north of Fattig Creek Road and PM Coal Road intersection; and 8,700 feet east of U.S. 87.	2:42 to 2:57 p.m.	L_{eq} 34 dBA L_{90} 27 dBA	Vehicles on Fattig Creek and Old Divide Road appeared to be the dominant noise sources during the measurement. Traffic noise on U.S. 87 was very faint. Other noise sources included wind blowing in trees and livestock in distance.
		10:17 to 10:32 p.m.	L_{eq} 33 dBA L_{90} 18 dBA	Field engineer's footsteps on the snow were the dominant noise source. Other audible sources included a commercial jet and a dog barking in the distance. Traffic on U.S. 87 appeared very faint.
2[2]	Approximately 1,500 feet south of plant site; 1,000 feet north of Old Divide Road; and 3,400 feet east of U.S. 87.	3:14 to 3:24 p.m.	L_{eq} 38 dBA L_{90} 33 dBA	Vehicles on U.S. 87 and wind blowing in trees appeared to be the dominant noise sources during the measurement. A commercial jet was audible in the distance.
		10:50 to 11:05 p.m.	L_{eq} 32 dBA L_{90} 19 dBA	Field engineer's footsteps on the snow were the dominant noise source. Other audible sources included a dog barking in the distance, a buzzing streetlight, and two cars passing on U.S. 87.
3[3]	Approximately 5,500 feet south-southeast of plant site; 300 feet east of 90° turn in Cole Road; 800 feet east of U.S. 87.	4:10 to 4:25 p.m.	L_{eq} 41 dBA L_{90} 29 dBA	Vehicles on U.S. 87 appeared to be the dominant noise source during the measurement. Other audible sources included singing birds.
		11:21 to 11:36 p.m.	L_{eq} 32 dBA L_{90} 20 dBA	Field engineer's footsteps on the snow and an occasional vehicle on U.S. 87 were the dominant noise sources. Other audible sources included a commercial jet in the distance and a car pulling into a residence west of the measurement location.

Notes:
1. Measurement location 1 has a direct line of sight to the proposed plant site, but U.S. 87 is not visible.
2. Measurement location 2 has a direct line of sight to the proposed plant site, and U.S. 87 is partially visible.
3. Measurement location 3 has a direct line of sight to the proposed plant site, but U.S. 87 is not visible.
4. Weather during daytime measurements: 25-30°F, 35-40% relative humidity, wind speed 7-10 miles per hour from the west. Weather during nighttime measurements: 10-15°F, 35-40% relative humidity, wind was calm.

When final construction for the Mine, its associated facilities, and its associated railroad begins, these facilities would contribute to the ambient noise at the receptors. Based on data and information provided in the Bull Mountains Mine FEIS (Montana Department. of State Lands, 1992), the day-night noise levels at the receptors once the mine is operational were estimated and are summarized in Table 3-16.

Table 3-16 Approximate Ldn Levels at Receptor Locations Due to the Operation of the Bull Mountains Mine No. 1 and Railroad

Receptor	Approximate L_{dn} Levels
A	43
B	44
C	38
D	40
E	32

Since the Mine has been approved, and the Project would be completed after the mine and railroad are operational, L_{dn} noise levels due to the mine and the railroad operations were approximated to represent the existing ambient noise levels at the receptors.

The measured ambient noise levels do not currently include railroad or traffic noise associated with the Mine. The levels shown in Table 3-16 represent a reasonable approximation of ambient noise levels after the Mine and railroad are operational.

The existing noise environment does not predict railroad traffic noise and does not extrapolate highway traffic noise. Noise studies cannot be conducted without the proposed activity being present.

There may be different equipment and machinery used at the mine site and the physical environment would change over time with the final placement of the railroad spur line. Sound attenuation levels may be different from these approximated levels due to current construction practices.

Figure 3-6 Noise

3.11 Land Use

3.11.1 Overview

This section presents an overview of the land use resources within the Generation Plant Study Area and the Transmission System Study Area. The resultant analysis establishes a land use baseline used in Chapter 4 to identify and assess the potential environmental impacts that may result from the construction, operation, and maintenance of the proposed Project.

3.11.2 Inventory Methods

The Generation Plant Study Area for land use resources generally encompasses lands within a one-mile radius of the proposed Generation Plant. The Transmission System Study Area for land use resources encompasses lands within a 1.5-mile-wide corridor centered along the proposed 161kV Transmission System.

The following discussion of land use is based on information provided by federal, state, and local government agencies and field reconnaissance of the Project site conducted in October 2002. The discussion also includes information extracted from the following documents: Supplemental EIS Support Document (Bull Mountain Development Company, LLC, 2002a) and Bull Mountains Mine FEIS (Montana Department of State Lands, 1992). Milepost references in this section can be found on the Roundup Generation Plant land use resource map, Figure 3-7.

3.11.3 Inventory Results

Generation Plant

The proposed Generation Plant would be located in the Bull Mountains region of central Montana. This region has considerable diversity in topography and economic activity. Farming, livestock ranching, timber production, mining, and some urban and residential development contribute to the economic base. The topography includes ridges capped by sandstone mesas, rolling hills, and gently sloping valleys. Ponderosa pine and Rocky Mountain juniper are common at higher elevations, with sagebrush and prairie grassland communities on benches, slopes, and drainages. The proposed Generation Plant would be situated in gently rolling upland terrain.

Existing Land Use Plans

The Generation Plant Study Area is within Musselshell County. While under the jurisdiction of the Musselshell County Comprehensive Plan, which was adopted in 1973, the area is not zoned. The Comprehensive Plan is currently being updated, but the revised plan is not expected to be available before 2003 (Danielson, 2002). The 1973 Comprehensive Plan does not include land use planning or management recommendations for unincorporated areas such as the Generation Plant Study Area. The revised Comprehensive Plan also is not expected to include land use planning or management recommendations for unincorporated areas.

Current Land Ownership

The proposed site for the Generation Plant and associated one-mile Generation Plant Study Area radius are located within Musselshell County. More specifically, the proposed Generation Plant would be located in Section 15, Township 6 North, Range 26 East. Land ownership within the Generation Plant Study Area consists primarily of private land with lesser amounts of Montana School Trust Land.

Current Land Use Characteristics and Trends

As of 1997 (the latest year for which statistics are available), approximately 95 percent of the land in Musselshell County was used for farming and/or ranching (Danielson, 2002). Approximately 40 percent of the land was classified as forest, but much of this land was grazed. Therefore, it is included in the ranch acreage. Approximately 5 percent of the land was in subdivisions, but much of this land had not yet been developed. Approximately 0.1 percent of the land was classified as urban, primarily in the City of Roundup and the Town of Melstone. There were no active mines in the county and no large-scale industry outside of the urban areas (Danielson, 2002).

Most private land holdings in Musselshell County originally were large parcels created when ranchers and miners settled the area. In recent years, rural subdivisions and other land divisions have split some of these large parcels into multiple smaller lots. As of 1999, there were 3,657 property parcels in the unincorporated parts of Musselshell County, of which 1,185 were improved with a house or house trailer (Danielson, 2002).

In the eight sections contiguous to Section 15, Township 6 North, Range 26 East where the proposed Generation Plant would be located (Sections 9, 10, 11, 14, 16, 21, 22, and 23, Township 6 North, Range 26 East), there are seven parcels of 640 acres or 320 acres (Musselshell County GIS Department 1999). However, four of the sections (Sections 9, 10, 22, and 23) have been subdivided, partially or entirely, into smaller lots. In these sections, there are approximately 105 smaller parcels, mostly 10 or 20 acres in size. These eight sections are generally referred to in this section as the vicinity of the proposed Generation Plant.

Land use near the proposed Generation Plant mirrors the trends in Musselshell County. Livestock grazing occurs within the Generation Plant Study Area but is not authorized on the site itself.

Montana School Trust Land is also located within the Generation Plant Study Area. This land is situated west of the proposed Generation Plant site in Section 16, Township 6 North, Range 26 East. School Trust Land Managers in the Montana Department of Natural Resources and Conservation (DNRC) manage each parcel to raise money for the state's Public School Trust Fund. The Southern Land Office of the DNRC has indicated that Section 16 is currently leased for grazing (cattle) and has an estimated carrying capacity of 150 animal unit months. Development of the Generation Plant site is expected to be compatible with this type of use (Brandenburg, 2002).

Figure 3-7 Land Use

A small area in the center of the proposed Generation Plant site is classified as commercial forest (Musselshell County GIS Department, undated), apparently because it produced commercial-grade timber at some time in the past. However, this area does not currently support large trees.

Some non-irrigated cropland can be found in the Generation Plant Study Area. Crops produced in Musselshell County include wheat, barley, oats, and hay (Charlton, 2002). No irrigated cropland, registered apiaries, or Conservation Reserve Program (CRP) land was identified within the Generation Plant Study Area or vicinity of the proposed Generation Plant.

Other than agriculture and the transportation corridor provided by U.S. Route 87, the only significant land use within the Generation Plant Study Area is small residential and religious developments. Shining Mountain Christian Ranch is located in Section 22, just south of the proposed Generation Plant site. This small development, which reportedly is used for religious retreats, includes one residential building and one house trailer.

Bull Mountains Community Church is located in Section 23, south-southeast of the proposed Generation Plant site. This small development includes a church building, a lodge, and a house trailer.

Eight residences were identified within the Generation Plant Study Area. Most of these residences are located south-southeast of the proposed Generation Plant site, primarily in the subdivided areas. Overall, Section 9 contains 12 housing units, Section 10 contains seven housing units, Section 14 contains one housing unit, Section 21 contains one housing unit, Section 22 contains eight housing units, and Section 23 contains 24 housing units. Sections 11 and 16 contain no occupied housing units (based on Musselshell County tax records).

The nearest commercial establishment is the Brandin' Iron Saloon, which is located along U.S. Route 87, approximately two miles north-northwest of the proposed Generation Plant site. A proposed commercial establishment (Whispering Pines Kettle Express) was also identified along U.S Route 87, approximately 1.75 miles northwest of the proposed Generation Plant. This establishment would include a proposed convenience store and a log furniture store. Other plans for the site include a recreational vehicle park and rough golf course.

The nearest schools, hospitals, and industrial developments are found in the City of Roundup. The PM Mine, an underground coal mining operation, was located partially in Section 14, east of the proposed Generation Plant site.

The PM Mine ceased operation in the 1990s, but the Bull Mountains Mine No. 1 plans to resume mining in the same area.

No private land conservation easements were identified within the Generation Plant Study Area.

Recreation

Recreational land use near the proposed Generation Plant site includes dispersed outdoor activities such as hunting and horseback riding. In 2001, 3,323 deer hunters generated 14,235 hunter days of recreation and 515 elk hunters generated 3,443 hunter days of recreation in Hunting District 590. The Generation Plant Study Area is located within this deer and elk hunting district. In 1995, 528 turkey hunters in Musselshell County generated 1,559 hunter days. Big game hunting season opens approximately in the middle of October and runs through

Thanksgiving weekend. There are both spring and fall seasons for turkey hunting (Newell, 2002).

Recreational use of Montana School Trust Land (Section 16, Township 6 North, Range 26 East) may include hunting and hiking. Since most land near the proposed Generation Plant is privately owned, access for recreational pursuits is dependent upon landowner permission.

The nearest public recreation facilities (including a golf course, tennis courts, and swimming pool) are in the City of Roundup, more than 13 miles from the proposed Generation Plant.

Transmission System

The following sections describe the general land use along the Transmission System route.

The Transmission System and associated 1.5-mile-wide study corridor fall within the counties of Musselshell and Yellowstone in central Montana. The Transmission System generally would parallel a proposed railroad spur from the Bull Mountains Mine No. 1 to the Burlington Northern and Santa Fe Railway main line south of the City of Broadview. The route traverses land ranging from wooded hills and grassy valleys with some small, steep-sided canyons on the eastern end, to flat, open fields and lowlands on the western end.

Existing Land Use Plans

The Transmission System Study Area in Musselshell County and Yellowstone County is not zoned and under jurisdiction of the Musselshell County Comprehensive Plan and the Yellowstone County Comprehensive Plan, respectively.

The Musselshell County Comprehensive Plan was adopted in 1973 and is currently being updated. The revised plan is not expected to be available before 2003 (Danielson, 2002). The 1973 Comprehensive Plan does not include land use planning or management recommendations for unincorporated areas, such as the Transmission System Study Area. The revised Comprehensive Plan also is not expected to include land use planning or management recommendations for unincorporated areas (Danielson, 2002). Goals and objectives in the 1973 Comprehensive Plan do not specifically address the siting of major transmission lines.

The Yellowstone County Comprehensive Plan was adopted in 1990 and is currently being updated. Goals, policies, and implementation strategies in the 1990 Comprehensive Plan do not specifically address the siting of major transmission lines.

Current Land Ownership

Land ownership within the Transmission System Study Area consists primarily of private land with lesser amounts of Montana School Trust Land. The Transmission System would cross both private land and Montana School Trust Land.

Current Land Use Characteristics and Trends

According to Musselshell County Facts At-A-Glance – Land Mass Data in Acres (1999 data), approximately 0.1 percent of the land was classified as urban. According to the Yellowstone County Comprehensive Plan, approximately three percent of the land in Yellowstone County is urban or urban built-up area. The remaining land in both counties is primarily agricultural, including rangeland, forest areas (forest cover and commercial forest), cropland, and pasture. There also are limited areas of rural/suburban tracts.

A variety of land uses exist in the Transmission System Study Area, including scattered residences, ranches, rangeland, non-irrigated cropland, roads and highways, railroads, utility rights-of-way for electrical power lines and telephone, communication sites, oil/gas pipelines, and recreation. In addition, an air facility was identified from a Yellowstone County Map prepared by the Montana Department of Transportation in cooperation with the U.S. Department of Transportation Federal Administration with revisions September 18, 2001. The air facility on the map is designated as a Landing Area or Strip and is located approximately one mile north of the Transmission System and ¼ of a mile north of the Transmission System Study Area (Section 11, Township 4 North, Range 24 East). This mapped air facility was not verified in the field. Twenty-five residences were identified in the Transmission System Study Area. The general locations of these residences by milepost are as follows:

- One residence from milepost 2 to milepost 3
- Seven residences from milepost 5 to milepost 10
- Four residences from milepost 13 to milepost 14
- Seven residences from milepost 17 to milepost 19
- Five residences from milepost 22 to milepost 25
- One residence from milepost 27 to milepost 28

No residences would be crossed by the Transmission System.

The Transmission System Study Area would traverse a variety of agricultural uses. The eastern end of the study area primarily consists of grazing land with ponderosa pine cover. The remaining portion is principally of fields of small grains, hay wheatgrass lowlands, alkali/salt grasslands, and CRP lands. Crops produced in Musselshell County includes wheat, barley, oats, and hay (Charlton, 2002). Crops in the Transmission System Study Area of Yellowstone County consist primarily of wheat with lesser amounts of barley, oats, and hay (Gaglia, 2002). The general location of non-irrigated cropland and CRP land by milepost are as follows:

Non-irrigated Cropland

- from milepost 0 to milepost 1
- from milepost 4 to milepost 5
- from milepost 6 to milepost 7
- from milepost 8 to milepost 9
- from milepost 13 to milepost 14
- from milepost 17 to milepost 18
- from milepost 21 to milepost 22
- from milepost 24 to milepost 26

<u>CRP Land</u>

- from milepost 5 to milepost 6
- from milepost 7 to milepost 8
- from milepost 9 to milepost 12
- from milepost 16 to milepost 17
- from milepost 18 to milepost 21
- from milepost 22 to milepost 24

Parcels of Montana School Trust Land within the Transmission System Study Area that would be crossed by the Transmission System are located in Section 32, Township 6 North, Range 26 East; Section 16, Township 5 North, Range 25 East; and Section 14, Township 4 North, Range 24 East. Lease information provided by the Southern Land Office of the DNRC for these sections indicated the following:

- A lease in Section 32 of 315.83 acres (280 grazing acres with an estimated carrying capacity of 56 animal unit months and 35.83 acres listed as unsuitable).
- Three leases in Section 16. Lease #3453 totaling 315.57 acres (228 acres in CRP and 87.57 grazing acres with an estimated carrying capacity of 32 animal unit months). Lease #5762 totaling 320 acres (205.9 acres in CRP and 114.1 grazing acres with an estimated carrying capacity of 31 animal unit months). Lease #9683 totaling 4.43 acres for a homesite.
- A lease in Section 14 of 160 acres (147.7 acres in CRP and 12.3 acres unused).

Recreation

Recreational land use within and adjacent to the Transmission System Study Area includes dispersed outdoor activities such as hunting and horseback riding. Recreational use of Montana School Trust Land in the Transmission System Study Area may include hunting and hiking. Since most land along the proposed Transmission System Study Area is privately owned, access for recreational pursuits is dependent upon landowner permission. Public recreation facilities (including a golf course, tennis courts, and swimming pool) can be found in the City of Roundup, more than 13 miles from the proposed Generation Plant site and in the BLM's Acton Recreation Area, located approximately 10 miles southeast of the City of Broadview. Recreational activities within the Acton Recreation Area include hunting, horseback riding, and all-terrain vehicle use. The Transmission System would be located approximately 3.5 miles north of the recreation area.

3.12 Socioeconomics

3.12.1 Overview

The following sections include socioeconomic data for the Project including population and housing, employment, taxes, education services, transportation, utilities, heath and safety, and social well being.

3.12.2 Socioeconomic Methods

The study areas for the Generation Plant and Transmission System are considered together in this analysis. Some socioeconomic patterns may differ across these areas but are not significant enough to report as part of the inventory results. Therefore, throughout the following sections, the Generation Plant and Transmission System are referred to jointly as the "Study Area."

The socioeconomic Study Area for the Project includes Musselshell County and its sub-jurisdictions. Selected data for adjacent Yellowstone County, the City of Billings, and other areas are also presented because some of the Project impacts would occur outside of Musselshell County. In each case, the data are presented for the smallest spatial area available. For example, annual employment is published only on a countywide basis, while population and housing information are available for sub-county areas.

3.12.3 Socioeconomic Results

Population and Housing

The population of Musselshell County rose from 4,106 in 1990 to 4,497 in 2000, an increase of 391 persons, or 10 percent, as reported in Table 3-17. Most of this increase was in the Klein County Census Division (CCD), where population increased 393 persons or slightly more than 39 percent. There are a number of new homes just inside Musselshell County's southern border. Many of these persons are retired or commute to Billings, rather than to a job in Roundup or elsewhere in the county. Population in the rest of the county was approximately stable. The Roundup CCD increased by roughly 100 persons and the Melstone CCD decreased by approximately 100 persons. Technically, because of the growth in the Klein CCD, Musselshell County experienced small net in-migration between 1990 and 2000. The Project would be located in the Klein CCD.

Table 3-17 1990 and 2000 Population - Musselshell and Yellowstone Counties and Selected Areas

Area	1990	2000	Change	Percent Change
State of Montana	799,000	902,000	103,000	13
Musselshell County	4,106	4,497	391	10

Klein CCD	1,002	1,395	393	39
Melstone CCD	584	476	-108	-18
Melstone Town	166	136	-30	-18
Roundup CCD	2,520	2,626	106	4
Roundup City	1,808	1,931	123	7
Yellowstone County	113,419	129,353	15,934	14

Sources: U.S. Bureau of the Census, 1990 and 2000 Census of Population

The median age in Musselshell County was 43.2 years in 2000. The median age for Montana was 37.5 years and the figure for Yellowstone County was 36.9 years. Within Musselshell County, the highest median age was in the Klein CCD (45.9 years), providing some evidence that retirees occupied the new homes. The median age was 41.8 years in the Roundup CCD and 41.5 years in the Melstone CCD (U.S. Bureau of the Census, 2000, http://www.census.gov). A summary of the Study Area's population by age is presented below in Table 3-18.

Table 3-18 Population by Age: Bull Mountains Study Area

Place/Age	1980	Percent of Total	1990	Percent of Total	2000	Percent of Total
Montana Total	**787,690**	**100.0**	**799,065**	**100.0**	**902,195**	**100.0**
0 to 4 Years	64,455	8.2	59,257	7.4	54,869	6.1
5 to 17 Years	167,440	21.3	162,847	20.4	175,193	19.4
18 to 64 Years	470,236	59.7	470,464	58.9	551,184	61.1
65+ Years	84,559	10.7	106,497	13.3	120,949	13.4
Musselshell Co. Total	**4,428**	**100.0**	**4,106**	**100.0**	**4,497**	**100.0**
0 to 4 Years	376	8.5	199	4.8	222	4.9
5 to 17 Years	937	21.2	844	20.6	829	18.4
18 to 64 Years	2,419	54.6	2,242	54.6	2,659	59.1
65+ Years	696	15.7	821	20.0	787	17.5
Roundup City Total	**2,116**	**100.0**	**1,808**	**100.0**	**1,931**	**100.0**
0 to 4 Years	186	8.8	100	5.5	119	6.2
5 to 17 Years	343	16.2	357	19.7	364	18.9
18 to 64 Years	1,129	53.4	884	48.9	1,026	53.1
65+ Years	458	21.6	467	25.8	422	21.9
Yellowstone Co. Total	**108,035**	**100.0**	**113,419**	**100.0**	**129,352**	**100.0**
0 to 4 Years	9,013	8.3	8,418	7.4	8,539	6.6

5 to 17 Years	22,665	21.0	22,455	19.8	24,426	18.9
18 to 64 Years	66,516	61.6	68,547	60.4	79,144	61.2
65+ Years	9,841	9.1	13,999	12.3	17,243	13.3
Billings City Total	**66,842**	**100.0**	**81,151**	**100.0**	**89,847**	**100.0**
0 to 4 Years	4,907	7.3	6,036	7.4	5,882	6.5
5 to 17 Years	12,606	18.9	14,785	18.2	15,707	17.5
18 to 64 Years	42,603	63.7	48,977	60.4	54,919	61.1
65+ Years	6,726	10.1	11,353	14.0	13,339	14.8

Source: U.S. Bureau of the Census, 1980, 1990 and 2000 Census of Population

Baseline projections of population and economic characteristics for Musselshell and Yellowstone Counties are presented below in Table 3-19. During the 20-year projection period, the population of Musselshell County, without either the Project or the Bull Mountains Coal Mine project, would be expected to grow at an annual rate of 0.8 percent to 5,290 persons in 2020. This projected growth is nearly identical to the 0.8 percent annual population growth in Musselshell County between 1990 and 2000. By the year 2010, Musselshell County employment would be projected to rise about 13.1 percent to 2,330. The population of Yellowstone County would be projected to rise from 129,352 in 2000 to 162,410 in 2020, or an average of 1.1 percent per year. This projected growth rate is slightly slower than the 1.3 percent annual rate between 1990 and 2000. Yellowstone County employment would be projected to increase 33.7 percent between 2000 and 2020.

Table 3-19 Baseline Economic Projections for Montana, Musselshell County, and Yellowstone County, 2000 to 2020

Place/Type	2000	2005	2010	2015	2020
Montana					
Population	902,200	952,150	1,000,870	1,053,490	1,108,910
Employment	565,300	618,400	669,940	712,520	750,030
Per Capita Income (1996$)	$22,307	$25,089	$27,658	$29,783	$31,790
Musselshell County					
Population	4,497	4,680	4,860	5,070	5,290
Employment	2,060	2,130	2,210	2,280	2,330
Per Capita Income (1996$)	$16,701	$19,128	$21,521	$23,625	$25,660
Yellowstone County					
Population	129,352	137,990	145,880	154,040	162,410
Employment	91,030	99,840	108,340	115,440	121,790
Per Capita Income (1996$)	$25,542	$28,392	$30,971	$33,010	$35,049

Source: National Planning Association 2002.

The number of housing units in Musselshell County increased from 2,183 in 1990 to 2,317 in 2000, a rise of 9.2 percent. All of this increase occurred in the Klein CCD, which encompasses the southwestern portion of Musselshell County, just to the west of the proposed Generation Plant site. The number of housing units in the Klein CCD rose from 549 in 1990 to 689 in 2000, and probably represents new suburban Billings housing located just north of the Musselshell County line. There were 41 seasonal housing units in the Klein CCD, many of which may be recreational housing. The number of housing units in the Melstone CCD, which is the northeastern portion of Musselshell County, declined from 287 in 1990 to 284 in 2000. In the Roundup CCD, the northwestern portion of the county, the number of housing units decreased slightly from 1,347 in 1990 to 1,344 in 2000 (U.S. Bureau of the Census, 2000 Census of Population, www.census.gov).

The city of Roundup had 1,006 housing units in 1990 and 978 in 2000. The corresponding figures for Melstone were 88 in 1990 and 87 in 2000 (U.S. Bureau of the Census, 2000 Census of Population, www.census.gov).

The 2000 Musselshell County homeowner vacancy rate was 6.8 percent and the rental vacancy rate was 8.4 percent. Both of these vacancy rates were much lower in the Klein CCD than in the remainder of the county. The Klein CCD homeowner vacancy rate was 2.7 percent while the vacancy rate for rentals was 2.6 percent. The homeowner vacancy rate in the Melstone CCD was 11.9 percent, and the rental vacancy rate was 10.5 percent. In the Roundup CCD, the homeowner vacancy rate was 8.2 percent and the figure for rentals was 8.4 percent (U.S. Bureau of the Census, 2000 Census of Population, www.census.gov).

Approximately 23.1 percent of the occupied housing units in Musselshell County were rentals in 2000. In the Klein CCD, about 12.8 percent were rentals. Approximately 18.0 percent of the occupied housing units were rentals in the Melstone CCD, while the corresponding figure for the Roundup CCD was 29.3 percent (U.S. Bureau of the Census, 2000 Census of Population, www.census.gov).

There were 145 vacant housing units in Musselshell County in 2000 that were ready for immediate occupancy. About 40 of these units were available for rent and 105 were for sale. Only 16 of these vacant units (2 for rent and 14 for sale) were in the Klein CCD. There were 104 vacant units (34 for rent and 70 for sale) in the Roundup CCD, and 26 vacant units (four-rentals and 21-for sale) in the Melstone CCD (U.S. Bureau of the Census, 2000 Census of Population, www.census.gov).

The number of housing units in Yellowstone County increased from 48,471 in 1990 to 54,563 in 2000. Approximately 30.8 percent of the occupied housing units in 2000 were rentals. The 2000 countywide homeowner vacancy rate was 1.2 percent and the rental vacancy rate was 5.4 percent (U.S. Bureau of the Census, 2000 Census of Population, www.census.gov).

Temporary housing may be provided by hotel/motel rooms and recreational vehicle (RV) spaces. Yellowstone County has 51 hotels/motels with 3,609 licensed units and 13 campgrounds with 337 total licensed RV spots. Musselshell County has three hotels/motels with 30 licensed units and two campgrounds with 12 total licensed units (Bull Mountain Development Company, LLC., 2002a).

Employment

As shown below in Table 3-20, 1999 employment in Musselshell County totaled 1,985, up about 12.8 percent from 1,760 in 1990. Peak employment of 2,064 was recorded in 1997. Agriculture (and related services), mining, and manufacturing are the major basic industries in Musselshell County, and they account for most of the employment trends in the 1990s. Employment in agriculture and related services was 377 in 1999 and remained relatively stable throughout the decade.

As reported in Table 3-20, the mining industry in Musselshell County consists of both coal mining and oil and gas exploration. Mining employment was 148 in 1990. Oil and gas exploration accounted for most of the rise in mining employment to 167 in 1994 and the subsequent decline to 86 in 1995. The rise in mining employment to 101 in 1996 and 107 in 1997 was associated with the short operation of the Mine. By 1998, only oil and gas employment remained, and it declined further in 1999.

Table 3-20 Employment by Broad Industry Musselshell County Selected Years 1970-1999

Year	1970	1980	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Total employment	1605	1958	1766	1733	1763	1787	1953	1990	2026	2064	2040	1985
Farm employment	345	321	339	336	335	332	325	323	316	295	318	317
Nonfarm employment	1260	1637	1427	1397	1428	1455	1628	1667	1710	1769	1722	1668
Ag. services, forestry, & other	36	30	41	44	49	43	49	48	56	64	60	60
Mining	197	281	148	113	108	133	167	86	101	107	72	54
Construction	49	75	66	70	89	82	94	121	124	145	144	147
Manufacturing	51	69	41	36	27	32	63	114	101	104	109	103
Transportation and public utilities	48	93	84	73	67	62	69	70	76	79	92	87
Wholesale trade	50	86	67	47	43	45	39	38	34	34	29	33
Retail trade	263	332	278	299	305	312	343	365	390	369	339	334
Finance, insurance, and real estate	92	79	75	69	77	74	73	94	90	104	112	113
Services	262	330	374	373	387	394	455	447	463	481	488	489
Government	212	262	253	273	276	278	276	284	275	282	277	268
Federal, civilian	13	19	20	20	22	20	18	17	17	18	17	16
Military	28	26	32	31	30	29	27	27	27	26	26	26
State and local	171	217	201	222	224	229	231	240	231	238	234	226
State	15	24	14	15	16	15	14	16	17	18	17	16

Year	1970	1980	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Local	171	193	187	207	208	214	217	224	214	220	217	210

Source: U.S. Bureau of Economic Analysis, Regional Economic Information System (REIS), 2001

The largest component of manufacturing in Musselshell County is lumber and wood products, as reported in Tables 3-21 and 3-22. The growth in manufacturing employment was mostly due to the opening of a stone-clay-glass firm, non-electrical machinery manufacturer, and a miscellaneous manufacturing firm.

Yellowstone County serves as the trade and service center for southeastern Montana and a disproportionate share of the jobs are in retail trade, wholesale trade, and the services (Table 3-21). Between 1990 and 1999, total employment increased 26.0 percent.

Unemployment in Musselshell County during the 1990s has ranged from a low of 6.1 percent in 1993 to a high of 8.6 percent in 1995. Generally, the low unemployment rates occurred during the years of peak mining employment (1993-94 and 1996-97) while the high rates were during the years when mining employment decreased (1995 and 1999). Overall, unemployment rates in Musselshell County averaged about 1.5 to 2.0 percent higher than statewide, as shown below in Table 3-22. Unemployment rates in Yellowstone County have been less than the statewide average throughout the 1990s.

Per capita personal income in Musselshell County is among the lowest in the state and its relative position deteriorated in the 1990s. As reported in Table 3-23, the 1990 Musselshell County per capita personal income was $12,377, about 79.7 percent of the statewide average of $15,524. By 1999, this figure had risen to $14,654, but this was only 66.6 percent of the Montana average of $21,997. Stated differently, per capita income in Musselshell County ranked 48 out of 56 counties in 1990, and had dropped to 55 out of 56 counties by 1999. Per capita income in Yellowstone County was consistently above the statewide average. It was 113.0 percent of the state figure in 1990, and rose to 114.8 percent in 1999. Yellowstone County ranked fourth in 1990 and rose to second by 1999.

Taxes

There are several local government entities in Montana with taxing and spending authority. County and city governments have general responsibilities for law enforcement, judiciary, road, and other functions within their boundaries. School districts are responsible for education. There may also be special districts established for specific purposes, such as weed or mosquito control, that can levy taxes within their boundaries.

Property taxes account for most of the local revenue received by local governments and taxing authorities. As shown in Table 3-24, governmental entities in Musselshell County (county, city, and schools) had total revenue about $9.4 million in 1997. Subtracting federal government revenue of $364,000 and the $5.1 million received from the state (mostly state equalization payments for education) yields a figure of $3.9 million, which derived from local sources. About $2.5 million of the locally derived revenue came from taxes, and almost all of that was from property taxes. Property taxes accounted for about 63.9 percent (2,472/3,867= .639) of locally derived revenue. Musselshell County is relatively more dependant on property taxes; the same calculations yield figures of 46.7 percent for Yellowstone County and 53.7 percent for Montana for the percentage of local revenue derived from property taxes.

Per capita revenues and expenditures for both Yellowstone and Musselshell counties are below their respective statewide averages. Musselshell County had revenues per capita of $2,010, about 97 percent of the statewide average of $2,070. Per capita expenditures in Musselshell County were $1,887, about 87 percent of the statewide average of $2,126. The corresponding Yellowstone County figures for both per capita revenues and expenditures were 95 percent of the respective statewide averages.

Property taxes in Montana are computed by multiplying the jurisdiction's tax rate (expressed in mills) by the taxable valuation within its boundaries. Taxable valuation is computed by applying one of nine rates (from 3 to 100 percent) to the market value of a taxable item. For example, residential property is taxed at 3.974 percent of its market value, with some important exceptions. Centrally assessed electric power company assets are taxed at 12 percent of its market value. There are also provisions for reducing the rate for certain types of property if they qualify as new industrial property.

Taxable valuations and mill rates in Musselshell and Yellowstone counties are shown in Table 3-25. In 1999-2000, Musselshell County had total mills of 115.75 and a taxable valuation $7.3 million. Persons living in Roundup paid an additional 95.36 mills, and those in Melstone paid an additional 134.02 mills. County governments compute and collect all the property taxes within their jurisdiction. Musselshell County billed $3.1 million in 1999-20000 for the taxes due to county, city, school districts, and special districts within its boundaries.

The Roundup School general fund budget was $4,612 for each high school pupil and $3,762 for each elementary school pupil (Bull Mountain Development Company, LLC., 2002a). The figures for Melstone were $7,951 for each high schools pupil and $4,882 for each elementary pupil. The Billings figures were $4,454 for each high school pupil and $4,033 for each elementary pupil. In Laurel, they were $4,573 for each high school pupil and $4,228 for each elementary pupil. No corresponding statewide averages were published.

Table 3-21 Employment in Montana, Musselshell County, and Yellowstone County- 1990 and 1999

	Montana				Musselshell County				Yellowstone County			
	1990 Number	Percent of Total	1999	Percent of Total	1990 Number	Percent of Total	1999 Number	Percent of Total	1990 Number	Percent of Total	1999 Number	Percent of Total
Total employment	436,574	100	552,276	100	1,766	100	1,985	100	70,506	100	88,846	100
Farm employment	30,576	7.0	32,122	5.8	339	19.2	317	16.0	1,288	1.8	1,431	1.6
Nonfarm employment	405,998	93.0	520,154	94.2	1,427	80.8	1,668	84.0	69,218	98.2	87,415	98.4
Ag. services, forestry, & other	6,154	1.4	8,554	1.5	41	2.3	40	2.0	568	0.8	848	1.0
Mining	7,824	1.8	6,498	1.2	148	8.4	54	2.7	879	1.2	653	0.7
Construction	19,070	4.4	34,527	6.3	66	3.7	147	7.4	2,842	4.0	5,526	6.2
Manufacturing	26,342	6.0	29,287	5.3	41	2.3	103	5.2	3,545	5.0	3,730	4.2
Transportation and public utilities	23,858	5.5	27,327	4.9	84	4.8	87	4.4	4,576	6.5	5,430	6.1
Wholesale trade	17,449	4.0	20,784	3.8	67	3.8	33	1.7	5,818	8.3	6,750	7.6
Retail trade	78,715	18.0	104,951	19.0	278	15.7	334	16.8	14,045	19.9	18,232	20.5
Finance, insurance, and real estate	27,693	6.3	36,927	6.7	75	4.2	113	5.7	5,935	8.4	6,231	7.0
Services	118,623	27.2	167,868	30.4	374	21.2	489	24.6	22,246	31.6	30,763	34.6
Government	80,270	18.4	83,431	15.1	253	14.3	268	13.5	8,764	12.4	9,252	10.4
Federal, civilian	13,771	3.2	12,522	2.3	20	1.1	16	0.8	1,811	2.6	1,724	1.9
Military	10,516	2.4	8,563	1.6	32	1.8	26	1.3	897	1.3	735	0.8
State and local	55,983	12.8	62,346	11.3	201	11.4	226	11.4	6,056	8.6	6,793	7.6
State	21,561	4.9	23,571	4.3	14	0.8	16	0.8	1,588	2.3	1,713	1.9

U.S. Bureau of Economic Analysis, Regional Economic Information System (REIS), 2001

Table 3-22 Labor Force Statistics Montana, Musselshell County, and Yellowstone County (Selected Years, 1970-2000)

Place/Category	1970	1980	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Montana													
Civilian Labor Force	273,000	371,000	401,000	407,000	422,000	426,000	439,502	437,098	445,910	454,614	466,450	474,006	479,132
Employed Persons	261,000	348,000	377,000	378,000	393,000	400,000	417,225	411,306	422,434	430,261	440,248	449,361	455,608
Unemployed Persons	12,000	23,000	24,000	29,000	29,000	26,000	22,277	25,792	23,476	24,353	26,202	24,645	23,524
Unemployment Rate	4.4	6.2	6.0	7.1	6.9	6.1	5.1	5.9	5.3	5.4	5.6	5.2	4.9
Musselshell County													
Civilian Labor Force	1,440	1,841	1,785	1,781	1,816	1,805	1,893	1,933	1,932	1,938	1,972	1,853	1,868
Employed Persons	1,333	1,798	1,658	1,641	1,680	1,694	1,772	1,766	1,776	1,786	1,826	1,700	1,729
Unemployed Persons	107	43	127	140	136	111	121	167	156	152	146	153	139
Unemployment Rate	7.4	2.3	7.1	7.9	7.5	6.1	6.4	8.6	8.1	7.8	7.4	8.3	7.4
Yellowstone County													
Civilian Labor Force	35,170	55,542	61,648	62,518	65,170	65,732	68,013	66,830	67,239	68,540	70,133	72,121	72,921
Employed Persons	32,966	52,861	58,563	59,101	61,517	62,508	65,300	63,611	64,247	65,433	67,049	69,224	70,158
Unemployed Persons	2,204	2,681	3,085	3,417	3,653	3,224	2,713	3,219	2,992	3,107	3,084	2,897	2,763
Unemployment Rate	6.3	4.8	5.0	5.5	5.6	4.9	4.0	4.8	4.4	4.5	4.4	4.0	3.8

U.S. Bureau of Economic Analysis, Regional Economic Information System (REIS), 2001

Table 3-23 Per Capita Personal Income, Montana, Musselshell and Yellowstone Counties, 1990 and 1999

	1990		1999	
Area	Per Capita Income	Percent of Montana	Per Capita Income	Percent of Montana
Montana	$15,524	100.0	$21,997	100.0
Musselshell County	12,377	79.7	14,654	66.6
Yellowstone County	17,536	113.0	25,253	114.8

Source: U.S. Bureau of Economic Analysis, Regional Economic Information System (REIS), 2001.

Table 3-24 County and Local Government Revenue and Expenses 1997

	Musselshell County	Yellowstone County	Montana
	(thousands of dollars)		
General Revenue	9,397	246,842	1,821,669
per capita (dollars)	*2,010*	*1,960*	*2,070*
Federal Intergovernmental Revenue	364	3,809	91,641
State Intergovernmental Revenue	5,166	78,043	632,393
Total Taxes	2,543	83,491	622,237
Property Taxes	2,472	77,090	590,177
General Current Charges	876	54,265	311,490
Interest Revenue	160	9,249	84,283
Other Revenue	288	17,985	79,625
Total Expenditures	8,810	250,237	1,869,516
per capita (dollars)	*1,884*	*1,960*	*2,126*

Source: (U.S. Bureau of the Census, 1997 Census of Governments, www.census.gov)

Note: Includes county government, municipal governments, and school districts.

Table 3-25 Taxable Valuation, Tax Mill and Property Taxes Billed Yellowstone and Musselshell Counties and Selected Cities 1999-2000

City/County	Total Mills	Taxable Valuation	Property Taxes Billed*
Musselshell County	115.75	$7,251,247	$3,162,915
Roundup City	95.36	1,602,953	
Melstone town	134.02	99,496	
Yellowstone County	80.74	$223,126,552	$117,082,228
Billings City	94	122,789,770	
Laurel City	95.51	6,694,717	

* includes county, city, and school district levies

Source: Bull Mountain Development Company, LLC., 2002a.

Education Services

The Roundup School District and the Melstone School District operate the only public schools within Musselshell County. Both districts maintain elementary, 7-8 grade, and a high school. The Musselshell School District was dissolved in the late 1990s, and the students were dispersed to the Roundup and Melstone school districts.

Yellowstone County contains the Billings School District, plus 15 other elementary school districts, which are shown in Table 3-26. The 16 elementary districts feed students into eight high schools.

As presented in Table 3-26, school enrollment in Musselshell County decreased from 832 students in the 1990-91 school year to 758 students in the 2000-01 school year, a decline of 8.9 percent. The Roundup School District experienced a decline of 9.1 percent during the 1990s, while the corresponding figure for the Melstone School District was a decrease of 6.9 percent.

Table 3-26 Enrollment by District and School Musselshell and Yellowstone Counties 1990-91 and 2000-01

District and School	1990-91	2000-01	Percent Change
Musselshell County	**832**	**758**	**-8.9**
Roundup	731	664	-9.2
Musselshell School	18		-100.0
Central School	394	316	-19.8
Roundup 7-8	117	109	-6.8
Roundup HS	202	239	18.3
Melstone	101	94	-6.9

District and School	1990-91	2000-01	Percent Change
Melstone School	39	43	10.3
Melstone 7-8	18	15	-16.7
Melstone HS	44	36	-18.2
Yellowstone County	**20,968**	**21,434**	**2.2**
TOTAL K-8	15,371	14,706	-4.3
Billings K-8	10,815	10,160	-6.1
Lockwood K-8	1,157	801	-30.8
Blue Creek K-8	95	173	82.1
Canyon Creek K-8	195	265	35.9
Laurel K-8	1,342	1,185	-11.7
Elder Grove K-8	192	316	64.6
Custer K-8	72	73	1.4
Morin K-8	27	31	14.8
Broadview K-8	75	116	54.7
Elysian K-8	89	120	34.8
Huntley Project K-8	494	522	5.7
Shepard K-8	501	584	16.6
Pioneer K-8	67	61	-9.0
Independent K-8	165	238	44.2
Yellowstone Academy	85	61	-28.2
TOTAL H.S.	**5,597**	**6,728**	**20.2**
Billings Sr. H.S.	1,688	1,956	15.9
Billings West H.S.	1,633	1,997	22.3
Skyview H.S.	1,254	1,571	25.3
Laurel H.S.	564	586	3.9
Custer H.S.	30	31	3.3
Broadview H.S.	40	52	30.0
Huntley Project H.S.	180	259	43.9
Shepherd H.S.	208	276	32.7

Source: Montana Office of Public Instruction, 2002.

School enrollment in Yellowstone County rose from 20,968 students in the 1990-91 school year to 21,434 students in the 2000-01 school year, a rise of 2.2 percent. A quick glance at the figures in Table 3-26 reveals a mixed picture in terms of the trends in the various schools and districts. For the most part, they reflect net in-migration of population and the changing central, suburban, and rural area residence patterns in Yellowstone County. The traditional urban areas in Billings and Laurel experienced elementary enrollment decline and slow high school growth. On the other hand, the rural-suburban areas such as Custer and Broadview experienced rapid elementary growth (Custer) and/or elementary and high school (Broadview) growth.

The declining school enrollment in Musselshell County occurred despite the small net in-migration between 1990 and 2000. Most of the in-migration apparently occurred in the Klein CCD with little or no impact on the Roundup or Melstone school districts. The declining school enrollment was mostly due to the demographic structure of the population in Musselshell County. As shown in Table 3-27, the number of students in each of the lower grades is less than in the upper grades. This was caused by the declining number of births and decreasing birth rates, in the 1980s and 1990s. There are almost one-third fewer students in the 1st grade as compared to the number of students in the 12th grade (47 vs. 71). This means that even if there were no net out-migration in future years, total school enrollment would decline as the ever-decreasing classes progress through the grades.

Table 3-27 School Enrollment by Grade, Musselshell County 2000-01

Grade	Enrollment
K and Pre-K	47
1	47
2	52
3	62
4	49
5	52
6	50
7	66
8	58
9	70
10	64
11	66
12	71
Total	754

Source: Montana Office of Public Instruction, 2002.

Transportation

Maintenance and construction on U.S. Highway 12, U.S. Highway 87, and Montana Route 3 are the responsibility of the Montana Department of Transportation. The primary source of revenue for maintaining state highways is the Montana fuel and gross vehicle weight (GVW) tax. Construction of state highways also is funded by Montana fuel taxes; however, matching federal funds account for about two-thirds of all highway construction in Montana. The Montana Department of Transportation does not attempt to justify whether or not traffic, and related fuel and GVW tax on any roadway, support the cost of maintenance or reconstruction. Furthermore, local governments do not track maintenance costs of roadways by location; therefore, operation and maintenance costs are not available for locally maintained roads. Old Divide Road is maintained by Musselshell County and is relevant as this is the route to the work site should the Project be built.

Traffic levels near the Project are low, averaging around 2,300 vehicles per day in the stretch along U.S. Route (SR 87) between the Musselshell/Yellowstone county line and the town of Klein, just south of Roundup. According to traffic counts made by the Montana Department of Transportation in Musselshell County in 1999, average daily traffic (ADT) levels were as follows:

- SR87 between the Musselshell/Yellowstone County boundary and the town of Klein — 2,322 ADT
- SR87 north of Roundup — 1,627 ADT
- SR12 east of Roundup — 509 ADT
- SR12 west of Roundup — 2,930 ADT

Data on traffic levels on Old Divide Road are not available, but as a minor rural road serving homes and ranches in the area, traffic levels on the roads would be light, probably at most in the high tens or low hundreds of vehicles per day (Jonutis, 2002).

Utilities

Municipal water for Roundup residents is obtained from two sources and then stored in two concrete reservoirs with a combined capacity of three million gallons. The primary water source originates in an abandoned coalmine on the south side of the Musselshell River. The primary source is supplemented as necessary by water directly from the Musselshell River. The present water supply is adequate for the current population. With the region entering its fifth year of drought conditions, dependence upon the Musselshell River as a supplemental water source may be in question, as rationing may be required to maintain an adequate water supply down river. In average/normal precipitation patterns, there would be more than adequate water supplies for anticipated needs.

The Roundup wastewater system has been updated to a three-cell aerated lagoon, which is underutilized. The Musselshell County Refuse District provides solid waste removal. Refuse is picked up and hauled to the Roundup transfer station where it is then hauled by a private contractor to the Billings landfill for disposal. The transfer station is operating under capacity (Gary Thomas; Waste Water Manager, City of Roundup, personal communication, January 22, 2002). Rural locations, such as the Project site, can purchase water to be delivered for cistern storage if well water is not available. Rural wastewater typically is handled by individual septic systems. Refuse collection for rural locations is available within 50 miles of Billings. A local provider, BFI Waste Systems, can provide commercial service to the “mine site” (John Whitman, Facility Manager BFI, personal communication March 13, 2002).

Health and Safety

The Montana Highway Patrol, Musselshell and Yellowstone County Sheriff’s departments, and Billings Police Department provide Law enforcement in the affected area. The Highway Patrol concentrates on traffic patrol and traffic-related incidents, whereas the sheriff's departments focus on criminal activity in Musselshell and Yellowstone counties.

The Musselshell County Sheriff's Department, a consolidated city (Roundup)/County agency, provides law enforcement services for the city and county. Law enforcement personnel currently include one resident Montana Highway Patrol Officer, one Sheriff, six full time deputies, and 10 reserve deputies, five of whom are qualified to work as full deputies. Staffing generally is considered adequate at best and any increase in population would require increased staffing and infrastructure. County-wide enhanced 911 service is anticipated within the next two years. The jail is capable of holding 14 inmates, is not handicap accessible, and is considered “antiquated” (Construction on this structure was started in 1909 and completed in 1913). There have been upgrades to plumbing, electrical, and surveillance equipment. There have been discussions of merging inmate facilities with Yellowstone County (Rosalie Mercardo, dispatcher; Mark Shoup, Montana Highway Patrol; and Chuck Poulos, commissary manager; personal communication, January 22, 2002).

Fire services in Musselshell County are provided by volunteer organizations, which have adequate personal and equipment for existing needs in Roundup. However, the Bull Mountain Volunteers, a loosely organized group of local landowners who respond to the presence of smoke and phone calls, are adequately staffed but have limited firefighting equipment (nothing designed for commercial application) (Gary Thomas, City Hall, personal communication, January 22, 2002).

The Musselshell County Ambulance Service in Roundup provides on-the-ground ambulance service in the county. The service currently has two employees (one full time and one part time) and several volunteers. Three individuals are qualified at EMT- I levels, the rest are EMT Basic. They are currently responding to an average of 46 calls per month. There are three ambulances in service, one currently needs to be replaced (high mileage), and a second is scheduled for replacement in next two to three years (high mileage). Based on the current resources and the geographic challenges, the ambulance services are at the limits of acceptable response parameters. Any change in demographics would require additional staffing and response vehicles. Ideally, it would not require an ambulance and staff to be dispatched from Roundup to service the edges of the county (Ron Solberg, Director of Ambulance Services, personal communication, January 22, 2002).

Roundup Memorial Hospital is an 11-bed acute care, 37-bed long-term care facility with an average acute inpatient census of 1.3 patients per day. There are three physicians in Roundup, one optometrist, and one dentist. Courtesy privileges are extended to physicians from Billings conducting outpatient clinics (Dave McIver, Hospital Administrator, personal communication, January 18, 2002).

State, Federal, and County funding support social welfare services in Musselshell County. The County-administered welfare program provides Aid to Families with Dependent Children, Food Stamps, County Assistance (general and medical), and Medicaid. The current number of staff is not adequate to dispense the required services in a timely manner (Pam Gable, Social Worker, personal communication, January 23, 2002).

Musselshell County Mental Health Center and Musselshell Chemical Dependency Center share an office in Roundup. The Mental Health Center provides counseling to individuals with chronic mental illness. The Musselshell Chemical Dependency Center provides outpatient counseling, referrals for in-patient care and mandatory classes to driving-under-the-influence offenders. There is limited access to these services, with each available only two to three days a week (Deloris DesJarlais, Secretary, personal communication, January 28, 2002).

Social Well-Being

The social and economic character of Roundup and the area surrounding the Generation Plant site has evolved in conjunction with ranching, coal mining, and oil production. These have been the dominant sources of employment and income for Roundup area residents. Historically the economy of the Roundup area has followed a boom-and-bust pattern, starting with the cattle industry in the 1880s and extending through the coal mining and oil development periods. Many area residents' social values, perceptions, and lifestyles have been influenced by the cyclical nature of good economic times followed by recession. Though residents of the area have experience with boom-and-bust cycles, they have not been inured to the disruptive effects these cycles have.

The ways in which people identify and respond to one another in Roundup are typical of small western towns–informal and personal. Residents know almost everyone in town and are aware of individuals' character, occupation, and socioeconomic status. They can also be very suspicious of outsiders. Residents value the small town atmosphere, the quiet and predictable pace of life, and mutually supportive networks of family and friends.

Communities such as Roundup develop unique rhythms and tempos, because of their predictable and supportive lifestyles. People know when to do things–stores open during certain hours; there are slack times and busy times; they know where and how to find people they might need or wish to see; they know how things are expected to be done; they know who is who and how and when to speak to whom. An influx of people who do not "know the ropes," the local ways and lore, is disruptive to these patterns. Rhythms and tempos change and long-time residents are forced to re-adjust to when and how to do things. New norms and values challenge the old ways of doing things. Economic development can increase the income and wealth of residents, both new and old, and disrupt the social status structure of pre-development times.

Rapid social change that is characteristic of development "boom" periods brings with it qualitative change to the composition of local populations, as migrants arrive from a wide array of origins, with a wide array of socio-cultural backgrounds. The quantitative and qualitative population changes result in a variety of changes that can disrupt established social patterns. Ensuing problems have been found to include increases in divorce and broken homes (Mudock et al., 1980, Cortese and Jones, 1977, Hardt, 1994).

Reflective of social status disruptions, in recent years the Bull Mountains area has experienced an influx of people seeking the seclusion, scenery, and relatively pristine natural surroundings of the area. Many Roundup residents have termed these newcomers "mini-farmers" because they have purchased small acreages and have small numbers of livestock. It is perceived by Roundup residents that Bull Mountain area residents are becoming somewhat of a social, political, and economic influence because they are organizing to reflect their specific interests, such as the Bull Mountains Landowners Association and Bull Mountain Volunteers.

The effects of proposed development on the social life of Roundup and Bull Mountains residents are apparent within the area. Some people have become polarized based on their support for or opposition to the mining development and the strains may extend to the Generation Plant. Roundup residents tend to favor new coal development, whereas the ranchers and Bull Mountain "mini-farmers" are perceived by Roundup residents to oppose it. Social interaction between the "pro" and "anti" factions has become strained because of the relatively high degree of emotion associated with coal development (Northwest Economic Consultants, 1989). Factional strains are likely to persist, at least in the near term, regardless of whether the proposed development goes forward. If it does go forward the "anti" faction would likely blame the "pro" faction for any problems that emerge, whether these were pre-existing or not or whether the problems are associated with the development. If the development does not go forward, the "pro" faction would likely blame the "anti" faction for being responsible for the lost opportunity and the social and economic benefits that might have come with the new coal development. In this respect, the social impact of the mining development has already occurred and likely would persist for some time, regardless of the outcome of the issue.

CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

4.1 Introduction

The purpose of this chapter is to describe adverse and beneficial impacts of the Proposed Action and Alternatives on the affected environment as described in Chapter 3. The Proposed Action would grant an Air Quality Permit for the proposed Roundup Power Project (Project). The Project includes a coal-fired Generation Plant, a conveyance system for acquiring coal from the nearby Bull Mountains Mine (Mine), a 28-mile 161kV Transmission System, and associated access roads that would have to be built or upgraded to construct and maintain the Project facilities.

Alternatives to the Project are described in detail in Chapter 2 and include 1) Alternative Landfill and 2) a 230kV Transmission System. The Alternative Landfill calls for storing the Generation Plant waste ash in permanent landfill sites on and adjacent to the plant site for the life of the plant. Methods associated with the Proposed Action call for storing waste ash in a landfill on the plant site for 10 years and the Mine for the remaining 30 years identified as the life of the Project.

The 230kV Transmission System Alternative would utilize 230kV circuits instead of the proposed 161kV circuits for the transmission of power from the Generation Plant to the Broadview Substation.

4.1.1 Impact Assessment Methods

This chapter evaluates the direct and indirect impacts that may result from the Project and the alternatives. The nature and area of these potential impacts are described in detail later in this chapter.

Where potential impacts to a resource were identified, an evaluation was conducted to determine if one or more actions would be effective in avoiding or reducing (e.g. intensity and/or duration) the potential impact. The Project was designed to include mitigation measures to avoid or minimize impacts of the Project. Refer to Chapter 2 for a list of these measures. Mitigation measures were categorized as 1) mitigation that may be required in a permit or license without the Project proponent's consent and 2) recommended mitigation that can be made a permit or license condition only with the Project proponent's consent. Mitigation measures that are not associated with a permit or license cannot be enforced as part of this MEPA process unless the Project proponent agrees to have them made permit conditions and are recommended by the DEQ for further reduction in impacts associated with this Project. Mitigation measures are discussed for each resource.

Impact assessments were conducted for the Proposed Project and Alternatives. Criteria for determining the level of impacts are stated for each resource. Irreversible and irretrievable commitments of resources that would be involved in the Project are presented in Section 4-13. Cumulative effects are to be described in Section 4-14.

Cumulative impacts are identified only where there is a reasonable likelihood that the Project would have a cumulative effect with consideration of other past or present actions or future actions which are under concurrent consideration by DEQ (or another state agency) through pre-impact statement studies, separate impact statement, or permit –processing procedures.

4.2 Air Resources

The emission of air pollutants is regulated under both federal and Montana State laws and regulations. The federal Clean Air Act (CAA) and the subsequent Clean Air Act Amendments of 1990 (CAAA) require the Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS) to protect public health and welfare.

The CAA and CAAA established NAAQS for pollutants known as "criteria" pollutants. Primary NAAQS and Montana Ambient Air Quality Standards (MAAQS) are established at a level designed to protect public health with an adequate margin of safety, Secondary NAAQS have also been defined, "based on criteria requisite to protect the public welfare from any known or anticipated adverse effects associated with the presence of [the] pollutant in the ambient air."

In addition to the MAAQS and NAAQS, an additional level of air quality protection for the Project would be provided by the requirements of the Prevention of Significant Deterioration (PSD) program. The PSD regulations set "PSD Increments," which are maximum allowable increases above a baseline ambient concentration. The PSD Increments range from 20% to 40% of the NAAQS for each pollutant and averaging period.

Increases in ambient pollutant concentrations are not considered to cause significant adverse impacts, if they do not exceed any applicable MAAQS, NAAQS, or PSD Increment.

As part of the CAAA, Congress also adopted a program for control of air toxics (also known as hazardous air pollutants [HAPs]). Congress designated 188 individual HAPs for control through development of National Emissions Standards for Hazardous Air Pollutants (NESHAP). These NESHAP standards have taken the form of Maximum Achievable Control Technology (MACT) requirements for emission source categories. As the MACT requirements are promulgated by EPA, Montana has incorporated them by reference into ARM 17.8.302. The MACT establishes HAP emissions limits and/or monitoring and emissions control technology requirements for an emissions source category (i.e., generation plants).

4.2.1 Methods

Impacts from the Project facility on air quality were assessed using emission rate data, emission point parameters (e.g., stack temperature, stack exhaust flow rate, etc.) and local meteorological (met) data together with computer models to predict the pollutant-specific and site-specific impacts for each pollutant. Specifically, the Industrial Source Complex (ISC3) and CALPUFF (this is a puff model originally developed for the California Air Resources Board and it is not an acronym) dispersion models were used to predict impacts.

Impacts from greenhouse gas emissions were assessed using source-specific emission rates for greenhouse gases. Equations developed by the Intergovernmental Panel on Climate Change (IPCC) were used to assess the global warming potential (GWP) of the Project facility emissions.

Information obtained from the Supplemental EIS Support Document (Bull Mountain Development Co., LLC, 2002a) was used as background in creating the air resources analysis.

Impact Criteria

Ambient and Increment Analysis Criteria

The PSD modeling significance levels, PSD monitoring *de minimis* levels, PSD increments, NAAQS, and MAAQS can be found in the Code of Federal Regulations (CFR) and the Administrative Rules of Montana (ARM) Title 17, Chapter 8. The PSD increments are further broken down into either Class I or Class II increments depending on the classification of the impact area of concern. A Class I area is held to more stringent standards than a Class II area. Table 4-1 summarizes the PSD modeling significance levels, PSD monitoring *de minimis* levels, PSD Class I and II increments, and NAAQS/MAAQS that are applicable to the Project facility.

Impacts that exceed the NAAQS/MAAQS and/or PSD increments are classified in this document as high and could lead to a decision to reject a permit application by either DEQ or EPA.

Impacts above the PSD modeling significance levels are classified in this document as moderate and require a cumulative ambient and increment modeling analysis. The PSD modeling significance levels in Table 4-1 apply to PSD Class II areas. For Class I areas, EPA has suggested significant impact levels (SILs) should be set equal to 4% of the respective Class I PSD increment. This approach for Class I areas is widely used in modeling analyses, but has not been formally adopted by EPA.

Impacts that are below NAAQS/MAAQS and Class II PSD increments are classified in this document as low and negligible by DEQ and EPA regulations.

Table 4-1 National and Montana Ambient Air Quality Standards, PSD Increments and PSD Significance Levels

Pollutant	Average Period	NAAQS (μg/m³)	MAAQS (μg/m³)	PSD Class I Increment (μg/m³)	PSD Class II Increment (μg/m³)	PSD Modeling Significance Level (μg/m³)[a]	PSD Monitoring De Minimis Levels (μg/m³)[a]
NO_2	Annual	100	94	2.5	25	1	14
	1-hour[b]	--	564	--	--	--	--
SO_2	Annual	80	52	2	20	1	--
	24-hour[b]	365	262	5	91	5	13
	3-hour[b]	1,300	--	25	512	25	--
	1-hour[c]	--	1,300	--	--	--	--
CO	8-hour[b]	10,000	10,350	--	--	500	575

Pollutant	Average Period	NAAQS ($\mu g/m^3$)	MAAQS ($\mu g/m^3$)	PSD Class I Increment ($\mu g/m^3$)	PSD Class II Increment ($\mu g/m^3$)	PSD Modeling Significance Level ($\mu g/m^3$)[a]	PSD Monitoring De Minimis Levels ($\mu g/m^3$)[a]
	1-hour[b]	40,000	26,450	--	--	2,000	--
PM_{10}	Annual	50	50	4	17	1	--
	24-hour[b]	150	150	8	30	5	10
Ozone[d]	1-hour	235	196	--	--	--	100 tpy[e]
Lead	Calendar Quarter	1.5	1.5	--	--	--	0.1[f]

Source: Administrative Rules of Montana, Title 17, Chapter 8, Sub-chapter 2, Ambient Air Quality, 1996;Title 40 Code of Federal Regulations Part 50, National Primary and Secondary Ambient Air Quality Standards, Revised July 2002;EPA, Office of Air Quality Planning and Standards, New Source Review Workshop Manual (Draft) October, 1990.

[a] Based on High 1st High Impact
[b] Based on High 2nd High Impact
[c] Based on High 19th High Impact
[d] Emission of VOCs
[e] If facility's VOC emissions are 100 tpy or greater then ozone monitoring is required
[f] Based on a 24-hr average

AQRV Analysis Criteria

Significance criteria are also established for impacts to air quality-related values (AQRV) in Class I areas. The impacts on Class I AQRV that were assessed for the Project facility included visibility impacts; acid deposition impacts; and impacts to soils, plants, and animals.

Table 4-2 summarizes the significance levels that Federal Land Managers (FLM) use for visibility and acid deposition (acid rain) impacts. These values are obtained from the Federal Land Managers Air Quality Related Values Workgroup (FLAG) – Phase I Report (US Forest Service et al., 2000) and the report titled, Guidance on Nitrogen and Sulfur Deposition Analysis Thresholds (US Forest Service et al., 2002a), respectively. These documents are not state or federal regulations but guidance prepared by the FLMs, which they use in a determination of potential adverse effects.

Table 4-2 Class I Visibility and Acid Deposition Significance Levels

Analysis	Parameter	Levels of Concern
Visibility	Change in Light Extinction	0.4% (de minimis level)
		5% (triggers cumulative analysis)
		10% (may indicate an adverse impact)
Acid Deposition	Nitrogen Flux	0.005 kg/ha/yr
	Sulfur Flux	0.005 kg/ha/yr

Sources: U.S. Forest Service, National Park Service and U.S. Fish and Wildlife Service, "Federal Land Managers Air Quality Related Values Workgroup (FLAG) Phase I Report", December, 2000, "Guidance on Nitrogen and Sulfur Deposition Analysis Thresholds", 2002.

Visibility impacts are measured by the change in atmospheric light extinction relative to natural background conditions. A change in extinction is calculated as a 24-hour average per calendar day. An "Adverse Impact on Visibility" is defined in the FLAG guidance document (FLAG, 2000) on page 152 and in Chapter 8, Glossary of this report.

For modeled visibility impacts, a predicted change in extinction less than 0.4% due to emissions from the proposed facility would be considered below *de minimis* and would not require further analysis. Therefore, predicted impacts from a facility that are below 0.4% are classified in this document as low and negligible. A predicted change in extinction less than 5% due to emissions from a proposed facility would likely not trigger an FLM objection to the air quality permit. Therefore, predicted impacts from a proposed facility below 5% would be classified in this document as low. Model-predicted impacts for the facility between 5 and 10% are classified in this document as moderate, and a cumulative analysis would be expected to be performed for the Class I area of concern. If a change in extinction due to emissions from the facility is predicted to be greater than 10%, the FLM would likely raise objections to the pollutant loading without mitigation of the source. These impacts are classified in this document as high and may result in a finding of adverse impact by the FLM.

Cumulative model-predicted impacts above 10% are also classified in this document as high but not necessarily unacceptable by the FLM. In this case, the FLM makes an acceptability determination based on whether the facility's contributions are *de mininis* (<0.4%) on the days when cumulative impacts are above 10%. Adverse visibility impacts are typically determined by the FLM on a case-by-case basis for the Class I area of concern. Depending upon the FLM finding on visibility impacts and their review of the application, DEQ makes a finding whether the facility would "cause or contribute to adverse impact on visibility within any federal Class I area" (ARM 17.8.1106). This finding determines whether DEQ will issue the air quality permit.

Deposition-induced changes to AQRVs are of serious concern to FLMs. Deposition analysis thresholds (DAT) have been established and are intended to distinguish where deposition increases may result in potentially adverse ecosystem stresses, as well as where deposition increases are likely to have a negligible impact on AQRVs. The DAT is a screening threshold, not necessarily an adverse impact threshold. The DAT defines the additional amount of deposition that triggers a management concern, not necessarily the amount that constitutes an adverse impact to the environment. Adverse impact determinations are typically determined on a case-by-case basis for modeled deposition values that are higher than the DAT. The DAT for Western U.S. Class I areas for both south and north is set at 0.005 kilograms per hectare per year (kg/ha/yr) (NPS and USFWS, 2002). Model-predicted impacts of acid deposition below the DAT are classified in this document as low. Model-predicted impacts between a 0.005 kg/ha/yr and 0.125 kg/ha/yr are classified in this document as moderate, and a cumulative analysis would be required by the FLM. Model-predicted impacts above 0.125 kg/ha/yr would be classified in this document as high and potentially unacceptable by the FLM.

Other impacts to AQRV include impacts to plants, soils, and animals. The screening document, (EPA Office of Air Quality Standards, 1980), provides screening values for effects of gaseous criteria pollutants on vegetation and for effects of trace metals on soils, plants, and animals. The screening levels provided are not necessarily safe levels or levels above which concentrations would necessarily cause harm in a particular situation. They are minimum levels at which adverse effects have been reported. If impacts are above the screening levels, then the source might have adverse impacts on plants, soils, and animals and appropriate action would have to be taken by the FLM *(*EPA, 1980). Model-predicted impacts below these screening levels are classified in this document as low. Model-predicted impacts above these screening levels are classified in this document as high. The numerous screening values are provided in the screening document. The nature of screening is to identify impacts. There are no definable moderate boundaries, it is either below the screen level and considered low, or it is above the screen level and considered high.

No specific significance criteria are available for assessing the greenhouse gas emission impacts on global warming. There is still much debate about how much impact emissions from stationary sources have on global warming. Therefore, for this EIS, no impact levels are established.

4.2.2 Proposed Action

Generation Plant

A detailed evaluation of the air impacts from the Project was included in the PSD air quality permit application submitted to the Montana Department of Environmental Quality (DEQ) in January 2002 for this Project and in supplemental data submitted through July 2002 as part of the permitting process. The methods used and results obtained from the air quality impact analyses are summarized in the following sections.

Air Contaminant Emission Rates

Air contaminant emissions from combustion sources at the Project would include the following criteria air pollutants: NO_2, SO_2, CO, PM_{10}, and VOC. The facility would also emit HAPs, including mercury, HCl, and lead. Lead is regulated as both a criteria air pollutant and a HAP (lead compounds).

Fugitive PM and PM_{10} ("dust") emission sources associated with the proposed facility include vehicle travel on unpaved roads, construction activities, material handling (coal, ash [bottom and fly], and lime), and wind erosion of storage piles and disturbed areas. During construction of the generation plant, fugitive dust would result from heavy construction equipment operations, travel on unpaved roads, disturbance of soils, and general construction activities. Dust emissions would be mitigated through the application of water and restriction of vehicle speeds. Once the plant is operational, fugitive dust emissions at the facility would be primarily material handling activities, vehicle traffic on unpaved roads, and wind erosion.

Table 4-3 summarizes the maximum potential plant-wide emission rates for criteria pollutants and HAPs. A detailed breakdown of the emission totals, by source category, is presented in the air quality permit.

Table 4-3 Plant-Wide Source Emission Summary

Source	PM_{10}		SO_2		Pb		NO_2		VOC		CO		HAPs	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Main	120	491	964	3928	0.04	0.2	562	2291	24	99	1204	4910	21	90.2

Source	PM_{10}		SO_2		Pb		NO_2		VOC		CO		HAPs	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
boilers														
Other combus-tion	3.8	2.8	21	11	0.004	0.002	128	38	1.4	0.5	9	7	0.4	0.3
Material handling	--	15	--	--	--	--	--	--	--	--	--	--	--	--
Fugitive	--	3.6	--	--	--	--	--	--	--	0.02	--	--	--	--
Totals	124	512	985	3939	0.04	0.2	690	2329	25.4	99.5	1213	4917	21.4	90.5

Source: Bull Mountain Development Company. LLC, 2002a.

The HAP emissions reported in Table 4-3 can be further broken down into specific HAPs. Table 4-4 presents individual HAP emissions estimates for the two coal-fired boilers (Bull Mountain Development Company, LLC., 2002b). Because individual HAP emissions for HCl exceed the 10-tons/year threshold, and because total HAP emissions for each boiler exceed the 25 tons/year threshold, the Project would be considered a major source of HAPs. Total mercury emissions are projected at 0.110 tons/year for both boilers.

Table 4-4 Boiler HAP Emission Inventory

HAP	Emission Rate Per Main Boiler		Emission Rate for Both Boilers	
	lbs/hr	tpy	lbs/hr	tpy
Antimony	0.001	0.004	0.002	0.008
Arsenic	0.004	0.017	0.008	0.034
Asbestos	0.000	0.000	0.0	0.0
Beryllium	0.000	0.001	0.0	0.002
Cadmium	0.003	0.011	0.006	0.022
Chromium	0.011	0.049	0.022	0.098
Cobalt	0.003	0.015	0.006	0.030
Hydrogen Fluoride	1.272	5.572	2.544	11.144
Hydrogen Chloride	6.903	30.236	13.806	60.472
Manganese	0.031	0.137	0.062	0.274
Mercury	0.013	0.055	0.026	0.110
Nickel	0.011	0.048	0.022	0.096
Selenium	0.134	0.588	0.268	1.176

HAP	Emission Rate Per Main Boiler		Emission Rate for Both Boilers	
	lbs/hr	tpy	lbs/hr	tpy
Lead	0.013	0.059	0.026	0.118
PCDD/PCDF[a]	1.48e-04	6.47e-04	2.96e-04	1.29e-03
PAH[b]	4.20e-03	1.84e-02	8.40e03	3.68e-02
Other organic compounds[c]	1.856	8.128	3.712	16.256
Total	**10.3**	**44.9**	**20.5**	**89.8**

Source: Bull Mountain Development Company, LLC., 2002b

[a] Polychlorinated Dibenzo-P-Dioxins and Polychlorinated Dibenzofurans
[b] Polynuclear Aromatic Hydrocarbons listed in Table 1.1-13, (AP-42, 1998)
[c] Organic compounds listed in Table 1.1-14, (AP-42, 1998)

Air Pollutant Control Technologies

BACT Analysis

Federal and state regulations require that the Best Available Control Technology (BACT) be employed on each emitting unit at the facility. BACT is a case-by-case determination that is developed based on a balance between technical and economic feasibility and potential environmental impacts of the control alternatives. A BACT analysis utilizes a top-down approach. First, all of the control technologies for the pollutant of concern are listed by control efficiency with the highest control listed first. Second, the control technologies are eliminated based on economic and/or technical infeasibilities. Third, the remaining control technologies are then evaluated based on potential adverse environmental impacts. Those associated with unacceptable impacts are eliminated. Finally, the remaining technology with the highest control efficiency is chosen as BACT.

Under PSD regulations, the proposed facility is required to prepare a BACT analysis for each pollutant that would be emitted at a rate greater than or equal to the significant annual emission rate specified in the regulations. This section provides an overview of the BACT analysis for the two main coal-fired boilers. A detailed discussion of each of the BACT technologies is provided in the air quality permit application.

The BACT analysis for the main boilers addressed the criteria pollutants and sulfuric acid mist (H_2SO_4). Table 4-5 lists the BACT technologies considered for the main boilers.

Table 4-5 Review of BACT Analysis

Pollutant	BACT Considered	Comments
NO_X	Low NO_X Burners and Overfire Air (LNB/OFA)	Controls the stoichiometry and temperature of the combustion flame
	Flue Gas Recirculation (FGR)	Generally used in natural gas-fired units

	Selective Non-Catalytic Reduction (SNCR)	Direct injection of ammonia or urea into the flue gas
	Selective Catalytic Reduction (SCR)	Injection of ammonia into the flue gas in the presence of a catalyst
Particulate Matter	Electrostatic Precipitators (ESPs)	Removes particulate from the flue gas by charging particles and attracting them to charged collection plates
	Fabric Filters (FF)	Fabric bags act as filters to collect particulate matter
Sulfur Dioxide	Fuel Switching	Controlling the amount of sulfur in the combusted coal
	Wet Scrubbing (wet FGD)	Lime or limestone slurry used to remove SO_2 from the flue gas
	Dry Flue Gas Desulfurization (dry FGD)	A lime reagent applied to the combustion gases
Carbon Monoxide	Catalytic Oxidation	No history of use on a coal-fired generation plant
	Thermal Oxidation	No history of use on a coal-fired generation plant
	Proper Boiler Design and Operation	Minimizes the formation of CO
VOCs	Proper Boiler Design and Operation	Minimizes VOC emissions
Sulfuric Acid Mist	Wet Scrubbing (wet FGD)	Approx. 25% control of H_2SO_4
	Wet FGD with wet ESP	ESP provides an additional 90% control of H_2SO_4
	Dry Flue Gas Desulfurization (dry FGD)	Approx. 90% control of H_2SO_4

Source: Bull Mountain Development Company, LLC., 2002b

Table 4-6 lists the BACT technologies proposed for the Project and, for the main boilers only, the proposed emission limits for each pollutant in pounds per hour (lbs/hr). Emission limits for all other sources can be found in the Project's draft air quality permit (see Appendix A).

Table 4-6 Proposed BACT Emission Limits and Control Technologies

Pollutant	Emission Limit Based on Following Criteria (lbs/MMBtu)	Proposed Emission Limit (lbs/hr)	Proposed BACT
NO_X (Main Boilers)	0.07 lb/MMBtu	262 (30-day rolling average)	LNB/OFA and SCR
PM_{10} (Main Boilers)	0.015 lb/MMBtu	56.1	Fabric Filter

Pollutant	Emission Limit Based on Following Criteria (lbs/MMBtu)	Proposed Emission Limit (lbs/hr)	Proposed BACT
SO_2 (Main Boilers)	0.12 lb/MMBtu	448.4 (30-day rolling average)	Dry Flue Gas Desulfurization
CO (Main Boilers)	0.15 lb/MMBtu	560.6	Proper Boiler Design and Operation
VOC (Main Boilers)	0.0030 lb/MMBtu	11.2	Proper Boiler Design and Operation
Sulfuric Acid Mist (Main Boilers)	--	--	Dry Flue Gas Desulfurization
PM_{10} (Material Handling)	—	—	Transfer Points: Spray Dust Suppression/Enclosed Transfer Points and Baghouses Storage Piles: Windbreak Fence and Spray Dust Suppression
Auxiliary Boilers	—	—	Low NOx Burners, low sulfur No. 2 fuel oil, and maximum of 3,300 hours/year operation
Emergency Diesel Generator	—	—	Low sulfur No. 2 fuel oil and maximum of 200 hours/year operation

Source: DEQ Preliminary Determination on Permit Application, Permit #3182-00, 2002b

MACT Analysis

Federal and state regulations require that Maximum Achievable Control Technology (MACT) be applied to emitting units (source categories) that are major sources of hazardous air pollutants (HAPs). MACT is a defined set of emissions limits, monitoring and/or control technologies to be applied to each source category. EPA has established MACT requirements for many source categories. However, for generation plants, the CAAA required that EPA study the public health effects of air toxic emissions from utilities that burn fossil fuels (coal, oil and natural gas) and determine whether it is necessary to regulate those emissions (EPA, 2000). EPA has completed their study, reported to Congress, and recommended “regulation of HAP emissions from coal- and oil-fired electric utility steam generating units under Section 112 of the Clean Air Act is appropriate and necessary” (65 FR 79826). EPA further indicated in a December 14, 2000, Fact Sheet that it would propose regulations for emissions of air toxics from coal- and oil-fired generation plants by December 15, 2003, and issue final regulations by December 15, 2004 (EPA, 2000).

In the situation where a MACT is required, but not yet promulgated, the CAAA requires a case-by-case MACT analysis for a new or reconstructed major source. The Project falls into this category by virtue of being a major source of HAPs and being subject to EPA's finding that regulation of HAP emissions from coal- and oil-fired electric utility steam generating units is appropriate and necessary.

As a major source of HAPs, MACT must be implemented for the two coal-fired boilers. A case-by-case MACT analysis for the main boilers was submitted to DEQ as part of the air quality permit application. As shown in Table 4-7, the design and operation of the boiler combustion systems, along with the planned criteria pollutant control systems (selective catalytic reduction, dry FGD, and fabric filters), are effective in controlling HAPs. The Proponent has proposed that these technologies are the appropriate MACT determination for the Generation Plant and they have proposed that the BACT emissions limits would serve to monitor compliance with MACT requirements.

Table 4-7 Proposed MACT Technology

HAP Category	MACT Technology	Compliance Determination
Acid Gases	Spray Dryer Absorber (SDA)	Compliance with SO_2 BACT limit
Trace Metals	Fabric Filter	Compliance with PM_{10} BACT limit
Radionuclides	Fabric Filter	Compliance with PM_{10} BACT limit
Organic Compounds	Combustion Controls	Compliance with CO and VOC BACT limits

Source: Bull Mountain Development Company, LLC., 2002b

The addition of powdered activated carbon (PAC) for mercury control was also considered in the case-by-case MACT analysis for the Project. A technical paper evaluating mercury controls for generation plants was presented in the Journal of the Air and Waste Management Association titled "Preliminary Estimates of Performance and Cost of Mercury Control Technology Applications on Electric Utility Boilers" (Srivastava, et al., 2001). This paper indicates that control technologies using injection of PAC into the flue gas appear to hold promise for reducing mercury emissions from utility boilers. However, the paper states, "because data are not available on mercury control technology applications involving …boilers firing bituminous coals and using fabric filters (FF), PAC injection rate algorithms could not be developed for these applications." Moreover, the paper concludes that "the performance and cost estimates of the PAC injection-based mercury control technologies presented in this paper are based on relatively few data points from pilot scale tests, and are therefore considered preliminary." Ongoing research efforts are anticipated to address the remaining questions regarding application of mercury controls.

While this research is being conducted, EPA provides a perspective on use of criteria pollutant devices for HAPs control. In a *Federal Register* notice on HAP emissions from generation plants, EPA states, "bituminous coals contain higher concentrations of chlorine and other constituents that promote the oxidation and capture of mercury in conventional pollution control devices" (65 FR 79828). They further state, "dry scrubbers which employ a spray dryer absorber (SDA) in conjunction with an ESP or FF are typically very effective in reducing HAP emissions.

Some coal-fired utilities that use bituminous coal in pulverized coal-fired units have shown mercury capture in excess of 90 percent in SDA/FF systems" (65 FR 79829). EPA would be considering this information as well as the results of ongoing research in preparing a MACT standard for generation plants. The Project would likely be subject to the generation plant MACT standards when they are promulgated.

Air Dispersion Modeling Impacts from the Facility

Air dispersion modeling has been performed to determine the radius of impact of plant emissions from the Project. First, the emissions of NO_X, SO_2, CO, and PM_{10} have been modeled and impacts compared to the PSD modeling significance levels. Based on these results, the radius of impact is established. PSD modeling significance levels have not been established for PM, VOC, or any of the HAPs (i.e., lead, sulfuric acid mist, fluorides, reduced sulfur compounds, and total reduced sulfur) (EPA, 2002, A.R.M.17.8.8, 1996).

Radius of Impact

The radius of impact is the geographic area where the modeled impacts from the plant exceed PSD modeling significance levels contained in the PSD regulations. Modeling significance levels are regulatory impact levels that trigger cumulative analyses, but do not necessarily indicate adverse environmental effects. The size of the Project's radius of impact is pollutant- and averaging-time specific. The modeling receptor network used for cumulative analyses must extend outward as far as necessary to include all receptors whose values equal or exceed the PSD modeling significance levels. Once the most distant "significant" modeling receptor was identified, ambient and PSD analyses were completed for all receptors within the circle drawn around this receptor. Once the radius of impact was established, all minor sources within the radius of impact and all major sources within the radius of impact and 50 km past the radius of impact were included in a cumulative NAAQS/MAAQS and PSD increment dispersion modeling analysis (EPA, 1990). The cumulative NAAQS/MAAQS analysis is presented in Section 4.14.

The modeling results from this radius of impact analysis were also compared to the MAAQS/NAAQS and PSD Class II increments to make sure that the Project, by itself, did not cause a violation of the MAAQS/NAAQS or PSD Class II increment. No Class I area is within the radius of impact; therefore, impacts from this analysis were not compared to the PSD Class I increment.

Modeled Receptors

Model coordinates for the sources and the receptors are expressed as Universal Transverse Mercator (UTM) coordinates, with the elevations obtained from digitized (USGS) maps otherwise known as digitized terrain data (DTD). Beeline-Software created a DTD map that encompasses the entire impact area and beyond to 100 km in all directions. The DTD map is created with high resolution 7.5 minute USGS quadrangle maps out to 50 km in all directions and USGS 3 arc-second data out from 50 to 100 km in all directions.

The ambient air property boundary for the Project is the site fenceline. Modeling receptors were placed at 50-meter intervals along the fenceline, and Cartesian grid receptors were used for the remainder of the modeling as listed below:

- 100-meter spacing from fenceline to 2,000 meters,
- 500-meter spacing from 2,000 meters to 10,000 meters,
- 1000–meter spacing from 10,000 meters to 50,000 meters, and
- Individual receptors at identified house sites in the area.

Refined receptor grids were used around points of peak model-predicted impact (hotspots) with a spacing of 10 meters. Several hotspot receptor grids were developed for each pollutant and averaging time (Bull Mountain Development Company, LLC., 2002b).

Meteorological Data

Five years of meteorological (met) data from 1987-1991 were used for the modeling demonstration. The data are from the National Weather Service (NWS) station at the Billings airport, located approximately 35 miles south of the site. The Billings data are considered representative for the Project site due to nearby location and similar wind patterns. The NWS met data were processed using the latest version of EPA's PCRAMMET preprocessor program. A windrose of five years of Billings met data (Figure 3-1) can be found in Chapter 3.

Project Source Parameters

All of the proposed sources at the Project are included in the modeling. Gaseous pollutants are emitted from fuel combustion in the two main boilers, the two auxiliary boilers, and the emergency generator. Gaseous tailpipe emissions from vehicles were not modeled. Particulate emission sources include the combustion sources, material handling system vents and baghouses, fugitive emissions from the coal pile loading and coal handling, windborne emissions from the active and inactive coal piles, and vehicle road dust.

Annual impacts were predicted based on the proposed annual operating limits for individual sources. Short-term impacts for all pollutants were predicted based on maximum hourly emissions from each source. Emissions from all of the equipment, including the auxiliary boilers and the emergency generator, were modeled on coincident peak to determine the worst-case short-term impacts. Table 4-8 summarizes the modeled parameters for each point source at the Project. Fugitive emissions sources were not included in Table 4-8 because they are too numerous to list and relatively small in nature compared to the point sources (Bull Mountain Development Company, LLC., 2002b).

Table 4-8 Modeling Parameters and Emission Rates for Roundup Power Project Point Sources

Point Sources	Stack Height (ft)	Stack Velocity (fps)	Stack Diameter (ft)	Stack Temp. (F)	Emission Rate Averaging Period	NOx Emission Rate (lbs/hr)	PM_{10} Emission Rate (lbs/hr)	SO_2 Emission Rate (lbs/hr)	CO Emission Rate (lbs/hr)
Main Boiler #1	574	100	17.1	180	Hourly	281.0[a]	60.0[a]	482.0[a]	602[a]
					Annual	261.2[b, c]	56.1[b, c]	448.4[b, c]	
Main	574	100	17.1	180	Hourly	281.0[a]	60.0[a]	482.0[a]	602[a]

Point Sources	Stack Height (ft)	Stack Velocity (fps)	Stack Diameter (ft)	Stack Temp. (F)	Emission Rate Averaging Period	NOx Emission Rate (lbs/hr)	PM_{10} Emission Rate (lbs/hr)	SO_2 Emission Rate (lbs/hr)	CO Emission Rate (lbs/hr)
Boiler #2					Annual	261.2[b, c]	56.1[b, c]	448.4[b, c]	
Auxiliary Boiler #1	260	85	3.5	500	Hourly	19.77[a, c]	1.65[a, c]	6.47[a, c]	4.12[a]
					Annual	3.79[b]	0.32[b]	1.24[b]	
Auxiliary Boiler #2	260	85	3.5	500	Hourly	19.77[a, c]	1.65[a, c]	6.47[a, c]	4.12[a]
					Annual	3.79[b]	0.32[b]	1.24[b]	
Backup Generator	44	132	3.9	224	Hourly	44.22[a]	0.52[a]	0.80[a]	0.95[a]
					Annual	1.01[b]	0.02[b]	0.02[b]	

Source: Bull Mountain Development Company, LLC., 2002b

NOTE:
[a] Worst-case hourly emission rate used for short-term impacts obtained from modeling files submitted with air quality permit application
[b] Annual emission rate used for annual impacts obtained from modeling files submitted with air quality permit application
[c] Emission rate limit obtained from Preliminary Draft Air Quality Permit

Modeling Results

The modeling results presented in this section were used to establish the radius of impact, to determine premonitoring requirements for each pollutant, and to demonstrate that the proposed Project, by itself, would not cause a violation of any NAAQS, MAAQS, or PSD Class II Increment.

Identification of Radius of Impact

Table 4-9 lists the radius of impact modeling results for the Project. The table lists the distance, in miles, to the farthest point (i.e., receptor) at which the radius of impact level is reached. The largest identified radius of impact is 8.1 miles for the SO_2 24-hour averaging period (Bull Mountain Development Company LLC., 2002b). The radius of impact does not extend to the Billings/Laurel area. Therefore, the radius of impact would not extend into any non-attainment area. The results presented in the table also show that Project, by itself, does not cause a violation of the NAAQS/MAAQS. (See Table 4-1 for NAAQS/MAAQS and Class II increment.)

Table 4-9 Radius of Impact Analysis Results

Pollutant	Parameter	1-Hour	3-Hour	8-Hour	24-Hour	Annual
SO_2	Modeling Impact ($\mu g/m^3$)	107.6	53.8	--	19.2	2.4
	PSD Modeling Significance Levels ($\mu g/m^3$)	--	25	--	5	1
	Radius of Impact (miles)	7.4[b]	6.8	---	8.1	6.2
NO_2[c]	Modeling Impact ($\mu g/m^3$)	--	--	--	--	1.4

Pollutant	Parameter	1-Hour	3-Hour	8-Hour	24-Hour	Annual
	PSD Modeling Significance Levels (μg/m^3)	--	--	--	--	1
	Radius of Impact (miles)	---	---	---	---	4.5
PM_{10}	Modeling Impact (μg/m^3)	--	--	--	19.6	1.7
	PSD Modeling Significance Levels (μg/m^3)	--	--	--	5	1
	Radius of Impact (miles)	---	---	---	1.5	0.4
CO	Modeling Impact (μg/m^3)	132.8	--	35.6	--	--
	PSD Modeling Significance Levels (μg/m^3)	2,000	--	500	--	--
	Radius of Impact (miles)	None	---	None	---	---

Source: Bull Mountain Development Company, LLC., 2002b

[a]From modeling files submitted with air quality permit application
[b]Based on Montana 1-hour standard
[c]Based on NO_X modeling results

Since the impacts are above the PSD modeling significance levels but below the NAAQS/MAAQS and Class II increment, the predicted modeling impacts for SO_2, NO_2, and PM_{10} from the proposed Project, by itself, are considered moderate. Furthermore, the facility requires a cumulative impact analysis. Predicted impacts from CO are below the PSD modeling significance levels; therefore, these impacts are considered low.

Identification of Class I Impacts

The CALPUFF model was used for the visibility, Class I increment, and acid deposition analyses. Input variables for CALPUFF, CALMET (met preprocessor), and CALPOST (post-process) are detailed in the modeling protocol that was submitted with the air quality permit application (Bull Mountain Development Company LLC., 2002b).

A Class I AQRV analysis includes potential impacts from the Project on visibility, soils, plants, animals, and potential acid deposition on nearby Class I areas. ISC3 modeling results were used in the screening analysis for impacts to soils, plants, and animals. The screening analysis indicates that the maximum ambient impacts near the facility should be used as screening values for the Class I areas.

Class I Visibility Impacts

The CAA includes provisions for the protection of visibility in certain Class I areas. Visibility protection requirements are included in EPA's PSD program and Montana's air quality permitting program. The rules require that the Proponent demonstrate that the air contaminant emissions from the major source or modification would not cause or contribute to adverse impact on visibility within any federal mandatory Class I area. Class I areas can also be classified as non-federal Class I areas. Non-federal Class I areas are not subject to the same regulations as the federal mandatory Class I areas. These types of areas typically include Indian Reservations. It is important to note, the Montana air quality regulations do not require a cumulative visibility analysis only a visibility analysis from the Project (A.R.M. 17.8.11, 1996). However, the rules adopted pursuant to the Montana Environmental Policy Act (MEPA) state that cumulative impacts must be addressed in an Environmental Impact Statement (EIS)(A.R.M. 17.4.617).

The nearest mandatory Class I areas to the Project are the UL Bend Wilderness Area, located 130 km (81 miles) northeast of the site; Yellowstone National Park (YNP), located 180 km southwest of the site; and North Absaroka Wilderness (NAW), located 180 km (112 miles) southwest of the site in Wyoming near the northeast boundary of YNP. The closest non-federal Class I area is the Northern Cheyenne Reservation (NCR), located 130 (81 miles) km southwest of the site.

The FLAG document suggests that if the daily change in extinction is less than 5% daily then the FLMs are likely not to claim adverse impacts on the Class I area from the facility. If the daily change in extinction is between 5% and 10%, then the FLM is likely to request a cumulative analysis for visibility impairment. Finally, if the daily change in extinction is above 10% from the facility, then the FLM is likely to claim adverse effects on the Class I area and is likely to object to issuance of a final air quality permit unless the facility takes mitigation measures and, as a result, shows no adverse visibility impairment on the Class I area. (USFS, NPS, and USFWS, 2000).

CALPUFF modeling was used for the visibility analysis to assess the reduction in visual range relative to the natural background for these nearby Class I areas. The CALPUFF model used corrected 1990 MM4 met data (as provided by the National Park Service). The CALPUFF modeling results, based on the assumption of maximum emissions (5% overpressure condition) from the Project boilers, are summarized in Table 4-10.

Table 4-10 Visibility Analysis Results for the Roundup Power Project

Class I Area	Days Above 10%	Days Above 5%	Maximum Change (%)
Mandatory Federal Class I Areas			
Yellowstone National Park	1	9	13.0
UL Bend Wilderness	0	4	7.9
North Absaroka Wilderness	1	6	11.1
Non-federal Class I Areas			
Northern Cheyenne Reservation	15	38	41.01

Source: Letter to Dan Walsh, DEQ from Bull Mountain Development Co., L.L.C, 2001; Bull Mountain Development Company LLC., 2002a and Letter to Dan Walsh, DEQ from Diane Lorenzen, Nov. 7, 2002.

Since impacts are above 5% in all federal mandatory Class I areas, a cumulative visibility analysis was completed (see Section 4.14 and Appendix B). Model-predicted impacts are above 10% in YNP and the NAW; therefore, the predicted impacts would be considered high at these two Class 1 areas. The model-predicted impacts are above 5% for the UL Bend; therefore, the predicted impacts would be considered moderate at UL Bend.

Visibility modeling results for the non-federal Class I area (e.g., NCR) are also included. Representative background light extinction data are not available for the NCR; therefore, it is not possible to calculate realistic estimates of the potential change from existing conditions. Since the impacts on the NCR are above 10%, the predicted impacts would be considered high at the NCR.

Class I Increment Impacts

The impacts from the Project to the Class I increment were analyzed to see if the facility was significant to the aforementioned Class I areas. The recognized significance level for Class I increment is 4% of the Class I increment per averaging period and pollutant. If the consumed Class I increment is above 4%, then a cumulative analysis is recommended by the FLM. Table 4-11 summarizes the Class I increment.

Table 4-11 Class I Increment Impacts

Pollutant	Average Period	YNP Impacts ($\mu g/m^3$)	UL Bend Impacts ($\mu g/m^3$)	NAW Impacts ($\mu g/m^3$)	NCR Impacts ($\mu g/m^3$)	PSD Class I Increment ($\mu g/m^3$)	PSD Class I Sig. Level ($\mu g/m^3$)
NO_2	Annual	0.0004	0.0002	0.0004	0.017	2.5	0.1
SO_2	Annual	0.006	0.011	0.007	0.057	2	0.8
	24-hour[a]	0.30	0.29	0.17	0.66	5	0.2
	3-hour[a]	0.86	0.95	0.87	1.65	25	1.0
PM_{10}	Annual	0.001	0.002	0.002	0.009	4	0.16
	24-hour[a]	0.05	0.05	0.03[a]	0.09	8	0.32

Source: Memo to Dan Walsh, DEQ from Diane Lorenzen, P.E. , 2002

[a]Based on High Second High Impact.

Since predicted impacts from the proposed Project, by itself, for NO_2 and PM_{10} are below the PSD Class I significance levels, the impacts are considered low. The predicted impacts for SO_2 are considered moderate because the impacts are above the PSD Class I significance levels and below the PSD Class I increments.

Class I Acid Deposition Impacts

The CALPUFF modeling produced estimates of Class I acid deposition impacts. Deposition values are reported for total nitrogen (N) and total sulfur (S) in units of kilogram per hectare per year (kg/ha/yr). The total N deposition values are the sum of the dry NO_X, dry NO_3, dry HNO_3, wet NO_3, and wet HNO_3 deposition. The total S deposition is the sum of dry SO_2, wet SO_2, dry SO_4, and wet SO_4 deposition. Peak modeled deposition rates for the Class I area receptors are presented in Table 4-12. The recommended DAT for acid deposition for either S or N deposition is 0.005 kg/ha/yr (NPS and USFWS, 2002).

Table 4-12 CALPUFF Modeling Deposition Results

Class I Receptor Location	Peak Impact Total N Deposition (kg/ha/yr)	Peak Impact Total S Deposition (kg/ha/yr)
Yellowstone National Park	4.17E-04	3.31E-03
UL Bend Wilderness Area	1.46E-03	1.02E-02
North Absaroka Wilderness Area	4.49E-04	3.64E-03

Source: Letter to Dan Walsh, DEQ from Steven T. Wade, 2002

Only the S deposition at the UL Bend Wilderness area is above the DAT of 0.005 kg/ha/yr. Therefore, these predicted impacts would be considered moderate since they do not exceed 0.125 kg/ha/yr. At this level, the FLM may request a cumulative analysis for the Class I area. However, the DAT is only a screening value, which is 4% of the level of concern for adverse impacts to the Class I area (NPS and USFWS, 2002). Since no other major SO_2 emitting sources are within 200 km of the UL Bend Wilderness and the S deposition is only 8.2% of the level of concern, a cumulative S depositional analysis is considered not necessary. The remaining predicted acid deposition impacts are below 0.005 kg/ha/yr; therefore, the predicted impacts would be considered low.

Class II Acid Deposition Impacts

Deposition of sulfur and nitrogen in Class II areas is also of concern due to the potential effects of acid deposition on surface waters. Deposition values were obtained from the CALPUFF modeling for several receptors in the Class II areas surrounding Yellowstone National Park. Table 4-13 lists the deposition values for individual Class II area receptors.

Table 4-13 Nitrogen and Sulfur Deposition at Critical Class II Receptors Near Yellowstone National Park

Receptor Description	Total N Deposition (kg/ha/yr)	Total S Deposition (kg/ha/yr)
Sunset Peak	4.04E-04	3.33E-03
Meridian Peak	3.90E-04	3.25E-03
Wolverine Peak	4.08E-04	3.35E-03
Mount Abundance	4.26E-04	3.44E-03
Cooke City Ranger Station	3.75E-04	3.16E-03
Granite Peak	6.10E-04	3.56E-03
Mystic Lake	7.70E-04	3.42E-03
Monument Peak	5.32E-04	3.85E-03
Twin Outlet Lake	5.61E-04	4.34E-03
Stepping Stone Lake	5.15E-04	4.04E-03

Source: Bull Mountain Development Company, 2002a.

None of the predicted total S or N deposition values at any of the Class II areas are above 0.005 kg/ha/yr; therefore, the predicted impacts would be considered low. Also, the Gallatin National Forest Service in a letter to DEQ dated June 6, 2002, stated that an analysis was conducted based on the deposition results in Table 4-13. The Forest Service concluded that the Project's impacts from deposition would be considered low on these Class II areas (Story, 2002)

Class I Screening Impacts on Plants, Soils, and Animals

An EPA screening document was used to determine the impact of increases in SO_2, CO, NOx, and VOC from the Project (EPA, 1980). The screening document provides information on the levels of air pollution that result in damage to plants, soils, or animals or an increase in sensitivity to the air pollutants. For the purpose of this analysis, all of the VOC emissions are assumed to be converted to ozone. The results in Table 4-14 show that the predicted impacts from the proposed Project are below the sensitive species concentrations; therefore, the predicted impacts would be considered low.

Table 4-14 Existing Ambient Air Quality Concentrations Values

Pollutant	Averaging Time	Sensitive Species[a] ($\mu g/m^3$)	Predicted Impact ($\mu g/m^3$)
Nitrogen Dioxide	4 hour	3,760	153
	8 hour	3,760	86.3
	1 month	564	74.6[b]
	1 year	94	1.02
	1 hour	392	19.8
Ozone (as VOC)	4 hour	239	8.91
	8 hour	67.9	5.03
	1 hour	1,725	106
Sulfur Dioxide	3 hour	1,125	52.8
	1 year	18	2.36
Lead	3 months	1.5	0.0025
Carbon Monoxide	1 week	1,800,000	23.7[b]

Source: Bull Mountain Development Company, LLC., 2002b

[a]Sensitive species are listed in Table 3.1 of the screening document
[b]Based on 24-hour modeling impact

Screening Impacts From Heavy Metals

The EPA screening document was also used to examine heavy metal contamination in the soil that may affect soils, plants, and animals (EPA, 1980). Ambient impacts obtained from the ISC3 model were calculated based on annual modeling results. Modeled concentrations of metals were converted to a deposited concentration then compared to screening values by the following equation (Bull Mountain Development Company LLC., 2002b).

DC = Deposition Concentration (ppm) = 21.5 * (N/d)X

Where:

N =Lifetime of facility in years = 40 years

d =depth of soil for deposited material = 3 cm

X = maximum annual average concentration

The results of the calculations are compared with screening levels from the screening document and presented in Table 4-15.

Table 4-15 Screening Analysis for Heavy Metal Deposition in Soils

Metal	Maximum Annual Average Concentration ($\mu g/m^3$)	Deposited Concentration (ppm)	Screening Values (ppm)		
			Soil	Plant	Animal
Arsenic	$3.30x10^{-5}$	$9.46x10^{-3}$	3	1.8	21
Cadmium	$1.45x10^{-5}$	$4.16x10^{-3}$	2.5	0.28	1.4
Chromium	$6.12x10^{-5}$	$1.75x10^{-2}$	8.4	50	---
Cobalt	$2.70x10^{-5}$	$7.74x10^{-3}$	1,000	280	180
Fluoride	$6.62x10^{-3}$	1.90	400	10,300	3,300
Manganese	$2.33x10^{-4}$	$6.68x10^{-2}$	2.5	6,100	7,600
Mercury	$6.55x10^{-5}$	$1.88x10^{-2}$	455	--	--
Nickel	$7.55x10^{-5}$	$2.16x10^{-2}$	500	1,300	22,000
Lead	$1.14x10^{-4}$	$3.27x10^{-2}$	1,000	280	180
Selenium	$6.98x10^{-4}$	0.20	500	1,300	22,000

Source: Bull Mountain Development Company LLC., 2002b

Since the deposited concentrations are below the screening values, it is presumed that heavy metal deposition during the proposed life of the Project would have low impacts to soils, plants, and animals.

Greenhouse Gas Estimates

This section provides information on emissions that could increase the concentration of greenhouse gases that contribute to the “greenhouse effect” in the atmosphere. The greenhouse effect is described in the “Introduction to Estimating Greenhouse Gas Emissions”(EPA, 1999) as:

> The Earth naturally absorbs and reflects incoming solar radiation and emits longer wavelength terrestrial (thermal) radiation back into space. On average, the absorbed solar radiation is balanced by the outgoing terrestrial radiation emitted to space. A portion of this terrestrial radiation, though, is itself absorbed by gases in the atmosphere. The energy from this absorbed terrestrial radiation warms the Earth’s surface and atmosphere, creating what is known as the “natural greenhouse effect.” Without the natural heat-

trapping properties of these atmospheric gases, the average surface temperature of the Earth would be about 34 degrees Celsius (93 degrees Fahrenheit) lower.

The greenhouse effect is primarily a function of the concentration of water vapor, carbon dioxide, and other trace gases in the atmosphere that absorb the terrestrial radiation leaving the surface of the Earth. Changes in the atmospheric concentrations of these greenhouse gases can alter the balance of energy transfers between the atmosphere, space, land, and the oceans. A gauge of these changes is called radiative forcing, which is a simple measure of changes in the energy available to the Earth-atmosphere system. Holding everything else constant, increases in greenhouse gas concentrations in the atmosphere would produce positive radiative forcing.

The United Nations Environment Programme has established the Intergovernmental Panel on Climate Change (IPCC) to "assess the scientific, technical and socio-economic information relevant for the understanding of the risk of human-induced climate change" (IPCC 2002). The IPCC has developed a global warming potential (GWP) factor for most of the direct greenhouse gases. The GWP is defined as the cumulative radiative forcing—both direct and indirect—over a 100-year period.

Direct effects occur when the gas itself is a greenhouse gas. Indirect radiative forcing occurs when chemical transformations involving the original gas produce a gas or gases that are greenhouse gases, or when a gas influences the atmospheric lifetimes of other gases. The forcing is measured relative to a reference gas, carbon dioxide (CO_2), and is expressed in terms of metric tons of carbon equivalent. GWP factors have not been established for the indirect greenhouse gases because there is no agreed-upon method to estimate the contributions of the gases to radiative forcing.

A quantitative emissions inventory of the greenhouse gas emissions from the Project is provided in this section, based on EPA guidance and calculation methodologies. Direct greenhouse gases, including CO_2, methane (CH_4), and nitrous oxide (N_2O), are formed during the combustion of fossil fuels. The indirect greenhouse gases that are emitted from the combustion of fossil fuels include NO_X, CO, and non-methane volatile organic compounds (NMVOCs). Other direct greenhouse gases, which are not products of coal combustion, include chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).

The primary greenhouse gas emitted from coal burning is CO_2. Most of the carbon contained in fossil fuels is emitted as CO_2 during the fuel combustion process. The remainder is emitted as CO, CH_4, or NMVOCs, all of which oxidize to CO_2 in the atmosphere within a time range of a few days to about 11 years. Table 4-16 lists the estimated greenhouse gas emissions from the Project in several different units of measure.

Table 4-16 Estimated Roundup Power Project Greenhouse Gas Emissions

Gas	Emissions (ton/yr)	Emissions (lb/MWh)	Emissions (metric tons/yr)	Emissions (kg/MWh)
CO_2	8,199,803	2,496	7,454,366	2,269
CH_4	65.96	0.020	60	0.018

Gas	Emissions (ton/yr)	Emissions (lb/MWh)	Emissions (metric tons/yr)	Emissions (kg/MWh)
N_2O	49.56	0.015	45	0.014
CO	4,917	1.50	4,470	1.36
NO_X	2,329	0.709	2,117	0.645
NMVOC	99.45	0.030	90	0.028

Source: Bull Mountain Development Company, LLC., 2002a.

Table 4-17 summarizes the Project greenhouse gas emissions relative to the US (year 2000) trends for greenhouse gasses. The table also lists the total greenhouse gasses from electric generation and transportation in US. The greenhouse gas emissions from the Project are calculated to be approximately 0.12 % of the total greenhouse gas emissions in the US.

Table 4-17 Estimated Greenhouse Gases in US and from the Project

	Emissions (million tpy)	% of Total US Greenhouse Gases
US Trends for all Greenhouse Gases	7001	--
Electric Generation for all Greenhouse Gases	2376	33.94%
Transportation for all Greenhouse gases	1877	26.81%
Roundup Power Project	8.2	0.12%

Source: EPA Specific Emission Inventory, 2002.

The data in Table 4-16 and Table 4-17 provide information needed to compare the greenhouse gas emissions from the Project to nationwide greenhouse gas emissions. No basis exists for determining the severity of greenhouse gases impacts on global warming; therefore, an impact level cannot be assigned.

161kV Transmission System

No impacts to existing air quality are expected from the 161kV Transmission System except during construction activities. Fugitive dust emissions would be expected during construction but would cease after construction has ended. As such, adverse effects to air quality are expected to be low from the 161kV Transmission System.

4.2.3 Action Alternatives

Landfill Alternative

No significant increase of fugitive emission impacts is expected from an expansion of the landfill for waste disposal. Fugitive emissions may slightly increase and/or change location for this alternative. New fugitive emissions would also occur during the construction of the landfill and cease after construction has ended. Therefore, adverse effects to the airshed from this alternative are expected to be similar to those described for the Proposed Action.

230kV Transmission System

No impacts to existing air quality are expected from the alternative 230kV Transmission System except during the construction. Fugitive dust emissions would be expected during construction but would cease after construction has ended. Therefore, low adverse effects to the airshed are expected from a 230kV Transmission System.

Summary of Impacts

Table 4-18 summarizes the potential impacts to air resources from the proposed actions and the alternative actions. The proposed activity, potential impact, and impact severity are outlined in the table.

Table 4-18 Summary of Potential Impacts to Air Resources

Proposed Activity	Potential Impact to Air Resources	Impact Severity
Proposed Actions		
Generation Plant	NAAQS/MAAQS	Moderate for PM_{10}, NO_2, SO_2. Low for CO.
	PSD Class II Increment	Moderate for PM_{10}, NO_2, SO_2. Low for CO.
	PSD Class I Increment	Moderate for SO_2 at Yellowstone National Park, North Absaroka Wilderness, UL Bend Wilderness, and Northern Cheyenne Reservation. Low for NO_2 and PM_{10} at Yellowstone National Park, North Absaroka Wilderness, UL Bend Wilderness, and Northern Cheyenne Reservation.
	Class I Visibility	High at Yellowstone National Park, North Absaroka Wilderness, and Northern Cheyenne Reservation. Moderate at UL Bend Wilderness.
	PSD Class I Acid Deposition	Moderate at UL Bend Wilderness. Low at Yellowstone National Park and North Absaroka Wilderness.
	PSD Class II Acid Deposition	Low at specific Class II areas surrounding Yellowstone National Park.
	PSD Class I Impacts from Gaseous Pollutants to Plants, Soils, and Animals	Low compared to screening levels.

Proposed Activity	Potential Impact to Air Resources	Impact Severity
	PSD Class I Impacts from Heavy Metals to Plants, Soils, and Animals	Low compared to screening levels.
	Greenhouse Gas Emissions	No basis exists to measure severity on global warming.
160 kV Transmission System	Fugitive Emissions – Emissions of PM_{10} from Construction	No impacts to existing air quality are expected from the 160kV Transmission System except during construction.
Alternative Actions		
Landfill Alternative	Fugitive Emissions – Emissions of PM_{10} from Construction	No significant increase of fugitive emission impacts is expected from an expansion of the landfill for waste disposal.
230kV Transmission System	Fugitive Emissions – Emissions of PM_{10} from Construction	No impacts to existing air quality are expected from the 230kV Transmission System except during construction.

4.2.4 Mitigation Measures

Mitigation measures, actions that could be taken to reduce impacts but that cannot be required through DEQ's statutory authority, can be enforced if the Project proponent requests that they be incorporated into a permit. Suggested mitigation measures for the Project and alternatives are provided in Chapter 2, Section 2.2.5 in the Air Quality subsection. Measures include dust control, coal cleaning and handling techniques, and emission control technologies.

Coal cleaning and/or coal preparation (e.g., drying) technologies are a potential means of reducing virtually all criteria pollutant emissions and many HAP emissions by improving heat rate and boiler efficiency. Those technologies can have both a direct and indirect effect on emissions, with the magnitude of the effect dependent upon the coal characteristics and the use of other pollutant controls.

Coal cleaning can directly affect emissions by removing impurities in the coal, which ultimately leave the process as air pollutants. For example, coal cleaning can remove pyretic sulfur from the fuel and, as a result, reduce sulfur dioxide emissions from the boiler, expressed as pounds per million Btu of heat input. Coal cleaning may also reduce the amount of mercury in the coal and, therefore, the amount of mercury emitted from the boiler.

Coal cleaning can indirectly affect the emission rates for virtually all criteria pollutants by removing impurities (coal cleaning) and by increasing the heating value of the coal (coal cleaning and drying). For example, removing precursors to ash can improve heat transfer efficiency in the furnace section of the boiler by reducing ash and improving ash chemistry relative to slagging. Removing moisture from the coal may serve to avoid the need to provide heat for vaporization and may reduce the amount of gas (by reducing water vapor) that must be moved by the fan. In both cases, it may mean less heat input would be needed to obtain a given amount of energy out. Traditional coal cleaning processes require available water and handling/disposal of water used in the cleaning process. Because of these water issues, coal cleaning was rejected as a potential emissions control technology during the Project BACT analysis.

A dry coal cleaning process under development in North Dakota may hold promise for reducing emissions from coal-fired generation plants. Current development of the technology is being done on lignite-fired generation plants in North Dakota, where it holds promise for reducing both criteria pollutants and HAPs. A feasibility and cost effectiveness study would need to be conducted to determine if this developing technology has application to the Project.

The proponent has recommended 80% NOx control efficiency for the proposed SCR unit. Literature reports that SCR units can achieve up to 90% NOx control. The NOx BACT discussed and eliminated a higher control efficiency of 90% for an SCR unit. Nevertheless, a higher NOx control efficiency from the SCR unit (between 80% and 90%) could be achievable and could mitigate some impacts from NOx emissions. A cost optimization study to balance the reductions in NOx emissions with the costs of mandating a higher NOx control efficiency would better define the appropriate level of NOx control.

Greenhouse gas reduction programs have been part of agreements between power plant developers and environmental protection organizations to settle appeals of air quality permits for new power projects in Montana. Carbon sequestration has been a proposed mitigation measure for reducing impacts from greenhouse gases emitted from the power projects. One agreement settling an appeal of a natural gas fired power generating facility specified carbon sequestration through the planting of 100,000 trees. Other proposed mitigation strategies in these proposals have included funding and implementing energy conservation programs (e.g., purchase of energy efficient light bulbs, preparation of energy education programs and conservation incentives, etc.). In a natural gas-fired plant permit appeal, the developer agreed to purchase 50, 000 efficient light bulbs for distribution to electricity consumers.

4.2.5 No-Action Alternative

Under the No-Action alternative, the Project would not be built; therefore, no impacts to air quality would occur as a result of the Project.

4.3 Water Resources

This section describes the types of impacts that would potentially occur to surface and groundwater resources from construction and operation of the proposed Project and its alternatives as described in Chapter 2. Mitigation measures and Project design used to reduce or eliminate potential impacts to surface water and groundwater resources are also discussed.

4.3.1 Methods

In order to assess the impacts associated with construction and operation of the Project (Generation Plant and Transmission System), the proposed construction, operation and maintenance activities were reviewed. Information was obtained from the Supplemental EIS Support Document (Bull Mountain Development Co., LLC, 2002a) for background information on the water resources analysis. The Bull Mountains Mine FEIS (Montana Dept. of State Lands,

1992) and the Railroad Spur Checklist EA (DNRC, Trust Land Management Division, FF) were also used as references for this assessment. A professional determination, based on the topography and locations of sensitive features, was then made of how these activities may impact water resources.

Impact Levels

Impacts on water resources would be classified in this document as high if the action being considered would result in one or more of the following:

- A substantial degradation of surface or groundwater quality to the extent that beneficial uses are affected or impacts would result in either the short or long-term violation of state or federal agency water quality standards or objectives
- Substantial erosion, scour, or siltation that would affect public water supplies or aquatic life
- An alteration of existing drainages in a manner that could substantially negatively affect listed and/or sensitive species or associated habitats
- The possibility of oil spills from the oil storage tank or plant equipment reaching surface or groundwater where no spill containment or protective measures are used
- Construction would substantially alter recharge to an aquifer resulting in a decrease in local well production rates
- Plant supply well withdrawals would impact other users on the Madison Aquifer

Impacts on water resources would be classified in this document as moderate if the action being considered would result in one or more of the following:

- New roads would be constructed across a stream or where existing stream crossings are inadequate and would require re-building
- Impacts would be primarily short-term, with an increase in normal erosion rates for a few years following soil disturbance until erosion and drainage controls become effective
- There would be little possibility of oil spills or other pollutants affecting surface or groundwater, and facilities have some minor spill protective measures
- Surface or groundwater quality degrades in violation of state or federal standards, but can be partially mitigated to lessen impacts
- Construction alters recharge to an aquifer resulting in a short term change in groundwater levels

Impacts on water resources would be classified in this document as low if the action being considered would result in one or more of the following:

- Impacts to water quality could be easily mitigated to state or federal standards with common mitigation measures and Project design
- There would be little possibility of oil or other pollutants affecting surface or groundwater, and facilities have good spill containment protective measures

- Structures would be away from water bodies and little or no sediments would reach the water
- Extraction rates in production wells caused only localized drawdown in the screened aquifer

No impact would occur where water quality or groundwater levels would remain unchanged.

4.3.2 Proposed Action

There are several general adverse impacts to water resources that could potentially be caused by the Project:

- Runoff can increase sedimentation and water turbidity
- Capture of runoff can decrease downstream water availability
- Contamination of surface water or groundwater can occur due to spills, runoff, or leachate from plant operation or landfills
- Road improvements and vehicular traffic at stream crossings can increase turbidity and alter stream channels
- Clearing streamside vegetation can increase a stream's exposure to sunlight, possibly raising water temperature
- The impervious area occupied by the plant and waste landfills can eliminate recharge from natural sources
- Water produced from wells drilled for the plant could alter or lower water levels in local aquifers if the new plant production wells were not cased through the shallow aquifer

Generation Plant

Direct impacts from the Project's Generation Plant include disturbance of approximately 208 acres of watershed that would be removed from the Rehder Creek and Halfbreed Creek drainage basins. This acreage amounts to a very small percentage (less than ½ of 1%) of the total drainage areas for Rehder and Halfbreed Creeks. All precipitation that falls within the boundaries of the plant facilities, and would normally run off into nearby drainages, would be contained in a "zero discharge" sediment control system. This system would contain all waters used in the Generation Plant operations, along with storm water diverted into sediment control ponds. Water from this system would be recycled within the Generation Plant.

The storm water flow across undisturbed areas of the site would be maintained with storm water discharging to natural drainage courses. The storm water drainage system for the Generation Plant Study Area would be designed to discharge the peak 10-year, 24-hour runoff without backup of water in the sewer and ditch systems, and the 50-year, 24-hour runoff without flooding roads or equipment areas.

Storm water runoff from the Generation Plant Study Area would be collected in three storm water detention ponds. These ponds would detain the runoff to settle suspended solids and reduce downstream flooding. Each pond would be designed to contain storm water runoff from a 25-year, 24-hour storm event

There is a leachate collection pond designed to store storm water from waste disposal cells 1 and 2. The collection pond would be designed for an appropriate storm event and is expected to be less than 10 acre-feet when designed.

Since there are no surface water bodies or streams in the Generation Plant Study Area, no direct or indirect impacts are anticipated.

No impact would occur to groundwater if the "zero discharge" system is properly implemented and does not experience any unplanned releases. The Generation Plant Study Area is located on rocks of the Fort Union Formation, which is composed of sandstone, siltstone, claystone, and coal beds. No coal mining would occur in this area. The downward movement of fluids originating from releases or storm water overflow into these sediments would be retarded by the low hydraulic conductivity and permeability of the shale and silt interbeds. If a regulated material or petroleum hydrocarbon release occurs and impacts the subsurface, standard release and investigation site characterization and remediation measures would minimize impacts to groundwater. The potential for releases would be decreased by the routine observation of containment berms, sumps and floor areas as required by MPDES permits, landfill management operation and maintenance guidelines, and the proponent's Best Management Practices to be defined as part of the water permitting process.

Two aquifers may be impacted from construction of the Generation Plant. Local domestic wells produce water from shallow perched aquifers in the Fort Union Formation. Production wells for the plant would be completed in the deeper Madison Aquifer. The wells associated with this Project would extract water from the Madison Aquifer, and are not likely to influence local shallow aquifers.

The supply wells produce a minimum of 1,050 gallons per minute (gpm) required for the Generation Plant. These wells would be drilled approximately 8,500 feet below ground surface (bgs) into the Madison Aquifer. The wells would penetrate approximately 600 feet into the Madison Aquifer.

Twenty-six separate geologic formations occur between the surface aquifers and the deeper Madison Aquifer. These formations contain thousands of feet of impermeable geologic strata in the form of clays and shales, which can restrict vertical movement of water between aquifers. The potential for impact on the shallow aquifer from withdrawals originating in the Madison Aquifer is low.

The Madison Aquifer has hydrostatic pressure that would cause water to rise upward in wells installed by the Project. The elevated hydrostatic pressures in the Madison Aquifer would likely result in water levels rising in the well casings to within 300 feet of the surface. These deep wells would require proper installation in accordance with A.R.M. 36.21.660 of the Montana Department of Natural Resources and Conservation (DNRC), Water Resource Division to minimize the potential of commingling of water from different aquifers.

Recharge in the Madison Aquifer comes from mountain ranges tens to hundreds of miles distant. There are no local users of the Madison Aquifer near the Generation Plant Study Area. The proposed production rate is considered slight in comparison to the total water resource available in the Madison Aquifer.

Wells currently being used by local homeowners and ranchers produce water from shallow aquifers in the Fort Union Formation. The shallow aquifers gain water mainly through recharge from precipitation and leakage from underlying near surface aquifers. Elimination of the recharge area beneath the Generation Plant footprint may influence local shallow aquifers. If the recharge area of a particular aquifer is to a great degree altered by the Generation Plant, the aquifer may experience a slight decrease in productivity.

On-site waste disposal by landfill is proposed for the initial ten-year Generation Plant operation. Subsequent to the ten-year period, solid waste would be transported and stored in the Mine for disposal. The impacts of storing solid wastes in the Mine are unknown at this time and would require additional investigation prior to beginning that phase of the Project. Unknown factors associated with Mine storage of the solid waste include:

- Conveyance type and route to the Mine site
- Estimated size of the proposed underground landfill
- Relationship of the landfill area to groundwater levels
- Hydrogeologic characteristics of the area of the Mine to receive the waste
- Relationship of the waste storage site to groundwater recharge and discharge pathways
- Leaching characteristics of the waste

Potential impacts for underground storage of solid waste cannot be quantified at this time, but could include elevated concentrations of TDS and metals, and impacts to spring and well production due to replacement of the aquifer material (coal) with the low permeability ash waste. Additional environmental review may be necessary when plans are prepared and reviewed before Mine storage construction begins.

161kV Transmission System

Direct impacts would be caused by access road construction or improvements, maintenance activities, right-of-way clearing, and site preparation for structures and work areas. Several ephemeral drainages may be crossed. Existing roads and fords would be used wherever feasible, however, new culverts or fords may be required in some locations. No perennial streams would be crossed.

A portion of the proposed Transmission System crosses the Hay Basin lakebed east of State Highway 3 approximately 12 miles east of Broadview. This area is underlain by lakebed deposits consisting of silt and clay. Because these soils are poorly drained, runoff from higher lying land may cause the area to pond for several days or weeks following heavy rains or snow melt. Groundwater is likely to be less than three feet below ground surface (bgs) during portions of the year. Construction impacts would be minimized by avoiding this area during the wet period, or construction of an all-weather access road. Construction and maintenance impacts to this area could be eliminated by avoiding this area and rerouting the alignment.

At this time, exact crossing locations are not known. Until final designs are completed, the amount of ground disturbance and number of crossings is not known. Following construction, implementation of mitigation measures listed below including erosion control and revegetation would reduce impacts to a minimum and would not cause degradation of water quality below state or federal standards.

4.3.3 Action Alternatives

Landfill Alternative

Potential impacts from an alternative that includes expanding the on-site landfill would be similar to those described for the Proposed Action. All plant operations involving products that could contaminate surface or groundwater would have containment systems as described above. As such, impacts to surface water bodies or groundwater would be low.

230kV Transmission System

Impacts associated with an alternative that includes construction and operation of a 230kV system would be substantially the same as the impacts described for the Proposed Action utilizing a 161kV system. Road construction or improvement, and ground disturbance resulting from site preparation and right-of-way clearing would be identical. Following construction, implementation of mitigation measures listed below including erosion control and revegetation would reduce impacts to a minimum and would not cause degradation of water quality below state or federal standards.

4.3.4 Mitigation Measures

Since no perennial streams would be impacted at the Generation Plant Study Area or the Transmission System Study Area, the Montana Natural Streambed and Land Preservation Act (310) permit would not be required. Prior to construction, a jurisdictional determination would be requested from the U.S. Army Corps of Engineers to confirm that no jurisdictional waters occur in the Generation Plant Study Area or the Transmission System Study Area. If this were the case, no 404 permit would be required. Storm water permits associated with construction activities and industrial operations would be required (Refer to Table 1-1 in Chapter 1).

The following measures, associated with the Proposed Action and alternatives, would be enforceable as part of the DEQ water permitting processes (identified in Table 1-1, Chapter 1):

- Process wastewater from construction and operations would not be released into surface water or soil for migration to shallow groundwater
- Herbicides used for weed control would be applied according to the label instructions and by qualified personnel.
- Transmission system structures would be engineered and located to span streams and drainages.
- To minimize erosion and sedimentation transport in identified sensitive areas, temporary control measures (e.g. silt fences, straw bale fences, terracing, water bars, matting,

settling ponds, or other erosion control techniques) may be installed prior to and during construction.

- Water supply wells would be completed in accordance to DNRC regulations in a manner to prevent commingling of shallow and deep aquifer waters.

The regulatory agency does not have the authority to create mitigation measures that they can enforce, without the direct consent of the Project proponent. Mitigation measures proposed for water resources is listed in Chapter 2, Section 2.2.5 in the Water Resources subsection.

- Alternate water supplies may be necessary for a small number of wells that are proven to be directly influenced by reduction of recharge due to the plant construction.
- Installation of groundwater monitoring wells near the landfill area would serve to identify groundwater impacts from leachate releases. Groundwater monitoring wells should be installed prior to startup of landfill operation in order to establish baseline conditions. A minimum of three groundwater-monitoring wells would be required to characterize groundwater quality and flow direction beneath the landfill area.

Measures recommended for other resources would also further reduce or eliminate impacts to surface waters and groundwater.

4.3.5 No-Action Alternative

With the No-Action Alternative, there would not be any impacts to the surface water or groundwater resources of the area, beyond those that may be caused by the Mine and other existing actions.

4.4 Earth Resources

This section describes the types of impacts that would potentially occur to earth resources from construction, operation and maintenance of the Project, and alternatives as described in Chapter 2. Mitigation measures and Project design used to reduce or eliminate potential impacts to earth resources are also discussed.

4.4.1 Methods

In order to assess impacts to earth resources resulting from the Project or alternatives to the Project, the proposed construction, operation and maintenance activities were reviewed. Information was obtained from the Supplemental EIS Support Document (Bull Mountain Development Co., LLC, 2002a) for background information on earth resources. The Bull Mountains Mine FEIS (Montana Dept. of State Lands, 1992) and the Railroad Spur Checklist EA (DNRC, Trust Land Management Division, 2002) were also used as references for this assessment. of earth resources. A professional determination, based on the topography and locations of sensitive features, was made of how the Project and alternatives would potentially impact earth resources.

Impact Levels

Impacts on earth resources would be classified in this document as high if the action being considered would result in the following:

- Construction or clearing would be required on slopes that are prone to mass movement or have very high susceptibility to erosion
- Soil properties would be so unfavorable or difficult that standard mitigation measures such as revegetation, would be ineffective
- Long-term impacts associated with accelerated erosion, sedimentation, or disruption of unstable slopes would occur
- Destruction of unique geologic features or resources would be required
- A large volume release of fuel oil from an uncontained area that would flow overland and pool in drainages and swales

Impacts on earth resources would be classified in this document as moderate if the action being considered would result in the following:

- Impacts would be primarily short-term, with an increase in normal erosion rates for a few years following soil disturbance until erosion and drainage controls become effective
- Soil properties and site features are such that mitigation measures would be effective in controlling erosion and sedimentation to acceptable levels
- There would be little possibility of oil spills or other pollutants affecting surface soil, and facilities have some minor spill protective measures

Impacts on earth resources would be classified in this document as low if the action being considered would result in the following:

- There would be little possibility of oil or other pollutants impacting soil, and the facilities have adequate product spill prevention and containment measures
- Facility construction and clearing would be performed on soils with low to moderate erosion hazard, and the potential for mitigation would be good using standard erosion and runoff control practices

No impact would occur where earth materials would remain unchanged.

4.4.2 Proposed Action

There are several general impacts of concern relating to earth resources that potentially could result from the Project:

- Surface disturbance can increase the potential for wind and water erosion of exposed soils
- Soil contamination can occur due to spills, runoff, or leachate from plant operation

Generation Plant

Construction of the Generation Plant and associated facilities could slightly alter the surface topography of an existing plateau. In addition to the general site grading, there would be some additional topographic alteration to facilitate ponds, ditches, and the solid waste disposal and coal storage and handling areas. The estimated total surface disturbance is expected to be approximately 208 acres. This acreage would be irreversibly altered due to the development activities. The anticipated level of impacts to geologic features are low for construction of the Generation Plant and appurtenances.

Table 4-19 summarizes the soils impacts. An average of three inches of soil would be salvaged over the 208-acre Generation Plant site, for a total of about 83,570 cubic yards. This soil would be stored in four stockpiles located around the property. The soil would be available for future reclamation activities.

Table 4–19 Summary of Impacts on Geology and Soils from Construction and Operation of the Proposed Roundup Power Project

Impact	Impact Level	Rationale
Geologic features would be disturbed	Low	No unique or irreplaceable features present in the construction footprint
Increased soils erosion and offsite sedimentation	Low to moderate	Soil would be affected on about 208 acres. Soil would be salvaged to an average depth of three inches over this area. Wind and water erosion during construction would be minimized using standard practices stipulated in water and air quality permits. Some salvaged soil would be spread on sediment dam faces or other exposed subsoil areas following construction. Stockpiled soils and all soiled surfaces would be revegetated. Sediment ponds would be maintained to prevent downstream releases of sediment.
Soil contamination from leachate leakage or product spills	Low	Ponds, landfills, and fuel tank areas would be designed with protective barriers to prevent migration of liquid from source areas.
Long-term loss of soil productivity	Low	Soils productivity would be reduced over the short-term, but would be recovered over the long-term.

Construction activities, including soil salvage, would increase the potential for wind and water erosion and offsite sedimentation. Water and wind erosion on the site would be controlled using practices established for other environmental permits, particularly water quality and air quality permits. Sediment control dams would be constructed and maintained through the life of the Project to prevent offsite sedimentation. These impacts would be further mitigated by timely soil replacement and revegetation after construction of exposed surfaces such as the outfaces of sediment control dams, dikes, slopes, and other “idle” areas within the Generation Plant site.

The remaining salvaged soil would be stockpiled until needed to cover the solid waste disposal cells. These cells would be covered with a minimum of six inches of salvaged soil. Since the surface area of the cells would be approximately 25.6 acres, it would require a minimum of about 20,660 cubic yards of soil to cover these cells. It may be 10 years or longer before this soil is needed. While the chemical and physical characteristics of the soils to be stripped are generally conducive for reclamation, it is reasonable to assume that some soil productivity would be lost during long-term storage due to potential changes in soils structure and texture, and reduced biological activity and nutrient content. Soils spread over the waste disposal cells would be revegetated. If necessary, mulching, fertilization and noxious weed control would be used to enhance revegetation success. Following replacement and revegetation, microorganisms should naturally recolonize these soils within a few years.

Sanitary water effluent would be discharged to the shallow subsurface in an engineered drainfield. Construction of the drainfield would cause permanent, localized saturation in the soil column beneath the drainfield, and add increased nitrogen, phosphate, TDS, and coliform loads to the current condition. Septic system design in accordance with DEQ regulations would result in low impact to the local soil conditions.

Impacts to shallow soil may occur from introduction of contaminants arising from wastewater pond or landfill leachate, releases from the 400,000-gallon fuel oil tank and rail car unloading area, sumps, other chemical usage areas, and uncontrolled surface spills. The landfill is exempt from Montana Solid Waste Management Act regulation, but would be constructed as described in Section 2.2.2 to minimize the potential for leachate release to the subsurface. Fuel oil tank area controls are required by DEQ MPDES and by US EPA– NPDES and Spill Prevention, Control and Countermeasure (SPCC) requirements. Implementation of these controls would minimize the potential for releases. Hazardous materials or petroleum hydrocarbon use, storage, and disposal in other areas should be conducted in accordance with manufacturers recommendations and US EPA Resource Conservation and Recovery Act (RCRA), Toxic Substance Control Act (TSCA) and other applicable state and federal regulations.

In summary, impacts to soil productivity in areas where soil was replaced after construction and operation of the Generation Plant would be low with implementation of standard mitigation measures. Productivity losses on unreclaimed portions of the Generation Plant site would be irretrievable. Impacts to soil from pond, landfill, or septic system leachate, petroleum hydrocarbon or hazardous materials releases would also be low with implementation of standard design controls and mitigation measures.

161kV Transmission System

Construction of the Transmission System would have a low impact to the geologic resources along the alignment. Minor displacement of earth materials can be expected with road construction and borings for pole placement. Small quantities of earth materials would be irretrievably lost due to construction and operation activities. These resources are not considered unique or irreplaceable in that there are abundant quantities of like material in the vicinity.

Direct impacts to soils would be caused by access road construction or improvements, maintenance activities, right-of-way clearing, and site preparation for structures and work areas. At this time, the actual line route and number of pole locations has not been identified. Until final design is completed, the total amount of ground disturbance is unknown. Following construction, implementation of mitigation measures listed below including erosion control and revegetation would reduce impacts to a minimum.

A portion of the proposed Transmission System alignment crosses the Hay Basin lakebed east of State Highway 3 approximately 12 miles east of Broadview. This area is underlain by lakebed deposits consisting of silt and clay. Soil developing on this material is highly erodible and subject to annual inundation during spring runoff and during above average precipitation years. Groundwater is likely to be less than three feet bgs during portions of the year. Construction impacts would be minimized by avoiding this area during wet period, or construction of an all-weather access road. Construction and maintenance impacts to this area could be eliminated by avoiding this area and rerouting the alignment.

4.4.3 Action Alternatives

Landfill Alternative

Potential impacts from an alternative to include expanding the on-site landfill would be similar to those described for the Proposed Action. Additional impacts would result from surface disturbance and soil needs for the landfill cap protective cover and vegetative layer. The landfill footprint would expand by a minimum of 70 acres, and require an additional 62,000 cubic yards of topsoil and 306,000 cubic yards of protective soil cover above the clay cap. The protective soil cover material could be used from the material excavated to construct the new landfill cells. Topsoil could be reclaimed from the soil stockpiles from initial plant construction, and stripping of the new landfill area. The increased soil disturbance and volumetric requirements for this alternative is considered to have a low impact to the environment.

Increasing the landfill area would also increase the risk of a leachate release through a failure in the liner. The potential for this would be minimized by adherence to the design specification and construction quality control. The potential impact of leachate contact to shallow soil from selection of this alternative is low.

Displacement of earth materials can be expected with the landfill alternative construction. Some earth materials would be irretrievably lost due to construction and operation activities. These resources are not considered unique or irreplaceable in that there are abundant quantities of like material in the vicinity.

230kV Transmission System

Impacts associated with an alternative to include the construction and operation of a 230kV Transmission System would be similar to those described for the Proposed Action (161kV Transmission System). However acres of impacts may be less due to the fewer number of poles likely required for the two, single-circuit 230kV lines as compared to the Proposed Action. Road construction or improvement, and ground disturbance resulting from site preparation and right-of-way clearing would be similar. Following construction, implementation of mitigation measures listed below including erosion control and revegetation would minimize impacts.

4.4.4 Mitigation Measures

The DEQ is responsible for enforcement of runoff control measures in the MPDES permit. The Mine landfill may be subject to regulation though the Montana Solid Waste Management Act if provisions of the coal ash exemption are not met. A ruling in this regard has not been established as yet.

The following conditions would be placed in the MPDES permit and would be enforceable as part of the MPDES permit:

- Water from construction and operations would be routed around exposed soil surfaces
- Soil stockpiles would be stabilized by application of temporary cover or revegetation
- Transmission System structures would be engineered and located so as to span steep slopes and areas of highly erodible soils
- To minimize erosion and sedimentation transport in identified sensitive areas, temporary control measures (e.g. silt fences, straw bale fences, terracing, water bars, matting, settling ponds, or other erosion control techniques) would be installed prior to and during construction
- Spill containment and waste management controls would be implemented to minimize potential release of hazardous materials and petroleum hydrocarbon compounds.

The regulatory agency does not have the authority to create mitigation measures that they can enforce, without the direct consent of the Project proponent. Effective landfill management may substantially mitigate the potential adverse impact(s) from this Project. A Landfill Management Plan was identified as a recommended mitigation measure in Chapter 2, Section 2.2.5 in the Waste and Cleanup subsection. This Plan could avoid potential environmental impacts such as nuisance dust, erosion, storm water runoff, and inadvertent leachate release into soil and groundwater. The Plan would also establish guidelines for minimum construction and maintenance standards. A typical Landfill Management Plan would include the following subject areas:

- Specialized equipment and maintenance schedules
- Daily solid waste loads, design loads, and maximum loads
- Manpower training
- Standard operating procedures
- Dust control
- Leachate control
- Planning
- New cell construction
- Cell closure
- Storm water management
- Liner construction
- Groundwater monitoring (if applicable)
- Quality assurance
- Closure monitoring and maintenance
- Security
- Severe weather operations
- Safety and health requirements
- Record keeping

In addition, mitigation proposed for other resources listed in Section 2.2.5 would further reduce or eliminate impacts to soils and geologic features.

4.4.5 No-Action Alternative

With the No-Action Alternative, there would no impacts to the earth resources of the area, beyond those that may be caused by the Mine and other existing actions.

4.5 Botanical and Wetland Resources

This section describes the types of impacts that would potentially occur to botanical resources and wetlands from construction and operation of the Project, and alternatives as described in Chapter 2. Mitigation measures and Project design used to reduce or eliminate potential impacts to botanical resources and wetlands are also discussed.

4.5.1 Methods

In order to assess the impacts to botanical resources and wetlands from the Project, proposed construction, operation and maintenance activities were reviewed. Information was obtained from the Supplemental EIS Support Document (Bull Mountain Development Co., LLC, 2002a) for background information. The Bull Mountains Mine FEIS (Montana Dept. of State Lands, 1992) and the Railroad Spur Checklist EA (DNRC, Trust Land Management Division., 2002) were also used as references for the botanical and wetland assessment. A professional determination, based on the locations of vegetation habitat types, was made for how these activities may impact botanical resources and wetlands.

Impact Levels

Impacts to botanical resources and wetlands would be classified in this document as high if the action being considered would result in one or more of the following:

- There would be an irretrievable or irreversible loss of unique vegetation communities (vegetation communities defined by the Montana Natural Heritage Program as imperiled in the state).
- Federally listed, candidate, or state listed sensitive plant species were adversely affected.
- New noxious weed populations became established or existing populations of noxious weeds expanded.
- Surrounding vegetation was substantially affected (loss of ecosystem function or value) by emissions from the Generation Plant.
- A wetland area would be destroyed by permanently filling all or most of it, or by altering wetland hydrology.
- A wetland area would be destroyed that serves as habitat for a rare plant or animal species.

Impacts would be classified in this document as moderate if the action being considered would result in one or more of the following:

- Native plant communities would be permanently removed through removal of plant parts and/or altering the substrate upon which they exist.
- Native tree species in riparian areas would be removed or topped.
- A portion of a wetland area would be filled such that the majority of the wetland would still be able to function as a wetland (e.g., for a road crossing through a wetland adjacent to a creek).

Impacts would be classified in this document as low if the action being considered would result in one or more of the following:

- Native plant communities would be temporarily disturbed or altered such that recovery to pre-disturbance conditions would be likely.
- Vegetation would be permanently removed from a plant community dominated by non-native species.
- A wetland would be temporarily filled or wetland hydrology, soils, or vegetation would be altered. This would be followed by restoring the area to its former condition or enhancing the area.

No impact would occur where:

- Direct or indirect disturbance to native plant communities would be avoided.
- The habitats of rare plant species would be completely avoided.
- There would be no increase in the cover or distribution of noxious weeds.
- Direct impacts to wetlands would be avoided.
- Wetland hydrology, vegetation, or soils would not be affected by nearby activities.

4.5.2 Proposed Action

Generation Plant

Because there are no wetlands present in the Generation Plant Study Area, the Project would have no impact on wetland resources.

Potential impacts to vegetation are summarized in Table 4-20. Construction and operation and maintenance of the Generation Plant would result in the long-term loss of native and non-native vegetation on approximately 199 acres and the short-term loss of native vegetation on approximately 8 acres. Table 4-21 lists acreage affected in the Generation Plant Study Area by vegetation type. Burned ponderosa pine, grassland, go-back hay meadow, and ponderosa pine types would be the dominant vegetation types removed for the life of the Project. Temporary construction workspace would primarily affect burned ponderosa pine, grassland, and ponderosa pine vegetation types. Following the completion of construction, temporary workspace, downstream embankment faces, road and railroad cut and fill slopes, and areas within the plant site not covered by facilities would be revegetated with grasses and forbs to reduce wind and water erosion, to provide competition with noxious weeds, and to enhance aesthetics.

Long-term loss of native vegetation would be a moderate impact, although these vegetation types are common in the area and acreage affected is small relative to the extent of the types in the Bull Mountains. Short-term loss of native vegetation would result in a low impact assuming revegetation efforts are successful. Revegetation of temporary workspace and other areas would reduce impacts, although diversity (number of species and presence of woody plants) would be reduced in revegetated areas.

According to the Project's application for an air quality permit (Bull Mountain Development Co., LLC, 2002b), increases over background levels of SO_2, NO_x, CO, VOC, and metals would result from the Project. Emissions from coal-fired generation plants are known to affect vegetation surrounding the emissions source, although changes in plant community structure, reduction in species diversity, and modifications to species composition have been documented only after severe and sustained exposure to pollutants (Grodzinski and Yorks, 1981). Ponderosa pine is sensitive to sulfur and trace elements, and studies around the Colstrip generation plants, southeast of the Generation Plant Study Area, have documented increases of sulfur and trace elements in ponderosa pine foliage, primarily within five miles downwind of the emissions source (Gordon et al. 1978, 1979; USGS 1979; Munshower et al. 1975; Munshower and Dupuit 1976). The studies showed, however, that pollutant output at Colstrip for the term of the studies was not sufficient to trigger changes in morphology of ponderosa pine needles.

No changes in plant community structure, species diversity, density, or primary productivity were proved after six years of monitoring in the Colstrip area (Taylor and Leininger 1980). Continued vegetation exposure over a longer term would be expected to result in increased pollutant levels, although studies covering 12 to 20 years at other coal-fired facilities have not documented significant changes in adjacent vegetation (Grodzinski and Yorks 1981).

Potential impacts to vegetation from coal-fired generation plant emissions in Montana have not been intensively evaluated since the Colstrip studies of the late 1970s. This is likely related to the lack of coal-fired generation plant development in the state, termination of funding for the Colstrip studies, and lack of significant vegetation impacts identified during the term of the Colstrip studies. Except for localized impacts related to seepage from the fly-ash ponds, impacts to vegetation peripheral to the Colstrip facilities are not visually apparent (T. Ring, DEQ, October 2002).

An environmental effects assessment for a proposed expansion of a coal-fired generation plant complex in Alberta has recently been completed (EPCOR, 2001). The Project would include adding a 450MW coal-fired station to an existing two-unit complex generating 762 MW. The assessment of potential impacts concludes that cumulative emissions of SO_2, NO_2, potential acid input, and heavy metals would cause an insignificant impact to vegetation. Air emissions from the Genesee complex and the Colstrip units exceed predicted emissions from the Project; hence, it can reasonably be concluded that impacts to vegetation from Project emissions would be low.

Fugitive dust from handling and storage of coal, fly ash, and lime could adversely affect offsite vegetation by changing surface soil temperatures or by depositing deleterious materials on plants or in the soil. Control measures implemented during operations would limit the quantity of coal, fly ash, or lime blown offsite. These control measures include silo storage for lime, enclosed transfer houses and crusher, enclosed coal conveyor, and lowering the coal stacker to reduce coal drop distance. Blowing fly ash from the disposal cells would be controlled by watering and/or by armoring the surface with coarser bottom ash.

Threatened and Endangered Species

No threatened, endangered, or sensitive plant species or unique vegetation communities are known to occur within 10 miles of the Generation Plant Study Area (Montana Natural Heritage Program. 2002b). State-listed plant species of concern were not identified within the Bull Mountains Mine study area to the east of the Generation Plant Study Area (Western Technology and Engineering, Inc. 1991) and, given the similarity of vegetation types between the Mine area and the Generation Plant Study Area, suitable habitat for plant species of concern is not expected within areas that could be affected by the construction and operation of the Generation Plant. As such, no unique vegetation communities would be affected by the Generation Plant.

Noxious Weeds

Noxious weeds are often early-successional, pioneer species that are very successful at colonizing disturbed areas. They typically produce large quantities of easily dispersed seeds that establish quickly and grow to out-compete native plant species for water, nutrients, and other resources. They may also spread vegetatively following disturbance. Once introduced into an area, these species can invade intact vegetative cover and displace native plants. The four species of noxious weeds present in the Generation Plant Study Area—spotted knapweed, Canada thistle, houndstongue, and field bindweed—could expand onto areas disturbed by the Generation Plant construction and operation. Species of noxious weeds not currently present could be introduced during construction and operation by contaminated equipment or vehicles. The expansion of noxious weed populations or the introduction of new species of noxious weeds would be a high impact as noxious weeds pose the single greatest threat to native vegetation habitats in the West (Duncan, 2001). Disturbed areas can serve as conduits for the spread or establishment of noxious weeds. The Montana County Noxious Weed Control Act requires that landowners or managers control noxious weeds. Developing and implementing a noxious weed management plan, in consultation with Musselshell and Yellowstone counties, would help reduce the impacts of noxious weeds.

Table 4-20 Summary of Impacts on Vegetation from Construction and Operation of the Generation Plant

Impact	Impact Level	Rationale
Long-term loss of vegetation cover, production and diversity on 199 acres at the facility site.	Moderate	The size of the impact area and long-term loss of vegetation is a moderate impact, however, vegetation types affected are extensive in the Bull Mountains.
Short-term loss of vegetation cover, production, and diversity on 8 acres of construction workspace.	Low	The relatively small size of the construction workspace and short duration of impacts before revegetation would limit impacts.

Impact	Impact Level	Rationale
Reduced cover, production, and diversity on surrounding vegetation from facility emissions.	Low	Emission control technology would reduce emissions resulting in low impacts to vegetation.
Reduced cover, production, and diversity on surrounding vegetation from blowing fly ash, lime, or coal dust.	No impact	Fly-ash and coal dust emissions would be controlled by special handling procedures including sprinkling and, in the case of fly-ash, armoring with coarser-textured bottom ash. Ineffective control technology could result in offsite impacts.
Special status plant population loss.	No impact	No special-status plants are known to occupy the Project area.
Loss of unique vegetation communities.	No impact	No unique plant communities are known to occur within or adjacent to the Project area.
New or expanded weed infestations.	No impact	The applicant would be required to control noxious weeds pursuant to the Montana County Noxious Weed Control Act. Lack of weed control could result in a high impact.

Table 4-21 Affected Acres by Vegetation Type for the Generation Plant Study Area

Map Unit	Vegetation Type		Affected Acres	
			Short-Term	Long-Term
	Grassland		2	61
12	Green needlegrass/ Western wheatgrass	*Stipa viridula/ Agropyron smithii*	--	7
13	Needle-and-thread/ Western wheatgrass	*Stipa comata/ Agropyron smithii*	2	54
	Shrub/Grassland		--	7
21	Silver sagebrush/Green needlegrass	*Artemisia cana/Stipa viridula*	--	1
22	Western snowberry/Silver sagebrush	*Symphoricarpos occidentalis/Artemisia cana*	--	<1
23	Western snowberry/ Kentucky bluegrass	*Symphoricarpos occidentalis/Poa pratensis*	--	6
26	Skunkbush sumac/ Needle-and-thread	*Rhus aromatica/Stipa comata*	--	<1
	Ponderosa Pine Savannah and Forest		2	33

Map Unit	Vegetation Type		Affected Acres Short-Term	Affected Acres Long-Term
31	Ponderosa pine/Bluebunch wheatgrass	*Pinus ponderosa/Agropyron spicatum*	2	31
32	Ponderosa pine/Green needlegrass	*Pinus ponderosa/Stipa viridula*	--	2
34	Ponderosa pine/Western snowberry	*Pinus ponderosa/Symphoricarpos occidentalis*	--	<1
	Burned Ponderosa Pine		4	65
41	Burned Ponderosa pine/ Bluebunch wheatgrass	Burned *Pinus ponderosa/ Agropyron spicatum*	3	31
44	Burned Ponderosa pine/Western snowberry	Burned *Pinus ponderosa/Symphoricarpos occidentalis*	1	2
45	Burned Ponderosa pine/Common chokecherry	Burned *Pinus ponderosa/ Prunus virginiana*	--	<1
	Agricultural Land		--	33
50	Go-back Hay Meadow	*Gutierrezia sarothrae/ Artemisia frigida*	--	33
Total Disturbance			**16**	**370**

Source: Bull Mountain Development Company, LLC., 2002a.

161kV Transmission System

The Transmission System Study Area is primarily located in uplands; however, several small drainages may be crossed. Generally, the corridor is located in high areas where intersecting ephemeral channels drain small catchment areas. Small wetland/riparian areas may be associated with some of these ephemeral drainages. Other wetlands may be located along the corridor generally associated with springs, seeps, stock watering ponds, and intermittent streams. Mitigation measures including utilizing existing access roads and engineering and locating Transmission System structures to span drainages would reduce impacts to a minimum. Other mitigation measures listed below as well as those listed in Section 2.2.5 would further reduce or eliminate potential impacts to wetlands and riparian areas.

Long-term loss of native vegetation due to access road construction would be a moderate impact, although these vegetation types are common in the area and acreage affected is small relative to the extent of the types in the Bull Mountains. Short-term loss of native vegetation would result in a low impact assuming revegetation efforts are successful. Revegetation of temporary workspace and other areas would reduce impacts, although diversity (number of species and presence of woody plants) would be reduced in revegetated areas.

No threatened, endangered, or sensitive plant species or unique vegetation communities are known to occur within the Transmission System Study Area (Montana National Heritage Program, 2002b). State-listed plant species of concern were not identified within the Bull Mountains Mine study area to the east of the Generation Plant Study Area (Western Technology and Engineering, Inc. 1991) and, given the similarity of vegetation types between the Mine area and Transmission System Study Area, suitable habitat for plant species of concern is not expected within areas that could be affected by the construction and operation of the Transmission System. No unique vegetation communities would be affected by the Transmission System.

Although detailed weed surveys have not been conducted in the Transmission System Study Area, the four species of noxious weeds present in the Generation Plant Study Area—spotted knapweed, Canada thistle, houndstongue, and field bindweed—could be present and could expand onto areas disturbed by the Project. Species of noxious weeds not currently present could be introduced during construction and operation by contaminated equipment or vehicles. The expansion of noxious weed populations or the introduction of new species of noxious weeds would be a high impact as noxious weeds pose the single greatest threat to native vegetation habitats in the West (Duncan 2001). Utility corridors, including roads, railroads, and power lines, can serve as conduits for the spread or establishment of noxious weeds. The Montana County Noxious Weed Control Act requires that landowners or managers control noxious weeds. The Project would actively control noxious weeds on the property by developing a Noxious Weed Management Plan in consultation with Musselshell and Yellowstone counties or by contracting with the counties for weed control.

4.5.3 Action Alternatives

Landfill Alternative

Potential impacts from the alternative to expand the on-site landfill would be similar to those described for the Proposed Action. There would be a long-term loss of vegetation in the area to be expanded. Long-term loss of native vegetation would be a moderate impact, although these vegetation types are common in the area and acreage affected is small relative to the extent of the types in the Bull Mountains. No threatened, endangered, or sensitive plant species or unique vegetation communities are known to occur within 10 miles of the Generation Plant Study Area for the alternative (Montana Natural Heritage Program. 2002b).

230kV Transmission System

Impacts to vegetation and wetlands associated with the alternative to construct and operate a 230kV Transmission System would be similar to the impacts described for the Proposed Action (161kV system). Road construction or improvement, and ground disturbance resulting from site preparation and right-of-way clearing would be less with the 230kV Transmission System because of the need for fewer structures per mile of transmission line. Following construction, implementation of mitigation measures listed below including weed control, erosion control, and revegetation would reduce impacts to a low level.

4.5.4 Mitigation Measures

Because there are no federally listed plant species in the Generation Plant or Transmission System Study Areas, there is no mitigation enforceable by a federal agency relating to sensitive plant species.

The Montana County Noxious Weed Control Act is the state law that provides legal directions to counties with regard to weeds. It is unlawful for any person to permit any noxious weed to propagate or go to seed on his or her land. In addition, most counties in Montana have a county weed board that would enforce state regulations providing for the control of weeds. Coordination with both Yellowstone and Musselshell counties would take place in developing the weed control plan to mitigate impacts from noxious weeds.

Prior to construction, the Project would request a jurisdictional determination from the U.S. Army Corps of Engineers to confirm that no jurisdictional wetlands occur in the Transmission System Study Area, and thus no 404 permit would be required.

The regulatory agency does not have the authority to create mitigation measures that they can enforce, without the direct consent of the Project proponent. Potential mitigation measures to further reduce or eliminate impacts to botanical resources and wetlands are included in Chapter 2, Section 2.2.5 in the Botanical Resources and Wetlands subsection. Measures include limitations on vegetation clearing during construction, revegetation of those areas temporarily disturbed during construction and avoidance of streams, drainages, and wetland areas. These measures would minimize loss of vegetation as a result of the Project. Mitigation proposed for other resources also listed in section 2.2.5 would further reduce or eliminate impacts to botanical resources and wetlands.

4.5.5 No-Action Alternative

Under the No-Action alternative, the Project would not be built; therefore, no impacts to botanical resources and wetlands would occur as a result of the Project.

4.6 Wildlife Resources

This section describes the types of impacts that would potentially occur to wildlife resources from construction, operation and maintenance of the Project, and alternatives as described in Chapter 2. Mitigation measures and Project design used to reduce or eliminate potential impacts to wildlife resources are also discussed.

4.6.1 Methods

In order to assess impacts to wildlife resources resulting from the Project or alternatives to the Project, the proposed construction, operation and maintenance activities were reviewed. Information was obtained from the Supplemental EIS Support Document (Bull Mountain Development Co., LLC, 2002a) for background information. The Bull Mountains Mine FEIS

(Montana Dept. of State Lands, 1992) and the Railroad Spur Checklist EA (DNRC, Trust Land Management Division, 2002) were also used as references for the assessment of wildlife. A professional determination was made of how the Project and alternatives would potentially impact wildlife resources based on the occurrence of known populations and potential for sensitive species to occur in the area.

Impact Levels

Impacts from construction and operation of the Project on wildlife resources could be temporary (less than one year), short-term (one year to four years, or completion of construction), or long-term (longer than four years).

Impacts would be classified in this document as high if they result from actions that:

- Cause the 'take' of federally listed, endangered, threatened, candidate or proposed species.
- Cause long-term loss of habitat that would result in increased mortality or lowered reproductive success for entire species or populations of a species.
- Cause the long-term inability of fish and wildlife to use biologically important habitats, such as spawning areas, breeding areas or winter range.
- Harm or kill a significant number of individuals of a common wildlife species

Impacts would be classified in this document as moderate if they result from actions that:

- Create an effect on federally listed or proposed threatened or endangered wildlife species that could be partially mitigated.
- Cause a reduction in the population, habitat, or viability of a federal or state listed wildlife species of concern or sensitive wildlife species, without resulting in trends towards endangerment or the need for federal listing.
- Harm or kill a small number of individuals of a common wildlife species.

Impacts would be classified in this document as low if they result from actions that:

- Create an effect on federally listed or proposed threatened or endangered wildlife species that could be largely or completely mitigated (i.e., seasonal restrictions on construction activities) or are temporary and benign (i.e., temporary disturbance by construction noise.
- Cause a minor short-term (less than two years) reduction in the quantity or quality of the habitat of a federal or state listed wildlife species of concern or sensitive wildlife species, without resulting in trends towards endangerment and/or the need for federal listing.
- Cause a short-term (less than one year) reduction in the quantity or quality of habitat critical to the survival of local populations of common wildlife species.

No impacts would occur when an action has no effect or fewer impacts than the low impact level on wildlife habitat, populations, or individuals.

4.6.2 Proposed Action

Temporary impacts from the Proposed Action would potentially result from the presence of additional human and vehicle disturbance. There may be temporary displacement of avian species as a result of commotion caused by vehicle traffic and materials loading. Mobile species would simply move away from these activities, although some individuals (e.g., nesting birds, small mammals, reptiles, amphibians, and invertebrates) could be vulnerable to direct mortality. Temporary and short-term impacts could occur due to the loss of habitat in landfill space and other temporary-use areas that would be re-vegetated after construction or use was complete.

Long-term impacts would result from permanent disturbance such as tower locations, plant site, access roads, and long-term landfill footprints. Temporary impacts could become long-term if re-vegetation of these areas was unsuccessful or resulted in the introduction or spread of noxious weeds.

Generation Plant

Long-term impacts would occur on those portions of the Generation Plant site that would not be re-vegetated. The habitats that would be affected by construction and operation of the generation plant are listed in Chapter 3. These habitats are common and widespread in the Bull Mountains and over much of the Generation Plant Study Area.

Flashing lights associated with the generation plant could contribute to the overall avoidance of the site by wildlife. However, flashing lights or other activities may reduce the potential for collision impacts to flying birds. Minor beneficial impacts may occur, particularly to wildlife species that are habituated to human activity, as a result of creation of sediment ponds (e.g., use by breeding amphibians, waterfowl, or other wildlife) or micro site habitats associated with the plant facilities. Temporary impacts along transportation routes would potentially result from vehicular traffic as materials are transported from the landfill to the Mine or other locations.

Indirect impacts to wildlife resources could occur during construction and operation of the Generation Plant as the result of vehicle/wildlife collisions, illegal or unintentional killing or harassment of wildlife, or increased human occupation of the Bull Mountains. While construction and operation of the Generation Plant would not benefit wildlife, impacts to wildlife or habitat resulting from construction and operation of the Generation Plant would be low.

Because of their absence from the Generation Plant site, there would be no impacts to federally listed threatened and endangered species or to state or federal species of concern.

161kV Transmission System

Long-term impacts could occur on those portions of the Transmission System Study Area that would not be re-vegetated such as tower locations or access roads.

Indirect impacts to wildlife resources could occur during construction and operations of the 161kV Transmission System as the result of vehicle/wildlife collisions, illegal or unintentional harvest or harassment of wildlife, or increased human occupation of the area; however, presence of people and vehicles would not be expected to substantially change as a result of construction of the 161kV Transmission System.

Because much of the Transmission System would be constructed in open areas that may be lacking in perching opportunities for raptors, indirect impacts could include increased predation by raptors on sage and sharp-tailed grouse, as well as other birds, small mammals and reptiles, due to an increase in perching opportunities created by the transmission poles. Additionally indirect impacts could include bird collisions with conductors and/or guy wires.

While construction and operation of the 161kV Transmission System would not substantially benefit wildlife, impacts to wildlife or habitat resulting from construction and operation of the 161kV Transmission System would be low.

Because of their absence from the 161kV Transmission System, there would be no impacts to federally listed threatened or endangered species or to state or federal species of concern.

4.6.3 Action Alternatives

Landfill Alternative

Direct and indirect, as well as short- and long-term impacts to wildlife and habitat for the landfill expansion, are similar to those presented for the Proposed Action. Loss of some additional habitat would result from this alternative with the additional acreage of landfill required. However, the area identified for additional landfill does not provide habitat for sensitive species and is common to that found elsewhere on land surrounding the Generation Plant Study Area. Impacts to wildlife or habitat resulting from construction and operation of this alternative would therefore be low.

230kV Transmission System

Because the structure footprints and access road disturbance in the 230kV alternative would be similar to the Proposed Action (161kV Transmission System), impacts for the 230kV alternative are comparable to those discussed above for the Proposed Action. The 230kV structures would be 7 to 27 feet taller than the 161kV structures; however, fewer 230kV structures would be required. As a result, less habitat would be permanently removed from the construction of the 230kV alternative.

Indirect impacts during construction and to prey species resulting from increased perching opportunities for raptors would be the same as that described for the 161kV Transmission System. While construction and operation of the 230kV Transmission System would not substantially benefit wildlife, impacts to wildlife or habitat resulting from construction and operation of the 230kV Transmission System would be low.

Because of their absence from the 230kV Transmission System, there would be no impacts to federally listed threatened or endangered species or to state or federal species of concern.

4.6.4 Mitigation Measures

Because there are no federally listed species in the Project, there is no mitigation enforceable by a federal agency.

The regulatory agency does not have the authority to create mitigation measures that they can enforce, without the direct consent of the Project proponent. Potential wildlife mitigation measures are proposed in Chapter 2, Section 2.2.5 in the Wildlife Resources subsection. These measures include avoiding wildlife harassment during construction by equipment and workers. In addition, employees would be encouraged to follow established vehicle operation procedures, including speed limits.

Mitigation steps to control raptor predation and prevention devices or towers designed to prevent raptor perching, may be recommended by MFWP to reduce predation on sharp-tailed grouse in key habitat areas. Sharp-tailed grouse have been recorded in the Transmission System Study Area and are particularly susceptible to predation by raptors during spring breeding/strutting when they become inattentive to potential predators. One or more leks are considered likely. However, there are no known leks in the Transmission System Study Area.

Measures proposed for other disciplines, particularly water quality, air quality, and vegetation, would also minimize impacts to wildlife habitats.

4.6.5 No-Action Alternative

Under the No-Action alternative, the Project would not be built. There would be no direct, indirect, or cumulative effects to wildlife resources. Any environmental effects currently affecting wildlife at or near the Project would not be expected to change.

4.7 Fisheries and Aquatic Resources

4.7.1 Methods

In order to assess the impacts to fisheries and aquatic resources from the Project, the proposed construction, operation and maintenance activities as described in Chapter 2 were reviewed. Information was obtained from the Supplemental EIS Support Document (Bull Mountain Development Co., LLC, 2002a), the Bull Mountains Mine FEIS (Montana Dept. of State Lands, 1992) and the Railroad Spur Checklist EA (DNRC, Trust Land Management Division, 2002) for this assessment. A professional determination, based on the locations and type of surface water, was made for how these activities may impact fish and aquatic resources.

Impact Levels

Impacts would be classified in this document as high if they result from actions that:

- Cause the ‘take’ of federally listed, endangered, threatened, candidate or proposed species.
- Cause a significant long-term (more than two years) adverse effect on the populations, habitat, and/or viability of a federal or state listed fish species of concern or sensitive species, which would result in trends towards endangerment and/or the need for federal listing.
- Harm or kill a significant number of individuals of a common fish species at the local (stream reach or small watershed) level.

Impacts would be classified in this document as moderate if they result from actions that:

- Would, without causing a 'take', cause a temporary (less than two months) reduction in the quantity or quality of localized (stream reach or small watershed) aquatic resources or habitats at a time when federally listed threatened, endangered, or proposed fish species are not likely to be present (i.e., during non-spawning or rearing times).
- Cause a short-term (up to two years) localized (stream reach or small watershed) reduction in population, habitat, or viability of a federal or state listed fish species of concern or sensitive species, without resulting in trends towards endangerment or the need for federal listing.
- Harm or kill a small number of individuals of a common fish species at the local (stream reach or small watershed) level.

Impacts would be classified in this document as low if they result from actions that:

- Cause a temporary (less than two months) localized (stream reach or small watershed) reduction in the quantity or quality of aquatic resources or habitats of state listed fish species of concern or sensitive species, without causing a trend towards endangerment and the need for federal listing.
- Cause a short-term (up to two years) disturbance or displacement of common fish species at the local (stream reach or small watershed) level.

No impacts to fish or aquatics would occur when an action has no effect or fewer impacts than the low impact level on habitat, populations, or individuals.

4.7.2 Proposed Action

Generation Plant

Because there are no standing or flowing waters in the Generation Plant Study Area, no occupied or potential fisheries habitat would be removed by construction and operation of the plant. Sediment ponds would be constructed and maintained to capture runoff during construction and operation of the Project, so that sediment from the site would not be expected to enter Rehder or Halfbreed creeks. Neither of these streams apparently supports a substantial fishery; the nearest such fishery is in the Musselshell River, over 16 drainage miles down Halfbreed Creek from the Generation Plant Study Area. Consequently, construction and operation of the Generation Plant would not be expected to have any impacts to fishery resources.

161kV Transmission System

Because there are no standing or flowing waters in the Transmission System Study Area, no occupied or potential fisheries habitat would be removed by construction and operation of the 161kV Transmission System. Consequently, construction and operation of the 161kV Transmission System would not be expected to have any impacts to fishery or aquatic resources.

4.7.3 Action Alternatives

Landfill Alternative

Impacts to fishery resources from construction and operation of the landfill expansion alternative are identical to those presented for the Proposed Action. Because of the absence of fisheries and/or aquatic habitat in the Project area there would be no impacts to fisheries or aquatic resources resulting from construction and operation of the landfill expansion alternative.

230kV Transmission System

Because the tower footprint and access road disturbance in the 230kV Transmission System would be similar to the 161kV Transmission System for the Proposed Action, impacts for the 230kV alternative are similar to those addressed in the Proposed Action. The 230kV Transmission System would require slightly taller structures but would have wider spans with fewer structures required. Construction and operation of the 161kV Transmission System alternative would not be expected to have any impacts to fishery and aquatic resources.

4.7.4 Mitigation Measures

Because there are no fishery or aquatic resources impacted by the Project, there are no mitigation measures that are enforceable by an agency or recommended.

4.7.5 No-Action Alternative

Under the No-Action alternative, the Project would not be built. There would be no direct, indirect, or cumulative effects to fisheries resources. Any environmental effects currently occurring to streams such as Halfbreed Creek would not be expected to change.

4.8 Cultural Resources

4.8.1 Methods

Cultural resource impacts as a result of the Project were determined by reviewing the proposed construction, operation and maintenance activities as described in Chapter 2. Information was obtained from the Supplemental EIS Support Document (Bull Mountain Development Co., LLC, 2002a) for background information. The Bull Mountains Mine FEIS (Montana Dept. of State Lands, 1992) and the Railroad Spur Checklist EA (DNRC, Trust Land Management Division, 2002) were also used as references for cultural resource assessments. A professional determination of Project impacts was made based on the locations of cultural resources as described in Chapter 3.

Impact Levels

In terms of changes to visual setting, impacts could occur only if:

- The cultural resource is eligible to the National Register, potentially eligible, or unevaluated, and

- If visual setting contributes to the resource's National Register eligibility

For cultural resources that meet these two criteria, visual impacts would be considered high if the cultural resource is within a 1.0-mile radius of the proposed chimneys. Impacts would be considered moderate if the cultural resource is from 1.0 to 2.0 miles of the proposed chimneys. Impacts would be considered low if the cultural resource is from 2.0 to 3.0 miles of the proposed chimneys.

No impact would occur if:

- The cultural resource is not eligible to the National Register,
- The cultural resource is not visually sensitive (e.g. most archaeological sites), or
- The cultural resource is greater than 3.0 miles from the proposed chimneys.

In terms of physical disturbance to cultural resources, impacts could occur only if a cultural resource is eligible to the National Register, potentially eligible, or unevaluated.

For cultural resources that meet this criterion, impacts would be considered high if:

- The cultural resource would be disturbed by construction, operation, and maintenance
- The resource can not be avoided, and
- Mitigation measures, such as data recovery, are not feasible.

Impacts would be considered moderate if:

- The cultural resource would be disturbed by construction, operation, and maintenance
- The resource can not be avoided, and
- Mitigation measures, such as data recovery, are feasible.

Impacts would be considered low if:

- The cultural resource would be only slightly disturbed by construction, operation, and maintenance
- The resource can not be avoided, and
- Mitigation measures, such as data recovery, are feasible.

No impact would occur if:

- The cultural resource is not eligible to the National Register,
- The cultural resource would not be disturbed by construction, operation, or maintenance, or
- The cultural resource can be avoided through Project redesign.

4.8.2 Proposed Action

Generation Plant

Ground Disturbance

Under the Proposed Action, facilities that would disturb the ground would include:

- All buildings, structures, and facilities within the plant site itself. It is estimated that the total area disturbed during construction at the plant would be about 208 acres. Approximately 167 acres would be located within the plant fence, including a construction parking lot and an area for construction trailers, tools, vehicles, equipment, and material construction storage. An additional 40 acres of land would be outside the fenced area for additional Project facilities
- A 4,000-foot-long conveyor belt that would deliver coal to the plant from the Bull Mountains Mine transition point
- A 0.2-mile paved access road extending from Old Divide Road to the plant site
- A 50-foot wide solid waste disposal haul road from the Generation Plant to Bull Mountains Mine
- Four to six groundwater wells and buried water pipelines for the plant water supply

Detailed descriptions of these various aspects of the Proposed Action can be found in Chapter 2.

Within the fenced area at the plant site, only one cultural resource has been identified that would be affected by ground disturbance. This archaeological site, a prehistoric lithic scatter, requires more data before it is possible to evaluate its National Register eligibility (Bull Mountain Development Company, 2002a; Pouley, 2002).

The proposed access road would not affect any cultural resources other than isolated artifacts that are not National Register-eligible (Bull Mountain Development Company, 2002a; Pouley 2002).

The exact locations of the proposed solid waste disposal haul road and the proposed conveyor belt are not finalized. It appears that these facilities could potentially affect a prehistoric lithic scatter that may be National Register eligible. Because some of the land in the vicinity has not been surveyed for cultural resources, other important cultural resources might exist in the area.

Locations of groundwater wells and associated pipelines have not been surveyed for cultural resources. Important cultural resources could exist in these areas.

Visual Setting

The potential for changes in visual setting was evaluated by considering cultural resources within 3.0 miles of the proposed chimneys at the plant site. Under the Proposed Action, each unit of the Generation Plant would have a 574-foot tall chimney constructed of a reinforced concrete outer shell. FAA lighting and marking requirements would be met, as well.

Within 3.0 miles of the proposed 574-foot chimney, 51 cultural resources have been identified. Of these, 48 have been recommended by previous investigators as eligible to the National Register, have not been fully evaluated, or have an unknown eligibility recommendation. Of these 48, eight resources are considered potentially visually sensitive as a result of the Generation Plant. These include standing log structures, Native American petroglyphs, rock cairns, and rockshelters. The remaining cultural resources are collapsed or destroyed structures and archaeological deposits, none of which are visually sensitive.

A visual impact analysis (see Section 4.3) was performed to determine which of these eight resources were within the viewshed of the proposed chimneys. Table 4-22 lists the resources within the viewshed. Of the 8, the chimneys would be visible from 7.

Table 4-22 Resources Within the Viewshed

Resource Type	Distance from Chimneys
Petroglyphs	< 0.5 mile
Rockshelter	0.7 mile
Rock cairn	1.1 miles
Homestead	1.3 miles
Petroglyphs	1.6 miles
Homestead	1.6 miles
Cabin	2.1 miles

Source: Bull Mountain Development Company, LLC., 2002a.

Most of these resources have not been sufficiently documented to determine whether they are, in fact, eligible to the National Register or whether visual setting is an important aspect of their National Register eligibility. For this analysis, it is assumed that the resources are National Register eligible and that they are visually sensitive.

The petroglyphs and rock cairn may also be Traditional Cultural Property (TCP). The significance of these resources and the nature of adverse effects cannot be fully assessed until the importance of these resources to Native Americans has been determined.

Improved Access

Under the Proposed Action, there would be a 0.2-mile access road to the Generation Plant site. Access to the plant site would be restricted and most of the plant site would be fenced. Therefore, it is unlikely that the presence of the Generation Plant and associated facilities would increase vandalism at major cultural resources.

161kV Transmission System

Under the Proposed Action, transmission facilities include a 161kV Transmission System from the Generation Plant to the Broadview Substation. The system is proposed to parallel the existing Bull Mountain rail corridor from the Generation Plant site and would be 28 miles long and 300 feet wide. Detailed descriptions of the 161kV Transmission System can be found in Chapter 2.

The precise location of ground disturbance from H-poles has not been determined. However, within or near the railroad right-of-way, three cultural resources were identified that were either considered eligible to the National Register or required more data for evaluation (see Metcalf 2002b). These include a lithic scatter, a rock cairn, and a farmstead with no standing buildings. The rock cairn may also qualify as a TCP although this has not been confirmed through Tribal consultation.

During construction and maintenance of the Transmission System, existing access roads would be used wherever feasible. Any new access roads would be restored to their natural condition following construction of the Transmission System. Therefore, construction of the Transmission System would be unlikely to lead to increased vandalism of cultural resources.

4.8.3 Action Alternatives

Landfill Alternative

Ground Disturbance

This alternative differs from the Proposed Action by the presence of a landfill north of the Generation Plant site. This would increase the amount of ground disturbance around the plant site.

The landfill would not affect known cultural resources, but it is possible that undiscovered cultural resources exist in the landfill alternative site since the area may not have been surveyed for cultural resources. Therefore, there is a potential that ground disturbance under this alternative could have greater, but undetermined, impacts on cultural resources than the Proposed Action.

Visual Setting

Although the landfill under this alternative would be close to one cultural resource site that may be visually sensitive, it is not anticipated that the landfill would significantly affect the visual setting.

Improved Access

Access under this alternative would not differ from access under the Proposed Action. As such, impacts to cultural resources as a result of increased vandalism would be low.

230kV Transmission System Alternative

Ground Disturbance

Under this alternative, the only difference from the Proposed Action would be the use of a 230kV Transmission System rather than 161kV. The amount of right-of-way required would be the same. The spans between circuits would be slightly longer, so there would somewhat less potential for disturbing undiscovered cultural resources. However, it is anticipated that the amount of actual ground disturbance from installing H-poles would be similar to the Proposed Action.

Visual Setting

Visual effects on cultural resources under this alternative would be similar to the Proposed Action with potential for a slight increase in impacts as a result of increased structure height; however the fewer number of structures required for the 230kV system would likely negate this slight increase.

Improved Access

Access under this alternative would not differ from access under the Proposed Action. As such, impacts to cultural resources as a result of increased vandalism would be low.

4.8.4 Mitigation Measures

The regulatory agency does not have the authority to create mitigation measures that they can enforce, without the direct consent of the Project proponent. Recommended mitigation measures to further reduce or eliminate impacts to cultural resources are included in Chapter 2, Section 2.2.5, in the Cultural Resources subsection. Measures include further consultation with the SHPO, as well as additional documentation and evaluation of cultural resource sites associated with the Project.

4.8.5 No-Action Alternative

Under the No-Action Alternative, there would be no ground disturbance that would affect any cultural resources and no visual impacts on cultural resources.

4.9 Visual Resources

Visual resource impacts would result from the construction, operation and maintenance of the Project, specifically, the generation facility and Transmission System. Visual resource impacts were identified as they relate to sensitive viewpoints. Visual impacts can occur when changes in the landscape are noticeable to viewers looking at the landscape from residential viewpoints and travel routes. For issues associated with visibility of atmospheric haze in Class I PSD areas, see section 4.2, Air Resources.

4.9.1 Methods

The visual impacts that would result from the construction and operation of the Project are usually direct, adverse, and long-term. This analysis considers the potential visual impacts of changes in the landscape on:

- Views from residences
- Views from travel routes

Visual Contrast

Visual contrast is the measure of physical change in the existing landscape that would result from introduction of the Project. The addition of new poles, conductors, insulators, and access roads, would cause visible change in the landscape along the transmission corridor. The addition of Project chimneys, boiler buildings, air-cooled condensers, coal handling equipment, and an electrical switchyard would cause visible change in the landscape within the Generation Plant Study Area. Potential visual impacts were determined by analyzing how visual contrasts are perceived from sensitive viewpoints.

Structure contrast was emphasized over landform and vegetation contrast due to the nature of the Project, the presence of numerous existing access roads, and diminished or declining vegetation found within portions of the transmission corridor.

Structure contrast examines the compatibility of transmission and generation facilities with the existing landscape setting. Structure contrast is strongest where there are no other structures (e.g., industrial buildings/structures or existing transmission structures) in the landscape. For the most part, structure contrast is determined by the presence or absence of existing parallel transmission lines and other large heavy industrial facilities.

Photo Simulations

One area having potential visual impacts was identified and photographed. A photo simulation technique was used to evaluate the accuracy of the predicted visual impacts, to determine the effectiveness of recommended mitigation, and to illustrate the expected impacts to the concerned agencies and the public. The viewpoint from the simulation that was prepared includes one view depicting the proposed Generation Plant. Views from the Generation Plant simulation are looking north.

The photo simulation was created using a combination of computer digital imaging and Computer Aided Drafting and Design (CADD) software. Three-dimensional drawings were combined with a three-dimensional model of the terrain to create an accurate representation of the scale and the perspective of the transmission line and the physical changes in the landscape. The photo simulation is shown in Figure 2-2.

Viewshed Mapping

Seen area mapping, also known as view shed mapping, is a computer-derived analysis showing areas visible from inventoried viewpoints. A GIS uses point, line, or polygon information to analyze and perform this function. The results of the analysis are verified through site visits and other overlay mapping to account for such features as vegetation and localized conditions. The result is a detailed map showing areas visible from inventoried viewpoints.

Visual influence mapping of the Project's chimneys was conducted within five miles of the Project. To determine the visual influence of the Project chimneys, two analysis points were placed at separate points along the Project's chimneys. One point was placed at 515' while another point was placed at 308'. This method revealed both the visibility of sections near the top of the chimneys as well as sections near the middle. This method also determines if viewpoints nearby can see either just the top of the chimneys or from the middle all the way to the top of the chimneys.

Visibility mapping was conducted within two miles of all other Project facilities. The mapping was done to determine what sensitive viewpoints could see all of the Project facilities from the ground to the top of the boiler building and other appurtenant structures. As stated earlier, views of the chimney were assessed differently.

Impact Assessment Process

The potential effects of the visual contrasts associated with the Project are described in terms of visual impacts to viewers. The initial visual impact assessment was determined by analyzing the visibility of contrasts that would be caused by the Project from sensitive viewpoints. See Tables 4-23 through 4-24 for a summary of the impact assessment process.

Table 4-23 Distance Zones

Distance Zone	Distance	Visibility Threshold
Foreground (FG)	0-½ mile	High
Middle Ground (MG)	½ - 1 mile	Moderate
Background (BG)	1-5 miles	Low

Table 4-24 Viewer Impacts

Visual Sensitivity	Visual Contrast Level								
	S			M			W		
	Distance Zone			Distance Zone			Distance Zone		
	FG	MG	BG	FG	MG	BG	FG	MG	BG
H	H	H	M	M	M	L	M	M	L
M	M	M	L	M	M	L	L	L	L

Distance Zones: FG=Foreground MG=Middle Ground BG=Background

Visual Contrast Level: S=Strong M=Moderate W=Weak

Viewer Impacts: H = High M = Moderate L = Low

Impact Levels

To assess the ***initial*** visual impacts of the Project, the following set of criteria was used.

Impacts would be classified in this document as high where:

- The Project would become a view’s dominant feature or focal point.
- Several high sensitivity viewers would see the Project predominately in the foreground and middle ground distance zone.

Impacts would be classified in this document as moderate where:

- The Project would be clearly visible but not the dominant feature of the view.
- Several high and/or moderate sensitivity viewers would see the Project mostly within the middle ground distance zone.

Impacts would be classified in this document low where:

- The Project would be visible but not evident in the view.
- Views of the Project from either high and/or moderate sensitivity viewpoints would be screened or predominately seen in the middle ground and background distance zone.

4.9.2 Proposed Action

The visual impacts stated in this section are considered residual and have been assessed after mitigation measures have been applied.

Generation Plant

Visual Contrast

When completed, the Generation Plant would be a noticeable addition to the local landscape, which is otherwise predominantly rural. The most noticeable components would be the two main chimneys, each 574 feet high, and the one large boiler building, approximately 250 feet high. Other noticeable components would include the air-cooled condensers, air pollution control equipment, coal handling equipment, and electrical switchyard. As much as possible, the plant buildings and equipment would be designed to blend into the landscape. Buildings colors would be predominantly neutral tans and grays. As indicated by the visual simulation presented in Figure 2-2, the plant would be an obvious, dominant feature in the landscape. The visual contrast created by the Project would be strong.

Project Visibility from Sensitive Viewpoints

Views of the Project's chimneys vary from expansive to limited, depending on local topography and the presence or absence of surrounding vegetation, see Table 4-25, Visual Influence of Project Chimneys.

Table 4-25 Visual Influence of Project Chimneys

High Sensitivity Viewpoints		Project Visibility			
Number of Visually Sensitive Cultural Sites	**Number of Houses**	**Distance Zone**	**Top of Chimney Visibility**	**Combination of Middle and Top Visibility**	**No Visibility of Project Chimneys**
N/A	1	0 to ½ mile		✖	
2	7	½ to 1 mile		✖	
3	141	1 to 5 miles		✖	
2	26	1 to 5 miles	✖		
1	105	1 to 5 miles			✖

Short Term Impacts

Impacts would occur during the 4-year construction period due to the presence of equipment, materials, and work crews, along with the dust raised by construction activities. Earthmoving activities, followed by erection of chimneys and buildings, and the presence of large construction cranes, would be the most noticeable elements. The daily presence of up to 800 construction workers would also contribute to noticeable change at the site. These impacts would be noticeable to local residents and travelers on local roads, and they would be somewhat noticeable to travelers on U.S. Route 87. However, the impacts would be short term and intermittent. Overall, visual impacts due to construction are considered low due to the short duration.

Long Term Impacts

The visual impacts from the operation of the Project would be direct and long-term. The Generation Plant facility would be very noticeable to local residents and travelers on local roads. It would also be noticeable to travelers on U.S. Route 87 intermittently, when not screened by hills or trees, see Figure 3-6. Specifically, one residence would have clear views of the generation facility within the foreground distance zone. This view of the Project would be dominant and would be considered a focal point resulting in a high visual impact. This is a limited quantity (1) of affected viewpoints that would have Project views within the foreground distance zone. Seven residences would have views of the generation facility within middle ground distance zone. These views of the Project would be clearly visible but not the dominant feature of the view resulting in a moderate impact due to the limited quantity (7) of affected viewpoints that would have Project views within this distance zone. Ten residences would have views of the generation facility within the background distance zone. These views of the Project would be visible but not evident in the view resulting in a low impact due to the limited quantity (10) of affected viewpoints that would have Project views within this distance zone. Motorists traveling U.S. Route 87 would have views of the generation facility within the middle ground distance zone. These views of the Project would be clearly visible but not the dominant feature of the view resulting in a moderate impact due to the moderate sensitivity of road viewers that would have Project views within this distance zone.

The top half of the Project chimneys would be visible to travelers on U.S. Route 87 nearest the Project site within the middle ground distance zone. The top half of the Project chimneys would also be visible from one residence within the foreground distance zone as well as seven residences within the middle ground distance zone and 141 residences within the background distance zone. With the exception of one viewer located in the foreground distance zone, views of the Project chimneys would not be the focal point of the views discussed. The Project chimney views, however, would range from clearly visible to not evident in view dependant upon a viewers distance from the Project chimneys. Visual impacts are considered moderate, because they would be restricted to a limited local area with low population density. This localized area would have views of the Project chimneys that would be dominant within the foreground and clearly visible within the middle ground distance zones.

Long-term impacts also could result from strobe lights or other aviation safety lighting on the main chimneys. The intensity and flashing of strobe lights during operation at night would result in additional moderate impacts to surrounding viewers. The Project developer plans to work with the Federal Aviation Administration (FAA) to identify chimney lighting that would have the least impact on local residences and other viewers, consistent with aviation safety considerations. If the marking recommendation from the FAA is the installation of strobes and the lights are installed with baffles, visual impacts from the strobe lighting would decrease. Baffled strobe lights would direct the lighting upward rather than outward (Riley, 2001).

In-Mine Waste Disposal

In-Mine Waste Disposal would result in low to non-identifiable visual impacts from the presence of additional haul roads, truck traffic and potential dust visible in the foreground and middle ground distances zones from viewpoints described under the Generation Plant, long-term impacts.

161kV Transmission System

Visual contrast that would result from the construction and operation of the 161kV Transmission System would be strong where the Transmission System would not parallel other transmission lines from MP 0 to 23.6, see Figure 2-11. Where the Transmission System would parallel the northern circuit of the Colstrip to Broadview 500kV transmission line from milepost 23.6 to 28, visual contrasts would be moderate to weak.

Visual impacts would be moderate from MP 0 to 23.6 where 24 residences would have foreground to middle ground views of the 161kV Transmission System. Visual impacts would be low from MP 23.6 to 28 where one residence would have foreground to middle ground views of the 161kV Transmission System.

4.9.3 Action Alternatives

Landfill Alternative

The landfill alternative for waste disposal would result in low visual impacts from the presence of additional haul roads, truck traffic and potential dust visible in the foreground and middle ground distances zones from viewpoints described under Generation Plant, long term impacts. When compared to the proposed action, the expansion of the landfill would be more noticeable in views of the Project within the foreground and middle ground distance zones.

230kV Transmission System

Visual contrast that would result from the construction and operation of the 230kV Transmission System would be strong where the Transmission System would not parallel other transmission lines from MP 0 to 23.6, see Figure 2-11. Where the Transmission System would parallel the northern circuit of the Colstrip to Broadview 500kV transmission line from milepost 23.6 to 28, visual contrasts would be weak.

The impacts that would result from the 230kV Transmission System would differ slightly from the proposed action of the 161kV Transmission System. The visual contrasts associated with the introduction of 80-foot tall H-frame structures along the route are nearly identical to the 161kV system because both structures are of the same size and similar design. One difference with the 230kV Transmission System is that it would have one less circuit visible resulting in slightly weaker visual contrasts, see Figure 2-11. Another difference is that the 230kV alternative would have longer spans than the 161kV system. These longer spans would result in slightly less visual contrast when compared to the visual contrast of the 161kV system.

Visual impacts would be moderate from MP 0 to 23.6 where 24 residences would have foreground to middle ground views of the 230kV Transmission System. Visual impacts would be low from MP 23.6 to 28 where one residence would have foreground to middle ground views of the 230kV Transmission System.

4.9.4 Mitigation Measures

No Project mitigation measures specific to visual resources are enforceable by an agency. The regulatory agency does not have the authority to create mitigation measures that they can enforce, without the direct consent of the Project proponent.

Potential mitigation measures to further reduce or eliminate impacts to visual resources are included in Chapter 2, Section 2.2.5 in the Visual Resources subsection. Measures include altering the appearance of some Project structures to allow for less visual intrusion and minimizing ground disturbance during construction that would create noticeable changes to the landscape.

The effectiveness of the mitigation measures for visual resources are primarily found in measures VR-2, VR-5 and VR-6. Measure VR-2 would reduce the visual contrast and reflected light from the transmission structures. Measure VR-2 would be utilized along the entire Transmission System from MP 0 to 28. Measure VR-2 would help to blend the transmission structures into the woodlands that occur from MP 0 to 9. The application of Measure VR-2 from

MP 9 to 28 also assists to give the structures a more natural appearance. Measure VR-5 would reduce any reflected light from the transmission conductors. Measure VR-6 would reduce visual contrasts associated with vegetation clearing that would be necessary for the Generation Plant construction or Transmission System construction and operation. Measure VR-6 would be utilized from MP 0 to 9 along the Transmission System where the corridor would pass through ponderosa pine woodlands. Since the generation facility would be painted in neutral grays and tans, a specific mitigation measure isn't necessary to reduce reflected light or glare from the facilities. The neutral tans and grays would assist the generation facility, with the exception of the Project chimneys, to blend into the colors and hues seen in the surrounding natural landscape, see Figure 2-2. If strobe lights were required by the FAA, Measure VR-7 would reduce visual contrasts seen by local residences.

4.9.5 No-Action Alternative

Under the No-Action alternative, visual impacts would be low to non-identifiable. No large industrial buildings or Project chimneys would be visible from local residential viewpoints or motorists traveling a portion of U.S. Route 87 within the Generation Plant Study Area. Transmission structures and conductors would not be visible from residential viewpoints along the proposed Transmission System route resulting in no visual impacts along this corridor.

Views of rail traffic traveling upon the proposed railroad spur would increase under the No-Action alternative. The Project would not consume coal under this alternative, although coal would still be shipped to outside markets via the railroad spur. Although the visual impacts would be temporal, coal train operation would be visible particularly in the western two-thirds of the railroad spur where the landscape is flat to rolling and views are expansive and open from MP 9-28 along the parallel Transmission System corridor. Views of the temporal passing of increased coal train traffic along the railroad spur would result in a low to non identifiable visual impact.

4.10 Noise

4.10.1 Methods

Sensitive receptors near the Project were identified and were mapped in Chapter 3 (Figure 3-7). Impacts on these sensitive receptors from noise levels as a result of the Project equipment and associated facilities, were assessed using calculations developed in accordance with the International Organization for Standardization (ISO) Standard 9613, (ISO 1996). This standard specifies the calculations to determine the reduction in noise levels due to the distance between a noise source and a receptor, the effect of the ground on the propagation of sound, the influence of air absorption, and the effectiveness of natural barriers due to grade or of man-made barriers, such as walls and buildings.

Although the Project is in the preliminary design phase, a preliminary list of equipment, based on a similarly sized coal-fired generation plant and associated facilities, was provided (Sargent & Lundy, 2002b). This information included data on the expected operating conditions and equipment sizes and quantities. Noise control measures (such as duct insulation and separate fan enclosures along with inlet silencers and buildings with insulated wall as well as enclosures for equipment) for a typical coal-fired generation plant design were assumed for the noise level calculations.

Typical noise data for the associated Mine, construction and railroad equipment used in the noise level predictions were estimated based on noise emission equations from a variety of publications (Beranek 1992, Crocker, 1997, EEI, 1984, ISO, 1996, DOT, 1995). Since the design and engineering of the Project facilities and the selection of the equipment have not been finalized at this time, the predicted noise levels should be considered approximate, but reasonably accurate.

This section also includes information extracted from the Supplemental EIS Support Document (Bull Mountain Development Co., LLC, 2002a) and the Bull Mountains Mine FEIS (Montana Dept. of State Lands, 1992).

According to the EPA, outdoor yearly noise levels are sufficient to protect public health and welfare if they do not exceed 55 dBA on the L_{dn} scale in sensitive areas (e.g., residences, schools, and hospitals). EPA found that outdoor L_{dn} values greater than 55 dBA can cause sleep disturbance, annoyance, and stress, maintaining an L_{dn} noise level of 55 dBA outdoors should ensure adequate protection for indoor living. Because these protective levels were derived without concern for technical or economic feasibility, and contain a margin of safety to ensure their protective value, EPA has indicated that they should not be viewed as standards, criteria, regulations, or goals. Rather, they should be viewed as levels below which there is no reason to suspect that the general population would be at risk from any of the identified effects of noise. The EPA outdoor recommended level of L_{dn} 55 dBA is commonly accepted as a target to prevent impacts at residences due to noise.

A noise level increase of approximately 6 dBA typically appears to be a “clearly noticeable” increase, an increase of 10 dBA appears to be approximately twice as loud as the original noise level to a person with normal hearing, and an increase of 20 dBA appears to be about four times as loud as the original noise (Egan 1988). Noise impacts would be considered high if the predicted Project noise levels exceed the suggested Federal target levels by 15 decibels (dBA) or greater. Noise impacts would be considered moderate if the day-night noise level (L_{dn}) at a receptor were between 5 and 15 dBA. Noise levels would be considered low if the day-night noise level (L_{dn}) at a receptor were between 0 and 5 dBA. These criteria are adapted from the state highway administrations, Criteria 1, definitions.

Five noise-sensitive receptors, representing single residences, the Shining Mountain Christian Ranch, the Bull Mountains Community Church, and groups of residences, within1.5 miles of the Project facilities were assessed (see Section 3.10.3). The receptor locations are shown in Figure 3-7. Long-term noise impacts to sensitive receptors due to operation of the Project would be considered the most significant.

Impact Levels

Impacts would be classified in this document as high where an action would:

- Increase noise levels by > 15 dBA above the federal range, thereby being an annoyance and creating an adverse reaction.

Impacts would be classified in this document as moderate where an action would:

- Increase noise levels by 5 – 15 dBA above the federal range, thereby adversely affecting residential, commercial, or industrial properties and possibly creating some complaints.

Impacts would be classified in this document as low where an action would:

- Create short-term noise level disturbances or remain within 0 –5 dBA of federally suggested noise levels.

No impact would occur if there were no increase to the federal noise level.

4.10.2 Proposed Action

Generation Plant

Construction Noise

During construction of the Generation Plant and associated facilities, short-term noise sources would include heavy mobile equipment (e.g., bulldozers, backhoes, cranes, rock drills, heavy trucks, pumps, generators, compressors, loaders, and compactors). Construction equipment operation would vary considerably during the Project and during any given day. During the construction periods, the heavy mobile equipment is typically not run continuously and construction noise would generally occur only during the daytime hours (Sargent & Lundy 2002d).

The construction noise level predictions presented below are based on a conservative assumption that there would be five pieces of large mobile construction equipment operating simultaneously. Each individual piece of equipment typically generates noise levels up to 90 dBA at a distance of 50 feet from the equipment (DOT, 1995). Blasting is not expected, and most likely it would not be necessary to drive piles for any of the foundations (Sargent & Lundy, 2002d).

Construction activities typically occur during the daytime hours, but it is difficult to determine the length of time that the noise from a particular piece of equipment would persist during normal construction activities, since the noise is intermittent. Calculations indicate that the noise generated from five large pieces of construction equipment would be approximately 40 to 60 dBA at the noise sensitive receptor locations identified in Figure 3-7.

Near the end of the Project construction, it would be necessary to generate steam in the boiler and release it to the atmosphere to clean the steam piping. This operation is a one-time event and would be done during the day, one operation per day generally over a two-week period. A steam blow silencer could be used to reduce the steam discharge noise to about 85 dBA at 100 feet from the discharge, which would result in moderate noise levels at the receptors. Notices providing the schedule for these operations would be given to nearby residents and others in the community (Sargent & Lundy, 2002d).

Although the construction noise levels could be audible at the receptors and may be considered an annoyance during the various construction phases, the construction noise impacts are predicted to be low. Construction noise would normally only occur during the day and residents are typically less sensitive to noise during the day than they are at night.

Operation and Maintenance Noise

Once the twin Generation Plants are operational, dominant long-term noise sources could include exposed equipment, enclosed associated facility equipment, and the coal handling area. Table 4-26 lists the noise sources for the Generation Plant and associated facilities.

Table 4-26 Roundup Power Project Noise Sources

Exposed Generation Plant Equipment	Associated Facility/Coal Handling Equipment
Air-cooled condensing units	Coal pile bulldozers
Main transformers	Enclosed transfer tower
Induced-draft (ID) fans	Crushers in crusher house – enclosed
	Forced-draft (FD) fans
	Primary-air (PA) fans

Source: Bull Mountain Development Company, LLC., 2002a

Typical noise control measures for the Generation Plant, as previously mentioned, have been included in the noise level model. These measures are consistent with typical design practice for Generation Plants similar to the Proposed Action.

Lime would be delivered to the plant by bottom dump railroad cars. Generally, a main line locomotive would bring in the cars, and the empty cars would be removed in 10 to 15 car groups twice per month, or more cars would be removed less often. A small railroad car-moving tractor would be used to position several cars per day for unloading, five days per week (Sargent & Lundy, 2002d). The lime delivery operation would be audible at the receptors, but should not create any impact compared to operations associated with the plant.

Day Average (L_d) Generation Plant Noise Levels

The predicted noise levels at the receptors (Figure 3-7 in Chapter 3), due to the typical outdoor Generation Plant and associated facility (coal handling) equipment listed in Table 4-26, were calculated and estimated during the daytime and nighttime hours. For this analysis, it was assumed that all of the outdoor Generation Plant equipment would operate simultaneously and continuously 24-hours per day.

Table 4-27lists an approximate analysis of day average (L_d) noise levels hand calculated and generated from the combination of only the Generation Plant and associated facility equipment at the nearby receptors. The L_d level is the 15-hour average noise level between 7:00 a.m. and 10:00 p.m., and should not be compared to the EPA L_{dn} recommendation, because the L_{dn} and L_d are two different metrics.

Table 4-27 Day Average Noise Levels Due to the Power Project

Receptor	Estimated Generation Plant L_d Noise Level Without Additional Noise Control Measures Installed (dBA)	Estimated Associated Facility L_d Noise Level (dBA)	Combined Noise Level With Additional Generation Plant Noise Control Measures Installed (dBA)[1]
A	58	48	51
B	52	41	44
C	49	33	42
D	46	31	35
E	49	18	31

Source: Bull Mountain Development Company, LLC., 2002a.

[1] Combined L_d noise level were calculated assuming that the Generation Plant noise was continuous during the 15-hour period, with the associated facility mobile equipment operating for 3 hours.

Compared to the measured daytime ambient noise levels in the vicinity of the receptors, the combined day average noise level would exceed the measured ambient noise levels by approximately 18 dBA at Receptors A, with the additional noise control measures installed. The owners at this receptor received an offer to buy their property. They declined the offer but were made aware of the noise levels.

Night Average (L_n) Generation Plant Noise Levels

Table 4-28 lists the approximate night average (L_n) noise levels calculated and generated from only the Generation Plant equipment at the nearby receptors. The L_n level is the 9-hour average noise level between 10:00 p.m. and 7:00 a.m., and should not be compared to the EPA L_{dn} recommendation, because the L_{dn} and L_n are two different metrics.

Table 4-28 Night Average Noise Levels Due to the Power Project

Receptor	Estimated Generation Plant Ln Noise Level Without Additional Noise Control Measures Installed (dBA)	Estimated Generation Plant Ln Noise Level With Additional Noise Control Measures Installed (dBA)
A	58	48
B	52	39
C	49	42
D	46	33
E	49	31

Source: Bull Mountain Development Company. LLC, 2002a.

Compared to the measured nighttime ambient noise levels near the receptors the night average noise level due to the Project would exceed the existing ambient noise levels by approximately 12 dBA at the receptors, with the additional noise control measures installed.

Day-Night (L_{dn}) Generation Plant Noise Levels

The acoustical noise model was based on geometrical and acoustical data specifying the sources. The SoundPLAN prediction process scans the geometry from the receiver. The scanning or searching process is conducted with a search ray. For each source and receiver combination the SoundPLAN software determines the mitigation parameters based upon, spreading, meteorological effect, air absorption, ground effects, barrier effects (such as over vertical and around horizontal diffraction). The predicted L_{dn} noise levels were compared to the maximum L_{dn} value (55 dBA) recommended by the EPA for residences (EPA 1974) and the estimated existing L_{dn} values based on the measured levels (see Section 3.10.2). The calculated effects of the Mine and railroad operation were intermittent contributors to the overall noise directivity, and were eliminated from further consideration as concerns continual impacts. Table 4-29 summarizes the predicted L_{dn} noise levels

Table 4-29 Predicted Day-Night Noise Levels Due to the Power Project

Receptor	Estimated Ambient Ldn Before Construction of Mine and Railroad (dBA)	Estimated Ambient Ldn After Mine and Railroad Operations Begin (dBA)1	Predicted Ldn Due to Power Project Only Without Additional Noise Control Measures (dBA)2	Predicted Ldn Due to Power Project Only With Additional Noise Control Measures (dBA)2
A	35	44	74.1	55
B	35	45	70.5	51.5
C	35	40	67.7	47.2
D	35	41	64.7	46.5
E	35	37	68.7	46.9

Source: Based partially on information obtained in Supplemental Environmental Impact Statement Support Document,(Bull Mountain Development Company. LLC,. 2002a)

[1] L_{dn} noise level = estimated L_{dn} before construction of the Mine and railroad (Section 3.10.3) plus the estimated L_{dn} due to the operation of the Mine and railroad (Table 3-15) (using logarithmic addition).
[2] L_{dn} calculated using the Concawe Model with Soundplan Software.

The predicted day-night noise levels (L_{dn}) at the receptors are primarily due to the Generation Plant equipment and operations, since they operate continuously. See Figure 4-1 for comparisons of noise levels depicted graphically as noise contours. With the additional noise control measures installed, L_{dn} values of 55 dBA as recommended by the EPA, or less, are predicted at all the receptors. Without additional noise control measures, the EPA guideline is predicted to be exceeded at all receptors. The modeling predicts that noise reductions must be implemented to reduce noise from the stack at least 25.3 dBA, the Air Cooled Condensers at least 15 dBA, and from the transformers at least 10 dBA.

The EPA guideline of L_{dn} 55 dBA would not be exceeded at the receptors if the suggested noise control reduction measures were employed. As such, the noise impacts due to the Generation Plant would be low. However, if the described noise reduction measures were not installed, the noise impacts due to the Generation Plant are predicted to be high.

Steam Vent Equipment Noise

Steam from the boilers would need to be vented during the Generation Plant startup after construction, during restarting the plant after maintenance activities, and for emergency high-pressure safety releases. Although noise from the steam vents typically only lasts up to several minutes and occurs very infrequently (typically 1 to 2 times per year), the noise generated by the vents can be substantial. The noise levels generated during a single steam vent occurrence at the nearby receptors would be approximately 80 dBA. Since the potential disturbance is very infrequent and brief, the impact of the steam vent noise is predicted to be moderate. Steam vents were not included in the previously discussed calculations of L_{dn} values. To limit the noise produced by the high-pressure boiler steam vents, discharge mufflers would need to be installed at the vent openings, if action were to be continual. The steam vent relief valves were not considered in calculations for the noise contour modeling shown in Figure 4-1 because of the infrequent occurrence of this operation

In-Mine Waste Disposal

In-mine waste disposal for future expansion of the landfill operation would not be an immediate concern for plant operations. There were neither predictions nor impacts studied or associated with this ash landfill disposal method. This option is not expected to be in service for at least 10 years and would undergo further assessment at that time and further permitting and design decisions would be undertaken. It is expected that the ash would be trucked to the Mine on rubber tired vehicles over a Mine haul road. This road would be designed to minimize impacts from noise and would be farther from the sensitive receptors thus reducing any additional audible impacts. It is not foreseen to be a significant contributor of noise over the life of the Generation Plant.

The noise impacts at the receptors due to the Generation Plant are summarized in Table 4-30.

Table 4-30 Summary of Impacts on Noise Levels from Construction and Operation of the Project

Activity	Potential Impact	Impact Level
Construction Activities	Temporary and intermittent annoyance and stress due to increased noise levels at receptors during the construction period during daylight hours.	Low
Typical Generation Plant and Associated Facility Operations (with additional noise control measures as necessary)	Potential long-term annoyance, sleep disturbance, and stress at the receptors due to noise generated by the operations.	Low

Activity	Potential Impact	Impact Level
High-pressure steam vent	Temporary and infrequent annoyance, speech interference, stress, and possible sleep disturbance due to an intermittent and brief increase in noise levels at receptors.	Moderate

Source: : Bull Mountain Development Company. LLC,. 2002a.

Since the predicted noise levels of the Generation Plant would not exceed the EPA recommendation of L_{dn} 55 dBA (even though the predicted noise levels exceed the existing nighttime ambient noise levels by more than 10 dBA), the noise impacts at the receptors have been categorized as "low."

Because the range of reactions of a typical persons to a given noise environment fluctuates, there is a possibility that some people represented by these receptors may subjectively consider the noise levels generated by the Project to be an annoyance. Criteria 1 impacts from the State Highway Administration (SHA) are intended to indicate potential noise impacts and the EPA guideline is commonly accepted as a target to prevent impacts at residences due to noise.

Since the perception of noise by individuals can vary significantly, an estimated probable average was referred to for criteria that indicates potential for complaints. Previous surveys from the past forty years used a factor to assess community responses around generation plants. This factor is referred to as the normalized outdoor day-night sound level. Based on these case histories, community responses were quite negative when noise levels reached 80 dBA and were slightly negative when noise levels reached 62 dBA (Elliot et al., 1998). Since the predicted noise levels for the Project remain below the EPA guidelines of L_{dn} 55 dBA, we would not expect a community response; however, noise would be noticeable.

The predicted noise levels have been modeled according to a typical coal fired generation plant with and without additional noise control measures included. Since the Generation Plant and its associated facilities have not yet been designed in detail, these preliminary noise level estimates may change, as the design progresses and specific equipment selections are made.

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Figure 4-1 Noise Contours

161kV Transmission System

The 161kV Transmission System includes double circuit 161kV transmission lines and a parallel single circuit 161kV line to be installed on a wooden H-frame structure located adjacent to the railroad right-of-way (Figure 2-7 and Figure 2-11). The three proposed transmission circuits would interconnect with the Broadview Substation and follow the permitted railroad right-of-way. The Transmission System could generate a small amount of audible noise, typically during an abnormally foul weather event, such as fog or heavy torrential rain, noticeable only if you were underneath in the corridor. The predicted maximum audible noise levels, based upon similar designed transmission systems utilizing single conductors, has been calculated according to BPA references at the 43 dBA level at the right-of-way, measured from the center line. The lines are not expected to be audible nor approach the limit of the measured background noise levels. They would not be audible at any of the closest noise sensitive receptors, which were estimated to be further than 300 feet from the right-of-way. They would not be included in any cumulative nor predicted noise calculations. As such, no noise impact is expected for the Transmission System.

4.10.3 Action Alternatives

Landfill Alternative

It is expected that the ash would be transported by truck to the landfill as part of this alternative to the Proposed Action. This would require vehicular transport and would be located on the north side of the facility, thereby minimizing noise impacts to sensitive receptors. This alternative would allow for waste storage to be further from the sensitive receptors (as compared to Mine storage for the Proposed Action) thus minimizing any additional audible impacts. It is not foreseen to be a significant contributor of noise over the life of the Generation Plant. This action alternative could be a more environmentally noise friendly option than the Proposed Action (disposal to the Mine).

230kV Transmission System

The alternative to include a 230kV Transmission System would be similar to the Proposed Action, utilizing an H-frame design with parallel single circuit 230kV transmission lines (refer to Figure 2-7 for details) located adjacent to the railroad right-of-way. The 230kV Transmission System would interconnect with the Broadview Substation and follow the permitted railroad right-of-way. The Transmission System could generate a small amount of audible noise, typically during foul weather, such as fog or rain. The predicted maximum audible noise levels, based upon similar designed systems utilizing single conductors, has been calculated according to BPA's Corona and Field Effects program to be in the 58 dBA level at the right-of-way, measured from the center line. The lines are not expected to be audible nor approach the limit of the measured background noise levels at any of the closest noise sensitive receptors, which were verified to be further than 300 feet from the right-of-way. They were not included in any cumulative or predicted noise calculations. No noise impacts are expected from the 230kV Transmission System. As such, noise impacts are expected to be the same as impacts identified for the Proposed Action.

4.10.4 Mitigation Measures

There are no existing enforceable mitigation measures that can be acted upon by any agency. The regulatory agency does not have the authority to create mitigation measures that they can enforce, without the direct consent of the Project proponent. The EPA and the Department of Transportation provide suggested noise levels that minimize impact to the public.

To ensure that the Generation Plant noise is not excessive, careful evaluation and selection of typical low noise design options, equipment specifications, building and wall designs, and enclosure constructions should be made during the design process. Typical noise control measures, such as FD fan intake louver design and duct silencers, as well as PA fan location and equipment abatement enclosures, could be installed initially. The plant design could also include specifications calling out low noise options for cooling tower and transformer equipment. The design could also include provisions, such as longer-than-normal ID fan discharge ductwork and increased fan capacity, to accommodate silencers in the discharge stacks, but these silencers would not be installed initially (Sargent & Lundy 2002a). The Project could be constructed, and, if measured noise levels exceed L_{dn} 55 dBA at the sensitive receptors, the additional noise control measures then could be installed as necessary to avoid adverse impacts on the sensitive receptors.

4.10.5 No-Action Alternative

Under the No-Action alternative, the Project and associated facilities would not be built. There would not be any alteration to facilities that generated noise; therefore, no additional noise impact would occur.

4.11 Land Use

This section describes the types of impacts that would potentially occur to land use resources from construction, operation, and maintenance of the proposed Project and alternatives. Mitigation measures used to reduce impacts to land use resources are also discussed.

4.11.1 Methods

Information was obtained from the Supplemental EIS Support Document (Bull Mountain Development Co., LLC, 2002a) for background information on the land use impact assessment. The Bull Mountains Mine FEIS (Montana Dept. of State Lands, 1992) and the Railroad Spur Checklist EA (DNRC, Trust Land Management Division, 2002) were also used as references for this section.

Impact Levels

Impacts would be classified in this document as high where an action would:

- Convert active and productive farmlands to a non-farm land use
- Create areas of non-inhabitable land where residential uses already exist or are permitted
- Prevent the use of the land according to existing or approved land management plans

Impacts would be classified in this document as moderate where an action would:

- Adversely affect existing farmlands by limiting farm production or the types of farm uses
- Adversely affect residential, commercial, or industrial properties by eliminating or limiting the potential for residential development to occur
- Adversely affect commercial or industrial properties by introducing additional or new inconveniences to business operations
- Alter the use of the land according to existing or approved land management plans

Impacts would be classified in this document as low where an action would:

- Create short-term disturbances such as minor crop damage during construction or restrict improvements to previously affected areas (e.g. existing structure locations).
- Create short-term disturbances, but still allow the continued use of the land according to existing or approved land management plans.

No impact would occur when land uses would be able to continue as currently exist.

4.11.2 Proposed Action

Generation Plant

Construction of the Generation Plant would convert the immediate Generation Plant site to heavy industrial use. Currently, the entire site (Section 15, Township 6 North, Range 26 East) is undeveloped land potentially available for livestock grazing and other agricultural uses. During Project construction, the entire site would be unavailable for grazing or other uses. Upon completion of construction, the permanently disturbed area (conservatively estimated to be 208 acres) would be unavailable for uses other than power generation. Undeveloped parts of Section 15 outside the plant fence may be made available for livestock grazing, but these plans have not been finalized. Even if all 640 acres of Section 15 were permanently removed from agricultural use, this would represent a loss of less than 0.1% of the agricultural land in Mussellshell County. Industrial land use, on the other hand, is limited in Musselshell County, currently representing less than 0.1% of the total land in the county. Therefore, conversion to power generation would be a beneficial land use change that would add significant diversity to the county's economic base.

Recreational land use near the Generation Plant site includes dispersed outdoor activities such as hunting and horseback riding. Dispersed recreation use currently occurring within the Generation Plant site would be displaced during construction and operation, resulting in a long-term impact. Because numerous opportunities for dispersed recreation are present on surrounding private and public lands, impacts would be low.

Construction of the Generation Plant is expected to take approximately 4 years. During this time, the site would be a large construction area. Noise, dust, onsite machinery movement, and human activity would be noticeable from the residential, religious, and agricultural land uses located near the Project site. Construction also would generate considerable traffic to and from the site. Substantial increases in traffic, noise, and dust have the potential to temporarily affect the emotional setting or character of nearby areas. Residential and religious land uses would likely be most susceptible to impacts of this type. However, since construction would be restricted to daylight hours and would not continuously involve the same activities, impacts would be intermittent. Overall, land use impacts due to construction activities and vehicle movement would be short-term and low.

Generation Plant waste disposal would involve the conveyance of ash from the Generation Plant site east to a location within an adjacent Mine. Depending on the conveyance method, short-term impacts could result from noise and dust associated with construction of a haul road or other means of transport (e.g., conveyor, slurry pipeline). Long-term impacts could include noise, dust, and the conversion of land potentially available for livestock grazing, other agricultural uses and dispersed recreation activities to heavy industrial use. Based upon the same reasons stated above, impacts would be low.

Because the Generation Plant is within easy commuting distance of the City of Billings, in-migration of workers and their families to the local area would likely not be extensive. However, some non-local workers may choose to live near the construction site in their own campers or trailers. Local business people might respond to the increased demand for camper/trailer spaces by developing trailer courts and camper parks. Development of such facilities could be a permanent land use change. The new facilities could be established at any suitable locations within a reasonable commuting distance of the Project site, but it is likely that they would be located in the subdivided areas near the site. It is possible that a convenience store or other small commercial facility also could be established in the subdivided areas. Since most of the subdivided parcels near the site currently are undeveloped and the land is idle, such developments would represent a beneficial land use impact.

The long-term economic and population effects of the Generation Plant's operation would likely stimulate some land use changes in the City of Roundup and other parts of Musselshell County. The Project's direct and induced population and economic effects would generate demand for new and improved housing, business, and government products and services. Private and public sector responses to changes in demand for products and services would cause some changes to area land uses, including increased investment in housing and businesses. These changes generally would be considered beneficial land use impacts.

Currently there are no land use plans or zoning classifications applicable to the Generation Plant site. The proposed Generation Plant is not inconsistent with the Musselshell County Comprehensive Plan.

The Project Proponent would comply with Federal Aviation Administration (FAA) requirements regarding structure marking and lighting as well as other FAA requirements regarding public safety.

161kV Transmission System

Development of the proposed Transmission System would add a double circuit 161kV transmission line and a parallel single circuit 161kV transmission line to the current land uses within the 225-foot right-of-way.

Placement of transmission structures, access roads upgrades and construction, and conductor tensioning sites have the potential to impact residences, non-irrigated cropland, livestock grazing, CRP land, and dispersed recreation activities.

Short-term (construction) and long-term (maintenance) impacts could result from increased traffic, noise, dust, and restricted, blocked, or detoured access to residences and dispersed outdoor recreation activities such as hunting, horseback riding, and hiking. These impacts would primarily occur from the use of heavy machinery/equipment. Overall, disturbances to residences and dispersed outdoor recreation activities during construction and maintenance of the Transmission System would be low, due to the temporary nature of the construction activities and intermittent and temporary nature of the maintenance activities at any one location along the right-of-way.

Construction activities would also involve the crossing of various roadways. Agreements or permits to do so are available from the administering agency having jurisdiction over such road rights-of-way. Potential short-term direct impacts to roadways could occur from the crossing of the Project component. Generally, the potential impacts of these crossings are avoided by spanning the travel route and using traffic and safety controls during construction (e.g., flag-persons, warning signs, guard structures) and therefore are expected to be low.

Short-term (construction) impacts on non-irrigated cropland, livestock grazing, and CRP land could occur. Impacts to non-irrigated cropland could include disruption of farming practices (e.g., preclusion or interference with planting, maintaining, or harvesting) and seasonal loss of crops during construction. Impacts to livestock grazing could result from the disturbance, disruption, and/or alteration of this use. There is also a potential for damage to rangeland improvements, such as fences and gates. In addition, human activity, movement of vehicles/equipment, and noise could disturb grazing livestock and drive them away from livestock water sources near the construction area. Impacts to CRP land could result from construction disturbance. Disturbances from construction activities and temporary occupancy of the land within the 225-foot right-of-way could result in a temporary loss of non-irrigated cropland, grazing land, and CRP land through the removal of vegetation. This temporary loss of the use would result from construction disturbance at transmission structure sites (including laydown areas), staging areas, and in areas where new temporary access is required. Construction activities and temporary occupancy of the land could also result in a temporary loss of the use outside the right-of-way as a result of staging area construction.

Long-term (operation and maintenance) impacts on non-irrigated cropland, livestock grazing, and CRP land could occur. Impacts to non-irrigated cropland could include (1) removal of non-irrigated cropland from production at transmission structure sites and new access road sites; (2) reduction in crop yields around transmission structures because of soil compaction during construction and increased difficulties with weed and pest control; (3) increased time required for farming operations; (4) disruption of agricultural aircraft operations; and (5) economic losses. Impacts to livestock grazing could result from those grazing areas permanently displaced by transmission structure sites and new access road sites. Impacts to CRP land could include (1) removal of CRP land at transmission structure sites and new access road sites; (2) increased difficulties with weed and pest control; (3) disruption of aircraft operations involving weed and pest control application; and (4) economic losses.

Transmission System maintenance activities could cause impacts through land use interference. Depending on the season and timing of the maintenance activities, vehicular and foot traffic, human activity, and use of machinery/equipment could interfere with planting, maintaining, or harvesting crops. This same type of disturbance could disturb grazing animals, drive them away from the right-of-way, and disturb CRP land. This could result in a temporary, intermittent loss of non-irrigated cropland, grazing land, and CRP land over an area larger than the right-of-way.

Short-term and long-term impacts on non-irrigated cropland, livestock grazing/grazing land, and CRP land would be low because of the minimal extent of disturbance on these land uses as a result of Project construction, operation and maintenance. The area disturbed by construction would be minimal, and following rehabilitation, the only areas removed from use for the life of the Project would be the small areas at the transmission structure footings and/guy anchors and new access roads that would remain permanently. The non-irrigated cropland no longer available for farm use would represent a small portion of cropland when compared to 2000 non-irrigated harvested crop (all) acreage in Musselshell County (38,600 acres) and Yellowstone County (111,600 acres). The remainder of the non-irrigated cropland within the right-of-way would be available for non-irrigated cropland. Non-irrigated cropland would be able to continue around the transmission structures, and underneath the transmission line. Where non-irrigated cropland would be crossed, impacts would be minimized through spanning of cultivated fields, where feasible. The remainder of the rangeland within the right-of-way would be available for grazing. Livestock grazing would be able to continue around the transmission structures, underneath the transmission lines, and over necessary access roads. The removal of CRP land would represent a small portion of CRP land when compared to current (October 31,2002) total CRP acreage in Musselshell County (40,651 acres) and Yellowstone County (55,868.4 acres). The remainder of CRP land would be able to continue around the transmission structures, and underneath the transmission line. Where CRP land would be crossed, impacts would be minimized through spanning of fields, where feasible.

Maintenance activities would be intermittent, temporary, and generally occur at any one location or point along the right-of-way.

In addition, indirect long-term impacts from increased access and changes in access patterns may occur. Increased vehicle or foot access could increase with new roads and indirectly result in increased littering or dumping of trash, tree cutting, illegal hunting, and other unauthorized activities on private and public lands.

Currently there are no land use plans or zoning classifications applicable to the proposed Transmission System. The proposed Transmission System is not inconsistent with the Musselshell County Comprehensive Plan and Yellowstone County Comprehensive Plan.

The Project Proponent would comply with Federal Aviation Administration (FAA) requirements regarding structure marking and lighting as well as other FAA requirements regarding public safety.

Summary of Impacts from the Proposed Action

Table 4-31 provides a summary of impacts to land use from the Proposed Action.

Table 4-31 Summary of Impacts on Land Use from Construction, Operation, and Maintenance of the Proposed Roundup Power Project

Potential Impact	Impact Type	Impact Level
Conversion of Generation Plant site to industrial use	Direct, Long-term, Beneficial	Low
Displacement of dispersed outdoor recreation activities by construction and operation of the Generation Plant site	Direct, Long-term	Low
Increased traffic, noise and dust due to Generation Plant construction	Direct, Short-term	Low
Potential induced commercial and residential development due to Generation Plant operation	Direct, Long-term, Beneficial	Low
Disturbance of residences and dispersed outdoor recreation activities due to Transmission System construction and maintenance	Direct, Short-term and Long-term (maintenance)	Low
Disruption of farming practices and seasonal loss of crops during Transmission System construction	Direct, Short-term	Low
Removal of non-irrigated cropland; Interference with the use of non-irrigated cropland during Transmission System operation	Direct, Long-term	Low
Disruption or alteration to livestock grazing during Transmission System construction and maintenance	Direct, Short-term and Long-term (maintenance activities)	Low
Removal of grazing land during Transmission System operation	Direct, Long-term	Low
Disturbance of CRP land during Transmission System construction	Direct, Short-term	Low
Removal of CRP land during Transmission System operation	Direct, Long-term	Low
Increased access	Indirect, Long-term	Low

4.11.3 Action Alternatives

Landfill Alternative

Impacts would be the same as those presented for the Generation Plant. Impacts to the landfill expansion are not expected to take effect for ten years beyond the impacts that the Generation Plant would impose. This is because the landfill within the existing Generation Plant design is expected to take ten years to reach capacity. Impacts to land use resulting from construction and operation of the landfill expansion would therefore be low.

230kV Transmission System

Impacts for the most part would be the same as the 161kV Transmission System with the exception of the 230kV Transmission System utilizing a 300-foot right-of-way, fewer access roads, and fewer transmission structures. As a result, ground disturbance would be less than that of the 161kV Transmission System.

4.11.4 Mitigation Measures

The Project Proponent would comply with Federal Aviation Administration (FAA) requirements regarding structure marking and lighting as well as other FAA requirements regarding public safety.

The regulatory agency does not have the authority to create mitigation measures that they can enforce, without the direct consent of the Project proponent. Potential mitigation measures to minimize impacts to land use resources are listed in Chapter 2, Section 2.2.5 in the Land Use and Safety subsection. These measures mitigate impacts from the possible damage or alteration to existing structures (fences, gates, etc.) that could occur during construction activities.

4.11.5 No-Action Alternative

Under the No-Action Alternative, existing land uses on and near the Project site would continue. These land uses most likely remain largely agricultural and rural. Existing dispersed recreation activities would continue, subject to landowner permission. Residential development would continue in the subdivided areas near the Project site, but without the economic stimulation provided by the Project. Little or no commercial development would likely occur near the Project site.

4.12 Socioeconomics

4.12.1 Methods

This section discusses the socioeconomic impacts expected to result from construction and operation of the Project. The Mine is a separate project, which is considered an existing action for purposes of this report. However, the Mine is not currently operating and has not operated for several years, so the socioeconomic impacts of the Mine are not reflected in the current socioeconomic conditions of the Study Area. Therefore, this section discusses the socioeconomic impacts of the Mine where necessary to put the Generation Plant impacts into proper perspective.

Construction and operation of the Project entail deploying manpower and equipment, which impose to one or another degree on the residents and communities in the vicinity of the Project in the form of demands for housing, commerce, public services, and other resources. For some residents, the demands are beneficial sources of income and employment, while for others the influx of strangers can be an imposition and a burden.

The assessment of socioeconomic impacts is organized in the following manner. The main variables of socioeconomic activity—population and housing, employment, personal income, taxes, public services, and so forth—are discussed sequentially, with the proposed alternative compared to the no-action alternative.

4.12.2 Population and Housing

The population and housing impacts of the alternatives are presented below.

Proposed Action and Action Alternatives

All aspects of the Project would noticeably affect housing in Musselshell County, and rental housing in Yellowstone County may be affected during the construction phase.

The projected population and housing impacts of the Project were derived using the same overall approach reported in the Supplemental EIS Support Document (Bull Mountain Development Co., LLC, 2002a) along with workforce projections supplied by the Project proponent. However, a number of estimating parameters were revised using more current information, such as that available from the 2000 Census of Population. The employment and labor income multipliers are derived from the IMPLAN impact analysis system, which is used by several Montana state agencies. The IMPLAN analysis system provides industry employment and labor income multipliers for each county. Table 4-32 provides the projection parameters.

Table 4-32 Economic Projection Parameters

Parameter	Projections
Multipliers	Employment multipliers: Mine jobs = .97 Generation Plant jobs = .64 Construction jobs = .52 Labor income multipliers: Mine labor income = .41 Generation Plant labor income=.15 Construction labor income=.33
Local hire ratio	Mine jobs 60% Generation Plant jobs 60% Construction jobs 40% Secondary jobs 70%
Population per job	Mine and Generation Plant jobs 3.0 Construction and secondary jobs 2.0
Persons 0 to 17 years old	20.7 percent of population
Grade distribution of in-migrating children	K-8 45% High school 19% Not enrolled in school 36%

Parameter	Projections
Residence of workers	Mine and Generation Plant Musselshell County 60% Yellowstone County 40% Construction workers Yellowstone County 75% Musselshell County 25% Secondary workers Musselshell County 90% Yellowstone County 10%

As shown in Table 4-33, the total population in both Musselshell and Yellowstone counties associated directly and indirectly with the Project (excluding the Mine) is projected to rise from 167 persons in year 1 to a peak of 3,722 persons in year 3. The long-run population increase would be 642 persons, which would occur in year 5 and thereafter. The peak population in Musselshell County would be about 1,814 persons in year 3, about 44 percent more than the 2000 population. The long-run population associated with the Project in Musselshell County would be about 443 persons, or about 11 percent more than the 2000 figure. These figures include both persons directly involved in construction and operation of the Project as well as people associated with secondary activities stimulated by the multiplier effects of the Project.

Although the Mine is considered an existing action, it is not currently in operation. The additional persons directly and indirectly associated with the Mine need to be considered in evaluating the overall impacts. As shown in table 4-34, the additional population in Musselshell and Yellowstone counties associated with the Mine would rise from 222 persons in year 1 to about 1,571 persons in year 3 and thereafter. The Musselshell County population associated with the Mine would rise from 159 persons in year 1 to about 1,127 persons in year 3. The additional persons associated with the Mine would represent about 27 percent of the 2000 population in Musselshell County.

There were a total of 1,878 households in Musselshell County in 2000, and only 98 owner occupied units and 36 rental units were vacant. Therefore, the population forecasts presented in Tables 4-33 and 4-34 even with a sizable margin of error, imply a need for significant additional local housing. There are a sizable number of seasonal, recreational, and otherwise unoccupied housing units, but their suitability for year-round use, even for a short period, is unknown.

Table 4-33 Projected Direct and Secondary Employment, Labor Income, and Population Associated with the Roundup Power Project Musselshell and Yellowstone Counties

Category	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 30
Employment											

Category	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 30
Generation Plant Operations			60	120	150	150	150	150	150	150	150
Construction	55	755	1140	292							
Total Primary	55	755	1200	413	150	150	150	150	150	150	150
Secondary	29	392	631	228	97	97	97	97	97	97	97
TOTAL EMPLOYMENT	84	1147	1831	641	247	247	247	247	247	247	247
Labor Income (millions 2001$)											
Generation Plant Operations			3.30	6.60	8.25	8.25	8.25	8.25	8.25	8.25	8.25
Construction	2.64	36.24	54.72	14.00							
Total Primary	2.64	36.24	58.02	20.6	8.25	8.25	8.25	8.25	8.25	8.25	8.25
Secondary	0.87	11.96	18.56	5.41	1.03	1.03	1.03	1.03	1.03	1.03	1.03
TOTAL LABOR INCOME	3.51	48.2	76.58	26	9.28	9.28	9.28	9.28	9.28	9.28	9.28
Population											
Musselshell County	79	1084	1814	773	443	443	443	443	443	443	443
Yellowstone County	88	1211	1908	628	199	199	199	199	199	199	199
TOTAL POPULATION	167	2295	3722	1401	642	642	642	642	642	642	642

Source: Bull Mountain Development Company. LLC,. 2002a.

Table 4-34 Projected Direct and Secondary Employment, Labor Income and Population Associated with the Bull Mountains Coal Mine Project Musselshell and Yellowstone Counties

Category	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 30
Employment											
Mine	45	198	318	318	318	318	318	318	318	318	318
Secondary	44	192	308	308	308	308	308	308	308	308	308
TOTAL EMPLOYMENT	89	390	626	626	626	626	626	626	626	626	626

Labor Income (millions 2001$)											
Mine	2.45	9.93	15.82	15.82	15.82	15.82	15.82	15.82	15.82	15.82	15.82
Secondary	1.01	4.07	6.69	6.69	6.69	6.69	6.69	6.69	6.69	6.69	6.69
TOTAL LABOR INCOME	3.48	14.06	22.51	22.51	22.51	22.51	22.51	22.51	22.51	22.51	22.51
Population											
Musselshell County	159	702	1127	1127	1127	1127	1127	1127	1127	1127	1127
Yellowstone County	63	276	443	443	443	443	443	443	443	443	443
TOTAL POPULATION	222	978	1571	1571	1571	1571	1571	1571	1571	1571	1571

Source: Bull Mountain Development Company. LLC, 2002a.

Table 4-35 shows the combined employment and population impacts associated with the Project and the Mine, assuming that development of both projects begins in the same year. Cumulatively, the two operations would directly add nearly 5,300 persons to the two-county area population during the peak construction Year #3, while over the longer term; the incremental Project-related population would number about 2,200 persons.

Table 4-35 Projected Direct and Secondary Employment, Labor Income and Population Associated with the Bull Mountains Coal Mine and Roundup Power Project Together Musselshell and Yellowstone Counties

Category	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 30
Employment											
Mine	45	198	318	318	318	318	318	318	318	318	318
Generation Plant			60	120	150	150	150	150	150	150	150
Construction	55	755	1140	292							
Total Primary	100	953	1518	730	468	468	468	468	468	468	468
Secondary	73	584	939	537	405	405	405	405	405	405	405
TOTAL EMPLOYMENT	173	1537	2457	1267	873	873	873	873	873	873	873
Labor Income (millions 2001$)											
Mine	2.45	9.93	15.82	15.82	15.82	15.82	15.82	15.82	15.82	15.82	15.82

Generation Plant			3.30	6.60	8.25	8.25	8.25	8.25	8.25	8.25	8.25
Construction	2.64	36.24	54.72	14.00							
Total Primary	5.09	46.17	73.84	36.42	24.07	24.07	24.07	24.07	24.07	24.07	24.07
Secondary	1.88	16.03	25.25	12.10	7.72	7.72	7.72	7.72	7.72	7.72	7.72
TOTAL LABOR INCOME	6.97	62.20	99.09	48.54	31.8	31.8	31.79	31.79	31.79	31.8	31.79
Population											
Musselshell County	238	1785	2941	1901	1570	1570	1570	1570	1570	1570	1570
Yellowstone County	151	1487	2351	1071	642	642	642	642	642	642	642
TOTAL POPULATION	389	3272	5293	2972	2212	2212	2212	2212	2212	2212	2212

Source: Bull Mountain Development Company. LLC, 2002a.

[1]Besides the Generation Plant and Mine personnel, whose numbers are projected to peak at 1,518 workers in year 3, an additional maximum of 44 workers would be involved in construction of the Transmission System from the Generation Plant to the Broadview Substation. These workers would not represent a noticeable additional burden on the Roundup area local socioeconomic setting, mainly because they would largely originate from, or would seek temporary accommodation in, the Billings area (which is the principal labor market in the region as well as offering more amenities to transmission line special trade workers recruited from elsewhere).

Using the statewide household size of 2.45 persons, there would be a need for approximately 740 housing units in Musselshell County to serve the population increase expected during the peak of Generation Plant construction in year 3. During the operations phase in year 5 and thereafter, there would be a need for about 181 housing units to serve the population increase in Musselshell County. In addition, the Mine would create the need for about 65 housing units in Musselshell County during year 1, and this would rise to 460 housing units during year 4 and thereafter. Therefore, the Generation Plant and Mine together would create a peak need in Musselshell County for about 1,200 housing units, and a long-term need for about 641 housing units.

In Yellowstone County, the Project would create a peak need of about 778 housing units in year 3 and approximately 81 housing units in year 5 and thereafter. The Mine would create a need for about 26 housing units in year 1, which then rises to a need of 181 housing units in year 4 and thereafter. Altogether, the Generation Plant and Mine would create a peak need in Yellowstone County of about 959 housing units in year 3, and a long-run need of approximately 262 housing units.

As reported in Chapter 3, there was a total of 2,317 housing units in Musselshell County in 2000, and only 98 owner occupied units were vacant and 36 rental units were vacant. Therefore, the population forecasts presented in Tables 4-33 through 4-35, even with a sizable margin of error, implies a need for significant additional local housing. There are a sizable number of seasonal, recreational, and otherwise unoccupied housing units, but their suitability for year-round use, even for a short period, is unknown.

A lack of data makes it difficult to predict whether workers would choose to locate in Musselshell County or Yellowstone County. People try to minimize time spent in travel to and from work, which suggests that most non-local personnel would endeavor to find accommodations in the vicinity of the job site. Offsetting that propensity, however, is the availability of housing and other amenities, which are very limited in the Roundup area, as well as the length of time that a visiting worker would need to relocate. Many construction workers, for example, are "weekend commuters," spending the workweek near the site sharing space in a motor home or RV or motel room, but returning home for the weekend. Car-pooling construction workers often drive several hundred miles over the weekend in order to see their families.

The peak construction year housing needs may require temporary facilities. Obviously, the need of 1,200 housing units in Musselshell County would require some short-term solutions. Possibilities include using mobile homes or trailers, and the creation of temporary RV parks and other facilities. Much of the property near the Generation Plant site has been subdivided, and some of this property may be used for the development of trailer courts or RV parks.

In Yellowstone County, the year 3 housing requirement for 959 units compares with the 867 vacant rental units reported in Yellowstone County during 2000, with an additional 3,609 licensed hotel/motel rooms and 337 RV spots available for transient housing. Therefore, the need for rental housing Yellowstone County may exceed available units during the period of peak construction. Creation of temporary housing using mobile homes and the creation of temporary RV facilities could facilitate short term lodging.

Increased demand for temporary and permanent housing would be beneficial for those with rental property, those with permanent home sites, those desiring to sell existing housing units, and those in the home and apartment construction business. Of particular interest to local developers would be the permanent operating personnel, which would require long-term housing. On the other hand, people attempting to buy or rent housing may face increased costs and increased competition for existing units in the first couple of years during the buildup of the Generation Plant and Mine workforces.

No-Action Alternative

Under the No-Action alternative, the Project would not be permitted and constructed. There would be no need for the additional housing units associated with the Project permanent work force, although the need would still exist for the Mine. Residential land prices and prices of existing homes would not be affected by increased demand. The rental and temporary housing market in Yellowstone County would not be affected during the peak years of Project construction. There likely would not be a shortage of rental and temporary housing.

4.12.3 Employment

The employment impacts of the alternatives are presented below.

Proposed Action and Action Alternatives

The Mine is considered an existing action, but the employment impacts of the Mine have not yet occurred. The Mine impacts were calculated and included here for informational purposes. The

Mine impact estimates were derived with the revised parameters and projection methods used for the Generation Plant impacts.

The direct and indirect employment impacts of the Generation Plant were presented above in Table 4-33 while the corresponding impacts of the construction and operation phases of the Mine were shown in Table 4-34. The combined impacts of both projects together were presented in Table 4-35.

All Mine, Generation Plant, and secondary employment and labor income are assigned to Musselshell County regardless of where the workers live because employment and labor income are measured using a "where earned or worked" basis. There may be a small number of new secondary jobs and labor income created in Yellowstone County, but the projection method used here does not provide these estimates. This requires a respecification of the IMPLAN model for a different spatial area, and then re-solving the simultaneous equation system.

According to information provided by the Project sponsors, Generation Plant employment begins with 55 construction workers in year 1, as shown in Table 4-33. Construction employment rises to a peak of 1,140 in year 3. All construction activity is completed by year 5. Generation Plant operations start with 60 workers in year 3, and full operation with 150 workers is reached in year 5. Estimated secondary employment rises from 29 workers in year 1 to a peak of 631 workers in year 3, and then declines to its long-run level of 97 workers in year 5. At the peak in year 3, Generation Plant operations and construction employment would total approximately 1,831 workers, roughly doubling the existing total employment in Musselshell County (see Chapter 3). The long-run total primary and secondary employment associated with the Generation Plant is about 247 workers, or roughly ten percent of existing employment in Musselshell County.

As reported in Table 4-34, Mine employment begins with 45 workers in year 1 (mostly startup activities), rises to 198 workers in year 2, and with the Mine reaching full production in year 3 with 318 workers in year 3, continues at that level thereafter. Estimated secondary employment rises from 44 workers in year 1 to the long-run operations level of 318 workers in year 3 and thereafter. Beginning in year 3, long-run total employment associated with the Mine would be approximately 626 workers, representing about a one-third of the existing level of employment in Musselshell County (see Chapter 3).

Labor income associated with the construction and operation of the Project would rise from $3.5 million (2001 dollars) in year 1 to a peak of $75.6 million (2001 dollars) in year 3, and then decrease to its long-run level of about $9.3 million (2001 dollars) in year 5 and thereafter. As noted in Chapter 3, total labor income in Musselshell County was about $31.0 million (2001 dollars) in 1999. At its peak in year 3, construction, operations, and secondary labor income would be about 250 percent of the current labor income in Musselshell County.

The labor income earned by coal miners and secondary workers would rise from about $3.5 million (2001 dollars) in year 1 to approximately $22.5 million in year 3 and thereafter. The long-run level of primary and secondary coalmine labor income would be approximately two-thirds of existing labor income in Musselshell County.

The average labor income per worker (both primary and secondary) associated with the Mine and Generation Plant construction and operation would be about $40,800 (2001 dollars) in the peak year 3. The corresponding figure would be approximately $36,400 (2001 dollars) in year 5 and thereafter. Average labor income in Musselshell County was about $15,200 (2001 dollars) in

1999 (see Section 3.12.3). Therefore, the Project and Mine would significantly increase average earnings per worker in Musselshell County and would likely reverse the downward trend in relative per capita income (as reported in Chapter 3). If existing residents would fill many of the new positions, they would benefit from the higher rates of pay.

In summary, the proposed Project would have tangible beneficial economic impacts on Musselshell County. During the construction peak, employment would more than double and labor income would triple. When the Projects reach their long-run staffing levels, Musselshell County's labor income would increase by about one-third and employment would rise by 12 to 15 percent. The average earnings of the new jobs are well above those of existing jobs, thereby reversing the downward trend in relative per capita income in Musselshell County. The total population associated with the Project would reach a peak of 3,722 persons during the third year of the construction phase, and then stabilize back at about 443 persons during the operations phase. The increased job opportunities and higher wages would benefit those looking for employment and those seeking to increase their wages and income. The higher wages may also entice some persons to return to the labor force. The overall tightness of the local labor market may force existing employers to raise their wages in order to retain employees, however. The increased population, workforce, and incomes would improve the opportunities for local merchants serving these markets. Higher wages paid for existing jobs would increase costs to employers and possibly raise prices to ultimate customers.

No-Action Alternative

Under the No-Action alternative, employment, per capita income, and population would increase as described in the baseline economic projections presented in Table 4-36. Musselshell County would continue to grow slower than Montana or Yellowstone County. Increases in population may be mostly due to the increase of commuters to Billings (such as occurred in the Klein CCD), rather than growth in employment opportunities. Employment in Musselshell County is projected to rise only 13 percent between 2000 and 2020, much less than the 34 percent projected for Yellowstone and the 33 percent forecast for Montana. Per capita income is projected to grow, but it would remain well below the averages for Montana and Yellowstone County. The impacts associated with the proposed Mine are independent of those for the proposed Generation Plant. The negative impacts of disapproval would be minor in Yellowstone County.

Table 4-36 Baseline Economic Projections for Montana, Musselshell County, and Yellowstone County 2000 to 2020

Place/Type	2000	2005	2010	2015	2020
Montana					
Population	902,200	952,150	1,000,870	1,053,490	1,108,910
Employment	565,300	618,400	669,940	712,520	750,030
Per Capita Income (1996$)	$22,307	$25,089	$27,658	$29,783	$31,790
Musselshell County					

Place/Type	2000	2005	2010	2015	2020
Population	4,497	4,680	4,860	5,070	5,290
Employment	2,060	2,130	2,210	2,280	2,330
Per Capita Income (1996$)	$16,701	$19,128	$21,521	$23,625	$25,660
Yellowstone County					
Population	129,352	137,990	145,880	154,040	162,410
Employment	91,030	99,840	108,340	115,440	121,790
Per Capita Income (1996$)	$25,542	$28,392	$30,971	$33,010	$35,049

Source: National Planning Association 2002.

4.12.4 Taxes

The tax impacts of the alternatives are presented below.

Proposed Action and Action Alternatives

The Project would provide increased tax payments to the State of Montana, Musselshell County, and the Roundup School District.

The State of Montana taxes affected by this Project are the Electric Energy Production Tax (EEPT), the Wholesale Energy Transaction Tax (WETT), and the Individual Income Tax. The EEPT rate is $0.0002 per kilowatt-hour of electricity produced and the WETT is $0.00015 per kilowatt-hour produced. The net capacity of the plants is 700 MW. Assuming the plants run at 90 percent of capacity, annual production would be 5,518,800,000 KWH. The estimated annual payment for the EEPT is $1,103,760, while the corresponding estimate for the WETT is $827,820. Montana Individual Income Tax would be paid on the direct and indirect labor income associated with the Project. Using an average tax rate of 3.5 percent, the peak year Generation Plant’s labor income would yield income tax revenue of $ 2.7million (2001 dollars), and the corresponding figure for year 5 and thereafter is $324.8 thousand (2001 dollars).

In addition, the Project would pay property taxes to Musselshell County and the Roundup School District. The taxable value of electric generating plants is equal to 6.0 percent of their assessed value. The equipment and materials cost of the Project would be about $440 million, which translates into a taxable value of $26.4 million. As reported in Chapter 3 (Table 3-25), the total taxable value in Musselshell County in 2001 was about $7.2 million. Therefore, even allowing for considerable error in calculations, the Project would more than double the taxable value in Musselshell County and the Roundup School District. The current mill rate for Musselshell County is 115.75, and the corresponding figure for the Roundup School District is 237.36. Applying these rates to the estimated taxable valuation yields a figure of $3.1 million in property taxes to Musselshell County and $6.2 million to the Roundup School District.

The increased property tax revenue would benefit Musselshell County and the Roundup School District. If Musselshell County does not change its mill levies, there would be a significant increase in revenue, which could be used to expand existing facilities, update infrastructure, and other uses. If Musselshell County decides to reduce its mill rates, existing property tax payers would benefit because their taxes would be reduced but services may remain the same or even increase. A large portion of the increased school property taxes would go into the state equalization account and would not be available for the Roundup School District.

No-Action Alternative

Under the No-Action alternative, any improvements dependent upon the tax base would have to seek alternate funding. Demands placed on public services dependent upon this tax base would be minimized, as population growth would be slowed.

If the Project is disapproved, the State, County, and School District must rely on the existing tax base to fund additional projects and programs. Additional demands placed on public services dependent on this tax base may be small as population growth would be slow. The impacts associated with the proposed Mine are independent of those for the proposed Generation Plant.

4.12.5 Education Services

The education services impacts of the alternatives are presented below.

Proposed Action and Action Alternatives

Based on the population forecasts presented in Table 4-33, there would be approximately 92 additional persons under 18 years of age in Musselshell County associated with the Project during the operations phase in year 5 and thereafter. Of this total, about 41 can be expected to enroll in grades K to 8, and 18 in high school.

Although the Mine is considered an existing action, it is not currently in operation. The additional students associated with the Mine need to be considered in evaluating education services capacity. Based on the forecasts in Table 4-34, there would be about 233 additional persons less than 18 years of age in Musselshell County associated with the Mine; about 105 can be expected in grades K to 8 about 44 in high school. Therefore, during the operations phase of the Project and Mine, Musselshell County can expect increased enrollment of about 146 students in grades K to 8 and about 62 students in high school.

The Roundup School District had 2000 enrollment of 425 K-8 students and 239 high school students. During the 1990-91 school year, the Roundup School District with the same facilities had enrollment of 511 in K-8 and 202 in high school. This suggests that the Roundup School District currently may have some excess capacity. In addition, as discussed in Chapter 3, class sizes are progressively decreasing; therefore, it may be possible to accommodate the increased enrollment without building new schools. There would, of course, be the need for additional staffing and other costs. Higher enrollment would increase the equalization payments from the state.

In Yellowstone County, there would be there would be approximately 41 additional persons under 18 years of age associated with the Project during year 5 and thereafter. Approximately 18 would be enrolled in K-8 and about 8 would be in high school. There would be approximately 92 additional persons under 18 years of age during year 5 and thereafter associated with the Mine.

Approximately 41 would be enrolled in K to 8 and 18 would be enrolled in high school. Therefore, during the operations phase of the Project, Yellowstone County can expect a maximum of about 59 additional K to 8 students and approximately 6 additional high school students.

Yellowstone County had about 15,100 enrolled in K-8 and 6,700 in high school in 2000. Therefore, the enrollment associated with this Project would be unlikely to cause significant impacts on the Billings School District or elsewhere in Yellowstone County.

Applying the same parameters to the peak-year population in year 3 (Table 4-33) yields a total estimated enrollment of 390 students in Musselshell County and 311 students in Yellowstone County. These figures should be considered as maximum estimates, and unlikely to be realized. The in-migrating construction workers (60 percent of the total) are less likely to bring their families with them for a temporary job.

The increased enrollment in the Roundup School District would reverse the downward trend of the last decade. Since the additional students would also increase the equalization payments from the state, there would be more resources available to the school district. There appears to be the possibility of excess capacity available to accommodate some increase in enrollment, but there may be need for school construction.

No-Action Alternative

Under the No-Action alternative, the Roundup School District would continue to experience decreased enrollment as the ever-smaller classes advance through the grade levels. Declining enrollment would mean decreases in the equalization payments from the state, according to the existing payment formula. The impacts associated with the proposed Mine are independent of those for the proposed Generation Plant.

The Yellowstone County school districts would not experience the slight increases in enrollment associated with the permanent (and perhaps some temporary) workers who choose to live there.

4.12.6 Transportation

The transportation impacts of the alternatives are presented below.

Proposed Action and Action Alternatives

Approval of the Project would increase traffic on U.S. Highway 87 as employees commute from place of residence to place of employment. This increase in traffic on Highway 87 would require additional traffic patrol and enforcement efforts. The increased traffic would peak during years 2, 3, and 4, which reflect the construction activity. Whether Generation Plant and Mine workers choose to live in Roundup or the Billings area (and appropriate housing is built or otherwise available) would determine if traffic would increase more north or south of the site. Commuter traffic should not adversely affect the overall condition of the road surface. The Project would increase the volume of traffic on a short stretch of "Old Divide Road," as employees commute to and from work; however, a greater tax base would also increase funds available for road maintenance. Semi-truck traffic for construction periods would blend with the current transport traffic creating periods of congestions.

No-Action Alternative

The No-Action alternative would not reduce the present flow of traffic on U.S. Highway 87, nor would disapproval reduce the impact of an increasing number of out-migration commuters traveling to Billings employers. The need for increased law enforcement patrols is growing, but not supported on the current tax base.

4.12.7 Utilities

The impacts of the alternatives on utilities are presented below.

Proposed Action and Action Alternatives

As discussed in Section 3.12.6, municipal water for Roundup residents is obtained from two sources. The availability of municipal water would not be adversely affected by an increased population as current availability exceeds demand. Water availability for residents outside of the city of Roundup is dependent upon wells, or water delivered to individual cisterns. Water for Generation Plant operation would be withdrawn from on-site deep wells, which would have no effect on other groundwater users in the area.

The municipal wastewater treatment center is a revised 3-cell lagoon that would be adequate for the projected increase in population in Roundup. Residents outside of the city of Roundup require individual septic systems. Solid waste is transferred to Billings, and both the transfer station and the Billings landfill have excess capacity. Commercial waste disposal services would be available through BFI Waste Systems in Billings.

No-Action Alternative

The municipal utilities provided in Roundup are ample for the current population with room for additional use. Thus, disapproval of the proposed Project would have no effect on utilities.

4.12.8 Health and Safety

The impacts of the alternatives on health and safety are presented below.

Proposed Action and Action Alternatives

Increases in crime are generally associated with population increases. Applying the statewide 1999 crime rates to the projected population figures reported in Tables 4-33 through 4-35 provides a basis for projecting changes in crime associated with the Project (Montana Department of Justice, 2001). During the peak of Generation Plant construction in year 3, there would be about 153 additional Part 1 crimes, with about 144 more property crimes (burglary, larceny, and motor vehicle theft) and approximately nine more violent crimes (homicide, rape, and robbery). There would be about 251 additional Part II crimes (non-violent crimes). When the Project becomes operational in year 5 and thereafter, there potentially would be about 26 additional Part I crimes, with about 24 property crimes and roughly two violent crimes. There would also be about 43 nonviolent crimes per year.

Although the Mine is considered an existing action, it is not currently in operation. The additional population associated with the Mine need to be considered in evaluating health and safety capacity For the Mine, there would be about nine additional Part I crimes in year 1, with eight more property crimes and one more violent crime. There would be also approximately 15 more nonviolent crimes. For years 3 and thereafter, there would be 64 Part I crimes, with about 60 property crimes and four violent crimes. There would also be about 106 nonviolent crimes.

Altogether, the Project and Mine may add an estimated 217 Part 1 crimes during the peak Year 3, along with about 204 property crimes and approximately 13 violent crimes. There would also be an estimated 357 Part II crimes in that year. During the operations phase in year 5 and thereafter, there would be about 91 Part 1 crimes per year, with about 85 property crimes and approximately 6 violent crimes and approximately 149 Part II crimes.

Most of these estimated crimes would probably occur in Yellowstone County. Reported crime in Montana is heavily concentrated in the urban areas. For example, Yellowstone County accounted for about 25.3 percent of the reported 1999 crime in Montana, with only 16.0 percent of the state's population.

Musselshell County has one of the lowest crime rates in the state. In 1999, its crime rate of 455 per 100,000 persons ranked 48th out of 56 counties, and well below the statewide average of 4,099 per 100,000 persons. A total of 21 major offenses were reported in Musselshell County during 1999, including three assaults, four burglaries, and 13 larcenies.

The hospital has a current daily census of 1.3 inpatients (Dave McIver, 2002). The increase in usage that could be anticipated with an increase in population would not overwhelm the available medical facilities. The ambulance service would need additional staffing in the face of increased population; however, the potential for funding staff increases with the population. The Mental Health opportunities would increase as taxation monies supporting these benefits would increase.

The agencies responsible for fire management in the area are adequately staffed at present. An increase in population would increase the number of structures in the district, but would also bring additional volunteers to help staff the volunteer fire services.

No-Action Alternative

Under the No-Action alternative, agencies responsible for law enforcement in Yellowstone and Musselshell counties would not experience the increase in crime associated with the larger population. Most of this impact would be felt in Yellowstone County, where the crimes are more likely to be perpetrated.

Agencies responsible for health care would not see an increase in population requiring their services.

Agencies responsible for fire management would not anticipate a change in the need for intervention.

4.12.9 Well Being

The impacts of the alternatives on well being are presented below.

Proposed Action and Action Alternatives

The magnitude of potential consequences on social well-being would depend on the ability of community members to adapt to social changes resulting from the proposed Project or action alternatives. Past history in the Roundup and Bull Mountain areas with cyclical resource developments such as coal, oil, forest products, and agriculture has imparted a social history of boom and bust. Due to this pattern of life, many social experiences necessary to deal with new development already exist. This is, however, a sparsely populated area with an established and settled culture. Proposed development may be expected, but it is new and would affect social and cultural patterns. How much local growth results from the proposed development would influence the extent of the impact that mining development has on the immediate area.

Positive effects to social well-being would be realized through increased job opportunities and local spending. Since not all jobs created by the Generation Plant would be filled by local residents, and only a portion of the income would be spent locally, residents with high expectations that the Generation Plant would revitalize the area's depressed economy would experience disappointment if the Project failed to provide a large infusion of wages.

Negative effects would depend upon the extent to which the local area develops. Annual population growth rates above five percent are more likely to have deleterious impacts to communities associated with energy extraction (Lapping, et al,. 1989). Rapid growth in small communities can result in higher rates of crime (property crime during expansions periods), suicide, and stress-related mortality (Hardt, 1994). In particular, residents who oppose the Generation Plant may be adversely affected by its approval. These residents may be more likely to experience feelings of anxiety, stress, and a perceived loss in quality of life. Those residents who established and joined grassroots organizations to oppose the Generation Plant probably would feel their attempts had been futile.

If, however, most of the potential workers locate, and socially and economically associate in areas outside the Roundup area, the advantages to the Project would be minimized, so, too, would the potential disruptions and advantages. If the immediate impacts on the residents to the residents of the Roundup area were to be kept to manageable levels-no more than five percent annual growth--the cumulative impacts to Roundup residents should be manageable.

As mentioned above, annual population growth rates above five percent annually can lead to significant social disruptions. These may be manifest in increased rates in divorce and broken homes (Mudock et al., 1980; Cortese and Jones,1994). Energy extraction has been, and remains, a male dominated field. The intensity of activity during development periods pre-occupies those who are involved. The routine of work can also distract attention from adverse events in non-work settings, thus mitigating personal stresses that may occur. Females, on the other hand, are less likely to have routines that take them away from the observation of daily occurrences in their community. They are less likely to be employed, pre-occupied, or distracted. As a result, they are more likely than are males to report difficulty in coping with the dynamic changes wrought by periods of rapid social and demographic change associated with development that the Project would bring in the short term (Moen, 1980).

Assuming the baseline figures cited in Table 4-35 of this report are accurate, the annual rate of population growth in Musselshell County would be 0.8 percent, arriving at 5,290 residents in 2020. Employment in the county, however, is expected to increase approximately 13.1 percent by 2010. This suggests that the bulk of the growth associated with the Project would reside outside of Musselshell County in more heavily populated Yellowstone County, thus minimizing disruptive effects that might otherwise be expected. Given the size of the Billings area (Yellowstone County), the proposed Project should have only a negligible impact there.

No-Action Alternative

Individuals perceiving the Generation Plant to be a negative influence on the area would view its disapproval positively, whereas those favoring it would perceive disapproval as reducing the potential for increased local income and jobs. Individuals who supported the plant may perceive that their quality of life had been adversely affected by the Generation Plant's denial. Anticipation of a much-needed boost to the economy would not be realized and would cause disappointment to many. This loss of an optimistic outlook for the community could decrease the feeling of social well being for some people. It is likely that community conflict among groups favoring or opposing the Generation Plant would gradually subside with no development, but interpersonal polarization would remain for years. Other development should not affect the social well-being in the Bull Mountains.

4.12.10 Summary of Socioeconomic Impacts

Table 4-37 summarizes the socioeconomic impacts expected to occur due to construction and operation of the Project or the Action Alternatives.

Table 4-37 Summary of Socioeconomic Impacts

Proposed Action	Potential Impact	Impact Severity
Generation Plant Construction	Increased demand for housing Increased housing construction, trailer court development, etc.	**Beneficial, short term** – to homeowners, landowners, landlords, contractors, etc. **Adverse, low** – to existing renters
Generation Plant Construction	Increased employment opportunities Increased average earnings per worker	**Beneficial, short-term**
Generation Plant Operation	Increased employment opportunities Increased average earnings per worker	**Beneficial, long-term**
Generation Plant Operation	Increased tax payments to Montana, Musselshell County, and Roundup School District	**Beneficial, long-term**
Generation Plant Construction and Operation	Increased student enrollment in area schools	**Adverse, low** – due to need for additional staff and infrastructure; **Beneficial** – increased resources due to larger equalization payments from the state of Montana
Generation Plant Construction and Operation	Increased traffic from construction workers, construction equipment, and truck deliveries	**Adverse, low**

Proposed Action	Potential Impact	Impact Severity
Generation Plant Construction and Operation	Increased burden on utilities (water, sewers, solid waste, etc.) due to population increases	**Adverse, low** – there is adequate existing capacity and a projected increased tax base
Generation Plant Construction and Operation	Increased crime due to population increases	**Adverse, low** – increased tax base would allow for more law enforcement
Generation Plant Construction and Operation	Increased burden on fire protection services, ambulance, and medical facilities due to population increases	**Adverse, low** – increased tax base would allow for improved services
Generation Plant Construction and Operation	Altered sense of community culture and well-being	**Beneficial** – opportunities for new membership in clubs, churches, etc. **Adverse, low** – disruption of established social patterns

Source: Bull Mountain Development Company. LLC,. 2002a.

4.12.11 Mitigation Measures

No Project actions specific to socioeconomics are enforceable by an agency. The regulatory agency does not have the authority to create mitigation measures that they can enforce, without the direct consent of the Project proponent.

Most of the Project impacts to socioeconomics would be beneficial, so no mitigation measures would be recommended. Potential mitigation measures to further reduce or eliminate impacts to land use and safety would also minimize some adverse socioeconomic impacts. These measures are included in Chapter 2, Section 2.2.5 in the Construction and Maintenance Access subsection, as well as the Land Use and Safety subsection.

4.13 Irreversible and Irretrievable Commitment of Resources

This section details the effects where there would be a permanent loss of resources or where resources would be inaccessible or unusable for any pre-Project occurrences. The Project would result in an irreversible and irretrievable commitment of resources from direct consumption of materials used during construction and operation including fuel to operate equipment, equipment created for the Project that would not be usable or recyclable at the end of the life of the Project and all coal reserves used to fuel the Generation Plant.

Approximately 208 acres of mostly grass/shrubland habitat with some ponderosa pine would be irreversibly replaced by the Generation Plant. Portions of a 28 mile long and 300-foot wide right-of-way would also be irreversibly replaced by transmission structures and access roads associated with the Project; although, much of the transmission right-of-way would remain available for wildlife habitat, cattle grazing and agricultural practices. Due to the widespread, common nature of this habitat, and because no federally-listed Threatened and Endangered species are known to occur in these areas, the loss to wildlife habitat, cattle grazing and agricultural practices would result in a low impact to these resources.

If cultural or paleontological resource are discovered during Project construction and cannot be avoided, recovery of these resources would ensure no irreversible and irretrievable loss to cultural resources.

The Project operations would result in the consumption of approximately 8,000 tons of coal per day from the adjacent Mine, which would be irreversibly replaced by the generation of electricity. The loss of these coal reserves would be offset by the benefit of electricity generation by the Project.

4.14 Cumulative Impacts

4.14.1 Overview

Cumulative effects result from the incremental impact of the Proposed Action when added to other past and present actions, and future actions under state review. MEPA requires an agency to consider all past and present state and non-state actions; however, for future actions, only those actions under concurrent consideration by a state agency need to be included in the assessment.

The following actions were considered in the cumulative analysis of the Project:

- Residential Development
- Commercial Development
- Industrial Development
- Infrastructure Development

Residential and Commercial Development

Currently residential and commercial developments are minimal in the Project Study Area and surrounding county. Eight rural residences are located within a mile of the Project. The City of Roundup, located approximately 13 miles to the north, is the closest urban development.

No new residential developments are known to be planned for the Project Study Area. However, given the amount of recent residential development, and the amount of land in the Project Study Area that is subdivided, it is reasonable to assume that a small level of development would occur in the future.

The nearest commercial establishment is the Brandin' Iron Saloon, which is located along U.S. Route 87, approximately two miles north-northwest of the Project Study Area. A convenience store and a log furniture store are proposed along U.S Route 87, approximately two miles northwest of the Project Study Area. The next closest commercial establishment is located south of the plant site approximately five miles away. Other plans for the area include a recreational vehicle park and golf course.

Industrial Development

The PM Mine, an underground coal mining operation, was located partially in Section 14, east of the Project Study Area. The PM Mine ceased operation in the 1990s, but the Bull Mountains Mine No. 1 plans to resume mining of the same area. The environmental impacts of this Mine were described by the Montana Department of State Lands (MDSL) in a 1992 Final Environmental Impact Statement (Montana Dept. of State Lands, 1992). No new coalmines or other industrial developments are known to be proposed for the Project Study Area.

Infrastructure Development

Roads

Portions of U.S. Route 87 between Roundup and Billings were upgraded during the 1990s. The only known proposed future upgrades are the construction of acceleration-deceleration lanes where Old Divide Road (the proposed access road to the Project Study Area) intersects Route 87. Construction of these lanes would be expected to disturb relatively small amounts of land already subject to disturbance from traffic and maintenance activities on Route 87.

Transmission

The major backbone of the Montana transmission system is the two 500kV lines that run east to west across the state and through the Broadview Substation (the Project connection point). The 500kV lines connect to the Bonneville Power Administration (BPA) system at Garrison Substation, west of Broadview Substation. Additionally, 230kV transmission connects Broadview Substation to the PacifiCorp system at Yellowtail Substation southwest of the Project Study Area.

According to BPA, major transmission improvements to the BPA system are planned. These improvements would include substation upgrades and transmission line additions between Montana and the Pacific Northwest.

A recent regional transmission study by Western Area Power Administration (WAPA, 2002) determined that export capacity for Montana-generated power is limited and additional high voltage lines and substation upgrades would be required to alleviate congestion to existing transmission. The rules and requirements of new transmission of power are regulated by the Western Electric Coordinating Council (WECC) with system impact studies required for any requests to connect to the western transmission grid system.

The transmission lines from the Project would follow the existing railroad right-of-way for the Mine railroad to Broadview Substation, where the lines would connect to the NorthWestern Energy system. No additional land would be disturbed.

Cumulative effects from the above actions were assessed for each of the resources included in Chapters 3 and 4. The area of impact and level of impacts to these resources are described in the following sections.

4.14.2 Impacts to Resources

Air Resources

This section summarizes cumulative effects of the Project on air resources. A more detailed discussion of the cumulative impact assessment methods and results is included in Appendix B.

Impacts from Offsite Sources

Demonstration of MAAQS, NAAQS, and PSD increment compliance, either within the facility's radius of impact, or near surrounding Class I areas, requires inclusion of impacts from other emission sources that could affect air quality. All major and minor sources within the radius of impact and all major sources within 50 km beyond the radius of impact were included in the MAAQS and NAAQS compliance demonstrations. Only those sources consuming PSD increment (PSD sources) were included in the PSD increment compliance demonstration.

Modeled impacts from the NAAQS/MAAQS modeling analysis were added to the background concentration for the area to determine compliance with the MAAQS/NAAQS. The modeled impacts from existing PSD sources were added to the modeled impacts of the proposed source to determine PSD increment compliance.

Cumulative Ambient and Class II Analyses

Since the impacts from the Project, by itself, were above the PSD modeling significance levels, a cumulative impact analysis for both ambient standards and Class II increments was conducted. The ISC model was used to predict the cumulative ambient and Class II impacts.

Off-site Emitting Sources for Ambient and Class II Analyses

The major Billings/Laurel SO_2-emitting industrial sources were included in the SO_2 MAAQS and NAAQS compliance demonstrations. The predicted NO_2 impacts from the Project are so low that inclusion of other NO_X sources is not considered necessary. Table 4-38 summarizes the potential emissions for the Billings/Laurel SO_2 sources that are used in the ambient analysis.

Table 4-38 Potential Emissions from Billings/Laurel SO_2 Emission Sources

Facility	3-hour Emission Limit (lb/3-hr)	24-hour Emission Limit (lbs/24-hr)	Annual Emission Limit (tons/yr)	Rep. Stack Height (m)	Stack Temp. (K)	Stack Velocity (m/s)	Stack Diameter (m)
ExxonMobil Refinery	6,664	53,154	9,700	76.7	583	13.8	2.96
Yellowstone Energy Limited Partnership	2,204	16,320	2,978	60.6	450	27.4	2.7
Conoco Refinery	2,113	16,901	3,084	53.6	477	47.46	97
Montana Sulphur & Chemical Co.	9,292	74,336	4,544	100	542	10.4	1.07
PPL-Corette Plant	4,162	33,296	5,000	106.7	389	36.58	3.51
Western Sugar	944.7	7,558	797	54.9	309.7	8.24	2.93

Facility	3-hour Emission Limit (lb/3-hr)	24-hour Emission Limit (lbs/24-hr)	Annual Emission Limit (tons/yr)	Rep. Stack Height (m)	Stack Temp. (K)	Stack Velocity (m/s)	Stack Diameter (m)
Cenex Refinery	8,116	64,957	11,849	60.81	495.1	17.3	2.07

Source: Bull Mountain Development Company, LLC., 2002b; Steven T. Wade, 2002a

[a]Emissions were assumed to emit from a single stack at each source because of the large distance between the Project and the Billings/Laurel sources

Cumulative NAAQS and MAAQS Impacts

Table 4-39 compares the highest modeled impacts from the Project in combination with offsite sources with the appropriate NAAQS/MAAQS. In each case, the peak measured ambient concentration has been added to the highest modeled impact to determine the total concentration for comparison with ambient standards.

Table 4-39 Cumulative NAAQS/MAAQS Impacts

Pollutant	Average Period	Modeled Impact[a] (μg/m³)	Existing Conc. (μg/m³)	Total Conc. (μg/m³)	PSD Modeling Sig. Levels (μg/m³)	NAAQS (μg/m³)	MAAQS (μg/m³)
NO_2	Annual	1.12	1.26[d]	2.38	1	100	94
	1-hour[b]	266	15[d]	281	--	--	561
SO_2	Annual	3.42	0.97[d]	4.15	1	80	52
	24-hour[b]	40.5	8.58[d]	49.1	5	365	262
	3-hour[b]	201	26.0[d]	227	25	1,300	---
	1-hour[c]	480	41.6[d]	522	--	--	1,300
CO	8-hour[b]	33.6	1,125	1,159	500	10,000	10,350
	1-hour[b]	105	1,725	1,830	2,000	40,000	26,450
PM_{10}	Annual	1.69	9	10.7	1	50	50
	24-hour[b]	26.3	53	79.3	5	150	150

Source: Bull Mountain Development Company, LLC., 2002b

[a]Roundup Power Project and offsite source impacts
[b]Based on High Second High Impact
[c]Based on 19th High Impact
[d]Averaged from onsite monitoring data collected from January 1, 2002 thru July 15, 2002

The cumulative NAAQS/MAAQS analysis shows that the impacts are above the PSD modeling significance levels but below the ambient standards. Therefore, predicted cumulative impacts from the Project are considered moderate.

Cumulative Class II Increment Impacts

The PSD Class II designation allows for moderate growth or increases in ambient pollutant concentration within certain limits above baseline concentrations. The allowable increase is known as the PSD increment. Industrial sources proposing construction or modifications must demonstrate that impacts from the proposed emissions together with emissions from other PSD sources would not cause ambient pollutant concentrations to increase above the allowed increment in all areas.

Emissions from the Mine are assumed to consume PSD Class II increment for PM_{10}, NO_2, and SO_2. NO_2 and SO_2 emissions from the Mine are very low, and impacts outside the Mine boundary are considered negligible. No other sources consume SO_2 or NO_2 PSD Class II increment within the radius of impact.

Modeling for receptors within the Class II area near the plant was performed using the ISC model. The results in Table 4-40 show that the Project would be in compliance with Class II PSD increments.

Table 4-40 Cumulative PSD Class II Increment Impacts

Pollutant	Average Period	PSD Class II Impact (μg/m³)	PSD Class II Increment (μg/m³)	PSD Modeling Sig. Level (μg/m³)
NO_2	Annual	1.12	2.5	1
SO_2	Annual	2.45	20	1
	24-hour	18.5[a]	91	5
	3-hour	51.8[a]	512	25
	3-hour	51.8[a]	325[b]	25
PM_{10}	Annual	1.69	17	1
	24-hour	26.3[a]	30	5

Source: Bull Mountain Development Company, LLC., 2002a

[a]Based on High Second High Impact
[b]Montana maximum allowable increase above minor source baseline

The cumulative Class II increment analysis as outlined in the above table shows that the impacts are above the PSD modeling significance levels, but below the allowed increments. Therefore, the predicted impacts, with respect to the Class II increments, are considered moderate.

Cumulative Class I Increment Analysis

The predicted modeling impacts for the Project were above the PSD Class I increment significance levels (proposed by EPA but not adopted as regulation). Therefore, a cumulative Class I increment analysis was completed to address impacts from the Project and other major sources in the region. The focus of the cumulative PSD Class I analysis was on impacts to nearby PSD Class I areas, Yellowstone National Park (YNP), UL Bend Wilderness Area (UL Bend), North Absaroka Wilderness (NAW), and Northern Cheyenne Indian Reservation (NCR). The following paragraphs summarize the cumulative Class I increment impacts.

The cumulative PSD Class I increment impacts for the 24-hr and 3-hr SO_2 Class I increments at YNP, NAW, and UL Bend are above the PSD Class I significance levels but below the Class I increments. Therefore, these predicted impacts would be considered moderate. All of the other modeled PSD Class I increments at these Class I areas are below the PSD Class I significance levels. Therefore, the predicted impacts would be considered low.

The predicted cumulative NO_x and PM_{10} PSD Class I increment impacts at the NCR were considered moderate to low. Cumulative SO_2 model-predicted impacts were above the PSD Class I increments and are considered moderate to high. The high increment impacts are mainly due to the emissions from Units #3 and #4 at the PPL facility in Colstrip. During these high impacts, the predicted impacts from the Project were considered low (below the PSD Class I significance levels).

Appendix B contains a more thorough analysis of the PSD Class I modeling impacts on the four Class I areas.

Cumulative Visibility Analysis

As part of assessing air quality impacts of the Project in combination with impacts of other major sources in the region, a cumulative visibility analysis was completed. The focus of the cumulative visibility analysis was on impacts to the PSD Class I areas within 200 km of the Project: YNP, UL Bend, NAW, and NCR.

The FLAG Guidance document (U.S. Forest Service, et. al., December 2000) indicates that a cumulative visibility analysis is expected when an individual source shows impacts that exceed a 5% change in light extinction. The predicted modeling impacts from the Project exceeded the 5% change in light extinction criteria in three PSD Class I areas (YNP, NAW and UL Bend), so a cumulative impacts analysis was triggered. The NCR is not a mandatory PSD Class I area (not designated by the Federal Clean Air Act), so a visibility analysis was not required by regulation.

Procedures for conducting a cumulative visibility analysis are described in the FLAG Guidance document (Section D.2). While the FLAG Guidance document outlines a process for assessing potential visibility degradation from industrial sources of air pollution, CALPUFF modeling by the proponent has generated a number of questions on model algorithms, methodology, and results. These questions are the subject of discussion among the proponent, the FLM, and DEQ. Because the points of disagreement and discussion are still under review, the different methods used to assess visibility degradation are reported in this section. Additional detail on the analyses and methodologies can be found in Appendix B.

Three approaches to modeling cumulative visibility impacts have been applied in determining projected impacts on PSD Class I areas as follows:

> **Scenario #1:** Establishes a visibility baseline date in 1996 to reflect the availability of baseline visibility monitoring data in Class I areas. Emissions of sources constructed or proposed since that date are included in the modeling to determine the cumulative

visibility impact. This scenario proposed by the proponent reflects a practical approach to determining visibility based on the initiation of visibility monitoring. It does not include impacts of all major sources permitted since the PSD baseline date of 1975; therefore, it is less conservative and not favored by the FLMs. Model-predicted results indicate that the Project would be a contributor to days with over a 10% change in light extinction at YNP and NAW. These impacts would be considered high for this EIS document. The predicted impacts at the UL Bend would be considered moderate since the impacts are below 10%.

Scenario #2: Includes increases (but not decreases) in emissions of major sources permitted since the PSD baseline date of 1975 in the cumulative visibility modeling. The Scenario #2 modeling was conducted by the FLMs and includes additional major emissions sources in the cumulative analysis. Results show that emissions from Colstrip Units #3 & #4 are projected to cause high visibility impacts at YNP, UL Bend, and NAW. The Project shows significant contributions (>0.4%) to the high impacts at YNP, UL Bend, and NAW.

Scenario #3: Includes major source emissions increases and decreases since the PSD baseline date of 1975. Scenario #3 includes emissions decreases resulting from the shutdown of two major sources of sulfur dioxide in Montana and from adoption of a new State Implementation Plan (SIP) for controlling sulfur dioxide emissions decreases from sources in the Billings area. Results show an improvement from Scenario #2. However, model results show the Project continues to contribute to visibility impacts above 0.4% change in light extinction.

The proponent has reviewed the CALPUFF modeling results on the days when the predicted change in light extinction levels are above 10%. They have found that the days with the predicted high change in light extinction levels are days with high relative humidity. Based on these findings, the proponent has asserted that the model is likely over predicting real conditions on these days. They believe that precipitation events are likely to occur during these high humidity days, and that any impacts from industrial source emissions would be obscured by natural conditions. Additional discussion and evaluation of this concern along with the model predictions are anticipated as the FLMs determine whether a finding of adverse impact will be issued.

Appendix B contains a more thorough analysis of the Class I visibility impacts.

Water Resources

Surface and groundwater resources are present in the Generation Plant and Transmission System Study Area. Wells would allow access to groundwater at depths of approximately 8500 feet bgs from the Madison Aquifer.

No surface water would be intentionally impounded for beneficial use in the Project. Surface storm water would be captured to prevent discharge from the Project site. This captured water would be used in the disposal of fly ash and spent FGD reactant as well as for the disposal area irrigation system. The use of captured storm water would be purely a means of disposing of unwanted water as the groundwater wells would be fully capable of supplying the water needs for the entire Project.

Potential surface water and/or groundwater contamination would be mitigated by the implementation of a “zero discharge” sediment control system. This system would contain all water used in the Generation Plant operations, along with storm water diverted into sediment control ponds.

There are no local users of the Madison Aquifer in the Generation Plant Study Area and water used for the Project would be small in comparison to the total water resource available from that source. Local homeowners and ranchers currently access shallow aquifers for water. Elimination of the recharge area beneath the Generation Plant may influence these local shallow aquifers and cause a slight decrease in productivity. The Mine could contribute to cumulative effects on this shallow aquifer through dewatering practices during coal extraction.

Wildlife Resources

The Final Environmental Impact Statement prepared for the Mine (Montana Department of State Lands, 1992) concluded that impacts to fish and wildlife would be minor in the short-term and negligible in the long-term, with the exception that if mitigation measures for spring, seep, pond, and wetland effects failed, there could be an irreversible and irretrievable loss of wildlife associated with these features. Construction and operation of the Project would not affect spring, seep, pond, wetland habitat (i.e., there would be no direct disturbance of these habitats, nor would existing features be dewatered by the groundwater withdrawals needed for the Project). Therefore, cumulative effects that the Project would add would be low.

Subdivisions and residential developments in the Generation Plant and Transmission System Study Areas have resulted and probably would continue to result in the loss and alteration of wildlife habitat; intentional and unintentional harassment of wildlife; invasion of non-native wildlife species that are adapted to human developments, such as European starlings (*Sturnus vulgaris*) and house sparrows (*Passer domesticus*); and intentional and unintentional mortalities of wildlife through activities such as rodent or predator control, collisions with vehicles, and legal or illegal harvest of game species. When residential developments are constructed in previously rural settings, wildlife management activities of agencies such as the Montana Department of Fish, Wildlife and Parks (MDFWP) may be impeded. Some species of wildlife may habituate to these developments, while others may be at least seasonally displaced from otherwise favorable habitat. Subdivision and residential developments may have already influenced the occurrence, distribution, and abundance of wildlife near the Generation Plant and Transmission System Study Areas. The degree and magnitude of wildlife impacts that could be cumulative to the Project generally would be considered minor.

Construction of acceleration-deceleration lanes on U.S. Route 87 would not be expected to disturb substantial areas of previously undisturbed wildlife habitat. These lanes would be located adjacent to the ephemeral headwaters of Halfbreed Creek, and runoff controls used during construction would be expected to contain sediment sufficiently so that the impact to wildlife would be low. The Project would have no impact on downstream fisheries. The degree and magnitude of wildlife impacts that could be cumulative to the Project generally would be considered minor.

Transmission lines in the Transmission System Study Areas would be permitted under appropriate regulatory authorities. Depending on the mitigation measures applied under these authorities, transmission lines could create hazards to birds, either through transmission line strikes or electrocution. However, the separation of the conductors and the insulator size of the proposed and alternative Transmission System would be such that there should be little danger of even large birds making simultaneous contact with the energized conductors and ground to cause electrocution.

In parts of the United States, there has been a desire to provide nesting platforms on transmission structures to provide additional nesting sites for certain bird species. In other areas, nesting and perching sites are discouraged with the placement of devices that make it difficult for birds to land on the structures. If perching sites were located in habitats of species such as sage grouse, or sharp-tailed grouse, increased predation by raptors could be detrimental to these species. For this reason, it may be desirable to discourage perching, as discussed above.

Overall, the degree and magnitude of the Transmission System impacts on wildlife that could be cumulative to the Project are speculative but generally would be considered low.

Cultural Resources

Cultural resources in the general region are protected by the Montana Antiquities Act if they are on state lands and by the Archaeological Resources Protection Act, the NHPA, and other laws and regulations if they are on federal land. In addition, cultural resources are protected by the NHPA if they are in the area of potential effect for a federally funded or permitted undertaking. Cultural resources located on private property in Montana do not receive the same level of protection.

The Bull Mountains Mine FEIS (Montana Dept. of State Lands, 1992) found 13 cultural resources (10 lithic scatters, a homestead, a stone circle, and a prehistoric/historic site) in the proposed life-of-mine area. Five of the lithic scatters and the stone circle were recommended as being eligible to the National Register pending further investigation. However, the Bull Mountains Mine FEIS (Montana Dept. of State Lands, 1992) also estimated that as many as 230 undiscovered National Register-eligible prehistoric sites could be disturbed during construction and operation of the Mine.

It is possible that cultural resources exist within or next to the existing right-of-way for U.S. Route 87. Improvements to U.S. 87, if federally funded, would be required to comply with Section 106 of the NHPA.

Further residential development in the Bull Mountain area could result in disturbance to undiscovered cultural resources. There has been no attempt to inventory these resources.

Together these actions could result in a large amount of disturbance to National Register-eligible cultural resources. Only some of the resources would likely be protected by Section 106 of the NHPA. The Project would contribute to this cumulative effect, but its contribution would be relatively small compared to hundreds of cultural resources that could be disturbed by other actions in the area.

Cumulative impacts to traditional cultural properties are difficult to estimate without additional information from affected Native American organizations. In 1990, tribal and traditional representatives of the Crow, Northern Cheyenne, Atsina or Gros Ventre, Assiniboine, and Shoshone were contacted regarding potentially sensitive resources along the proposed railroad right-of-way through the Bull Mountains. This consultation included visits to the area by Tribal representatives (R. Bohman, 2002; Tetra Tech 1991). Concerns about potential impacts were expressed. Therefore, if the Tribes identify specific concerns about the effects of the proposed action on traditional cultural properties, the Project could contribute to cumulative effects as well.

Visual Resources

Developing an electrical Generation Plant on the Project site would cumulatively contribute to the landscape change of this area from rangeland to industrial development. The site is positioned among other existing industrial facilities, as it is located next to the Mine and it's to be constructed railroad spur. However, because some of the land near the Generation Plant and Transmission System Study Areas is currently being grazed for livestock, nearby residential viewers may feel that this Project would continue to transform the rural agricultural views from their homes to one that is more intensely developed.

Cumulative visual impacts from the Transmission System construction and operation would be considered moderate because the Transmission System would be sited away from several high sensitivity viewpoints. However, the width and cumulative effects of this corridor could increase over time as other linear facilities may locate along the proposed Transmission System corridor in the future.

The cumulative visual impacts associated with the Transmission System are expected to be minor in those areas where transmission lines currently exist, which is the case from MP 23.6 to 28. The existing linear corridors from MP 23.6 to 28 are usually viewed as lower impact locations for new linear facilities.

Noise

The Mine and associated railroad operations would increase ambient noise levels at the sensitive receptors near the Generation Plant and Transmission System Study Areas. Although the combination of noise from the Project and noise from the Mine and railroad would increase the L_{dn} levels at the sensitive receptors, the estimated cumulative L_{dn} is not predicted to exceed EPA noise guidelines, if additional noise control measures are installed as discussed earlier in Section 4.10. By not installing additional noise measures, a substantial noise level increase would result with a potential for nuisance complaints from neighbors.

The other actions that have been identified as potentially having cumulative effects (residential development, Route 87 lane construction, and transmission line construction) would also slightly increase ambient noise levels at the sensitive receptor locations, but the cumulative effect would be a temporary effect during construction and periods of maintenance. Ongoing noise impacts from these cumulative sources would be low.

Socioeconomic

Construction and operation of the Project and Mine could result in an increase in residential, commercial and industrial development, with associated population increases and additional demand for public and private services and facilities.

Population

Cumulatively, the two operations would directly add nearly 5,300 persons to the two-county area population during peak construction. Over the longer term, the Project-related population would increase by as many as 2,200 persons (Table 4-35). However, it is likely that the bulk of the growth associated with the Project would reside outside of Musselshell County, in the more heavily populated Yellowstone County, thus minimizing effects on the Project Study Area. Some of this impact could be spread to the larger town of Billings, outside the Project Study Area, where a project this size would have only a negligible impact.

Taxes

The equipment and materials cost of the Project would have an estimated taxable value of $26.4 million. With the total taxable value in Musselshell County in 2001 at about $7.2 million, the Project would significantly increase the taxable value in Musselshell County and the Roundup School District. As a result, Musselshell County could potentially reduce its mill rates and still maintain the same or possibly increased services currently paid for by property owners.

Transmission Infrastructure

Studies completed by NorthWestern Energy indicate that the Project's output would be restricted during an outage of one of their two existing 500kV lines in Montana. However, under some single line outage conditions and with additional improvements at the Broadview Substation and the Garrison Substation, the plant could maintain full output. These same substation improvements would also increase the ability of the Montana transmission system to transport considerable additional power through and out of the state. These improvements do not require the addition of new transmission lines for this Project other than the power lines to connect the generators to the NorthWestern Energy transmission system.

It is expected that some of the output from the Project would be utilized in the state of Montana by existing utilities and customers, but most of the power would be exported out of the state. Exports would be to the northwestern U.S. market and to the south through Wyoming. Much of the power is likely to flow on the lower voltage (100/161/230kV) portion of the NorthWestern Energy system.

The Project as well as all other proposed new generating facilities would be required to install and coordinate protective relay Remedial Action Schemes (RAS) to protect the transmission system integrity and stability. The RAS would be required regardless of the completion order of the Project.

The location of the Project within the NorthWestern Energy transmission system would have some clear benefits to the network. Currently, the area around Billings experiences low voltage during some transmission line outage conditions. The Project would bolster the voltage during single line outages, thus improving the transfer of electricity through the 500kV lines, as well as maintaining voltage in the Billings area.

The transmission lines from the Project would follow the existing railroad right-of-way for the Mine railroad to Broadview Substation, where the lines would connect to the NorthWestern Energy system. No additional land would be disturbed. There would be phase shifting transformers required to force flow into the Montana - Idaho path in a northbound direction, without these significant capability increases cannot be realized even with substation and transmission upgrades. Independent studies exist with identified upgrades. These studies are all the private intellectual property of BPA, UAMPS, NorthWestern Energy, and Pacificorp.

CHAPTER 5
CONSULTATION AND COORDINATION

5.1 Introduction

The action required by the Montana Department of Environmental Quality (DEQ) is to make a decision to issue or deny the necessary DEQ-authorized permits to construct and operate the Project. The primary DEQ authorization is granting a Final Air Quality Permit to the Project proponent. This permit action is required under the Montana Clean Air Act 75-2-201 et seq., Montana Code Annotated (MCA), and Administrative Rules of Montana (ARM) 17.8.701 et seq. This Draft Environmental Impact Statement (DEIS) is being prepared to comply with the Montana Environmental Policy Act (MEPA). The DEIS focuses on major actions resulting from the Project that may have significant impacts on the human environment. The Project proponent plans to begin commercial operation of the Project in November 2006.

A coordination program was carried out for the Project to ensure that all appropriate members of the public and federal, state, and local agencies were contacted, consulted, and given an adequate opportunity to be involved in the process. This section describes the agency and public scoping process, the public information program, and the issues and concerns identified from agency and public comments.

On January 18, 2002, the Project proponent published a public notice of the application submittal in the Billings Gazette. On January 23, 2002, the Project proponent published a public notice of the application submittal in the Roundup Record Tribune and the Winnett Times. A completeness review was completed by the DEQ. An incompleteness letter was sent to the Project proponent within 30 days of application submittal. Following this letter, a series of correspondence ended with a draft permit issued on August 12, 2002. DEQ published a public notice of permit issuance in the Billings Gazette on August 15, 2002. Comments were received on the draft permit.

5.2 Agency Consultation and Coordination

To begin the agency scoping process, federal, state, and local agencies with an interest in the Project or the Project study area were contacted and asked to provide comments about the Project, identify issues that would need to be addressed, and supply data, information, and/or mapping. On January 15, 2002, copies of the application were forwarded by DEQ to the following four agencies:

- USDI Fish and Wildlife Service, Denver - Ellen Porter
- USDA Forest Service, Missoula - Ann Acheson
- National Park Service, Denver - Don Codding
- US Environmental Protection Agency, Denver - Catherine Collins

Copies of the draft permit and a letter to the Project proponent were copied to the following stakeholders:

- USDI Fish and Wildlife Service - Ellen Porter
- National Park Service - Don Codding
- USDA Forest Service - Ann Acheson
- Bison Engineering, Inc. - Joe Lierow
- Montana Environmental Information Center - Patrick Judge
- Billings Gazette - Clair Johnson
- Environmental Defense Fund - Carrie Atiyeh
- Greater Yellowstone Central Labor Council - Tom Curry
- Wilbur Wood - private citizen
- US Environmental Protection Agency, Denver - Catherine Collins
- DEQ, AQCR 140, Jim Hughes

The following agencies, as well as those listed above, will be sent the DEIS in electronic or hardcopy format:

- Department of Natural Resources and Conservation - John Tubbs and Andy Brummond
- Montana Fish, Wildlife and Parks - Chris Smith
- Montana Department of Commerce - Gary Morehouse
- Montana Department of Transportation - Sandra Straehl
- Montana State Historic Preservation Office - Josef Warhank

5.3 Public Consultation and Coordination

Public comments on the scope of the MEPA review were also accepted by mail during the scoping period, March 20 to April 19, 2002. On April 4, 2002, a public scoping meeting was held by the DEQ in the City of Roundup. The purpose of this meeting was to identify issues and concerns that the public believed needed to be analyzed in the environmental review under MEPA. On October 18, 2002, a letter was sent to all who showed an interest in the Project and registered on the mailing list at the scoping meeting. The letter indicated that an EIS was being prepared and asked for input regarding the format each interested party would prefer to receive the EIS (CD, hardcopy, or executive summary).

In addition, the owners of the Project have sought public participation by making three presentations to the Legislature's Transition Advisory Committee, by participating in the Governor's Conference on Economic Development on March 7, 2002, in Billings, and by making a presentation to the executive board of the Big Sky Economic Development Authority in Billings. A summary of public, federal, and state resource management agencies issues and concerns is included in Chapter 1, Section 1.5.

5.4 Native American Consultation and Coordination

Agencies involved with federal undertakings have obligations to consult with Native American organizations under the National Historic Preservation Act (NHPA), 36 CFR Part 800 (as revised January 11, 2001), and other laws and regulations. Section 101(d)(6)(B) of the NHPA requires that agency officials "consult with an Indian tribe or Native Hawaiian organization that attaches religious and cultural significance to historic properties that may be affected by an undertaking." The agency must also provide the Indian tribe with a reasonable opportunity to identify concerns about historic properties, advise on the identification and evaluation of historic properties, including those of traditional religious and cultural importance, articulate its views on the undertaking's effects on such properties, and participate in the resolution of adverse effects (36 CFR Part 800.2(c)(ii)(A)).

While the Project is not a federal undertaking, it is following the guidelines of MEPA. MEPA requires agencies to conduct thorough, honest, unbiased, and scientifically based full disclosure of all relevant facts concerning impacts on the human environment that may result from agency actions. For identifying and evaluating cultural resources under MEPA, the Montana State Historic Preservation Office (SHPO) recommends using Section 106 of the NHPA and 36 CFR Part 800 as guidelines (J. Warhank, personal communication, 2002).

The Northern Cheyenne Tribe submitted comments on the draft permit on August 26, 2002.

On January 11, 2002, a letter was sent to the Crow Tribal Cultural representative by Ethnoscience, Inc. on behalf of the Project proponent describing the Project and the results of the survey in the vicinity of the proposed generation plant. Four follow-up phone calls were made the same month, but the Crow Tribe did not respond (Pouley, 2002).

The DEQ sent letters to the following Native American groups on October 24, 2002, inquiring about any concerns regarding the Project:

- Crow Tribal Council
  Mr. Vincent Goes Ahead, Acting Chairman
  Crow Agency, MT 59022
- Northern Cheyenne Tribal Council
  Ms. Geri Small, Chairman
  Lame Deer, MT 59043
- Eastern Shoshone Business Council
  Chairman
  Fort Washakie, WY 83514

CHAPTER 6
LIST OF PREPARERS

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Deborah Skibicki	Air Quality Permitting	B.S. Chemical Engineering, Montana State University M.S. Industrial and Management Engineering, Montana State University
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POWER Engineers, Inc.		
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Sean Connolly Big Sky Acoustics	Noise
Rebecca Hanna Ethnoscience, Inc.	Paleontology
McVehil-Monnett Associates	CALPUFF

CHAPTER 7
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CHAPTER 8
ACRONYMS AND GLOSSARY

ACSR – Aluminum conductor, steel reinforced.

AQRV - air-quality-related value.

ANSI – American National Standards Institute.

ASME – American Society of Mechanical Engineers.

Adverse Impact on Visibility - Visibility impairment which interferes with the management, protection, preservation, or enjoyment of a visitor's visual experience of a Federal Class I or Class II area. This determination must be made on a case-by-case basis taking into account the geographic extent, intensity, duration, frequency and time of visibility impairments, and how these factors correlate with (1) times of visitor use of the Class I area, and (2) the frequency and timing of natural conditions that reduce visibility. This term does not include effects on integral vistas. [40 CFR 51.301(a)]

Air-Cooled Condenser - Air-cooled steam condensers provide low turbine back-pressure and deaerate the condensate in a steam turbine. The heat rejected by the steam is absorbed in the form of a sensible heat gain in the ambient air.

Air Pollution – Dust, fumes, smoke, other particulate mater, vapor, gas odorous substance or any combination of these.

Acid Rain – Precipitation which contains carbonic acid, nitric acid, or sulfuric acid in solution. The source of these acids may be traced to the combustion of fossil fuels.

Alluvial – Composed of alluvium or deposited by a stream or running water.

Alluvium – A general term for all deposits resulting from the operations of modern rivers and creeks, including the sediments laid down in riverbeds, floodplains, and fans at the foot of mountain slopes.

Ambient Air Quality Standard – An established concentration, exposure time, and frequency of occurrence of air contaminant(s) in the ambient air that shall not be exceeded.

Ambient Level – The existing level of air pollutants, noise, or other environmental factors used to describe background conditions(i.e., conditions before a project is implemented).

Anticline – A configuration of folded, stratified rocks in which rocks dip in two directions away from a crest, as principal rafters of a common gable roof dip away from ridgepole.

Apiary – A place where bees are kept.

Aquifer – Rock of sediment in a formation, or group of formations, or part of that formation that is saturated and sufficiently permeable to transmit economic quantities of water to wells and springs.

Artesian flow – Discharge of water from a well, spring, or aquifer by hydrostatic pressure.

BPA - Bonneville Power Administration.

BTU – British thermal unit. A measure of the energy required to raise the temperature of one pound of water by one degree Fahrenheit.

Baghouse - Also referred to as a fabric filter, baghouses separate particulates from a flue gas stream by filtration of the gas through a woven or felted fabric that has been sewn into a bag. Collection efficiencies can be expected to be 99.8% or greater of inlet dust loading.

Benthic – Of, relating to, or occurring at the bottom of a body of water.

Best Available Control Technology (BACT) – An EPA requirement that all major new plants use to limit their emissions. Used to prevent significant deterioration (PSD) of air quality in areas that were already in attainment of the National Air Quality Control Standards.

Best Management Practices (BMP) – A practice or combination of practices that are determined to be the most effective and practicable (including technological, economic, and institutional considerations) means of controlling point and nonpoint pollutants at levels compatible with environmental quality goals.

Big Game – Those species of large mammals normally managed as a sport hunting resource.

Bituminous – Type of coal with carbon content from 45% to 86% and heat value of 10, 500 to 15,500 BTUs-per-pound; most plentiful form of coal in U.S.; used primarily to generate electricity and make coke for steel.

CAA - Clean Air Act.

CAAA - Clean Air Act Amendments.

CCD - County Census Division.

CFC – chlorofluorocarbon.

CFR - Code of Federal Regulations.

CO - Carbon monoxide.

CRIS - Cultural Resource Information System

Cairn – A pile of rocks of prehistoric or historic origin that may have had a variety of functions, such as a monument, a marker, or a burial site.

Carbonic Acid/Carbon Dioxide – Coal contains carbon, which converts to a gas upon burning. When carbon dioxide combines with atmospheric water, it forms carbonic acid, which is absorbed as a nutrient by plants and trees.

Chemical Cleaning – Any pre-combustion cleaning technique that creates a chemical reaction, which changes the molecular form of organic sulfur in order for the sulfur to be easily separated and removed.

Circulating Fluidized Bed Combustion (CFBC) – Circulating fluidized bed combustion is a clean coal technology process that produces a mixture of coal and limestone in a liquid state by vertically moving air. The process effectively removes sulfur from coal, thus reducing sulfur dioxide emissions Also tends to reduce the formation of nitrogen oxide emissions.

Clinker – Thermally metamorphosed, fine-grained sedimentary rocks created by naturally burned coal beds. Often reddish brown to purple, brittle, with high porosity.

Coal Seam – A deposit of coal.

Conservation Reserve Program – A voluntary program that offers annual rental payments, incentive payments for certain activities, and cost-share assistance to establish approved cover on eligible cropland. The program encourages farmers to plant long-term resource conserving covers to improve soil, water, and wildlife resources. The Commodity Credit Corporation (CCC) makes available assistance in an amount equal to not more than 50 percent of the participant's costs in establishing approved practices. Contract duration is between 10 and 15 years. The CRP is administered by the CCC through the Farm Service Agency (FSA).

Conveyor – A continuous moving belt that transports large volumes of material.

Cultural Resources – Sites, buildings, structures, districts, landscapes, or objects that are important to a culture or community for scientific, traditional, religious, or other reasons. Cultural resources can be divided into three major categories: archaeological resources, architectural resources, and Traditional Cultural Properties.

dB(A) – Stands for A weighted decibels. This decibel scale is used to approximate the way human hearing responds more to some frequencies than to others.

DEIS - Draft Environmental Impact Statement

DEQ - Department of Environmental Quality

Decibel (dB) – A unit of measure for sound.

Dip – The angle at which a rock surface is inclined from the horizontal.

Dry Scrubber - Dry scrubbing involves spraying an aqueous sorbent into a reactor vessel so that the droplets dry as they contact the hot flue gas. The SO_2 removal reaction occurs during the drying process. A dry scrubber is usually coupled with a particulates removal device to separate the dry powder produced in the reactor, and fly ash, from the flue gas.

EC - electrical conductivity.

EPA - (United States) Environmental Protection Agency.

Electrostatic Precipitator (ESP) – An electrical device for removing small particles such as fly ash from combustion gases before release from a power plant’s stack.

Emission – The release of air contaminants into the ambient air.

Ephemeral Drainage – A stream or stream segment that flows only briefly in response to local precipitation and has no base flow.

FD - Forced draft.

FEIS - Final Environmental Impact Statement.

FGR - Flue gas recirculation.

Flue Gas Desulfurization (FGD) – A clean coal technology consisting of a device fitted between a power plant’s boiler and its smokestack. The device removes sulfur dioxide from flue gases flowing up the stack during the post-combustion stage of coal churning. See "SCRUBBER".

Flue Gas Recirculation - A NO_x reduction process which reduces oxygen concentration and combustion temperatures by recirculating some of the flue gas to the furnace without increasing the total net gas mass flow.

Fluidized Bed Combustion – A clean coal technology process that removes sulfur from coal during combustion. In a fluidized bed boiler, crushed coal and limestone are suspended in the boiler by an upward stream of hot air. The coal is burned in this ebullient, liquid-like mixture, hence the name "fluidized." As the coal burns, sulfur gases from coal combine with limestone to form a solid compound that is recovered with ash.

Fluvial – Produced from the action of a river or stream. Refers to material transported by, suspended in, or deposited by river or stream action.

Fly Ash – The finely divided, inert particles of ash in flue gases arising from the combustion of fuel.

Formation – A body of rock of sufficient lateral extent and distinctive characteristics that allow geologists to map, describe, and name it.

Fossil Fuels – Naturally occurring fuels of an organic nature, such as coal, crude oil, and natural gas.

Fugitive Dust – A particulate emission made airborne by forces of wind, human activity, or both. Unpaved roads, construction sites, and tilled land are examples of areas that generate fugitive dust.

GVW – Gross vehicle weight.

GWP - Global warming potential.

Glaciated – Subjected to glacial action; also: showing the effects of glacial action.

Greenhouse Effect – A warming of the earth produced by the presence of certain gases in the atmosphere.

Greenhouse gases – A series of naturally-occurring gases capable of adsorbing heat in the atmosphere (e.g. carbon dioxide, methane, ozone, nitrous oxide). There are also unnatural greenhouse gases (e.g. chlorofluorocarbons).

Groundwater – Water found beneath the Earth’s surface where all empty space in the rock is completely filled with water.

Group – A major rock-stratigraphic unit next higher in rank than a formation consisting wholly of two or more contiguous or associated formations having significant common lithologic features.

HAP - Hazardous air pollutant.

HDPE – high density polyethylene

HCFC – Hydrochlorofluorocarbon.

HFC – Hydrofluorocarbon.

High Sulfur – Coal that naturally contains a large amount of sulfur that converts into sulfur dioxide upon burning.

Historic – The period of time following the common use of written records in a specific area. In Montana, this term generally refers to the period after Euroamericans came to the region.

Hydrostratigraphy – Identification of rock formations based on their ability to transmit water.

ID - Induced draft.

IPCC - Intergovernmental Panel on Climate Change.

ISC - Industrial Source Complex.

ISO - International Organization for Standardization.

Integrated Gasification Combined Cycle - Coal gasification is a process that converts coal from a solid to a gaseous fuel through partial oxidation. Once the fuel is in a gaseous state contaminants, such as ash and sulfur compounds, may be removed by established techniques. The cleaned gas may then be combusted in a combined cycle (combustion turbine, heat recovery steam generator, steam turbine) power system to produce electricity.

Intermittent Stream – A stream that flows in a well-defined channel in response to precipitation and is dry for part of the year.

Km – kilometer. Equivalent to 0.621 miles

L_{dn} - Day-night average noise level.

LDPE – low density polyethylene

Lacustrine – Of, relating to, formed in, living in, or growing in lakes.

Lithic – Of, relating to, or being a stone tool.

Lithic Scatter – A prehistoric archaeological site consisting primarily of stone tools and the flakes resulting from stone tool manufacturing and use.

Longwall Mining – Mechanized technique used to “scrape” coal from a block several hundred feet wide.

Low-NO_x Burner (LNB) - Specially designed burners which minimize the formation of NOx by reducing the oxidation of fuel-bound nitrogen and the formation of thermal NOx through reduced oxygen combustion. This lean-burning reduces devolatilization of fuel-bound nitrogen and reduces flame temperature which reduces thermally formed NO_x.

MAAQS – Montana Ambient Air Quality Standards.

MACT – Maximum achievable control technology.

MDEQ – Montana Department of Environmental Quality.

MDFWP – Montana Department of Fish, Wildlife and Parks.

MDSL – Montana Department of State Lands.

MEPA – Montana Environmental Policy Act.

MPDES – Montana Pollutant Discharge Elimination System.

NAAQS - National Ambient Air Quality Standards.

NET – National Emission Trends.

NHPA – National Historic Preservation Act

NFPA – National Fire Protection Agency.

NMVOC – Non-methane volatile organic compound.

NSPS - New Source Performance Standards.

NTI - National Toxics Inventory.

NWS - National Weather Service.

National Acid Precipitation Assessment Program (NAPAP) – A 10-year, $570 million federal effort that investigated and assessed the acid rain phenomenon from 1980 to 1990.

National Register of Historic Places (NRHP) – The Nation's official list of cultural resources worthy of preservation. Authorized under the National Historic Preservation Act of 1966, the National Register is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect our historic and archeological resources. The National Park Service administers the National Register.

Nitrogen Dioxide (NO_2) – A reddish brown gas that is a component of smog.

Nitrogen Oxides (NO_X) – A group of compounds containing varying proportions of nitrogen and oxygen.

Noxious Weeds – Exotic (non-native) species of plants that proliferate and reduce the value of land for agriculture, forestry, livestock, wildlife, or other beneficial uses.

OSHA - Occupational Safety and Health Administration

Overfire Air (OFA) - Relocated secondary air for a boiler combustion system. The air is diverted to ports which introduce it later in the combustion process. The majority of applications place the ports above (over) the burner zone in a furnace.

PA – Primary air.

PFC – Perfluorocarbon.

PM_{10} - Particulate matter smaller than 10 microns in diameter.

PSD - Prevention of Significant Deterioration (of air quality)

Permeability – The ability of a rock or other material to allow water to flow through interconnected spaces. Permeable bedrock makes a good aquifer, a rock layer that yields water to wells.

Petroglyph – Cultural symbols, lines, or figures inscribed onto a rock surface by grinding, pecking or incising. The symbols may be prehistoric or historic.

Porosity – The ratio of the volume of the void spaces in a rock or sediment to the total volume of the rock or sediment.

Post-Combustion Cleaning – Cleaning coal emissions after combustion between the boiler and the smokestack.

Pre-Combustion Cleaning – Coal is cleaned by removing sulfur and mineral matter before combustion to reduce the emission of sulfur dioxide from combustion gases.

Prehistoric – The period of time before the use of written records in a specific area. In Montana this term usually refers to archaeological resources associated with Native Americans before contact with Euroamericans.

Pulverized Coal-Fired Boiler - Pulverized coal-fired boilers burn coal as a fine powder suspension (generally 90% <200 mesh) in an open furnace. This type of boiler is the dominant type used for coal-fired power plants today.

Pyrites - A form of iron sulfur compounds that have the formula FeS_2. Found as a part of the ash in certain coals.

RAS – Remedial Action Schemes.

Reclamation – The process of restoring a surface mine site to its original contour, function, and appearance, thus “reclaiming” it.

Right-of-Way (ROW) – The right to pass over property owned by another. The strip of land over which facilities such as roadways, railroads, pipelines, or powerlines are built.

Rockshelter – A small overhang or cave used for shelter by prehistoric or historic people.

SO_x – Sulfur Oxides.

SO_2 - Sulfur dioxide.

Salmonid – Any of a family (Salmonidae) of elongate bony fishes (as a salmon or trout) that have the last three vertebrae upturned.

Scrubber – Any of several forms of chemical/physical devices that operate to remove sulfur compounds formed during coal combustion. These devices combine the sulfur in gaseous emissions with another chemical medium to form inert "sludge," which is removed for disposal or sold as a by-product.

Section 106 – A section of the National Historic Preservation Act of 1966 describing procedures for identifying, evaluating, and protecting cultural resources. The implementing regulations for Section 106 are in 36 CFR part 800.

Selective catalytic reduction (SCR) - A post-combustion NOx reduction process which remove NOx from flue gases by reaction with ammonia in the presence of a catalyst.

Selective non-catalytic reduction (SNCR) – A post-combustion NOx reduction process wherein ammonia or other compounds such as urea are injected downstream of the combustion zone in a temperature region of 1400F to 2000F. If injected at the optimum temperature, NOx is removed from the flue gas through reaction with the ammonia.

Slurry – A mixture of water and any of several finely crushed solids, especially cement, clay, or coal.

Special Status Species – Those species of plants or animals that have a protective status designated by a state or federal agency because of general or localized rarity or population decline.

State Historic Preservation Officer (SHPO) – The state official charged with overseeing the implementation of the Section 106 process.

Stoker Boiler - Mechanical stokers are boilers designed to feed fuel onto a grate where it burns with air passing up through it. The stoker is located within the furnace and is designed to remove the ash residue after combustion. Practical considerations limit stoker size and, consequently, the maximum steam generation rates.

Sulfur Dioxide Emission / Sulfuric Acid-Sulfate – Coal contains sulfur, which converts to gas upon burning. The sulfur dioxide gas combines with atmospheric water to form sulfuric acid/sulfate. Sulfate is a nutrient for trees and plants; however, in remote areas more sulfur is emitted than is needed by plants.

Sulfuric Acid Mist - H_2SO_4

Syncline – A configuration of folded, stratified rocks in which rocks dip downward from opposite directions to come together in a trough.

TSP - Total suspended particulates.

Traditional Cultural Property (TCP) – Resources associated with cultural practices and beliefs of a living community that are rooted in its history and are important in maintaining the continuing cultural identity of the community. In Montana, these are usually associated with modern Native Americans. Native American TCPs may include certain archaeological resources, such as cairns and petroglyphs; locations of important events; battlefields; sacred sites; and traditional hunting and gathering areas.

Tertiary – The tertiary period of systems of rocks.

Topsoil – Fertile soil or soil material, usually rich in organic matter, used to top dress disturbed areas. Topsoil is better suited to supporting plants than other materials.

USEPA - United States Environmental Protection Agency.

USGS – United States Geological Survey.

UTM – Universal Transverse Mercator.

Viewshed – The landscape that can be directly seen under favorable atmospheric conditions from a viewpoint or along a transportation corridor.

Visual Resources Management System (VRM) – The degree of acceptable visual change within a characteristic landscape. A class is based upon the physical and sociological characteristics of any given homogenous area as a management objective.

Volatile Organic Compound (VOC) – Any of several compounds of carbon that participate in atmospheric photochemical reactions, forming secondary pollutants.

WRCC - Western Regional Climate Center.

Wet Scrubber - A wet scrubber, used for removal of SO_2 from flue gases, contacts a sorbent slurry consisting of water mixed with lime, limestone, magnesium promoted lime, or sodium carbonate with the flue gas in a reactor vessel.

Wetlands – Areas that are inundated by surface or ground water with a frequency sufficient to support and under normal circumstances, does or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

YNP - Yellowstone National Park.

APPENDIX A
Draft Air Quality Permit

AIR QUALITY PERMIT

Issued To: Roundup Power Project
P.O. Box 1697
Helena, Montana 59624

Permit: #3182-00
Application Complete: 07/22/02
Preliminary Determination Issued: 08/12/02
Department Decision Issued:
Permit Final:
AFS: #065-0003

An air quality permit, with conditions, is hereby granted to the Roundup Power Project (Roundup Power), pursuant to Sections 75-2-204 and 211 of the Montana Code Annotated (MCA), as amended, and Administrative Rules of Montana (ARM) 17.8.701, *et seq*., as amended, for the following:

SECTION I: Permitted Facilities

A. Permitted Equipment

Roundup Power is proposing to construct and operate a nominal 780-megawatt (MW) pulverized coal (PC)-fired power plant. A complete list of the permitted equipment is contained in the permit analysis.

B. Plant Location

The proposed location for the Roundup Power coal-fired power plant is approximately 12 miles south-southeast of the town of Roundup, Montana. The site is located immediately east of U.S. Route 87, just east of Old Divide Road, and adjacent to the BMP Investments Incorporated proposed coal mine. The legal description of the site is the NW ¼ of the SE ¼ of Section 15, Township 6 North, Range 26 East in Musselshell County.

SECTION II. Conditions and Limitations

A. Operational and Emission Limitations

1. Roundup Power shall not cause or authorize emissions to be discharged into the outdoor atmosphere from any sources installed after November 23, 1968, that exhibit an opacity of 20% or greater averaged over 6 consecutive minutes (ARM 17.8.304).

2. Roundup Power shall not cause or authorize the use of any street, road, or parking lot without taking reasonable precautions to control emissions of airborne particulate matter (ARM 17.8.308).

3. Roundup Power shall treat all unpaved portions of the haul roads, access roads, parking lots, or general plant area with water and/or chemical dust suppressant as necessary to maintain compliance with the reasonable precautions limitation in Section II.A.2 (ARM 17.8.710).

4. The primary fuel feed rate for each of the two 390-MW PC boilers shall not exceed 1,646,880 tons of coal per rolling 12-month period (ARM 17.8.710).

5. The annual heat input to each of the 390-MW PC boilers shall not exceed 32,736,120 million British Thermal Units (mmBtu) per rolling 12-month period (ARM 17.8.710).

6. Oxides of nitrogen (NO_x) emissions from each of the two 390-MW PC boilers shall be controlled with the use of low-NO_x burners, overfire air, and selective catalytic reduction (SCR). NO_x emissions shall not exceed 261.6 lb/hr (0.07 lb/MMBtu) based on a rolling 30-day average (ARM 17.8.715).

7. Carbon monoxide (CO) emissions from each of the two 390-MW PC boilers shall be controlled by proper boiler design and operation. CO emissions shall not exceed 560.6 lb/hr (0.15 lb/MMBtu) (ARM 17.8.715).

8. Sulfur dioxide (SO_2) emissions from each of the two 390-MW PC boilers shall be controlled with the use of a dry flue gas desulfurization (FGD) system. SO_2 emissions shall not exceed 448.4 lb/hr (0.12 lb/MMBtu) based on a rolling 30-day average (ARM 17.8.715).

9. Particulate matter with an aerodynamic diameter less than 10 micrometers (PM_{10}) emissions from each of the two 390-MW PC boilers shall be controlled with the use of a fabric filter baghouse. PM_{10} emissions shall not exceed 56.1 lb/hr (0.015 lb/MMBtu) (ARM 17.8.715).

10. Volatile Organic Compound (VOC) emissions from each of the two 390-MW PC boilers shall be controlled by proper boiler design and operation. VOC emissions shall not exceed 11.2 lb/hr (0.0030 lb/MMBtu) (ARM 17.8.715).

11. Sulfuric Acid (H_2SO_4) Mist emissions from each of the two 390-MW PC boilers shall be controlled with the use of dry FGD (ARM 17.8.715).

12. The stack height for each of the two 390-MW PC boilers shall, at a minimum, be maintained at 574 feet above ground level (ARM 17.8.710).

13. SO_2 emissions from each of the two auxiliary boilers shall not exceed 6.46 lb/hr (ARM 17.8.715).

14. NO_x emissions from each of the two auxiliary boilers shall not exceed 19.8 lb/hr (ARM 17.8.715).

15. CO emissions from each of the two auxiliary boilers shall not exceed 4.12 lb/hr (ARM 17.8.715).

16. The combined diesel consumption of the two auxiliary boilers shall be limited to 5,438,400 gallons per rolling 12-month period (ARM 17.8.710).

17. The combined hours of operation of the two auxiliary boilers shall be limited to 3300 hours per rolling 12-month period (ARM 17.8.710).

18. The stack height for each of the auxiliary boilers shall, at a minimum, be maintained at 259.9 feet above ground level (ARM 17.8.710).

19. The sulfur content of the No. 2 fuel oil used in the auxiliary boilers shall not exceed 0.05% sulfur (ARM 17.8.710).

20. The hours of operation of the emergency backup diesel generator shall not exceed 200 hours per rolling 12-month period (ARM 17.8.710).

21. Roundup Power shall use any one of the following methods or combination of the following methods to control particulate matter emissions from the coal handling transfer points: dust suppression systems and/or enclosures (ARM 17.8.308 and ARM 17.8.715).

22. Roundup Power shall install, operate, and maintain a bin exhaust filter (VE-15) on the surge hopper of the Crusher House to control the particulate emissions from transfer points #15, #16, and #17 (ARM 17.8.715).

23. Roundup Power shall install, operate, and maintain a baghouse (EP-27) on the Unit #1 Tripper Room Silo Vent to control the emissions from transfer points #20, #21, and #23 (ARM 17.8.715).

24. Roundup Power shall install, operate, and maintain a baghouse (EP-26) on the Unit #2 Tripper Room Silo Vent to control the emissions from transfer points #22, #24, and #25 (ARM 17.8.715).

25. Roundup Power shall install and use a wind fence, use dust suppression sprays, and use pile compaction to control particulate emissions from the inactive storage pile (ARM 17.8.715).

26. Roundup Power shall install and use a wind fence and use dust suppression sprays to control particulate emissions from the active storage pile (ARM 17.8.715).

27. Roundup Power shall handle/transfer all lime using a pneumatic system (ARM 17.8.715).

28. Roundup Power shall install, operate, and maintain a bin exhaust filter to control the particulate emissions from the emission source points for the lime storage silo bin (VE-42) and the lime feed bin (VE-43) (ARM 17.8.715).

29. Roundup Power shall use a vacuum-pressure system to transfer all fly ash (ARM 17.8.715).

30. Roundup Power shall install, operate, and maintain a bin exhaust filter to control the particulate emissions from the emission source points for the fly ash handling system (EP-50, EP-51, EP-52, EP-53, and EP-54) (ARM 17.8.715).

31. All baghouses/bin exhaust filters used to control emissions from coal handling, lime handling, and fly ash handling shall be designed, maintained, and operated such that particulate emissions do not exceed 0.01 gr/dscf (ARM 17.8.715).

32. Roundup Power shall utilize air-cooled condensers (ACC) within the process (ARM 17.8.710).

33. Roundup Power shall comply with all applicable standards and limitations, and the reporting, recordkeeping, and notification requirements contained in 40 CFR 60, Subpart Da (ARM 17.8.340 and 40 CFR 60).

34. Roundup Power shall comply with all applicable standards and limitations, and the reporting, recordkeeping, and notification requirements contained in 40 CFR 60, Subpart Db (ARM 17.8.340 and 40 CFR 60).

35. Roundup Power shall comply with all applicable standards and limitations, and the reporting, recordkeeping, and notification requirements contained in 40 CFR 60, Subpart Y (ARM 17.8.340 and 40 CFR 60).

36. Roundup Power shall comply with all applicable standards and limitations, and the reporting, recordkeeping, and notification requirements of the Acid Rain Program contained in 40 CFR 72-78 (40 CFR 72 through 40 CFR 78).

B. Testing Requirements

1. Roundup Power shall test each of the two 390-MW PC boilers for NO_x and CO, concurrently, within 180 days of initial start-up of the respective boiler, or according to another testing/monitoring schedule as may be approved by the Department of Environmental Quality (Department), to demonstrate compliance with the NO_x and CO emission limits contained in Section II.A.6 and II.A.7. The testing of each boiler shall continue on an annual basis, or according to another testing/monitoring schedule as may be approved by the Department (ARM 17.8.105 and 17.8.710).

2. Roundup Power shall test each of the two 390-MW PC boilers for SO_2 within 180 days of initial start-up of the respective boiler, or according to another testing/monitoring schedule as may be approved by the Department, to demonstrate compliance with the SO_2 emission limits contained in Section II.A.8. The testing of each boiler shall continue on an annual basis, or according to another testing/monitoring schedule as may be approved by the Department (ARM 17.8.105 and 17.8.710).

3. Roundup Power shall test each of the two 390-MW PC boilers for PM_{10} within 180 days of initial start-up of the respective boiler, or according to another testing/monitoring schedule as may be approved by the Department, to demonstrate compliance with the PM_{10} emission limits contained in Section II.A.9. The testing of each boiler shall continue on an annual basis, or according to another testing/monitoring schedule as may be approved by the Department (ARM 17.8.105 and 17.8.710).

4. Roundup Power shall test each of the two auxiliary boilers for NO_x and CO, concurrently, within 180 days of initial start-up of the respective boiler, or according to another testing/monitoring schedule as may be approved by the Department, to demonstrate compliance with the NO_x and CO emission limits contained in Section II.A.14 and II.A.15. The testing of each boiler shall continue on an every 5-year basis, or according to another testing/monitoring schedule as may be approved by the Department (ARM 17.8.105 and 17.8.710).

5. Roundup Power shall test each of the two auxiliary boilers for SO_2 within 180 days of initial start-up of the respective boiler, or according to another testing/monitoring schedule as may be approved by the Department, to demonstrate compliance with the SO_2 emission limit contained in Section II.A.13 (ARM 17.8.105 and 17.8.710).

6. All compliance source tests shall conform to the requirements of the Montana Source Test Protocol and Procedures Manual (ARM 17.8.106).

7. The Department may require further testing (ARM 17.8.105).

C. Operational Reporting Requirements

1. Roundup Power shall supply the Department with annual production information for all emission points, as required by the Department in the annual emission inventory request. The request will include, but is not limited to, all sources of emissions identified in the emission inventory contained in the permit analysis.

Production information shall be gathered on a calendar-year basis and submitted to the Department by the date required in the emission inventory request. Information shall be in the units required by the Department. This information may be used to calculate operating fees, based on actual emissions from the facility, and/or to verify compliance with permit limitations (ARM 17.8.505).

2. Roundup Power shall notify the Department of any construction or improvement project conducted pursuant to ARM 17.8.705(l)(r), that would include a change in control equipment, stack height, stack diameter, stack flow, stack gas temperature, source location or fuel specifications, or would result in an increase in source capacity above its permitted operation or the addition of a new emission unit.

   The notice must be submitted to the Department, in writing, 10 days prior to start up or use of the proposed de minimis change, or as soon as reasonably practicable in the event of an unanticipated circumstance causing the de minimis change, and must include the information requested in ARM 17.8.705(l)(r)(iv) (ARM 17.8.705).

3. All records compiled in accordance with this permit must be maintained by Roundup Power as a permanent business record for at least 5 years following the date of the measurement, must be available at the plant site for inspection by the Department, and must be submitted to the Department upon request (ARM 17.8.710).

4. Roundup Power shall document, by month, the primary fuel feed rate for each of the two 390- MW PC boilers. By the 25^{th} day of each month, Roundup Power shall total the primary fuel feed rate for each of the boilers during the previous 12 months to verify compliance with the limitation in Section II.A.4. A written report of the compliance verification shall be submitted along with annual emission inventory (ARM 17.8.710).

5. Roundup Power shall document, by month, the annual heat input to each of the 390-MW PC boilers. By the 25^{th} day of each month, Roundup Power shall total the annual heat input to each of the boilers during the previous 12 months to verify compliance with the limitation in Section II.A.5. A written report of the compliance verification shall be submitted along with annual emission inventory (ARM 17.8.710).

6. Roundup Power shall document, by month, the combined diesel consumption of the two auxiliary boilers. By the 25^{th} day of each month, Roundup Power shall total the combined diesel consumption of the two auxiliary boilers during the previous 12 months to verify compliance with the limitation in Section II.A.16. A written report of the compliance verification shall be submitted along with annual emission inventory (ARM 17.8.710).

7. Roundup Power shall document, by month, the combined hours of operation of the two auxiliary boilers. By the 25^{th} day of each month, Roundup Power shall total the combined hours of operation of the two auxiliary boilers during the previous 12 months to verify compliance with the limitation in Section II.A.17. A written report of the compliance verification shall be submitted along with annual emission inventory (ARM 17.8.710).

8. Roundup Power shall document, by month, the hours of operation of the emergency backup diesel generator. By the 25^{th} day of each month, Roundup Power shall total the hours of operation of the emergency backup diesel generator during the previous 12 months to verify compliance with the limitation in Section II.A.20. A written report of the compliance verification shall be submitted along with annual emission inventory (ARM 17.8.710).

D. Continuous Monitoring System Requirements

1. Roundup Power shall install, operate, calibrate, and maintain continuous monitoring systems for the following:

   a. A continuous emission monitoring system (CEMS) for the measurement of SO_2 shall be operated on each main boiler stack (ARM 17.8.340; 40 CFR 60, Subpart Da; 40 CFR 60, Subpart Db; and 40 CFR 72-78).

   b. A flow monitoring system to complement the SO_2 monitoring system shall be operated on each main boiler stack (ARM 17.8.340 and 40 CFR 72-78).

   c. A CEMS for the measurement of NO_x shall be operated on each main boiler stack (ARM 17.8.340; 40 CFR 60, Subpart Da; 40 CFR 60, Subpart Db; and 40 CFR 72-78).

   d. A CEMS for the measurement of opacity shall be operated on each main boiler stack (ARM 17.8.340; 40 CFR 60, Subpart Da; 40 CFR 60, Subpart Db; and 40 CFR 72-78).

   e. A CEMS for the measurement of oxygen (O_2) or carbon dioxide (CO_2) content shall be operated on each main boiler stack (ARM 17.8.340 and 40 CFR 60, Subpart Da).

   f. A CEMS for the measurement of CO_2 content shall be operated on each main boiler stack (ARM 17.8.340 and 40 CFR 72-78).

2. All continuous monitors required by this permit and by 40 CFR Part 60 shall be operated, excess emissions reported, and performance tests conducted in accordance with the requirements of 40 CFR Part 60, Subpart Da; 40 CFR Part 60, Subpart Db; 40 CFR Part 60, Appendix B (Performance Specifications #1, #2, and #3); and 40 CFR 72-78 (ARM 17.8.340 and 40 CFR 60).

E. Notification

1. Roundup Power shall provide the Department (both the Billings regional and Helena offices) with written notification of the following dates within the specified time periods (ARM 17.8.710):

   a. Commencement of construction of the power generation facility within 30 days after commencement of construction;

   b. Anticipated start-up date of the facility postmarked not more than 60 days nor less than 30 days prior to start-up;

   c. Actual start-up date of the first 390-MW boiler within 15 days after the actual start-up of the boiler;

   d. Actual start-up date of the second 390-MW boiler within 15 days after the actual start-up of the boiler,

   e. All compliance source tests as required by the Montana Source Test Protocol and Procedures Manual (ARM 17.8.106), and

   f. Any malfunction that occurs that can be expected to create emissions in excess of any applicable emission limitations or can be expected to last for a period greater than 4 hours shall be reported to the Department promptly by telephone (ARM 17.8.110).

2. Roundup Power shall provide the Department (both the Billings regional and Helena offices) with written notification of the following items within 30 days after actual startup of the power generation facility, or another time period as may be approved by the Department (ARM 17.8.710):

   a. Make, model, type, size, serial number, year of manufacture, and year of installation of all proposed process equipment identified in Section 4.0 of Montana Air Quality Permit Application #3182-00.

   b. Make, model, type, size, serial number, year of manufacture, and year of installation of all proposed control equipment identified in Section 5.0 of Montana Air Quality Permit Application #3182-00.

SECTION III: General Conditions

A. Inspection – Roundup Power shall allow the Department's representatives access to the source at all reasonable times for the purpose of making inspections or surveys, collecting samples, obtaining data, auditing any monitoring equipment (CEMS, CERMS) or observing any monitoring or testing, and otherwise conducting all necessary functions related to this permit.

B. Waiver – The permit and the terms, conditions, and matters stated herein shall be deemed accepted if Roundup Power fails to appeal as indicated below.

C. Compliance with Statutes and Regulations – Nothing in this permit shall be construed as relieving Roundup Power of the responsibility for complying with any applicable federal or Montana statute, rule or standard, except as specifically provided in ARM 17.8.701, *et seq*. (ARM 17.8.717).

D. Enforcement – Violations of limitations, conditions and requirements contained herein may constitute grounds for permit revocation, penalties or other enforcement action as specified in Section 75-2-401, *et seq*., MCA.

E. Appeals – Any person or persons jointly or severally adversely affected by the Department's decision may request, within 15 days after the Department renders it's decision, upon affidavit setting forth the grounds therefore, a hearing before the Board of Environmental Review (Board). A hearing shall be held under the provisions of the Montana Administrative Procedures Act. The Department's decision on the application is not final unless 15 days have elapsed and there is no request for a hearing under this section. The filing of a request for a hearing postpones the effective date of the Department's decision until conclusion of the hearing and issuance of a final decision by the Board.

F. Permit Inspection – As required by ARM 17.8.716, Inspection of Permit, a copy the air quality permit shall be made available for inspection by the Department at the location of the source.

G. Permit Fee – Pursuant to Section 75-2-220, MCA, as amended by the 1991 Legislature, failure to pay the annual operation fee by Roundup Power may be grounds for revocation of this permit, as required by that section and rules adopted thereunder by the Board.

H. Construction Commencement – Construction must begin within 3 years of permit issuance and proceed with due diligence until the project is complete or the permit shall be revoked (ARM 17.8.731).

Attachment 2

INSTRUCTIONS FOR COMPLETING EXCESS EMISSION REPORTS

PART 1 Complete as shown. Report total time during the reporting period in hours. The determination of plant operating time (in hours) includes time during unit start up, shut down, malfunctions, or whenever pollutants of any magnitude are generated, regardless of unit condition or operating load.

Excess emissions include all time periods when emissions, as measured by the CEMS, exceed any applicable emission standard for any applicable time period.

Percent of time in compliance is to be determined as:

(1 – (total hours of excess emissions during reporting period / total hours of CEMS availability during reporting period)) x 100

PART 2 Complete as shown. Report total time the point source operated during the reporting period in hours. The determination of point source operating time includes time during unit start up, shut down, malfunctions, or whenever pollutants (of any magnitude) are generated, regardless of unit condition or operating load.

Percent of time CEMS was available during point source operation is to be determined as:

(1 – (CEMS downtime in hours during the reporting period[a] / total hours of point source operation during reporting period)) x 100

a - All time required for calibration and to perform preventative maintenance must be included in the opacity CEMS downtime.

PART 3 Complete a separate sheet for each pollutant control device. Be specific when identifying control equipment operating parameters. For example: number of TR units, energized for ESPs; pressure drop and effluent temperature for baghouses; and bypass flows and pH levels for scrubbers. For the initial EER, include a diagram or schematic for each piece of control equipment.

PART 4 Use Table I as a guideline to report all excess emissions. Complete a separate sheet for each monitor. Sequential numbering of each excess emission is recommended. For each excess emission, indicate: 1) time and duration, 2) nature and cause, and 3) action taken to correct the condition of excess emissions. Do not use computer reason codes for corrective actions or nature and cause; rather, be specific in the explanation. If no excess emissions occur during the quarter, it must be so stated.

PART 5 Use Table II as a guideline to report all CEM system upsets or malfunctions. Complete a separate sheet for each monitor. List the time, duration, nature and extent of problems, as well as the action taken to return the CEM system to proper operation. Do not use reason codes for nature, extent or corrective actions. Include normal calibrations and maintenance as prescribed by the monitor manufacturer. Do not include zero and span checks.

PART 6 Complete a separate sheet for each pollutant control device. Use Table III as a guideline to report operating status of control equipment during the excess emission. Follow the number sequence as recommended for excess emissions reporting. Report operating parameters consistent with Part 3, Subpart e.

PART 7 Complete a separate sheet for each monitor. Use Table IV as a guideline to summarize excess emissions and monitor availability.

PART 8 Have the person in charge of the overall system and reporting certify the validity of the report by signing in Part 8.

EXCESS EMISSIONS REPORT

PART 1

a. Emission Reporting Period ______________________________

b. Report Date ______________________________

c. Person Completing Report ______________________________

d. Plant Name ______________________________

e. Plant Location ______________________________

f. Person Responsible for Review
and Integrity of Report ______________________________

g. Mailing Address for 1.f. ______________________________

____

h. Phone Number of 1.f. ______________________________

i. Total Time in Reporting Period ______________________________

j. Total Time Plant Operated During Quarter ______________________________

k. Permitted Allowable Emission Rates: Opacity ______________________________

SO_2 ____________ NO_x ____________ TRS ____________

l. Percent of Time Out of Compliance: Opacity ______________________________

SO_2 ____________ NO_x ____________ TRS ____________

m. Amount of Product Produced
During Reporting Period ______________________________

n. Amount of Fuel Used During Reporting Period ______________________________

PART 2 - Monitor Information: Complete for each monitor.

a. Monitor Type (circle one)

Opacity SO_2 NO_x O_2 CO_2 TRS Flow

b. Manufacturer ______________________________

c. Model No. ______________________ ______________

d. Serial No. ______________________

e. Automatic Calibration Value: Zero ______________ Span ______________

f. Date of Last Monitor Performance Test ______________________

g. Percent of Time Monitor Available:

1) During reporting period ______________________

2) During plant operation ______________________

h. Monitor Repairs or Replaced Components Which Affected or Altered Calibration Values ______________________

i. Conversion Factor (f-Factor, etc.)

j. Location of monitor (e.g. control equipment outlet)

PART 3 - Parameter Monitor of Process and Control Equipment. (Complete one sheet for each pollutant.)

a. Pollutant (circle one):

Opacity SO_2 NO_x TRS

b. Type of Control Equipment ______________________

c. Control Equipment Operating Parameters (i.e., delta P, scrubber water flow rate, primary and secondary amps, spark rate)

____

d. Date of Control Equipment Performance Test ______________________

e. Control Equipment Operating Parameter During Performance Test

____

____

____

____

PART 4 - Excess Emission (by Pollutant)

Use Table I: Complete table as per instructions. Complete one sheet for each monitor.

PART 5 - Continuous Monitoring System Operation Failures

Use Table II: Complete table as per instructions. Complete one sheet for each monitor.

PART 6 - Control Equipment Operation During Excess Emissions

Use Table III: Complete as per instructions. Complete one sheet for each pollutant control device.

PART 7 - Excess Emissions and CEMS performance Summary Report

Use Table IV: Complete one sheet for each monitor.

PART 8 - Certification for Report Integrity, by person in 1.f.

THIS IS TO CERTIFY THAT, TO THE BEST OF MY KNOWLEDGE, THE INFORMATION PROVIDED IN THE ABOVE REPORT IS COMPLETE AND ACCURATE.

SIGNATURE ____

NAME ____

TITLE ____

DATE ____

TABLE I

EXCESS EMISSIONS

Date	Time From	Time To	Duration	Magnitude	Explanation/Corrective Action

TABLE II

CONTINUOUS MONITORING SYSTEM OPERATION FAILURES

Date	Time From	Time To	Duration	Problem/Corrective Action

TABLE III

CONTROL EQUIPMENT OPERATION DURING EXCESS EMISSIONS

Date	Time From	To	Duration	Operating Parameters	Corrective Action

TABLE IV

Excess Emission and CEMS Performance Summary Report

Pollutant (circle one): SO_2 NO_x TRS H_2S CO Opacity

Monitor ID

Emission data summary [1]	**CEMS performance summary** [1]
1. Duration of excess emissions in reporting period due to: a. Startup/shutdown b. Control equipment problems c. Process problems d. Other known causes e. Unknown causes 2. Total duration of excess emissions 3. [Total duration of excess emissions / Total time CEM operated X 100 =]	1. CEMS[2] downtime in reporting due to: a. Monitor equipment malfunctions b. Non-monitor equipment malfunctions c. Quality assurance calibration d. Other known causes e. Unknown causes 2. Total CEMS downtime 3. [Total CEMS downtime / Total time source emitted X 100 =]

[1] For opacity, record all times in minutes. For gases, record all times in hours. Fractions are acceptable (e.g., 4.06 hours)

[2] CEMS downtime shall be regarded as any time CEMS is not measuring emissions.

Permit Analysis
Roundup Power Project
Permit #3182-00

I. Introduction/Process Description

A. Permitted Equipment

The Roundup Power Project (Roundup Power) facility will be located approximately 35 miles north of Billings and 12 miles south-southeast of the town of Roundup. The facility's primary equipment will consist of the following:

- Two main boilers with dry Flue Gas Desulfurization (FGD) systems, Selective Catalytic Reduction (SCR) systems, and pulse jet baghouses. The boilers will use coal as their primary fuel and No.2 fuel oil for startup.
- Two steam turbine-generators rated at 390-megawatt (MW) gross electrical output each.
- Two air-cooled condensers.
- Two auxiliary boilers fueled with No.2 fuel oil.
- One emergency generator fueled with No.2 fuel oil.
- Storage and handling equipment for coal, lime, ash, and No.2 fuel oil.
- 4000-foot long overland conveyor.

B. Source Description

Coal for the main boilers will be supplied by the BMP Investments Incorporated coal mine that is located on the adjacent property immediately to the east of the power plant location. The coal will be transferred to the power plant via a 4000-foot long overland conveyor. The coal that is transferred to the power plant facility will be stored in either the active coal storage pile or in the inactive coal storage pile. The inactive coal storage pile will consist of approximately 92,500 tons of coal (11 days worth of coal storage for the power plant).

From the active coal storage pile (Transfer House 1), coal will be transferred to the 25,000-ton capacity reclaim hoppers (3 days worth of coal storage), and then on to the crusher house. From the crusher house, coal is transferred via conveyors to the main boilers for combustion.

II. Applicable Rules and Regulations

The following are partial explanations of some applicable rules and regulations that apply to the facility. The complete rules are stated in the Administrative Rules of Montana (ARM) and are available, upon request, from the Department of Environmental Quality (Department). Upon request, the Department will provide references for location of complete copies of all applicable rules and regulations or copies where appropriate.

A. ARM 17.8, Subchapter 1 – General Provisions, including but not limited to:

1. ARM 17.8.101 Definitions. This rule includes a list of applicable definitions used in this chapter, unless indicated otherwise in a specific subchapter.

2. ARM 17.8.105 Testing Requirements. Any person or persons responsible for the emission of any air contaminant into the outdoor atmosphere shall, upon written request of the Department, provide the facilities and necessary equipment (including instruments and sensing devices) and shall conduct test, emission or ambient, for such periods of time as may be necessary using methods approved by the Department.

3. ARM 17.8.106 Source Testing Protocol. The requirements of this rule apply to any emission source testing conducted by the Department, any source or other entity as required by any rule in this chapter, or any permit or order issued pursuant to this chapter, or the provisions of the Clean Air Act of Montana, 75-2-101, et seq., Montana Code Annotated (MCA).

   Roundup Power shall comply with the requirements contained in the Montana Source Test Protocol and Procedures Manual, including, but not limited to, using the proper test methods and supplying the required reports. A copy of the Montana Source Test Protocol and Procedures Manual is available from the Department upon request.

4. ARM 17.8.110 Malfunctions. (2) The Department must be notified promptly by telephone whenever a malfunction occurs that can be expected to create emissions in excess of any applicable emission limitation or to continue for a period greater than 4 hours.

5. ARM 17.8.111 Circumvention. (1) No person shall cause or permit the installation or use of any device or any means that, without resulting in reduction of the total amount of air contaminant emitted, conceals or dilutes an emission of air contaminant that would otherwise violate an air pollution control regulation. (2) No equipment that may produce emissions shall be operated or maintained in such a manner as to create a public nuisance.

B. ARM 17.8, Subchapter 2 – Ambient Air Quality, including, but not limited to the following:

1. ARM 17.8.204 Ambient Air Monitoring
2. ARM 17.8.210 Ambient Air Quality Standards for Sulfur Dioxide
3. ARM 17.8.211 Ambient Air Quality Standards for Nitrogen Dioxide
4. ARM 17.8.212 Ambient Air Quality Standards for Carbon Monoxide
5. ARM 17.8.213 Ambient Air Quality Standard for Ozone
6. ARM 17.8.214 Ambient Air Quality Standard for Hydrogen Sulfide
7. ARM 17.8.220 Ambient Air Quality Standard for Settled Particulate Matter
8. ARM 17.8.221 Ambient Air Quality Standard for Visibility
9. ARM 17.8.222 Ambient Air Quality Standard for Lead
10. ARM 17.8.223 Ambient Air Quality Standard for PM_{10}

Roundup Power must maintain compliance with the applicable ambient air quality standards.

C. ARM 17.8, Subchapter 3 – Emission Standards, including, but not limited to:

1. ARM 17.8.304 Visible Air Contaminants. This rule requires that no person may cause or authorize emissions to be discharged into the outdoor atmosphere from any source installed after November 23, 1968, that exhibit an opacity of 20% or greater averaged over 6 consecutive minutes.

2. ARM 17.8.308 Particulate Matter, Airborne. (1) This rule requires an opacity limitation of 20% for all fugitive emission sources and that reasonable precautions be taken to control emissions of airborne particulate matter. (2) Under this rule, Roundup Power shall not cause or authorize the use of any street, road, or parking lot without taking reasonable precautions to control emissions of airborne particulate matter.

3. ARM 17.8.309 Particulate Matter, Fuel Burning Equipment. This rule requires that no person shall cause, allow, or permit to be discharged into the atmosphere particulate matter caused by the combustion of fuel in excess of the amount determined by this rule.

4. ARM 17.8.310 Particulate Matter, Industrial Process. This rule requires that no person shall cause, allow, or permit to be discharged into the atmosphere particulate matter in excess of the amount set forth in this rule.

5. ARM 17.8.322 Sulfur Oxide Emissions--Sulfur in Fuel. (4) Commencing July 1, 1972, no person shall burn liquid or solid fuels containing sulfur in excess of 1 pound of sulfur per million Btu fired. Roundup Power will comply with this limitation by combusting low sulfur coal and using dry flue gas desulfurization.

6. ARM 17.8.324 Hydrocarbon Emissions--Petroleum Products. (3) No person shall load or permit the loading of gasoline into any stationary tank with a capacity of 250 gallons or more from any tank truck or trailer, except through a permanent submerged fill pipe, unless such tank is equipped with a vapor loss control device as described in (1) of this rule.

7. ARM 17.8.340 Standard of Performance for New Stationary Sources and Emission Guidelines for Existing Sources. This rule incorporates, by reference, 40 CFR 60, Standards of Performance for New Stationary Sources (NSPS). Roundup Power is considered an NSPS affected facility under 40 CFR 60 and is subject to the requirements of the following subparts.

   40 CFR Part 60, Subpart A – General Provisions. This subpart applies to all affected equipment or facilities subject to an NSPS subpart as listed below.

   40 CFR 60, Subpart Da, Standards of Performance Electric Utility Steam Generating Units for Which Construction is Commenced after September 18, 1978. Roundup Power is an affected facility under this subpart because 1) the electric utility steam generating units are capable of combusting more than 73-MW heat input of fossil fuel and 2) the construction of the facility would occur after September 18, 1978.

   40 CFR 60, Subpart Db, Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units. Roundup Power is an affected facility under this subpart because 1) the steam generating units will commence construction after June 19, 1984 and 2) the facility will have a heat input capacity from fuels combusted in the steam generating unit of greater than 29 MW.

   40 CFR 60, Subpart Y, Standards of Performance for Coal Preparation Plants. Roundup Power is an affected facility under this subpart because 1) the facility meets the definition of a coal preparation facility as defined in §60.251, 2) the facility has coal processing and conveying equipment (including breakers and crushers), and 3) the facility would process more than 200 tons of coal per day.

8. ARM 17.8.341 Emission Standards for Hazardous Air Pollutants. This source shall comply with the standards and provisions of 40 CFR 61.

9. ARM 17.8.342 Emission Standards for Hazardous Air Pollutants for Source Categories. This source, as defined and applied in 40 CFR 63, shall comply with the requirements of 40 CFR 63.

D. ARM 17.8, Subchapter 4 – Stack Height and Dispersion Techniques, including, but not limited to:

1. ARM 17.8.401 Definitions. This rule includes a list of definitions used in this chapter, unless indicated otherwise in a specific subchapter.

2. ARM 17.8.402 Requirements. Roundup Power must demonstrate compliance with the ambient air quality standards with a stack height that does not exceed Good Engineering Practices (GEP). The proposed height of the new or altered stack for Roundup Power is below the allowable GEP stack height.

E. ARM 17.8, Subchapter 5 – Air Quality Permit Application, Operation and Open Burning Fees, including, but not limited to:

1. ARM 17.8.504 Air Quality Permit Application Fees. This rule requires that an applicant submit an air quality permit application fee concurrent with the submittal of an air quality permit application. A permit application is incomplete until the proper application fee is paid to the Department. Roundup Power submitted the appropriate permit application fee for the current permit action.

2. ARM 17.8.505 When Permit Required--Exclusions. An annual air quality operation fee must, as a condition of continued operation, be submitted to the Department by each source of air contaminants holding an air quality permit (excluding an open burning permit) issued by the Department. The air quality operation fee is based on the actual or estimated actual amount of air pollutants emitted during the previous calendar year.

   An air quality operation fee is separate and distinct from an air quality permit application fee. The annual assessment and collection of the air quality operation fee, described above, shall take place on a calendar-year basis. The Department may insert into any final permit issued after the effective date of these rules, such conditions as may be necessary to require the payment of an air quality operation fee on a calendar-year basis, including provisions that prorate the required fee amount.

F. ARM 17.8, Subchapter 7 – Permit, Construction and Operation of Air Contaminant Sources, including, but not limited to:

1. ARM 17.8.701 Definitions. This rule is a list of applicable definitions used in this chapter, unless indicated otherwise in a specific subchapter.

2. ARM 17.8.704 General Procedures for Air Quality Preconstruction Permitting. This air quality preconstruction permit contains requirements and conditions applicable to both construction and subsequent use of the permitted equipment.

3. ARM 17.8.705 When Permit Required--Exclusions. This rule requires a facility to obtain an air quality permit or permit alteration if they construct, alter or use any air contaminant sources that have the potential to emit greater than 25 tons per year of any pollutant.

4. ARM 17.8.706 New or Altered Sources and Stacks--Permit Application Requirements. This rule requires that a permit application be submitted prior to installation, alteration or use of a source. Roundup Power submitted the required permit application for the current permit action.

5. ARM 17.8.707 Waivers. ARM 17.8.706 requires that a permit application be submitted 180 days before construction begins. This rule allows the Department to waive this time limit. The Department hereby waives this time limit.

6. ARM 17.8.710 Conditions for Issuance of Permit. This rule requires that Roundup Power demonstrate compliance with applicable rules and standards before a permit can be issued. Also, a permit may be issued with such conditions as are necessary to ensure compliance with all applicable rules and standards. Roundup Power demonstrated compliance with all applicable rules and standards as required for permit issuance.

7. ARM 17.8.715 Emission Control Requirements. This rule requires a source to install the maximum air pollution control capability that is technically practicable and economically feasible, except that Best Available Control Technology (BACT) shall be utilized. The required BACT analysis is included in Section III of this permit analysis.

8. ARM 17.8.716 Inspection of Permit. This rule requires that air quality permits shall be made available for inspection by the Department at the location of the source.

9. ARM 17.8.717 Compliance with Other Statutes and Rules. This rule states that nothing in the permit shall be construed as relieving Roundup Power of the responsibility for complying with any applicable federal or Montana statute, rule, or standard, except as specifically provided in ARM 17.8.701, *et seq*.

10. ARM 17.8.720 Public Review of Permit Applications. The rule requires that the applicant notify the public by means of legal publication in a newspaper of general circulation in the area affected by the application for a permit. Roundup Power submitted an affidavit of publication of public notice for the January 18, 2002, issue of the *Billings Gazette*, a newspaper of general circulation in the city of Billings in Yellowstone County, as proof of compliance with the public notice requirements. Roundup Power submitted a second affidavit of publication of public notice for the January 23, 2002, issue of the *Roundup Record-Tribune* and *The Winnett Times*, newspapers of general circulation in the area of the project, as proof of compliance with the public notice requirements.

11. ARM 17.8.731 Duration of Permit. An air quality permit shall be valid until revoked or modified, as provided in this subchapter, except that a permit issued prior to construction of a new or altered source may contain a condition providing that the permit will expire unless construction is commenced within the time specified in the permit, which in no event may be less than 1 year after the permit is issued.

12. ARM 17.8.733 Modification of Permit. An air quality permit may be modified for changes in any applicable rules and standards adopted by the Board of Environmental Review (Board) or changed conditions of operation at a source or stack that do not result in an increase of emissions as a result of those changed conditions. A source may not increase its emissions beyond those found in its permit unless the source applies for and receives another permit.

13. ARM 17.8.734 Transfer of Permit. This rule states that an air quality permit may be transferred from one person to another if written notice of Intent to Transfer, including the names of the transferor and the transferee, is sent to the Department.

G. ARM 17.8, Subchapter 8 – Prevention of Significant Deterioration of Air Quality, including, but not limited to:

1. ARM 17.8.801 Definitions. This rule is a list of applicable definitions used in this subchapter.

2. ARM 17.8.818 Review of Major Stationary Sources and Major Modifications--Source Applicability and Exemptions. The requirements contained in ARM 17.8.819 through ARM 17.8.827 shall apply to any major stationary source and any major modification, with respect to each pollutant subject to regulation under the Federal Clean Air Act (FCAA) that it would emit, except as this subchapter would otherwise allow.

This facility is a listed source because it is a fossil-fuel fired steam-electric plant having more than 250 MMBtu/hr heat input. Furthermore, the facility's emissions are greater than 100 tons per year; therefore, the facility is a major source under the New Source Review (NSR)-Prevention of Significant Deterioration (PSD) program.

H. ARM 17.8, Subchapter 12 – Operating Permit Program Applicability, including, but not limited to:

1. ARM 17.8.1201 Definitions. (23) Major Source under Section 7412 of the FCAA is defined as any source having:

   a. Potential to Emit (PTE) > 100 tons/year of any pollutant;

   b. PTE > 10 tons/year of any one Hazardous Air Pollutant (HAP), PTE > 25 tons/year of a combination of all HAPs, or lesser quantity as the Department may establish by rule; or

   c. Sources with the PTE > 70 tons/year of PM_{10} in a serious PM_{10} nonattainment area.

2. ARM 17.8.1204 Air Quality Operating Permit Program. (1) Title V of the FCAA amendments of 1990 requires that all sources, as defined in ARM 17.8.1204(1), obtain a Title V Operating Permit. In reviewing and issuing Air Quality Permit #3182-00 for Roundup Power, the following conclusions were made.

   a. The facility's PTE is greater than 100 tons/year for PM_{10}, SO_2, NO_x, and VOCs.

   b. The facility's PTE is greater than 10 tons/year for an individual HAP and greater than 25 tons/year for the combination of all HAPs.

   c. This source is not located in a serious PM_{10} nonattainment area.

   d. This facility is subject to several current New Source Performance Standards (NSPS).

   e. This facility is currently subject to case-by-case MACT. As appropriate, the electric utility MACT standards will apply to the facility once they are promulgated.

   f. This source is a Title IV affected source.

   g. This source is not an EPA designated Title V source.

   Based on these facts, the Department determined that Roundup Power is a major source of emissions as defined under the Title V Operating Permit Program.

III. BACT Determination

A BACT determination is required for each new or altered source. Roundup Power shall install on the new or altered source the maximum air pollution control capability which is technically practicable and economically feasible, except that BACT shall be utilized. A BACT analysis was submitted by Roundup Power in Permit Application #3182-00, addressing some available methods of controlling emissions from the power plant's main boilers, auxiliary boilers, backup generator, and fugitive emissions. A BACT analysis has been performed for the following boiler emissions: CO, NO_X, SO_2, PM_{10}, and VOCs. A BACT analysis was also performed for PM_{10} emissions from the fuel handling and storage, lime handling and storage, and ash handling and storage.

The Department reviewed these methods, as well as previous BACT determinations. The following control options have been reviewed by the Department in order to make the following BACT determination.

A. Main Boilers (MB-1 and MB-2)

1. NO_x Emissions

Two types of control methods exist for NO_x--combustion controls and post-combustion controls. Combustion controls reduce the amount of NO_x that is generated in the boiler, while post-combustion controls remove NO_x from the boiler exhaust gas.

a. Low Excess Air (LEA) - LEA technology is a combustion control. Combustion processes typically require excess air in order to ensure that fuel molecules find and react with oxygen. With LEA, the amount of excess air supplied to the firing chamber is reduced, thereby lowering the combustion temperature. The lower combustion temperature reduces the amount of thermal NO_x formed during the combustion process. Incorporating LEA into boiler design is a technologically feasible option and is common with current boiler design.

b. Low NO_x Burners (LNB) - LNB technology is a combustion control. LNBs limit NO_x formation by controlling both the stoichiometric and temperature profiles of the combustion flame in each burner flame envelope. This control is achieved with design features that regulate the aerodynamic distribution and mixing of the fuel and air, yielding reduced oxygen residence time at peak combustion temperatures. The combination of these techniques produces lower NO_x emissions during the combustion process.

c. Overfire Air (OFA) - OFA technology is a combustion control that involves the injection of air into the firing chamber in two staged zones. The staging of the combustion air reduces NO_x formation by two mechanisms. The staged combustion results in a cooler flame, and the staged combustion results in less oxygen reacting with fuel molecules. The degree of staging is limited by operational problems since the staged combustion results in incomplete combustion conditions and a longer flame.

d. Flue Gas Recirculation (FGR) - FGR is a combustion control that controls NO_x by recycling a portion of the flue gas back into the primary combustion zone. The recycled air lowers NO_x emissions by lowering combustion temperatures (the recycled gas is made up of combustion products, which are inert during combustion) and by lowering the oxygen content in the primary flame zone. The amount of recirculation is based on flame stability. The Department was unable to find any examples of FGR being required to control NO_x emissions from other coal-fired boilers.

e. Selective Non-Catalytic Reduction (SNCR) - SNCR is a post combustion control that involves the direct injection of ammonia or urea at high flue gas temperatures. The ammonia (or urea) reacts with the NO_x in the flue gas to produce N_2 and water. Flue gas temperature at the point of reagent injection can greatly affect NO_x removal efficiencies and the quantity of ammonia or urea that would pass through the SNCR unreacted. If the temperature is too low, NO_x reduction reactions are less effective and ammonia emissions may increase. Conversely, if the temperature is too hot, ammonia is oxidized to NO_x, and the efficiency of NO_x reduction is reduced.

Mixing of the reactant and flue gas within the reaction zone is also an important factor to SNCR performance. In large boilers, the physical distance over which the reagent must be dispersed increases, and the surface area/volume ratio of the convective pass decreases. Both of these factors may make it difficult to achieve good mixing of the reagent and flue gas, to deliver the reagent in the proper temperature window, and to provide sufficient residence time of the reagent and flue gas in that temperature window.

In addition to temperature and mixing, several other factors influence the performance of an SNCR system, including residence time, reagent-to-NO_x ratio, and fuel sulfur content.

Both urea and ammonia-based SNCR systems have been applied to new coal-fired fluidized bed combustion (FBC) boilers. The application of SNCR to FBC boilers is feasible due to the extensive flue gas mixing which occurs as a result of the fluidizing process, and the normal operating temperature of an FBC is also at the optimum temperature for NO_x reduction by ammonia. On FBCs, SNCR systems have been designed to achieve a NO_x reduction of approximately 30-60%. However, SNCR has not been used on large pulverized coal units. Pulverized coal boilers present several design problems that make it difficult to ensure that the reagent will be injected at the optimum fuel gas temperature, and that there will be adequate mixing and residence time.

f. Selective Catalytic Reduction (SCR) - SCR is a post combustion control that involves injecting ammonia into the boiler flue gas in the presence of a catalyst to reduce NO_x to N_2 and water. The performance of the SCR is influenced by several factors including flue gas temperature, SCR inlet NO_x level, surface area, volume and age of the catalyst, and the amount of ammonia slip that is acceptable.

The optimal temperature range depends on the type of catalyst used, but is typically between 560°F and 800°F to maximize the NO_x reduction efficiency and minimize salt formation. This temperature range typically occurs between the economizer and the air heater in a large utility boiler. Below this range, ammonium sulfate is formed resulting in catalyst deactivation. Above the optimum temperature, the catalyst will sinter and thus deactivate rapidly.

Another factor affecting SCR performance is the condition of the catalyst material. As the catalyst degrades over time or is damaged, NO_x removal decreases.

Based on the inlet NO_x concentration expected for the Roundup Power units, an 80% reduction efficiency would be anticipated using SCR.

The Department determined that a NO_x emission limit of 0.07 lb/MMBtu would constitute BACT for each of the main power boilers. The Department also determined that the use of a combination of LNBs, OFA, and SCR technology on each boiler would be necessary to meet the NO_x emission limit established through this BACT analysis.

2. PM_{10} Emissions

The primary methods for PM_{10} control are post-combustion methods. There are two generally recognized particulate matter control devices that are used to control particulate matter emissions from pulverized coal-fired boilers: electrostatic precipitators (ESP) and fabric filters (or baghouses). Either of these devices, if properly designed and operated, is capable of reducing particulate matter emissions below the 0.03 lb/MMBtu limit required by 40 CFR 60, Subpart Da (NSPS) as well as limiting opacity to below 20%.

For this BACT analysis, and for permitting purposes, uncontrolled particulate matter emissions from the proposed boiler were calculated based on the following assumptions: (1) 80% of the ash would be emitted as fly ash; (2) all fly ash would be emitted as filterable particulate matter; and (3) all filterable particulate matter would be classified as PM_{10}. Assuming a maximum coal ash content of 10.12% and a heating value of 9,916 Btu/lb, the maximum uncontrolled PM_{10} emissions from the boiler would be 8.16 lb/MMBtu. This will be used as the baseline PM_{10} emission rate for this BACT analysis.

a. ESP - Electrostatic precipitation technology is applicable to a variety of coal combustion sources. ESPs remove particulate matter from the flue gas stream by charging fly ash particulates with a high direct current (dc) voltage and attracting these particles to charged collection plates. A layer of collected particulate forms on the collecting plates (electrodes) and is removed by rapping the electrodes. The collected particulate drops into hoppers below the precipitator and is periodically removed from the fly ash handling system.

   Because of their modular design, ESPs can be applied to a wide range of system sizes and should have no adverse effect on combustion system performance. The operating parameters that influence ESP performance include fly ash mass loading, particle size distribution, fly ash electrical resistivity, and precipitator voltage and current. Other factors that determine ESP collection efficiency are collection plate area, gas flow velocity, and cleaning cycle. Data for ESPs applied to coal-fired sources show fractional collection efficiencies of approximately 95% for fine particles (less than 0. 1 microns) and greater than 99% for coarse particles (greater than 10 microns). These data show a reduction in collection efficiency for particle diameters between 0.1 and 10 micrometers.

   ESPs are considered a technically feasible option for Roundup Power. Based on information provided by Roundup Power, the lowest anticipated post-control PM_{10} emission rate that could be practically achieved with ESP technology is 0.018 lb/MMBtu, which represents control efficiency of 99.78%.

b. Fabric Filters - Fabric filtration has been widely applied to coal combustion sources and consists of a number of filtering elements (bags) along with a bag cleaning system contained in a main shell structure incorporating dust hoppers. Fabric filters use fabric bags as filters to collect particulate matter. The particulate-laden gas enters a fabric filter compartment and passes through a layer of filter bags. The collected particulate forms a cake on the bag that enhances the bag's filtering efficiency. Excessive caking would increase the pressure drop across the fabric filter at which point the filters must be cleaned.

The particulate removal efficiency of fabric filters is dependent upon a variety of particle and operational characteristics. Particle characteristics that affect the collection efficiency include particle size distribution, particle cohesion characteristics, and particle electrical resistivity. Operational parameters that may affect fabric filter collection efficiency include bag material, air-to-cloth ratio, and operating pressure loss. In addition, certain filter properties (e.g., structure of the fabric and fiber composition) can affect the system's particle collection efficiency.

Fabric filters are considered a technically feasible option to control particulate matter from the proposed boilers. Fabric filters are capable of collection efficiencies greater than 99% when appropriately sized and operated. For Roundup Power a pulse jet fabric filter system was proposed that would be designed to consistently achieve a post-control PM_{10} emission rate of 0.015 lb/MMBtu. Based on an uncontrolled PM_{10} emission rate of 8.16 lb/MMBtu, 0.015 lb/MMBtu represents a control efficiency of 99.82%.

The Department determined that a PM_{10} emission limit of 0.015 lb/MMBtu constitutes BACT for each of the main power boilers. The Department also determined that the use of a fabric filter baghouse will be necessary to meet the emission limits established through this BACT analysis.

3. SO_2 Emissions

SO_x emissions from coal combustion consist primarily of SO_2 with a much lower quantity of SO_3 and gaseous sulfates. These compounds form as the organic and pyretic sulfur in the coal is oxidized during the combustion process. On average, about 95% of the sulfur present in bituminous coal will be emitted as gaseous SO_x. Boiler size, firing configuration, and boiler operations generally have little effect on the percent conversion of fuel sulfur to SO_2.

The generation of SO_2 is directly related to the sulfur content and heating value of the fuel burned. The sulfur content and heating value of coal can vary dramatically depending on the source of the coal. Roundup Power would be a mine-mouth facility and would receive coal from the BMP Investments Incorporated coal mine located adjacent to the proposed power plant.

Based on analysis of the poorest quality coal sample obtained from the BMP Investments Incorporated, the worst case heating value of coal would be approximately 9,916 Btu/lb, and the maximum sulfur content is expected to be 0.94%. Without post-combustion controls, maximum SO_2 emissions from the boiler firing this coal would be 1.9 lb/MMBtu. This emission rate was considered as the baseline emission rate for this BACT analysis.

Several techniques are used to reduce SO_2 emissions from coal combustion. Strategies for the control of SO_2 emissions can be divided into pre-combustion and post-combustion categories. A pre-combustion method is to switch to lower sulfur coals, since SO_2 emissions are proportional to the sulfur content of the coal. Post-combustion flue gas desulfurization (FGD) techniques can remove SO_2 formed during combustion.

a. Fuel Switching - A potential control for reducing SO_2 emissions from the proposed project is reducing the amount of sulfur contained in the coal. The Roundup Power boilers are designed to burn local coal from the BMP Investments Incorporated coal mine. The coal is a bituminous western coal with a relatively high heat content and low sulfur content. Bituminous coals from mines in the eastern and midwestern U.S. generally have a higher heating value, but also have a significantly higher sulfur content. Western sub-bituminous coals may have a somewhat lower average sulfur content but also typically have lower heating values.

Roundup Power is designed as a mine-mouth project. The economics of this project are based on the availability of an abundant supply of fuel in the immediate vicinity. Therefore, burning coal from another vicinity is not consistent with the project concept. Furthermore, although burning western sub-bituminous coal may reduce the uncontrolled SO_2 emission rate somewhat, the controlled SO_2 emission rate would be essentially the same for either sub-bituminous coal or BMP Investments Incorporated coal. Overall, there is no justification, either economically or environmentally to bum a coal that may have a slightly lower sulfur content.

b. Wet Scrubbing (Lime/Limestone)

Wet FGD technology is an established SO_2 control technology. Wet FGD systems are generally categorized as lime or limestone scrubbing systems. The scrubbing process and equipment for both lime scrubbing and limestone scrubbing is similar. Some FGD systems are designed to accommodate both lime and limestone.

i. Wet Lime Scrubbing

The wet lime scrubbing process uses an alkaline slurry made by adding lime (CaO) to water. The alkaline slurry is sprayed in the absorber and reacts with SO_2 in the flue gas. Insoluble calcium sulfite ($CaSO_3$) and calcium sulfate ($CaSO_4$) salts are formed in the chemical reaction that occurs in the scrubber. The salts are removed as a solid waste by-product. The waste by-product is made up of mainly $CaSO_3$, which is difficult to dewater. Solid waste by-products from wet lime scrubbing are typically managed in dewatering ponds and landfills.

ii. Wet Limestone Scrubbing

Limestone scrubbers are very similar to lime scrubbers. However, the use of limestone ($CaCO_3$) instead of lime requires different feed preparation equipment and a higher liquid-to-gas ratio. The higher liquid-to-gas ratio typically requires a larger absorbing unit. The limestone slurry process also requires a ball mill to crush the limestone feed.

Forced oxidation of the scrubber slurry can be used with either the lime or limestone wet FGD system to produce gypsum solids instead of the calcium sulfite by-product. Forced oxidation of the scrubber slurry provides a more stable by-product and reduces the potential for scaling in the FGD. The gypsum by-product may be salable, reducing the quantity of solid waste that needs to be landfilled.

Wet lime/limestone scrubber systems can achieve SO_2 control efficiencies of greater than 95% when used for boilers burning higher sulfur bituminous coals. The actual control efficiency of a wet FGD system depends on several factors, including the uncontrolled SO_2 concentration entering the system.

Wet FGD is considered a technically feasible control option for this project. For this BACT analysis, it was assumed that the wet FGD system would consist of wet limestone scrubbing with forced oxidation. Wet lime and wet limestone scrubbing systems achieve about the same SO_2 control efficiency, however, the higher cost of lime makes wet limestone scrubbing the more attractive option of the two.

Using a maximum uncontrolled SO_2 emission rate of 1.9 lb/MMBtu, the wet limestone scrubbing system could consistently achieve 96% SO_2 removal, resulting in a controlled emission rate of 0.08 lb/MMBtu.

iii. Wet FGD with Wet Electrostatic Precipitator (WESP)

Wet FGD systems can result in increased emissions of condensable particulates and acid gases. Additional add-on technology (such as WESP) exists to address the particulate and acid gas concern associated with wet FGD. WESP operates in much the same way as a dry ESP; charging and collecting the fine particulates. However, with WESP cleaning is performed by washing the collection surfaces with water rather than cleaning by mechanical means.

Wet FGD combined with WESP (wet FGD+WESP) is considered a technically feasible option to control SO_2 and acid gases from the proposed facility. The major advantage of using this combined technology instead of wet FGD alone is the reduction of sulfuric acid mist. It is anticipated that the SO_2 emission rate would still be approximately 0.08 lb/MMBtu; however, the collateral environmental impact of the control system would be reduced.

iv. Dual-Alkali Wet Scrubber

Dual-alkali scrubbing is a desulfurization process that uses a sodium-based alkali solution to remove SO_2 from combustion exhaust gas. The process uses both sodium-based and calcium-based compounds. The sodium-based reagent absorbs SO_2 from the exhaust gas, and the calcium-based solution (lime or limestone) regenerates the spent liquor. Calcium sulfites and sulfates are precipitated and discarded as sludge, while the regenerated sodium solution is returned to the absorber loop.

The dual-alkali process requires lower liquid-to-gas ratios than scrubbing with lime or limestone. The reduced liquid-to-gas ratios generally mean smaller reaction units, however additional regeneration and sludge processing equipment is necessary.

The sodium-based scrubbing liquor, typically consisting of a mixture of sodium hydroxide, sodium carbonate, and sodium sulfite, is an efficient SO_2 control reagent. However, the high cost of the sodium-based chemicals limits the feasibility of such a unit on a large utility boiler. In addition, the process generates a less stable sludge that can create material handling and disposal problems.

The total water use demands for a wet FGD system (for two 390-MW units) would be approximately 420.5 MMgal/year, the total sorbent feed rate for a wet FGD system would be approximately 24,740 lb/hr, and the total solid waste generation rate would be approximately 206,296 ton/yr. In addition, the use of a wet FGD system by Roundup Power would result in approximately 35 gal/min of wastewater. Treatment of the wastewater may require settling, pH adjustment, desupersaturation, and chemical precipitation.

Wet FGD provides some control of H_2SO_4 emissions. The total emissions (from both units) of H_2SO_4 while using wet FGD would be approximately 1,254 tons per year. If wet FGD was used in conjunction with WESP, the total H_2SO_4 emissions would be 125 tons per year.

The use of wet FGD would potentially result in visibility impacts both locally and on a more widespread basis. Locally, the high moisture plume would be quite visible on days with cool weather or humid conditions. On a more widespread basis, the facility's modeled emissions indicate that impacts would result at Class 1 areas around the facility.

The average cost per ton of reduction was determined for wet FGD and wet FGD+WESP. For wet FGD, the average cost per ton of reduction was estimated to be $435 and for wet FGD+WESP, the average cost per ton of reduction was estimated to be $542.

c. Dry Flue Gas Desulfurization

An alternative to wet scrubbing that has proven to effectively remove SO_2 from combustion gases is dry scrubbing. Dry FGD systems produce a dry by-product that is removed in the particulate control equipment, versus wet FGD systems where the by-product is a slurry collected separately from the fly ash. Various types of dry FGD systems are described below.

i. <u>Spray Dry Absorber</u>

The typical spray dry absorber uses a slurry of lime and water injected into the tower to remove SO_2 from the combustion gases. The towers must be designed to provide adequate contact and residence time between the exhaust gas and the slurry in order to produce a relatively dry by-product. The process equipment associated with a spray dryer typically includes an alkaline storage tank, mixing and feed tanks, an atomizer, spray chamber, particulate control device, and a recycle system. The recycle system collects solid reaction products and recycles them back to the spray dryer feed system to reduce alkaline sorbent use.

Spray dry systems are the typical dry scrubbing method in large industrial and utility boiler applications. Spray dry systems have demonstrated the ability to achieve greater than 90% SO_2 reduction on a consistent basis. The actual control efficiency depends on several factors, including the SO_2 concentration in the flue gas exhaust entering the spray dryer. Based on a maximum uncontrolled SO_2 emission rate of 1.9 lb/MMBtu, the dry spray absorber technology would consistently achieve a removal efficiency of approximately 94% and a maximum controlled emission rate of 0.12 lb/MMBtu.

ii. <u>Dry Sorbent Injection</u>

Dry sorbent injection involves the injection of powdered absorbent directly into the flue gas exhaust stream. Dry sorbent injection systems are simple systems, and generally require a sorbent storage tank, feeding mechanism, transfer line and blower, and an injection device. The dry sorbent is typically injected countercurrent to the gas flow. An expansion chamber is often located downstream of the injection point to increase residence time and efficiency. Particulates generated in the reaction are controlled in the systems particulate control device.

Typical SO_2 control efficiencies for a dry sorbent injection system are around 50%. The control efficiency of the dry sorbent system is lower than the control efficiency of either the wet FGD or spray dry absorber FGD.

iii. Circulating Dry Scrubber

A third type of dry scrubbing system uses a circulating fluidized bed of dry hydrated lime reagent to remove SO_2. Flue gas passes through a venturi at the base of a vertical reactor tower and is humidified by a water mist. The humidified flue gas then enters a fluidized bed of powdered hydrated lime where SO_2 is removed. The dry by-product produced by this system is similar to the spray dry absorber by-product and is routed with the flue gas to the particulate removal system. Because of the high particulate loading, the pressure drop across a fabric filter is generally unacceptable; therefore, ESPs are generally required for particulate control.

The circulating dry scrubber has limited application and has not been used on large pulverized coal boilers. Assuming that a circulating dry scrubber system could be designed for the proposed project, the anticipated SO_2 control efficiency would be similar to the control efficiency of a spray dry absorber system.

The total water use demands for a dry FGD system (for two 390-MW units) would be approximately 304.8 MMgal/year, the total sorbent feed rate for a dry FGD system would be approximately 20,664 lb/hr, and the total solid waste generation rate would be approximately 154,458 ton/yr. In addition, the dry FGD system would not generate a wastewater stream. The dry by-product that is created in a dry FGD system does not require dewatering or treatment prior to disposal.

Dry FGD also provides some control of H_2SO_4 emissions. The total emissions (from both units) of H_2SO_4 while using dry FGD would be approximately 209 tons per year.

The use of dry FGD would potentially result in visibility impacts on a more widespread basis, but would likely not result in impacts on a local basis. On a more widespread basis, the facility's modeled emissions indicate that impacts would result at Class 1 areas around the facility. Locally, the plume would be relatively dry and would not be much more visible on any one day as compared to another.

The average cost per ton of reduction was determined for dry FGD. The average cost per ton of reduction was estimated to be $390.

The Department determined that an SO_2 emission limit of 0.12 lb/MMBtu will constitute BACT for each of the two main power boilers. Wet scrubbing does not constitute BACT for the main power boiler for a variety of reasons. Although wet lime and wet limestone scrubbing are technically feasible, the technologies can result in collateral impacts. For example, both of these technologies can result in the formation of condensable particulates and acid gases, neither of which would be controlled with the proposed particulate control (baghouse). In addition, the wet process would require additional water, which is a critical limiting factor in the area. In fact, an air cooled condenser (ACC) will be used elsewhere in the process, rather than a cooling tower, to minimize water usage. Also, the solid waste by-product from the scrubbing process would need to be managed in dewatering ponds and/or a landfill. Conversely, the Department determined that the control provided by a dry FGD system is consistent with other recently permitted similar sources and that the collateral environmental effects from using a wet FGD system are too great to justify designating that a wet FGD (with or without WESP) system constitutes BACT.

4. CO Emissions

CO is a product of incomplete combustion. In order to minimize emissions of CO, good combustion must be ensured. An ideal burner scenario designed for complete combustion would allow for maximum temperatures, maximum residence time, and enough excess air and turbulence to assure good mixing and availability of O_2. However, CO emissions vary inversely with NO_x emissions. Combustion controls designed to reduce NO_x emissions, including low excess air, reduced residence time, and lower temperatures, tend to increase the generation of CO.

Two post-combustion control systems have been identified for potential application at the proposed Roundup Power facility; thermal oxidation and catalytic oxidation. Both of these post-combustion control systems are currently used to control volatile organic compound emissions from sources in petro-chemical industry.

a. Catalytic Oxidation - Catalytic oxidation systems are designed to oxidize CO to CO_2 in the presence of a catalyst. In refinery applications, and on gas turbine applications, catalytic oxidation systems have demonstrated CO reduction efficiencies of 80-90%. However, there are no known installations of oxidation catalysts on coal-fired power plant boilers.

   Several technical issues accompany the use of catalytic oxidation as a control for a coal-fired power plant boiler. For example, sulfur compounds in the flue gas tend to deactivate the catalyst at a rapid rate. Furthermore, in a coal fired boiler, dust suspended in the exhaust gas tends to foul and poison the catalyst. Because of the catalyst fouling concern, the catalyst would have to be place downstream of the particulate control device and the SO_2 control device. Even then, sulfur compounds and particulates remaining in the flue gas would tend to foul the catalyst.

   The need to place the catalyst downstream of the SO_2 and particulate control devices creates other problems--primarily dealing with flue gas temperature. The flue gas exiting the particulate control device (baghouse) would be approximately 180°F, while the catalyst requires a minimum temperature of approximately 500°F-600°F to oxidize CO to CO_2. The exhaust gases would have to be reheated to approximately 500°-600°F for the CO oxidation to occur. Reheating the exhaust would require oil - fired heaters, which would increase overall emissions of NO_x and PM_{10}.

   Finally, the conditions necessary to oxidize CO would also oxidize SO_2 to SO_3. It is estimated that as much as 30-50% of the SO_2 in the flue gas would oxidize to SO_3 as a result of the CO oxidation catalyst. SO_3 would react with moisture in the flue gas to form sulfuric acid mist in the atmosphere.

b. Thermal Oxidation - Thermal oxidation uses heat and oxygen to convert CO to CO_2. Because no catalyst is used in a thermal oxidizer, the temperature at which the conversion takes place is much higher. Temperatures above 1500°F are required to convert CO to CO_2.

   Particulate matter present in the coal-fired boiler exhaust gas would accumulate in the thermal oxidizer chamber and would plug and foul fans, ductwork, and other essential equipment. Therefore, as with catalytic oxidizers, thermal oxidizers must be located downstream of the particulate control device. The exhaust gas temperature at the baghouse outlet is typically approximately 180°F. To increase the exhaust temperature from 180°F to 1500°F requires a series of heat exchangers and a natural gas-fire furnace. Burning of additional fuel to heat the exhaust gas would increase overall emissions of NO_x, CO, and PM_{10}.

There are no known installations of thermal oxidizers on coal-fired power plants. Most thermal oxidation technology for stationary sources is utilized for the control of volatile organic emissions.

c. Proper Boiler Design and Operation - A properly designed and operated boiler effectively minimizes CO emissions. CO formation is minimized when the boiler temperature and excess oxygen availability are adequate for complete combustion. Minimizing CO emissions is in the economical best interest of the boiler operator because CO represents unutilized energy exiting the process.

Proper boiler design and operation can minimize the generation of both CO and NO_x. The Department determined that an emission limit of 0.15 lb/MMBtu constitutes BACT for the proposed boiler. Furthermore, the Department determined that proper boiler design and operation is necessary to maintain compliance with the CO emission limit established as part of this BACT analysis. Because of the technological difficulties associated with designing an oxidation catalyst for a coal-fired boiler, and because an oxidation catalyst system has not been used on a coal-fired power plant and is not commercially available, catalytic oxidation is deemed to be technically infeasible and was eliminated from further consideration in the BACT analysis. Furthermore, because of the technical issues (need to reheat gas and burn more fuel) associated with thermal oxidation and because thermal oxidizers have not been used on coal-fired power plants or any other stationary source applications of this magnitude, the use of a thermal oxidizer was eliminated from further consideration.

5. VOC Emissions

The rate at which VOCs are emitted depends on the combustion efficiency of the boiler. Controls that are designed to reduce NO_x emissions tend to increase VOC emissions and controls that tend to reduce CO emissions tend to reduce VOC emissions. Post-combustion catalytic oxidation and thermal oxidation would generally reduce VOC emissions, but neither of these control options is considered technically feasible because they have not been practically proven on a pulverized coal unit.

The only technically feasible control option for VOC control is proper design and operation. With proper design and operation, a pulverized coal boiler will provide all of the factors to facilitate complete volatile combustion, including extended residence time, consistent high temperatures in the combustion chamber, and continuous mixing of air and fuel. Proper boiler design and operation will minimize VOC emissions and limit the generation of NO_x. Also as part of the BACT determination, the Department determined that a VOC limit of 0.0030 lb/MMBtu is appropriate.

6. Sulfuric Acid Mist Emissions

Sulfuric acid mist (H_2SO_4) is one of the PSD pollutants listed in 40 CFR 52.21. Sulfuric acid mist is typically generated when sulfuric trioxide (SO_3) in the flue gas reacts with water to form sulfuric acid. The combustion of coal will result in the formation of sulfuric acid.

Four options were analyzed for the sulfuric acid mist control technology review. The four options are summarized below.

a. Dry FGD (Spray Dry Absorber) - Using a dry FGD system, SO_3 would react with sprayed lime in the absorber to form calcium sulfate. Because SO_3 is very reactive, approximately 90% of the SO_3 would be removed from the flue gas in the spray dry absorber and subsequent reactions in the fabric filter. The remaining 10% (5 ppm) of the SO_3 would be emitted to atmosphere and would react with water in atmosphere and precipitate out of the atmosphere as sulfuric acid.

b. Wet FGD - Using a wet FGD system, SO_3 would enter the wet scrubbers and react with the water to form micron sized sulfuric acid droplets. Because micron sized droplets can pass through the spray levels and the mist eliminator, the droplets can be emitted as sulfuric acid mist. Although some of the droplets would react with limestone in the wet scrubber, the size of the droplets would prevent the majority of the droplets from contacting the limestone. Approximately 25% of the sulfuric acid mist droplets would be captured by this system and approximately 75% (37.5 ppm) of the sulfuric acid mist droplets would be released to atmosphere from this system.

c. Wet FGD with WESP - While using Wet FGD, sulfuric acid mist can be further reduced by using a WESP downstream from the Wet FGD. The sulfuric acid mist would be removed from the flue gas stream as a condensable particulate in the WESP. Using WESP in conjunction with wet FGD would reduce the sulfuric acid mist emissions by approximately 90%. The remaining 10% (5 ppm) would be emitted to atmosphere.

d. No Additional controls - The base case would result in approximately 50 ppm of sulfuric acid mist.

Roundup Power proposed and the Department agrees that dry FGD constitutes BACT for sulfuric acid mist emissions. Not only is the use of dry FGD technology feasible, but dry FGD is required as part of the SO_2 BACT analysis and will be economically feasible. Furthermore, the use of dry FGD will yield the highest sulfuric acid control of the technically feasible control options.

B. Auxiliary Boilers

In addition to the coal-fired main boilers, the Roundup Power Project will have two oil-fired auxiliary boilers. The auxiliary boilers will generate steam for heating plant buildings and for start-up of the main boilers when both of the main units are shut down. Generally, operation of the auxiliary boilers will not be necessary when either of the main boilers is operating.

As proposed, the auxiliary boilers would be designed with low NO_x burners, and would be fired with low sulfur No. 2 fuel oil. This is an inherently clean fuel, with a maximum sulfur content of 0.05% and a maximum ash content of 0.25%. Emissions from the auxiliary boilers would also be minimized by limits on the annual hours of operation of the boilers. As stated above, the primary function of the auxiliary boilers is to provide steam for start-up and plant heating when both of the main boilers are shut down. Each of the main boilers is expected to have an average annual capacity factor of approximately 90%, so operation of the auxiliary boilers should be very infrequent.

In order to estimate maximum annual emissions from the auxiliary boilers, it was assumed that during some years the auxiliary boilers might need to operate as much as 3,300 hours/year (total for both boilers). This assumption is considered very conservative, because in most years the auxiliary boilers are expected to operate much less than 3,300 hours/year. Nevertheless, limiting the hours of operation to 3,300 hours/year will reduce the potential annual emissions from the auxiliary boilers by more than 81%.

The Department determined that the use of low NO_X burners and low sulfur No. 2 fuel oil, in conjunction with the requested hourly restriction (3300 hours per rolling 12-month period), constitutes BACT for the auxiliary boilers.

C. Backup Generator

The proposed Roundup Power facility will be equipped with one 1.6-MW emergency generator fired with low sulfur No. 2 fuel oil. As discussed above, low sulfur No. 2 fuel oil is an inherently clean fuel. Furthermore, the emergency generator would be used only during an interruption of the electrical power supply to the site and for short test periods. It is estimated that the emergency generator would be fired for a maximum of 200 hours per year.

The Department determined that the use of low sulfur No. 2 fuel oil, in conjunction with the requested hourly restriction (200 hours per rolling 12-month period), constitutes BACT for the emergency generator.

D. Material Handling Emission Sources - Particulate Emissions

The proposed Roundup Power facility would consist of numerous sources of particulate emissions (transfer points, fugitive sources, and storage piles). Control options for each of the sources have been analyzed to determine the best available control technology.

1. Transfer Points

Transfer points include railcar/truck loading and unloading, conveyor to conveyor drops, material transfers from reclaim hoppers to conveyors, and transfers from conveyors to storage silos. Particulate emissions would be generated as the material drops through the transfer point. The potential to generate particulate emissions at a transfer point is a function of the rate at which the material flows through the transfer point, the material's particle size, and the material's moisture content.

Based on EPA's emission factor for predicting particulate emissions from a transfer point (which factors in wind speed, material particle size distribution, and moisture content), potential emissions from a transfer point can be reduced by decreasing the speed at which the material is transferred or increasing the aggregate's moisture content by watering or chemical wetting agents. Transfer point emissions may be further reduced by enclosing the transfer operations within a structure and exhausting the structure through a particulate control device.

The Department determined that the use of a combination of dust suppression systems, enclosures, and baghouses to control particulate matter emissions from coal handling transfer points constitutes BACT. Furthermore, the Department determined that the lime needs to be handled/transferred using a pneumatic system ant that a bin exhaust filter needs to be used on each of the two lime storage silos. Roundup Power will be required to ensure that all fly ash is transferred using a vacuum-pressure system. The Department also determined that all baghouses/bin vents used to control emissions from the material handling system need to be capable of maintaining a maximum outlet emission rate of 0.010 grain/dscf.

2. Fugitive Dust Sources

Fugitive particulate emissions from coal, lime, and fly ash handling can occur at several points in the storage cycle, including material loading onto a storage pile, disturbances by strong wind currents, and loadout from the pile. Based on AP-42 equations that predict the potential particulate emissions from an aggregate storage pile, the generation of fugitive dust from material handling is a function of the following variables:

a. Threshold Friction Velocity. Threshold friction velocity is a characteristic of the storage pile that relates to the wind speed necessary to remove dust particles from the storage pile. The higher the threshold friction velocity the higher the wind speed needed to generate dust. Threshold friction velocity is a function of the material's erosion potential, which in turn is a function of the material's size distribution and moisture content. Increasing the material's particle size or moisture content would decrease its erosion potential and increase the storage pile's threshold friction velocity.

b. Wind Speed. Wind speed at the face of the storage pile must exceed the threshold friction velocity in order to generate dust.

c. Frequency of Disturbance. Emissions generated by wind erosion are dependent on the frequency of disturbance of the erodible surface of the storage pile. Each time that a surface is disturbed, its erosion potential is restored. A disturbance is defined as an action that results in the exposure of fresh surface material. On a storage pile, this would occur whenever material is added to or removed from the old surface.

The potential for fugitive emissions from a storage pile can be reduced by reducing the material's erosion potential, reducing the wind speed at the face of the storage pile, and/or reducing the frequency of storage pile disturbances. Watering, or the use of chemical wetting agents can reduce the erosion potential of a storage pile. Reducing the maximum wind speed that impacts the face of the storage pile can reduce wind erosion. Technologies that may feasibly reduce wind speed include enclosures and wind breaks around the storage pile.

Several control technologies may be used to reduce particulate emissions from material handling transfer points. Particulate matter control options considered for the Roundup Power Project include dust suppression systems, enclosed transfer points, pneumatic lines, and baghouse filters.

Spray dust suppression systems consist of a fine water mist that is sprayed onto the aggregate as it moves through the transfer point. The water mist effectively knocks down particulates before they are emitted to the atmosphere. Based on manufacturer studies and literature, it is predicted that a properly operating spray dust suppression system can reduce potential particulate emissions from a material transfer point by approximately 95%.

Locating transfer points within an enclosed building would also reduce particulate emissions. Dust generated from the transfer point would be contained within the building. Depending on air movement within the enclosure, and the material's particle size distribution, dust generated from the transfer point would either settle out in the enclosure or be emitted with the building's exhaust. If transfer operations within an enclosure are such that significant dust will be exhausted, a dust collection system (e.g., baghouse) can be used at the building's emission point to reduce particulate emissions. A baghouse can reduce particulate emissions from the transfer points by greater than 99.5% on a consistent basis, and can be designed to meet an outlet loading of 0.010 grain/dscf under all inlet loading conditions.

Separate material handling systems will be designed to handle lime and fly ash. Lime will be handled/transferred using a pneumatic system, and fly ash will be transferred using a vacuum/pressure system. A complete description of the proposed material handling systems, identifying the coal, lime, and fly ash transfer points, emission points, and control systems is included in Section 2 of the permit application.

3. Active Storage Piles

Totally enclosing the active storage pile is not practical because of the activity at the active storage pile (i.e., bulldozing and adding coal to the pile with a radial stacker). However, active coal storage piles have been located within coal storage sheds. Storage sheds are designed such that coal is delivered to the active storage pile by way of a conveyor system. Coal in the storage shed is funneled to the bottom of the shed where large rotary plows scrape the coal onto conveyors to be transported to the boilers. A storage shed would eliminate wind erosion from the active storage pile, however, particulates would still be generated by the rotary plows and from adding coal to the storage pile.

Particulates generated from the rotary plows and from adding coal to the active storage pile may be emitted with the storage shed's ventilation exhaust. It is estimated that total particulates from the active storage pile would be reduced by approximately 98% if the active storage pile is located within a storage shed.

Roundup Power is proposing to control particulate emissions from the active storage pile by installing a wind fence and using dust suppression sprays on coal as it is added to the pile. It is predicted that this combination of control strategies would reduce potential particulate emissions from the active storage pile by 98%.

4. Inactive Storage Pile

Several design and operational techniques exist to control fugitive emissions from an aggregate storage pile. The effectiveness of each control system would depend on the type of material stored, the size and shape of the pile, and how often the storage pile is disturbed. Fugitive emission control options considered for the Roundup Power Project are described below.

Totally enclosing a material storage pile that is infrequently disturbed may be a technically feasible option to control fugitive emissions. It may be possible to construct a structure covering approximately 100,000 square feet to cover the inactive coal storage pile. The structure would have to be designed to allow coal to be added and removed from the pile. The most economical structure available to cover a storage pile would likely be an air-inflated building. Although enclosing the inactive storage pile may be technically feasible, the Department is not aware of any pulverized coal facilities with covered inactive storage piles, and technical issues may arise which would preclude covering the entire storage pile. For example, heat generated within the storage pile may not be effectively dissipated thus creating a fire hazard.

Enclosing the inactive storage pile would reduce wind speeds at the surface of the storage pile, essentially eliminating emissions generated from wind erosion. Particulates would only be generated when the storage pile is disturbed (e.g., material is either added to or removed from the pile). Particulates generated when the pile is disturbed may be emitted to the atmosphere with the enclosure's exhaust system. Assuming that particulates would only be generated when the inactive storage pile is disturbed, it is predicted that totally enclosing the inactive storage pile would reduce potential particulate emissions by approximately 99.5%.

A wind fence may be a feasible option to reduce the wind speed at the surface of a storage pile and thus reduce particulate emissions. Wind tunnels and field experiments have shown that windbreaks produce large areas of reduced wind speed in their line. A properly designed windbreak placed upwind of a oval, flat-topped storage pile can produce wind speed reduction factors of 20 - 60% over the surface of the pile. To be effective, the windbreak should be at least as high as the pile and as long as the pile base. Windbreaks of height and/or length less than that of the pile are less effective. Based on published literature, and AP-42 emission factors, it is predicted that a windbreak would reduce potential particulate emissions by 90% for each wind event. Reducing the windspeed reduces the number of events in which the coal threshold friction velocity is exceeded. Therefore, the number of emission events per year is reduced and the annual emission reduction is 98%.

Dust suppression sprays can be used on storage piles to reduce particulate emissions. Dust suppression sprays can consist of a water spray or water mixed with surfactants to increase wetting and/or produce a residual crust over the storage pile. Dust suppression sprays reduce the material's erosion potential, thus increasing the threshold friction velocity. Therefore, a higher wind speed would be required to generate dust from the storage pile. Compacting the storage pile can further reduce the pile's erosion potential. It is estimated that treating material storage piles which are not frequently disturbed (e.g., the inactive coal pile) with compaction and a dust suppression spray can reduce total particulate emissions from aggregate storage operations by up to 90%.

Using a dust suppression spray consisting of water and/or a surfactant to increase wetting on the active storage pile would not be as effective, and would require more frequent application of the suppressant because disturbing the pile would restore its erosion potential. It is projected that application of a dust suppression spray to material being added to the active storage pile will reduce potential fugitive emissions from the pile by 80%.

Roundup Power is proposing, and the Department agrees, that particulate emissions from the inactive storage pile should be controlled by installing a wind fence and using dust suppression sprays and pile compaction. It is predicted that this combination of control strategies will reduce potential particulate emissions from the inactive storage pile by 98%.

The control options selected have controls and control costs comparable to other recently permitted similar sources and are capable of achieving the appropriate emission standards.

IV. Emission Inventory

Source	PM_{10} (tpy)	SO_2 (tpy)	NO_x (tpy)	VOC (tpy)	CO (tpy)	HAPs (tpy)	Pb (tpy)
Main Boiler #1 (MP-1)	245.5	1964.1	1145.7	49.5	2455.1	45.09	0.10
Main Boiler #2 (MP-2)	245.5	1964.1	1145.7	49.5	2455.1	45.09	0.10
Auxiliary Boiler #1 (AB-1)	1.38	5.43	16.61	0.17	3.46	0.15	0.00
Auxiliary Boiler #2 (AB-2)	1.38	5.43	16.61	0.17	3.46	0.15	0.00
Backup Generator (BG-1)	0.05	0.08	4.42	0.10	0.10	0.00	0.00
Coal Handling	8.29	---	---	---	---	---	---
Lime Handling	1.06	---	---	---	---	---	---
Fly Ash Handling	5.26	---	---	---	---	---	---
Totals	508.41	3939.1	2329.0	99.45	4917.2	90.48	0.19

Main Power Boiler #1 (MP-1)

Fuel: Pulverized bituminous coal
Gross Plant Output = 390,100 kW
Net Plant Output = 350,172 kW
Primary Fuel Feed Rate = 188 ton/hr

Full Load Heat Input to Boiler = 3737 MMBtu/hr
Sorbent Feed Rate = 10,332 lb/hr (45,255 ton/yr)
Annual Capacity Factor = 100% per year

PM_{10} Emissions
Emission Factor (uncontrolled) = 8.16 lb/MMBtu
Emission Factor (controlled) = 0.015 lb/MMBtu (permit condition)
Calculation: 0.015 lb/MMBtu * 3737 MMBtu/hr = 56.055 lb/hr
56.055 lb/hr * 8760 hr/yr * 0.0005 ton/lb = 245.5 ton/yr

SO_x Emissions
Emission Factor (uncontrolled) = 1.90 lb/MMBtu
Emission Factor (controlled) = 0.12 lb/MMBtu (permit condition)
Calculation: 0.12 lb/MMBtu * 3737 MMBtu/hr = 448.44 lb/hr
448.44 lb/hr * 8760 hr/yr * 0.0005 ton/lb = 1964.2 ton/yr

NO_x Emissions
Emission Factor (uncontrolled) = 31 lb/ton (AP-42, Table 1.1-3, 9/98)
Emission Factor (unc.) = 31 lb/ton * 188 ton/hr * 1hr/3737 MMBtu = 1.56 lb/MMBtu
Emission Factor (controlled) = 0.07 lb/MMBtu (permit condition)
Calculation: 0.07 lb/MMBtu * 3737 MMBtu/hr = 261.59 lb/hr
261.59 lb/hr * 8760 hr/yr * 0.0005 ton/lb = 1145.8 ton/yr

VOC Emissions
Emission Factor (uncontrolled) = 0.0030 lb/MMBtu (permit condition)
Calculation: 0.0030 lb/MMBtu * 3737 MMBtu/hr = 11.21 lb/hr
11.21 lb/hr * 8760 hr/yr * 0.0005 ton/lb = 49.1 ton/yr

CO Emissions
Emission Factor (uncontrolled) = 0.15 lb/MMBtu (permit condition)
Calculation: 150 lb/MMBtu * 3737 MMBtu/hr = 261.59 lb/hr
261.59 lb/hr * 8760 hr/yr * 0.0005 ton/lb = 1145.8 ton/yr

HAP Emissions
Total HAP emissions were determined for "unwashed coal." A summary of the calculations for the HAP emissions is contained in permit application #3182-00 (in Appendix B). The total HAP emissions are the sum of the total emissions from several tables in the appendix. HAPS = 45.09 ton/yr

Main Power Boiler #2 (MP-2)
Fuel: Pulverized bituminous coal
Gross Plant Output = 390,100 kW
Net Plant Output = 350,172 kW
Primary Fuel Feed Rate = 188 ton/hr
Full Load Heat Input to Boiler = 3737 MMBtu/hr
Sorbent Feed Rate = 10,332 lb/hr (45,255 ton/yr)
Annual Capacity Factor = 100% per year

PM_{10} Emissions
Emission Factor (uncontrolled) = 8.16 lb/MMBtu
Emission Factor (controlled) = 0.015 lb/MMBtu (permit condition)
Calculation: 0.015 lb/MMBtu * 3737 MMBtu/hr = 56.055 lb/hr
56.055 lb/hr * 8760 hr/yr * 0.0005 ton/lb = 245.5 ton/yr

SO_x Emissions

Emission Factor (uncontrolled) = 1.90 lb/MMBtu
Emission Factor (controlled) = 0.12 lb/MMBtu (permit condition)
Calculation: 0.12 lb/MMBtu * 3737 MMBtu/hr = 448.44 lb/hr
448.44 lb/hr * 8760 hr/yr * 0.0005 ton/lb = 1964.2 ton/yr

NO_x Emissions

Emission Factor (uncontrolled) = 31 lb/ton (AP-42, Table 1.1-3, 9/98)
Emission Factor = 31 lb/ton * 188 ton/hr * 1hr/3737 MMBtu = 1.56 lb/MMBtu
Emission Factor (controlled) = 0.07 lb/MMBtu (permit condition)
Calculation: 0.07 lb/MMBtu * 3737 MMBtu/hr = 261.59 lb/hr
261.59 lb/hr * 8760 hr/yr * 0.0005 ton/lb = 1145.8 ton/yr

VOC Emissions

Emission Factor (uncontrolled) = 0.0030 lb/MMBtu (permit condition)
Calculation: 0.0030 lb/MMBtu * 3737 MMBtu/hr = 11.21 lb/hr
11.21 lb/hr * 8760 hr/yr * 0.0005 ton/lb = 49.1 ton/yr

CO Emissions

Emission Factor (uncontrolled) = 0.15 lb/MMBtu (permit condition)
Calculation: 150 lb/MMBtu * 3737 MMBtu/hr = 261.59 lb/hr
261.59 lb/hr * 8760 hr/yr * 0.0005 ton/lb = 1145.8 ton/yr

HAP Emissions

Total HAP emissions were determined for "unwashed coal." A summary of the calculations for the HAP emissions is contained in permit application #3182-00 (in Appendix B). The total HAP emissions are the sum of the total emissions from several tables in the appendix. HAPS = 45.09 ton/yr

Auxiliary Boiler #1 (AB-1)

Fuel = No.2 Fuel Oil
Boiler Heat Input with Margin = 117 MMBtu/hr
Fuel Consumption = 6014 lb/hr
Total Fuel Consumption = 823 gal/hr
Annual Fuel Consumption = 1,383,000 gal
Hours of operation = 3360 hours per year combined (≅1680 hours)
Sulfur in Fuel = 0.5%

PM_{10} Emissions

Emission Factor = 2 lb/1000 gal (AP-42, Table 1.3-1, 9/98)
Calculation: (2/1000) lb/gal * 823 gal/hr = 1.646 lb/hr
1.646 lb/hr * 1680 hr/yr * 0.0005 ton/lb = 1.38 ton/yr

SO_x Emissions

Emission Factor = 157*S lb/1000 gal (AP-42, Table 1.3-1, 9/98)
Calculation: (157(0.5)/1000) lb/gal * 823 gal/hr = 64.61 lb/hr
64.61 lb/hr * 1680 hr/yr * 0.0005 ton/lb = 54.3 ton/yr

NO_x Emissions

Emission Factor = 24 lb/1000 gal (AP-42, Table 1.3-1, 9/98)
Calculation: (24/1000) lb/gal * 823 gal/hr = 19.75 lb/hr
19.75 lb/hr * 1680 hr/yr * 0.0005 ton/lb = 16.60 ton/yr

VOC Emissions
Emission Factor = 0.252 lb/1000 gal (AP-42, Table 1.3-1, 9/98)
Calculation: (0.252/1000) lb/gal * 823 gal/hr = 0.207 lb/hr
0.207 lb/hr * 1680 hr/yr * 0.0005 ton/lb = 0.17 ton/yr

CO Emissions
Emission Factor = 5 lb/1000 gal (AP-42, Table 1.3-1, 9/98)
Calculation: (5/1000) lb/gal * 823 gal/hr = 4.12 lb/hr
4.12 lb/hr * 1680 hr/yr * 0.0005 ton/lb = 3.46 ton/yr

HAP Emissions
Emission Factors (AP-42, Table 3.4-3, Table 3.4-4, 10/96)
Calculation: See Permit Application #3182-00, Appendix B = 0.15 ton/yr

Auxiliary Boiler #2 (AB-2)
Fuel = No.2 Fuel Oil
Boiler Heat Input with Margin = 117 MMBtu/hr
Fuel Consumption = 6014 lb/hr
Total Fuel Consumption = 823 gal/hr
Annual Fuel Consumption = 1,383,000 gal
Hours of operation = 3360 hours per year combined (≅1680 hours)
Sulfur in Fuel = 0.5%

PM_{10} Emissions
Emission Factor = 2 lb/1000 gal (AP-42, Table 1.3-1, 9/98)
Calculation: (2/1000) lb/gal * 823 gal/hr = 1.646 lb/hr
1.646 lb/hr * 1680 hr/yr * 0.0005 ton/lb = 1.38 ton/yr

SO_x Emissions
Emission Factor = 157*S lb/1000 gal (AP-42, Table 1.3-1, 9/98)
Calculation: (157(0.5)/1000) lb/gal * 823 gal/hr = 64.61 lb/hr
64.61 lb/hr * 1680 hr/yr * 0.0005 ton/lb = 54.3 ton/yr

NO_x Emissions
Emission Factor = 24 lb/1000 gal (AP-42, Table 1.3-1, 9/98)
Calculation: (24/1000) lb/gal * 823 gal/hr = 19.75 lb/hr
19.75 lb/hr * 1680 hr/yr * 0.0005 ton/lb = 16.60 ton/yr

VOC Emissions
Emission Factor = 0.252 lb/1000 gal (AP-42, Table 1.3-1, 9/98)
Calculation: (0.252/1000) lb/gal * 823 gal/hr = 0.207 lb/hr
0.207 lb/hr * 1680 hr/yr * 0.0005 ton/lb = 0.17 ton/yr

CO Emissions
Emission Factor = 5 lb/1000 gal (AP-42, Table 1.3-1, 9/98)
Calculation: (5/1000) lb/gal * 823 gal/hr = 4.12 lb/hr
4.12 lb/hr * 1680 hr/yr * 0.0005 ton/lb = 3.46 ton/yr

HAP Emissions
Emission Factors (AP-42, Table 3.4-3, Table 3.4-4, 10/96)
Calculation: See permit application #3182-00, Appendix B = 0.15 ton/yr

Backup Generator (BG-1)
Fuel = No.2 Fuel Oil
Size = 2336.2 Hp
Max. Sulfur in Fuel = 0.05%
Fuel Consumption = 111.5 gal/hr
Hours of operation = 200 hours per year

PM_{10} Emissions
Emission Factor = 0.52 lb/hr (Manufacturer's Data)
Calculation: 0.52 lb/hr * 200 hr/yr * 0.0005 ton/lb = 0.05 ton/yr

SO_x Emissions
Emission Factor = 0.00355 lb/gal (Mass Balance - Allowable Sulfur in Fuel)
Calculation: 0.00355 lb/gal * 111.5 gal/hr = 0.3958 lb/hr
0.3958 lb/hr * 200 hr/yr *0.0005 tons/lb = 0.04 ton/yr

NO_x Emissions
Emission Factor = 44.22 lb/hr (Manufacturer's Data)
Calculation: 44.22 lb/hr * 200 hr/yr * 0.0005 ton/lb = 4.42 ton/yr

VOC Emissions
Emission Factor = 0.98 lb/hr (Manufacturer's Data)
Calculation: 0.98 lb/hr * 200 hr/yr * 0.0005 ton/lb = 0.10 ton/yr

CO Emissions
Emission Factor = 0.95 lb/hr (Manufacturer's Data)
Calculation: 0.95 lb/hr * 200 hr/yr * 0.0005 ton/lb = 0.10 ton/yr

HAP Emissions
Emission Factors (AP-42, Table 3.4-3, Table 3.4-4, 10/96)
Calculation: See Permit Application #3182-00, Appendix B = 0.00 ton/yr

V. Existing Air Quality

As part of complying with the PSD program requirements, Roundup Power was required to conduct on-site pre-monitoring for PM_{10} and SO_2, because air modeling showed the concentrations of these pollutants to exceed the levels identified in ARM 17.8.818(7). Roundup Power requested to use, and the Department agreed to accept, ambient PM_{10} data that was collected by Meridian Minerals Company from March 1989 through March 1992. The measured PM_{10} values yielded an annual average PM_{10} concentration of 9 $\mu g/m^3$, and the maximum measured 24-hour concentration was 53 $\mu g/m^3$ (compared to standards of 50 $\mu g/m^3$ for the annual average, and 150 $\mu g/m^3$ for the 24-hour average).

Ambient monitoring was conducted by Roundup Power to measure the concentration of SO_x in the project area. Roundup Power began collecting ambient SO_x data on January 1, 2002. Based upon the data collected so far, the amount of SO_2 in the immediate area of the project facility is relatively low (highest measured 1-hour concentration was 16 ppb, highest measured 3-hour concentration was 10 ppb, highest measured 24-hour concentration was 3 ppb). All of the measured concentrations were very low in comparison to the applicable Montana and Federal ambient air quality standards.

Roundup Power also elected to conduct ambient monitoring to measure the concentration of NO_2 in the project area. Roundup Power began collecting ambient NO_2 data on January 1, 2002. Based upon the data collected so far, the amount of NO_2 in the immediate area of the project facility is relatively low (highest measured 1-hour concentration was 8 ppb for NO_2. The measured concentrations were very low in comparison to the applicable 1-hour Montana ambient air quality standards.

Baseline monitoring was not conducted for any other air pollutants. The proposed project area is considered to be in attainment of all air quality standards.

VI. Ambient Air Impact Analysis

The Department determined, based on ambient air modeling, that the impact from this permitting action will be minor. The Department believes the proposed project will not cause or contribute to a violation of any ambient air quality standard.

VII. Taking or Damaging Implication Analysis

As required by 2-10-105, MCA, the Department conducted a private property taking and damaging assessment and determined there are no taking or damaging implications.

VIII. Environmental Assessment

A Draft Environmental Impact Statement is being prepared for this project by the Department.

Permit Analysis Prepared By: Dan Walsh
Date: 08/08/02

APPENDIX B
DETAILED CUMULATIVE VISIBILITY AND PSD CLASS I INCREMENT ANALYSES

Cumulative Class I Increment Impacts

Since the predicted Class I increment impacts from the Project were above the Prevention of Significant Deterioration (PSD) Class I significance levels (proposed by EPA but never formally adopted), a cumulative Class I -increment analysis was conducted. There are three mandatory Class I areas within 200 kilometers (km) of the Project: Yellowstone National Park (YNP), UL Bend Wilderness (UL Bend), and North Absaroka Wilderness (NAW). The Northern Cheyenne Reservation (NCR) is a nonmandatory Class I area. Because these Class I areas are all located more than 50 kilometers from the site, CALPUFF modeling was used to assess the cumulative impacts on the Class I areas. The CALPUFF modeling protocol is detailed in the air quality permit application (Bull Mountain Development Company, LLC., 2002b).

Off-site Emitting Sources for Class I Analysis

The off-site emitting sources included in the Class I cumulative increment analysis are presented in Table B-1.

Table B-1 Emissions for Off-site Emitting Sources in Class I Cumulative Increment Analysis

Source	SO_2 Emissions (lbs/hr)	NOx Emissions (lbs/hr)	PM_{10} Emissions (lbs/hr)
Graymont Western Lime, Townsend, MT			
Kiln #1	63.5	89.8	20.8
Kiln #2	63.5	100	20.8
Rocky Mountain Generation, Hardin, MT			
Main Stack	195.6	117.4	19.56
Yellowstone Energy Limited Partnership, Billings, MT			
Main Stack	0	319	1.21
Colstrip Energy Limited Partnership, Colstrip, MT			
Main Stack	16.32	328	6.4
PPL Units #3 and #4, Colstrip, MT			
Unit #3, 3-hour	2136.5	5301	379
Unit #4, 3-hour	2136.5	5301	379
Unit #3, 24-hr	1363	5301	379
Unit #4, 24-hr	1363	5301	379
Sources in Park and Big Horn Counties, WY			
Williston Basin, EB	0	38.1	0
Colorado Inter. EB	0	34.2	0
Dakota Coal, Frannie	0.75	28.8	0

Source: Bull Mountain Development Company No 1 LLC., 2002f

PSD Class I Increment Impacts

A cumulative Class I increment analysis was performed since Class I increment impacts from Project, by itself, were greater than PSD Class I significance levels (the proposed, but not adopted PSD significance levels are 4% of the Class I increments). The CALPUFF modeling results in Table B-2 show the impacts for the cumulative PSD Class I increment analysis. This analysis includes impacts from all PSD-increment consuming sources in the area, including PPL Colstrip Units #3 and #4.

Table B-2: Cumulative Analysis PSD Class I Increments

Pollutant	Average Period	YNP Impacts ($\mu g/m^3$)	UL Bend Impacts ($\mu g/m^3$)	NAW Impacts ($\mu g/m^3$)	NCR Impacts ($\mu g/m^3$)	PSD Class I Increment ($\mu g/m^3$)	PSD Class I Sig. Level ($\mu g/m^3$)
NO_2	Annual	0.0005	0.009	0.0009	1.248	2.5	0.1
SO_2	Annual	0.013	0.037	0.015	0.50	2	0.08
	24-hour[a]	0.55	0.78	0.58	6.64[b]	5	0.2
	3-hour[a]	1.80	3.08	1.77	38.18[b]	25	1.0
PM_{10}	Annual	0.005	0.012	0.006	0.139	4	0.16
	24-hour[a]	0.17	0.31	0.18	2.25	8	0.32

Source: Memo to Dan Walsh, DEQ from Diane Lorenzen, P.E. , 2002b

[a]Based on High Second High Impact

[b]Prior to undertaking the cumulative impact analysis, MDEQ informed the Proponent that exceedances of the short-term SO_2 Class I increments had been previously modeled at receptors on the NCR.

The cumulative modeled impacts in the above table show that the 24-hr and 3-hr SO_2 Class I increments at YNP, NAW, and UL Bend are above the PSD Class I significance levels but below the Class I increments. Therefore, these predicted impacts would be considered moderate. All of the other modeled impacts at these Class I areas are below the PSD Class I significance levels. Therefore, the predicted impacts would be considered low.

The cumulative modeled impacts, as outlined in Table B-2, predict that the 24-hr and 3-hr SO_2 Class I increments at the NCR are exceeded. The modeling results indicate the major contributors to these predicted exceedances are PPL Colstrip Units #3 and #4. During any predicted exceedance shown by the model, the Project is not a significant contributor (i.e., Project impacts are below the PSD Class I significance level). Table B-3 and Table B-4 show the Project's highest impacts at the receptors where the 3-hr and 24-hr SO_2 Class I increments, respectively, are exceeded.

Table B-3 Project Contributions to Predicted SO_2 3-hr Class I Increment Exceedances on the Northern Cheyenne Reservation

Receptor Number	Receptor Location		Date of Impact		Cumulative Impact	Project Impact at Receptor		
	Lambert Conf. E. (km.)	Lambert Conf. N. (km.)	Day	Start Hour	($\mu g/m^3$)	Date and Time of Impact: Day	Start Hour	1st / 2nd High Impact ($\mu g/m^3$)
271	224.807	24.444	46	1200	38.18	275	0600	0.95
						302	1200	0.89
272	226.732	24.501	63	1200	36.80	336	1200	0.97
						275	0600	0.96
269	220.957	24.331	260	1200	36.31	275	0600	0.99
			178	1200	35.61	115	0600	0.93
			63	1200	32.24			
268	219.032	24.274	260	1200	35.37	275	0600	1.01
			178	1200	33.56	115	0600	0.96
			63	1200	25.91			
270	222.882	24.388	178	1200	31.59	275	0600	0.97
			46	1200	30.89	302	1200	0.91
273	228.657	24.558	63	1200	30.38	336	1200	1.06
						275	0600	0.98
267	217.152	24.176	178	1200	26.26	275	0600	0.96
			63	1500	25.71	302	1200	0.94
266	216.157	23.222	63	1500	25.51	302	1200	0.94

Source: Memo to Dan Walsh, DEQ from Diane Lorenzen, P.E. , 2002b

Table B-4 Project Contributions to Predicted SO2 24-hr Class I Increment Exceedances on the Northern Cheyenne Reservation

Receptor Number	Receptor Location		Date of Impact		Cumulative Impact	Project Impact at Receptor		
	Lambert Conf. E. (km.)	Lambert Conf. N. (km.)	Day	Start Hours	($\mu g/m^3$)	Date of Impact: Day	Start Hours	Project High Impact ($\mu g/m^3$)
268	219.032	24.274	363	00 - 23	6.64	363	00 - 23	0.05
			189	00 - 23	5.34	189	00 - 23	0.03

Source: Memo to Dan Walsh, DEQ from Diane Lorenzen, P.E. , 2002b

Cumulative impacts at the NCR, with respect to the 24-hr and 3-hr SO_2 PSD increments, are considered high, but the Project's contributions to the exceedances are below the PSD Class I significance levels. Therefore, the Project's contributions to the exceedances on the NCR are considered low during the times of exceedances. The annual modeled SO_2 impacts at the NCR are above the PSD Class I significance level but below the increment. Therefore, the predicted cumulative impacts with respect to the Class I increment are considered moderate.

Cumulative Visibility Analysis

As part of assessing air quality impacts of the Project in combination with impacts of other major sources in the region, a cumulative visibility analysis was completed. The focus of the cumulative visibility analysis was on impacts to PSD Class I areas in the Project vicinity (i.e., YNP, UL Bend, NAW, and NCR).

The Federal Land Managers Air Quality Related Values Workshop (FLAG) Guidance document (December 2000) indicates that a cumulative visibility analysis is expected when an individual source shows impacts that exceed a 5% change in light extinction. The Project exceeded this criteria in three PSD Class I areas (YNP, NAW and UL Bend), so a cumulative impacts analysis is expected. The NCR is not a mandatory PSD Class I area (not designated by the Federal Clean Air Act), so a visibility analysis is not required by regulation; however, results of visibility modeling on the NCR are provided in this Appendix.

Procedures for conducting a cumulative visibility analysis are described in Section D.2 of the FLAG Guidance document (U.S. Forest Service, et. al., 2000). In this case, several alternate approaches to determining cumulative visibility impacts from distant sources have been applied as follows:

Scenario #1: The proponent used a visibility baseline at year 1996 and modeled emissions from PSD sources proposed, built or with emissions since that date. Between 1987 and 1997, the US Forest Service and National Park Service started collecting aerosol and relative humidity background data at various PSD Class I areas located in the western U.S. as part of the Interagency Monitoring of Protected Visual Environments (IMPROVE) monitoring program. Natural visibility extinction coefficients listed in the FLAG document for western U.S. Class I areas are reasonably representative of baseline conditions existing during the first ten years of the IMPROVE monitoring program. Therefore, 1996 was assumed to be the visibility baseline date for determining which background sources should be included in the cumulative Class I visibility analysis (memo to Dan Walsh, DEQ, from Diane Lorenzen, P.E., 2002). Emissions from major sources or major modifications that were permitted since 1996 were included in the CALPUFF modeling.

Scenario #2: The Federal Land Managers (FLM) have asserted that a cumulative analysis must consider all major source and major modification emissions increases permitted after the PSD baseline date of January 6, 1975. Emissions increases (but not decreases) from the PSD sources permitted since 1975 were included in the CALPUFF modeling conducted by the FLMs.

Scenario #3: In response to the FLM position on baseline, the proponent has completed additional CALPUFF modeling to predict cumulative visibility impacts from all major sources and major modifications, including both emissions increases and decreases, since the PSD baseline date of January 6, 1975. This analysis predicts the aggregate visibility impacts of source emissions changes by combining both positive and negative predictions of visibility impact (change in light extinction or % delta b_{ext}) into a cumulative result.

The following sections discuss the results of cumulative visibility modeling with each scenario.

Scenario #1: Cumulative Visibility Modeling Results

Emissions sources included in Scenario #1 are listed in Table B-1; however, Graymont, Colstrip Energy Limited Partnership, and Colstrip Units 3 & 4 were permitted before the 1996 baseline date and are not included in the cumulative analysis. Results generated by application of Scenario #1, incorporating emissions since 1996, are given in Table B-5. The table summarizes the daily results of the cumulative visibility impact analysis on the Class I areas and it provides the Project's contribution during that day.

Table B-5 The Project and Cumulative Visibility Modeling Results with 1996 Baseline

Date	Receptor Number	Cumulative Change in Light Extinction (%)	Receptor Number	Change in Light Extinction from the Project (%)
Yellowstone National Park				
March 6	1	14.67	234	13.03
July 21	214	12.07	214	9.63
January 16	33	10.07	33	8.22
September 29	178	9.27	183	7.14
March 24	214	8.91	214	5.81
July 20	39	6.92	34	5.59
January 17	33	6.85	33	5.66
April 6	214	6.13	214	6.03
October 7	33	6.13	33	5.31
September 19	33	6.07	--	<5.0
June 16	33	5.90	--	<5.0
February 14	113	5.73	--	<5.0
September 20	156	5.69	--	<5.0

Date	Receptor Number	Cumulative Change in Light Extinction (%)	Receptor Number	Change in Light Extinction from the Project (%)
May 13	33	5.20	--	<5.0
May 12	57	5.06	--	<5.0
UL Bend Wilderness				
February 17*	243	9.95	243	7.93
February 18	243	9.75	243	6.83
August 27	243	8.30	243	6.39
February 16	243	6.62	243	6.49
December 11	243	5.62	243	<5.0
North Absaroka Wilderness				
January 16	349	13.65	349	11.07
March 6	349	10.62	349	7.29
January 17	349	9.52	349	7.68
June 16	349	7.90	--	<5.0
July 20	350	7.36	350	6.15
October 7	349	6.78	349	5.49
September 19	349	6.60	350	<5.0
September 29	350	5.95	--	5.30
May 13	349	5.29	--	<5.0
March 23	349	5.27	--	<5.0
May 12	350	5.26	--	<5.0
August 12	349	5.25	--	<5.0

Source: Memo to Dan Walsh, DEQ from Diane Lorenzen, P.E. , 2002b

Note: Relative Humidity (RH) Factor Estimation Method: Hourly CALMET Database RH Data (Maximum RH of 98% for Particle Growth)

The maximum impacts predicted by the cumulative visibility analysis in Scenario #1 are higher than 10% at YNP and NAW. Therefore, the predicted impacts would be considered high.

Cumulative impacts predicted at the UL Bend are below 10% but above the *de minimis* level. Therefore, the predicted impacts would be considered moderate.

Scenario #2: Cumulative Visibility Modeling Results

Impacts determined in the Scenario #2 cumulative visibility modeling conducted by the FLMs are given in Table B-6. The FLM modeling included the facilities listed in Table B-1 (7 other PSD sources and the Project) in a CALPUFF modeling analysis, resulting in the visibility impacts given in Table B-6.

Table B-6 The Project and Cumulative Visibility Impacts from the FLM Modeling Analysis

The Project Visibility Impacts (without other PSD sources)			
Class I Area	**Change in Light Extinction (Days > 5%)**	**Change in Light Extinction (Days > 10%)**	**Maximum Change in Light Extinction (%)**
Yellowstone NP	9	1	12.74 %
UL Bend WA	4	0	8.14 %
North Absaroka WA	5	1	10.47 %
Northern Cheyenne	35	12	38.35%
Visibility Impacts of the Project (with 7 other PSD Sources)			
Class I Area	**Change in Light Extinction (Days > 5%)**	**Change in Light Extinction (Days > 10%)**	**Maximum Change in Light Extinction (%)**
Yellowstone NP	39	24	119.93 %
UL Bend WA	46	28	156.05 %
North Absaroka WA	33	21	126.41 %
Northern Cheyenne	260	224	637.07%

Source: National Park Service and US Fish Wildlife Service, 2002b

Note: CALPUFF modeling with 1990 meteorological data and maximum RH of 98%

Scenario #2 modeling predicted days above 10% extinction with Project emissions alone at YNP and NAW, and numerous days above 10% in the cumulative analysis. This scenario may result in a finding of adverse impact by the FLMs and the resulting impacts to all Class I areas would be rated high.

Scenario #3: Cumulative Visibility Modeling

The proponent provided additional cumulative visibility modeling to address the FLM position that the baseline should be concurrent with the initiation of the PSD program. This modeling used the PSD sources listed in Table B-1, but also included reductions in sulfur dioxide emissions from major sources in the region over the time period of 1975 to present. Table B-7 provides the sources and emissions used in Scenario #3 modeling.

Table B-7 PSD Source SO_2 Emissions Changes Based on 1975 Baseline

Source	1977[e] Actual Emissions (tpy)	2001 Actual Emissions (tpy)	24-hour Max.		
			Baseline (lb/day)	Current[f] (lb/day)	Change (lb/day)
ExxonMobil Refinery, Billings[a]	9,800	5,112	101,402	53,154	-48,248
YELP, Billings	0	1,932	0	16,320	16,320
Conoco Refinery, Billings[a]	3,198	1,102	71,647	16,901	-54,746
MSCC, Billings[a]	2,000	1,969	198,400	74,336	-124,064
PPL-Corette, Billings[a]	9,986	2,647	78,200	33,296	-44,904
Western Sugar, Billings[b]	815	86	33,070	7,558	-25,512
Cenex Refinery, Laurel[a]	11,830	2,558	76,618	64,957	-11,661
Colstrip 3&4	NA	1,243	0	65,424	65,424
Rocky Mountain Generation	NA	NA	0	4,694	4,694
Anaconda Smelter, Anaconda[c]	321,136	0	1,759,649	0	-1,759,649
Asarco, East Helena[d]	80,000	0	188,420	0	-188,420
Graymont Lime, Townsend	NA	92	0	3,048	3,048
Total	**438,765**	**16,741**	**2,507,406**	**336,640**	

Source: Bull Mountain Development Company, No. 1, LLC, 2002d

a Baseline 24-hour emissions for Exxon, Conoco, MSCC, PPL and Cenex based on 1989 Pechan Report to EPA, Maximum Feasible Emissions.

b Baseline 24-hour emissions for Western Sugar based on 1989 Pechan Report to EPA, Potential to Emit.

c Baseline 24-hour emissions for Anaconda based on 1977 annual emissions divided by 365 days per year.

d Baseline 24-hour emissions for Asarco based on Operating Permit for facility, representing SIP restrictions.

e 1977 Emission are consistent with 1975 emissions

f Current 24-hour emission for existing and proposed sources based on permit allowables

Scenario #3 CALPUFF visibility modeling was completed by modeling all of the sulfur dioxide emissions increases since the baseline and then modeling all of the emissions decreases since the baseline. The shut-down of the Anaconda Smelter and the ASARCO Lead Smelter in East Helena, along with reductions in sources of sulfur dioxide in the Billings-Laurel area since adoption of a new State Implementation Plan (SIP) have produced large reductions of sulfur dioxide in the region. By modeling both increases and decreases and aggregating results in post-processing of the model data, a more complete picture of emissions changes and resulting visibility impairment is presented. Tables B-8, B-9, and B-10 provide the results of cumulative visibility monitoring under this Scenario for YNP, UL Bend and NAW.

Table B-8 Scenario #3: Yellowstone National Park Cumulative Visibility Modeling

Date	Receptor Number	RHDS[a] b_{ext}% (%)	RHIS[b] b_{ext}% (%)	Cumulative b_{ext}% (%)	Receptor Number	Project b_{ext}% (%)
March 5	33	120.03	-104.29	15.74	234	12.86
September 19	170	45.01	-292.09	-247.08	--	<5%
May 12	33	43.02	-237.42	-194.40	--	<5%
September 28	61	40.07	-43.23	-3.16	183	7.14
February 14	58	38.46	-129.39	-90.93	--	<5%
May 11	57	35.03	-102.07	-67.04	--	<5%
February 13	59	33.09	-73.92	-40.83	--	<5%
June 15	33	32.35	-52.01	-19.66	--	<5%
July 20	246	30.12	-173.20	-143.08	214	9.63
August 3	58	26.76	-14.99	11.77	--	<5%
July 21	58	26.14	-10.62	15.52	--	<5%
August 11	33	24.56	-127.11	-102.55	--	<5%
January 15	33	22.73	-350.89	-328.16	33	8.22
June 16	33	21.23	-46.76	-25.53	--	<5%
January 16	33	20.61	-639.65	-619.04	33	5.66
September 20	157	20.43	-221.89	-201.46	--	<5%
September 18	33	20.01	-111.73	-91.72	--	<5%
July 22	58	19.68	-49.60	-29.92	--	<5%
December 21	113	14.97	-1.83	13.14	--	<5%
August 10	33	13.30	-78.07	-64.77	--	<5%
March 6	113	12.44	-6.99	5.45	--	<5%
March 23	214	12.38	-65.63	-53.25	214	5.81
July 10	33	12.06	-164.32	-152.26	--	<5%
August 4	33	11.20	-96.43	-85.23	--	<5%
July 19	40	10.04	-244.98	-234.94	34	5.59

Source Bull Mountain Development Company, No. 1, LLC., 2002d

[a]Regional Haze Deteriorating Sources (RHDS); emissions from sources commencing after guideline baseline date of January 6, 1975

[b] Regional Haze Improving Sources (RHIS); emissions from sources shutting down after guideline baseline date of January 6, 1975

Note: Relative Humidity (RH) Factor Estimation Method: Hourly CALMET Database RH Data (Maximum RH of 98% for Particle Growth)

Table B-9 Scenario #3: UL Bend Wilderness Area Cumulative Visibility Modeling

Date	Receptor Number	RHDS (1) $b_{ext}^{\%}$ (%)	RHIS (2) $b_{ext}^{\%}$ (%)	Cumulative $b_{ext}^{\%}$ (%)	Receptor Number	Project $b_{ext}^{\%}$ (%)
February 16	243	143.49	-139.45	4.04	243	8.01
November 25	243	131.58	-13.92	117.66	--	<5%
March 7	243	87.62	-8.22	79.40	--	<5%
February 17	243	83.35	-132.55	-49.20	243	6.88
August 26	243	57.02	-277.34	-220.32	243	8.53
September 2	243	28.01	-41.82	-13.81	--	<5%
May 12	243	25.92	-5.47	20.45	--	<5%
May 14	243	25.53	-14.83	10.70	--	<5%
February 1	243	24.29	-123.00	-98.71	--	<5%
September 16	243	22.78	-11.95	10.83	--	<5%
February 15	243	22.75	-55.82	-33.07	243	6.49
May 15	243	20.98	-30.04	-9.06	--	<5%
September 5	243	20.95	-44.36	-23.41	--	<5%
June 16	243	20.35	-12.43	7.92	--	<5%
September 19	243	17.52	-15.10	2.42	--	<5%
September 29	243	17.24	-14.00	3.24	--	<5%
August 27	243	14.00	-477.44	-463.44	--	<5%
May 27	243	13.93	-38.77	-24.84	--	<5%
May 23	243	12.90	-13.16	-0.26	--	<5%
July 31	243	11.73	-74.30	-62.57	--	<5%
July 23	243	11.64	-29.03	-17.39	--	<5%
December 10	243	11.22	-56.13	-44.91	--	<5%
July 25	243	10.55	-13.64	-3.09	--	<5%

Source: Bull Mountain Development Company, No. 1, LLC., 2002d

Table B-10 Scenario #3: North Absaroka Wilderness Area Cumulative Visibility Modeling

Date	Receptor Number	RHDSạ bext% (%)	RHISb bext% (%)	Cumulative bext% (%)	Receptor Number	Project bext% (%)
March 5	349	124.89	-106.38	18.51	349	7.25
May 12	349	46.41	-237.96	-191.55	--	<5%

Date	Receptor Number	RHDS[a] bext% (%)	RHIS[b] bext% (%)	Cumulative bext% (%)	Receptor Number	Project bext% (%)
June 15	349	43.03	-73.52	-30.49	--	<5%
February 14	350	40.43	-127.60	-87.17	--	<5%
January 15	349	32.36	-360.22	-327.86	349	11.07
May 11	350	32.03	-88.39	-56.36	--	<5%
September 28	350	30.34	-19.38	10.96	350	5.30
January 16	349	28.97	-663.84	-634.87	349	7.68
February 13	350	28.85	-57.37	-28.52	--	<5%
June 16	349	28.27	-66.18	-37.91	--	<5%
August 11	350	27.56	-133.87	-106.31	--	<5%
July 20	350	25.81	-73.18	-47.37	--	<5%
September 19	349	23.20	-136.56	-113.36	--	<5%
September 18	349	21.74	-112.57	-90.83	--	<5%
August 5	350	21.20	-7.33	13.87	--	<5%
July 22	350	16.54	-40.76	-24.22	--	<5%
July 21	350	16.23	-12.97	3.26	--	<5%
August 10	349	15.13	-88.78	-73.65	--	<5%
July 10	349	13.75	-162.97	-149.22	--	<5%
August 4	349	11.87	-99.45	-87.58	--	<5%
July 19	350	10.42	-228.03	-217.61	350	6.15

Source: Bull Mountain Development Company, No. 1, LLC, 2002d
[a]Regional Haze Deteriorating Sources (RHDS); emissions from sources commencing after guideline baseline date of January 6, 1975
[b]Regional Haze Improving Sources (RHIS); emissions from sources shutting down after guideline baseline date of January 6, 1975
Note: Relative Humidity (RH) Factor Estimation Method: Hourly CALMET Database RH Data (Maximum RH of 98% for Particle Growth)

Results of cumulative visibility modeling in Scenario #3 show improvement over the more conservative results from Scenario #2. However, Tables B-8 and B-10 still show impacts exceeding the 10% light extinction level, for both cumulative analyses and the Project alone. These results indicate a potential for an impact to visibility in Class I areas that rates high. Table B-9 shows impacts at UL Bend that exceed 10% in the cumulative mode, but no exceedances of the 10% criteria by the Project alone. Impacts due to the Project at UL Bend would be considered moderate.

Since the cumulative model-predicted impacts remain above 10% at YNP and NAW in all three scenarios and the Project impacts are above the visibility *de minimis* level (0.4%), the FLM and MDEQ will need to make a decision as to whether or not the Project adversely affects the Class I areas.

The proponent has further analyzed the modeled visibility results on a case-by-case basis for the highest impact days and has asserted in a letter to MDEQ that, on the days the model-predicted impacts exceed the 10% threshold, the Project does not adversely impact visibility in any of the Class I areas. (Bull Mountain Development Company No 1 LLC., 2002c). In this letter, the proponent explains that during the high impact days, CALPOST, when predicting a change in light extinction, is highly sensitive to relative humidity. The model-predicted change in light extinction is calculated relative to natural background conditions. The proponent claims that on most model-predicted high impact days, weather conditions (e.g., snow, fog, rain, etc.) are causing changes in light extinction greater than any model-predicted visibility impact from the Project. Therefore, the proponent claims that the Project's visibility impacts on days of high relative humidity are insignificant compared to visibility impairment caused by natural conditions (snow, fog, rain, etc.). When the high relative humidity days are excluded, the predicted visibility impacts to the Class I areas are all below the 5% change in light extinction threshold. If the proponent's assertions about the CALPUFF model are accepted by DEQ and/or the FLMs, no cumulative visibility analysis would be expected at any of the Class I areas

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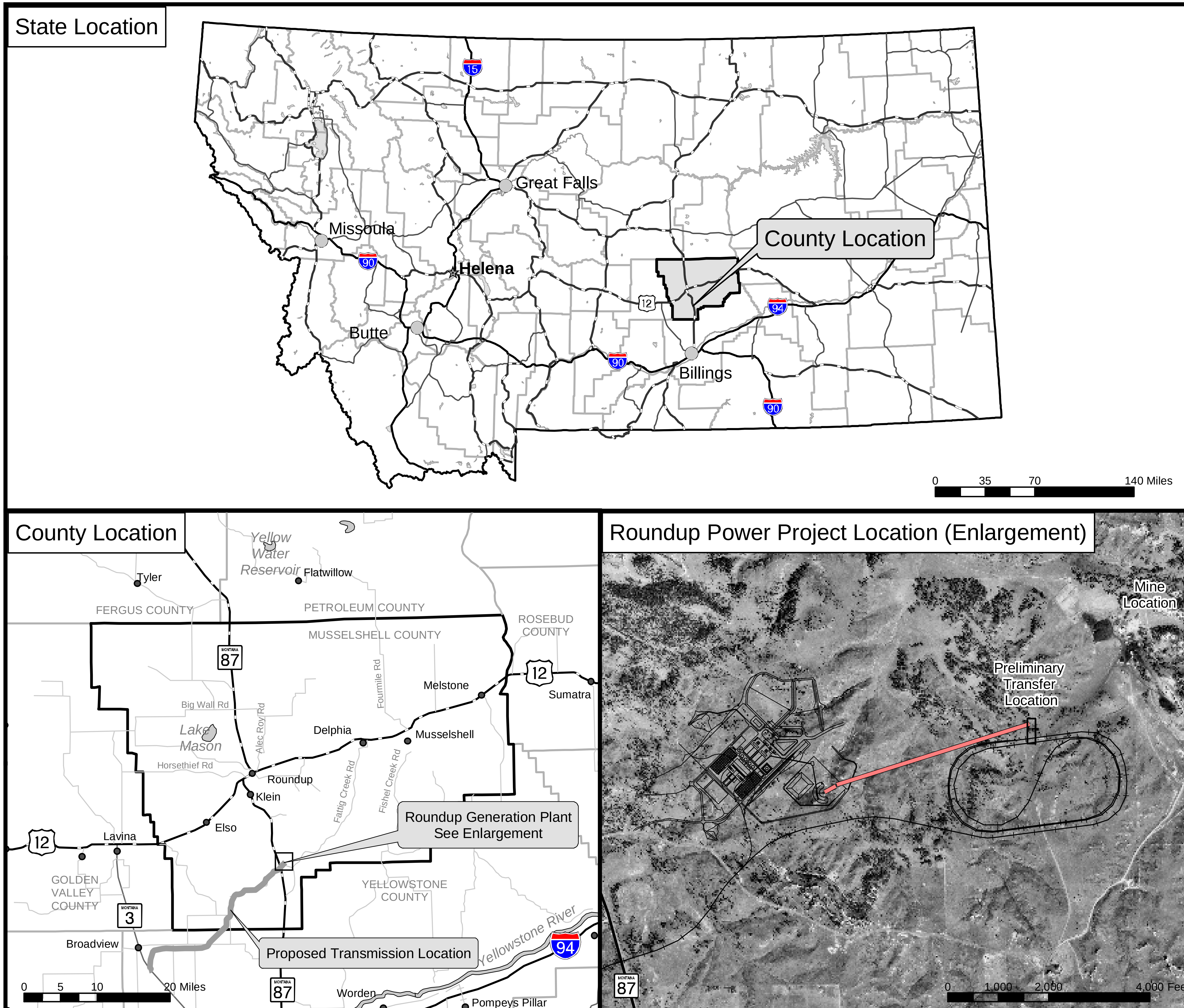
Figure 1-1

Vicinity Map

Roundup Power Project DEIS



Legend

- Preliminary Transfer Location
- Towns
- Cities
- State Capital
- Conveyor Location
- Proposed Transmission
- Interstate Highway
- U.S. Highway
- State Highway
- County Road
- Proposed Railroad
- County Line
- Lake / Stream

N W E S

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Figure 2-10

Alternative Solid Waste Disposal Area

Roundup Power Project DEIS

Legend

Preliminary Transfer Location

Fence Line

State Highway

Proposed Railroad

Section Line

River / Stream

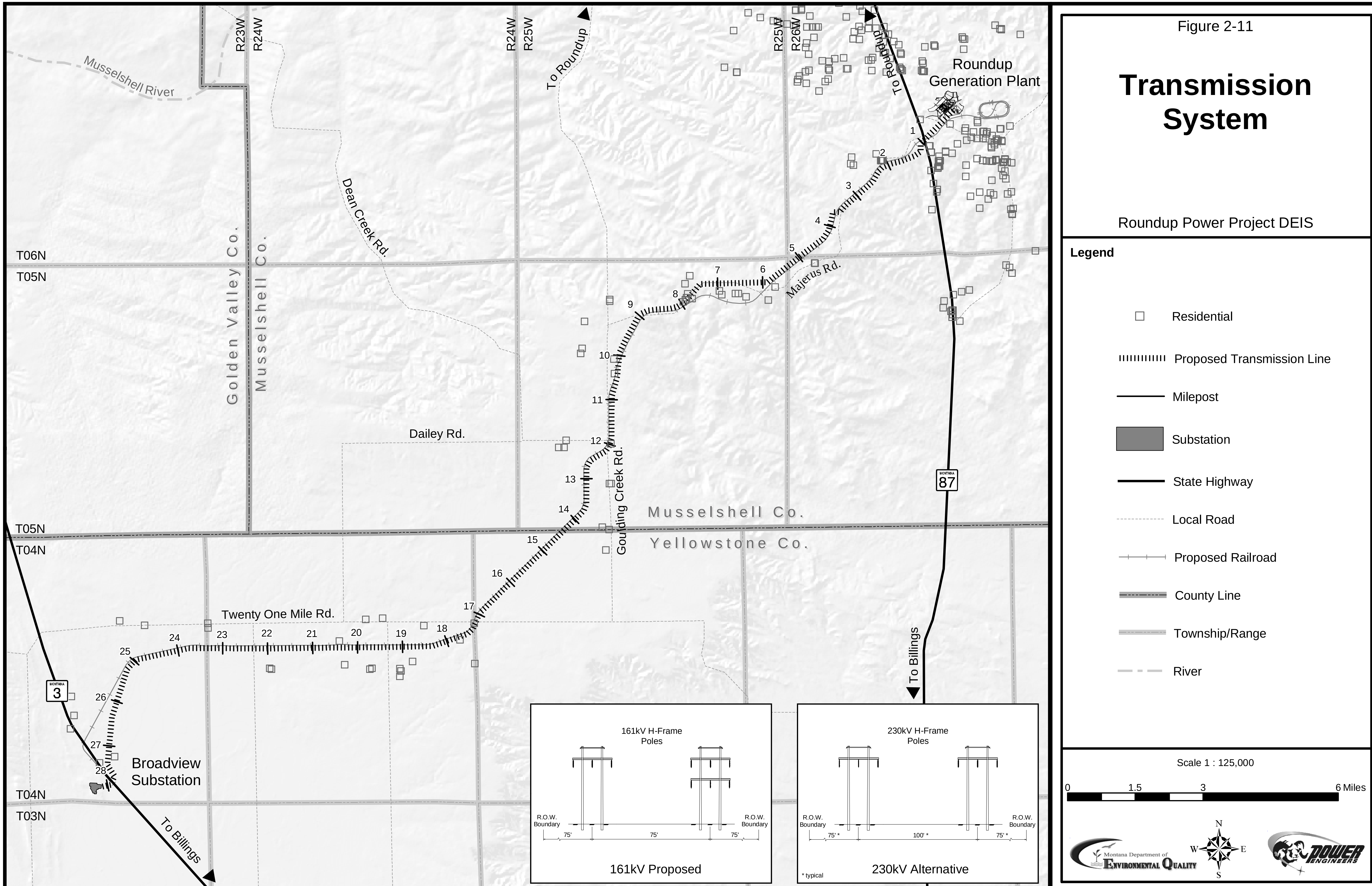
1" : 1,250'

0 625 1,250 2,500 Feet

N W E S

Montana Department of Environmental Quality

Power Engineers



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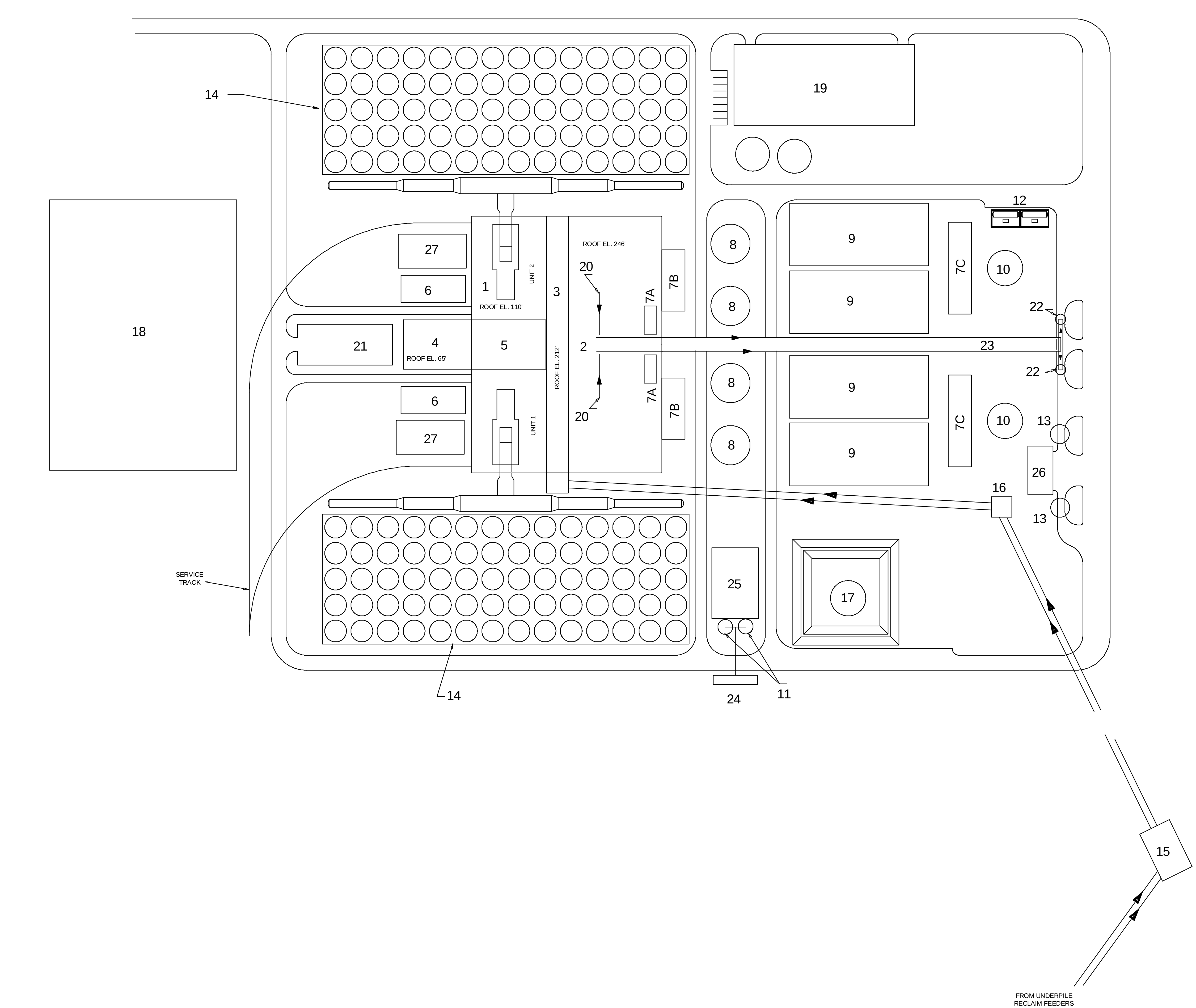

Figure 2-2

Plant Layout

Roundup Power Project DEIS

Legend

1	Turbine Room
2	Boiler Room
3	Pulverizer/Silo Bay
4	Administration
5	Control Room & Electrical Equip.
6	Transformers
7	Fans (A=P.A. B=F.D. C=I.D.)
8	Dry FGD Absorbers
9	Baghouses
10	Chimneys
11	Lime Storage Silos
12	Ammonia Tanks for SCR
13	Ash Silos
14	Air Cooled Condenser
15	Coal Crusher House
16	Transfer Tower
17	Oil Tank
18	Switchyard
19	Water Treatment, Shops/Storage
20	Drag Chain Conveyors
21	Parking
22	Bottom Ash Silos
23	Bottom Ash Conveyors
24	Lime Unloading Facility
25	Lime Preparation Building
26	Flyash Blower Building
27	Water to Air Cooler

1" : 150'

0 75 150 300 Feet

N W E S

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Figure 2-3

Site Design

Roundup Power Project DEIS

Legend

Preliminary Transfer Location

Fence Line

State Highway

Proposed Railroad

Section Line

River / Stream

1" : 1,250'

0 625 1,250 2,500 Feet

Montana Department of Environmental Quality

N W E S

Power Engineers

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Activity ID	Activity Description
SITE SELECTION / AUTHORIZATION	
A0001	SITE EVALUATION
A0005	AUTHORIZATION TO PROCEED
PERMITTING	
A0025	PREPARE PSD PERMIT APPLICATION
A0030	AGENCY REVIEW PSD APPLICATION
A0031	PREPARE OTHER PERMIT APPLICATIONS
A0034	AGENCY REVIEW OTHER APPLICATIONS
A0035	OBTAIN CONSTRUCTION PERMITS
ENGINEERING / PROCUREMENT	
A0045	GA / SITE DEVELOPMENT / PLANT PERFORMANCE
A0046	FINALIZE CYCLE & PREPARE MAJOR SPECIFICATIONS
A0047	PROCURE STEAM GENERATOR
A0047M	AWARD STEAM GENERATOR
A0048	FABRICATE/ DELIVER STEAM GENERATOR
A0050	PROCURE TURBINE GENERATOR
A0050M	AWARD TURBINE GENERATOR
A0051	FABRICATE / DELIVER TURBINE GENERATOR
A0052	PROCURE FGD SYSTEM
A0053	FABRICATE / DELIVER FGD SYSTEM
A0056	PROCURE MATERIAL HANDLING SYSTEM
A0057	FABRICATE / DELIVER MATERIAL HANDLING SYS
A0058	PROCURE GEOTECH SERVICES CONTRACTOR
A0059	GEOTECH TESTING / REPORT
A0060	PROCURE MAJOR EQUIPMENT
A0067	P&ID DEVELOPMENT
A0068	FINALIZE GAs / START DETAILED DESIGN
A0070	POWER BLOCK SUBSTRUCTURE DESIGN
A0072	POWER BLOCK STR. STEEL DESIGN/FAB/DELV
A0073	BOILER ROOM STRUCTURAL STEEL MILL ORDER
A0074	BOILER ROOM STRUCTURAL STEEL FAB RELEASE
A0076	WIRING DESIGN
A0078	CRITICAL PIPE DESIGN
CONSTRUCTION	
A0084	PROCURE SITE CLEARING CONTRACTOR
A0085	SITE CLEARING & ACCESS
A0086	SITEWORK
A0087	POWER BLOCK SUBSTRUCTURE
A0090	POWER BLOCK STRUCTURAL STEEL
A0115	BOILER PRESSURE PARTS
A0117	RAISE STEAM DRUM
A0125	BOILER HYDRO TEST
A0127	BOILER INSULATION & TRIM
A0137	TURBINE GENERATOR
A0140	CHIMNEY SHELL
A0141	CHIMNEY LINER
A0142	FGD / BAGHOUSE
A0145	MATERIAL HANDLING SYSTEM
STARTUP & TESTING	
A0160	ENERGIZE SWITCHGEAR
A0170	MATERIAL HANDLING SYSTEM CHECKOUT
A0175	BOILOUT / STEAM BLOW / RESTORE
A0180	UNIT INITIAL OPERATION
A0185	COMMERCIAL OPERATION - UNIT 1
A0190	COMMERCIAL OPERATION - UNIT 2

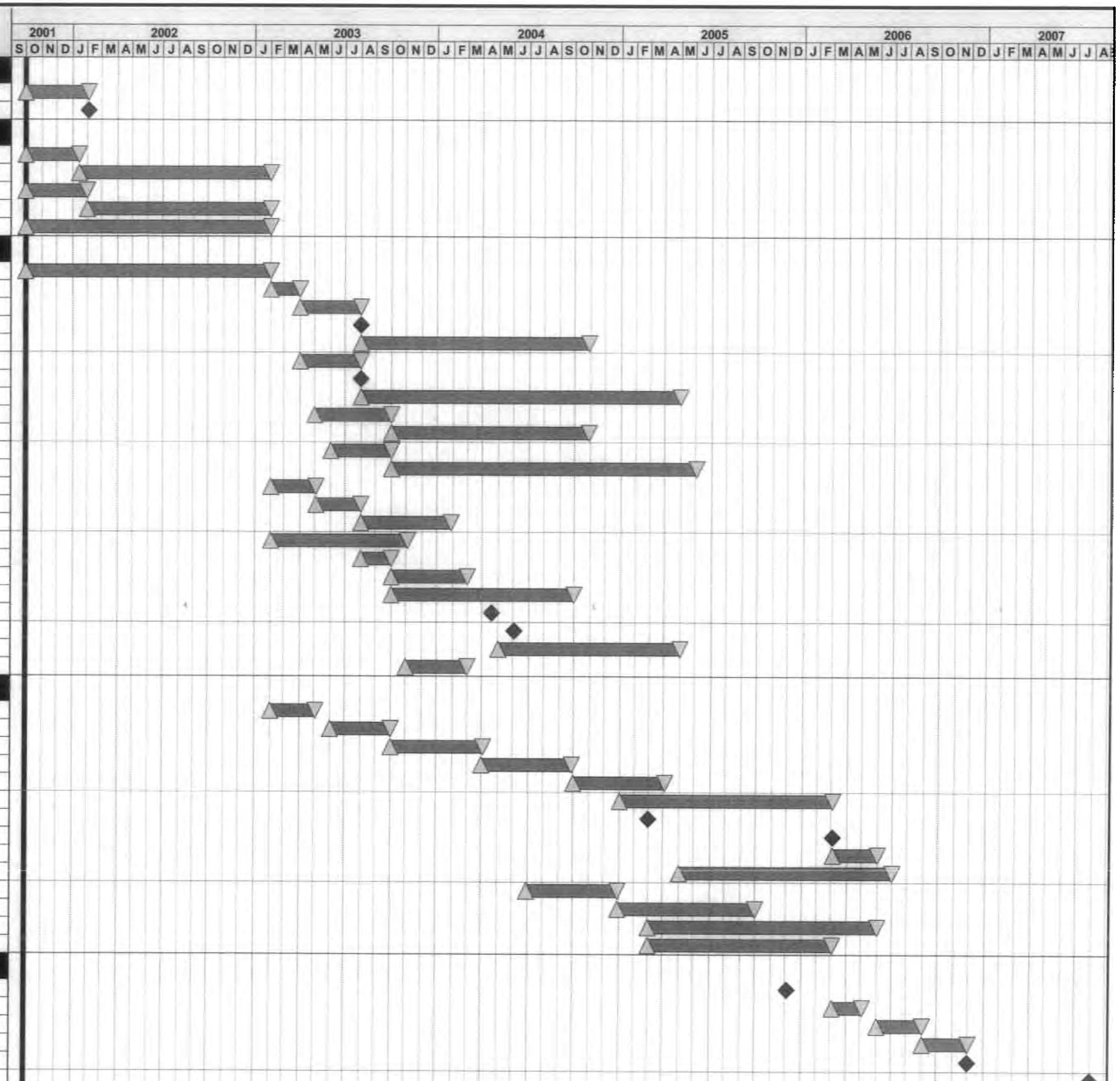

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Figure 2-7

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C395

ROUNDUP
PROJECT SCHEDULE
390 GROSS MW x 2 - PULVERIZED COAL PLANT
START ENGINEERING/PROCUREMENT AFTER PERMIT

Sheet 1 of 1

Sargent & Lundy LLC

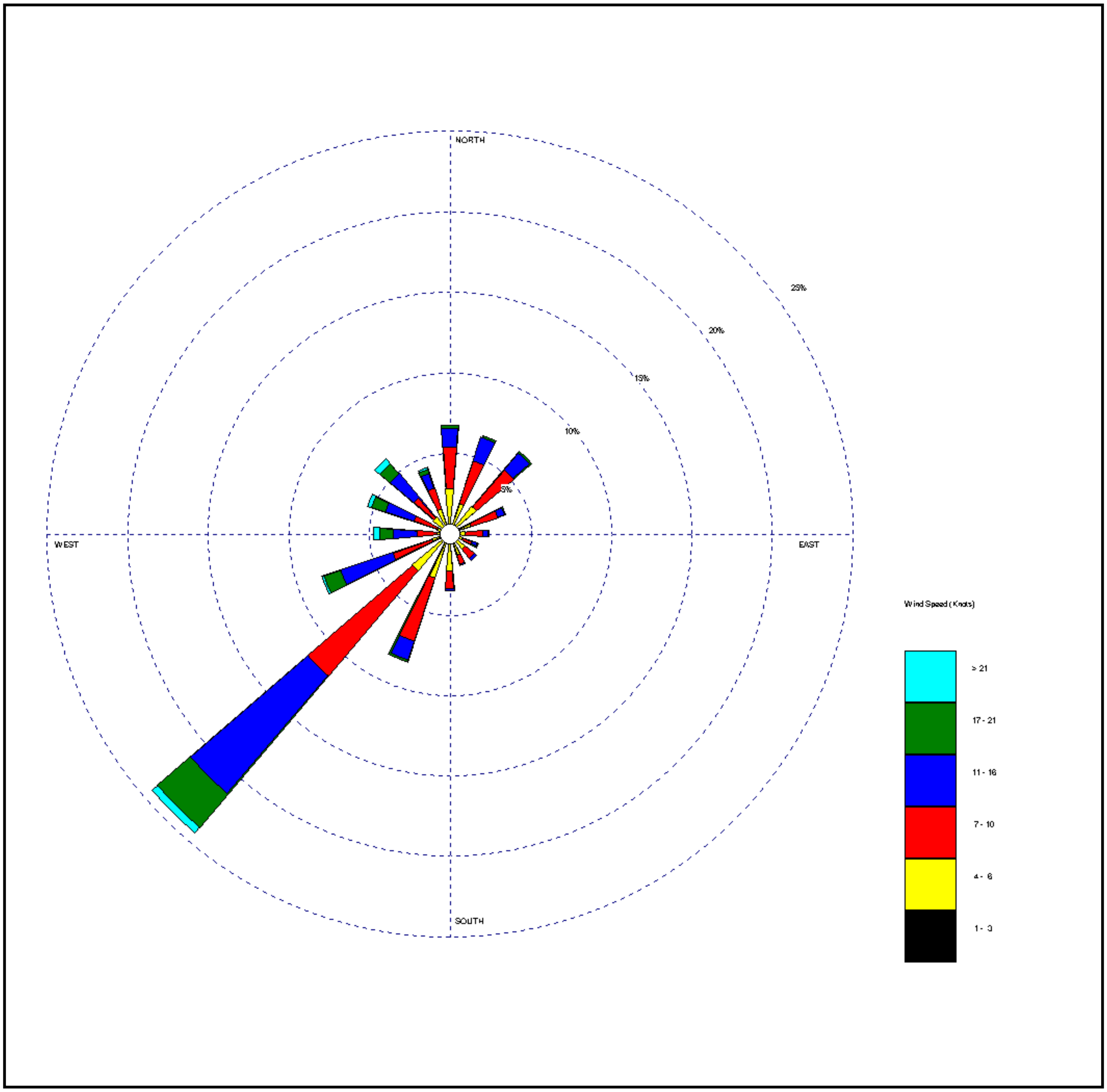

Figure 3-1 Billings WSO, Montana, Wind Rose, 1986-1990

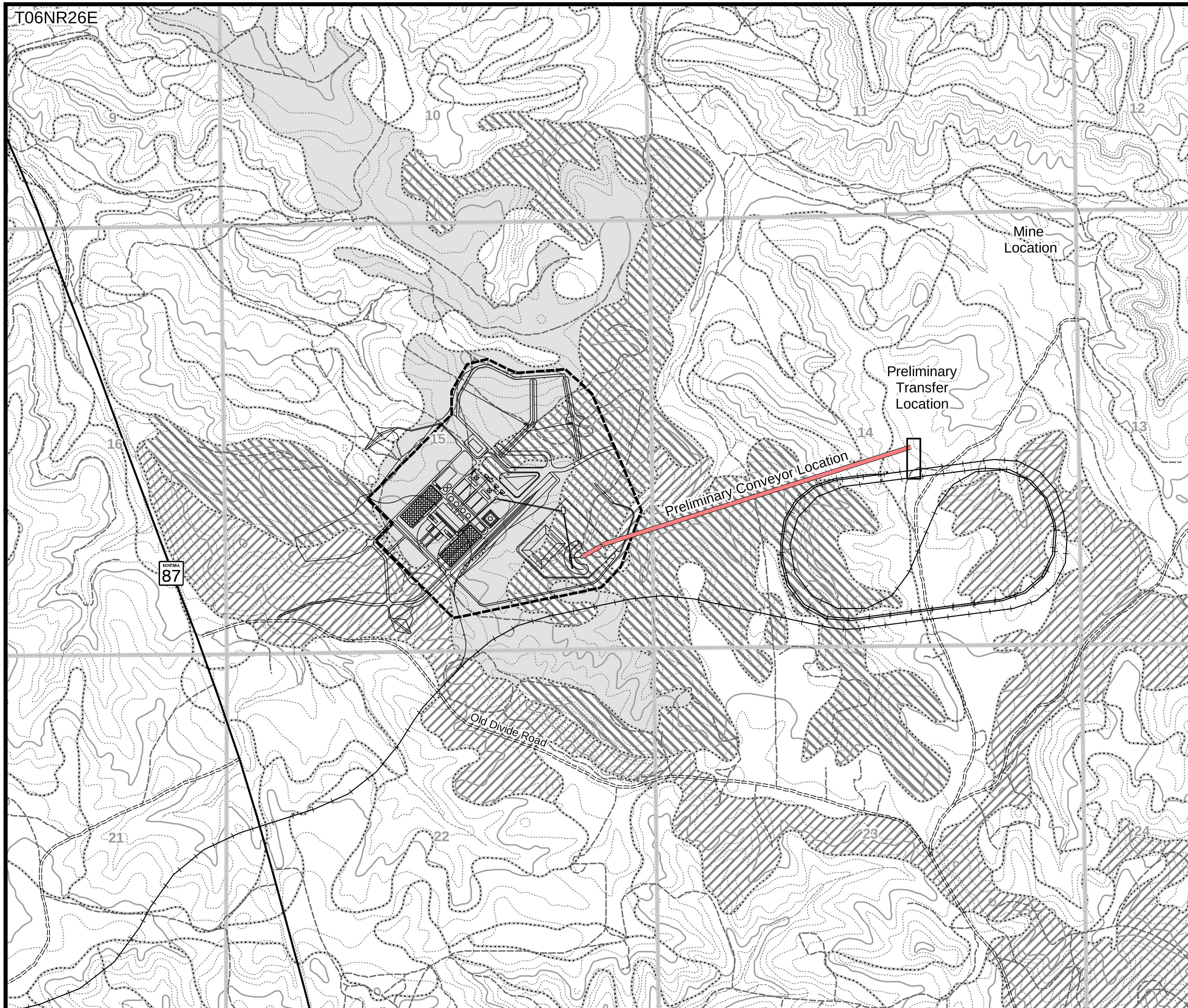

Figure 3-3

Soils

Roundup Power Project DEIS

Legend

Soil Boundary

B - Cabba-Barvon Loams,15-65% Slope

C - Cabba-Doney Loams,8-45% Slope

D - Doney-Cabba-Macar Loams,4-15% Slope

Preliminary Transfer Location

Fence Line

State Highway

Local Road

Dirt Road

Proposed Railroad

Section Line

River / Stream

1" : 1,250'

0 625 1,250 2,500 Feet

N W E S

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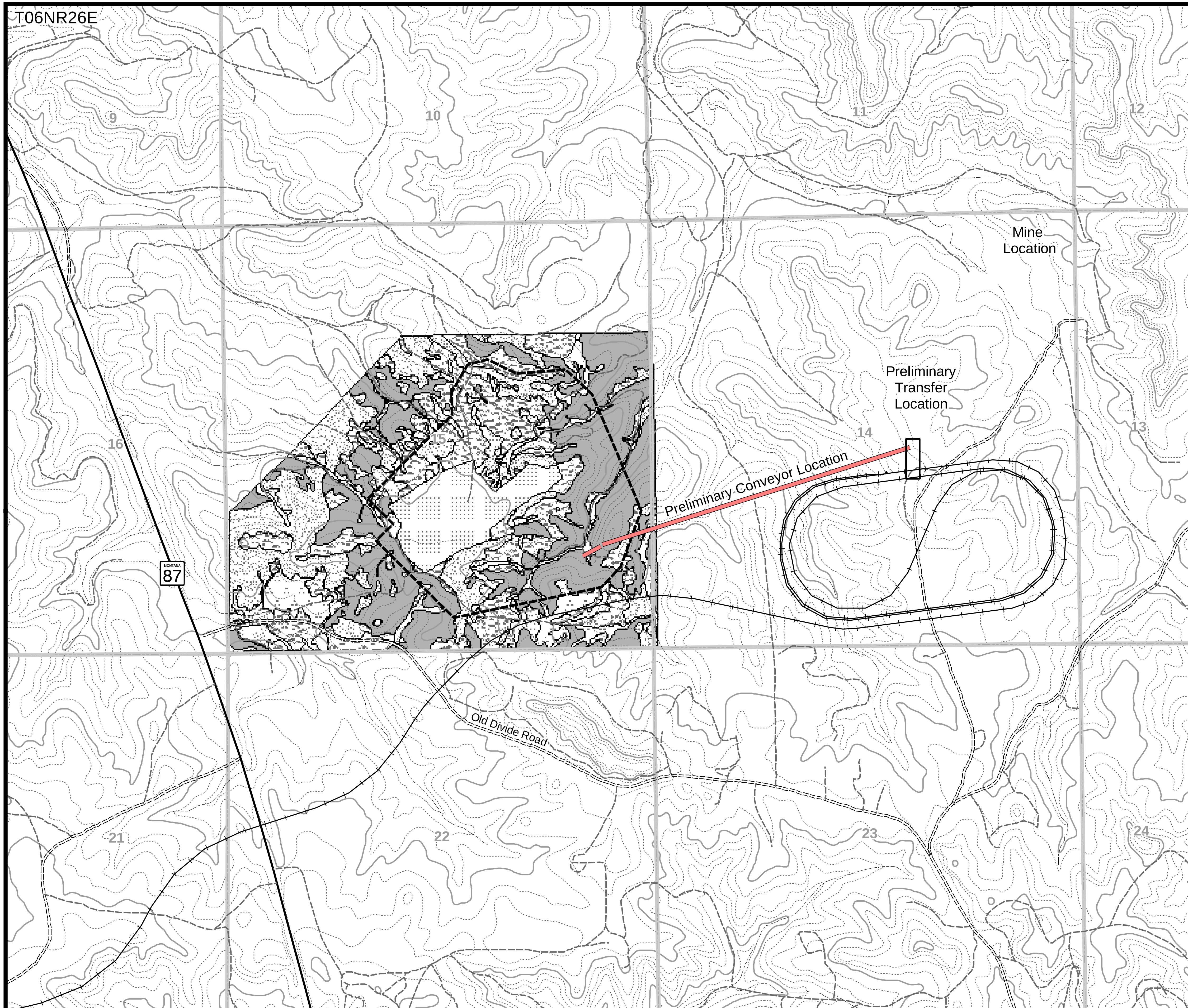
Figure 3-4

Vegetation

Roundup Power Project DEIS



Legend

- Agricultural Land
- Burned Ponderosa Pine Stands
- Grassland
- Ponderosa Pine Savannah & Forest
- Shrub/Grassland
- Preliminary Transfer Location
- Fence Line
- State Highway
- Local Road
- Dirt Road
- Proposed Railroad
- Section Line
- River / Stream

1" : 1,250'

0 625 1,250 2,500 Feet

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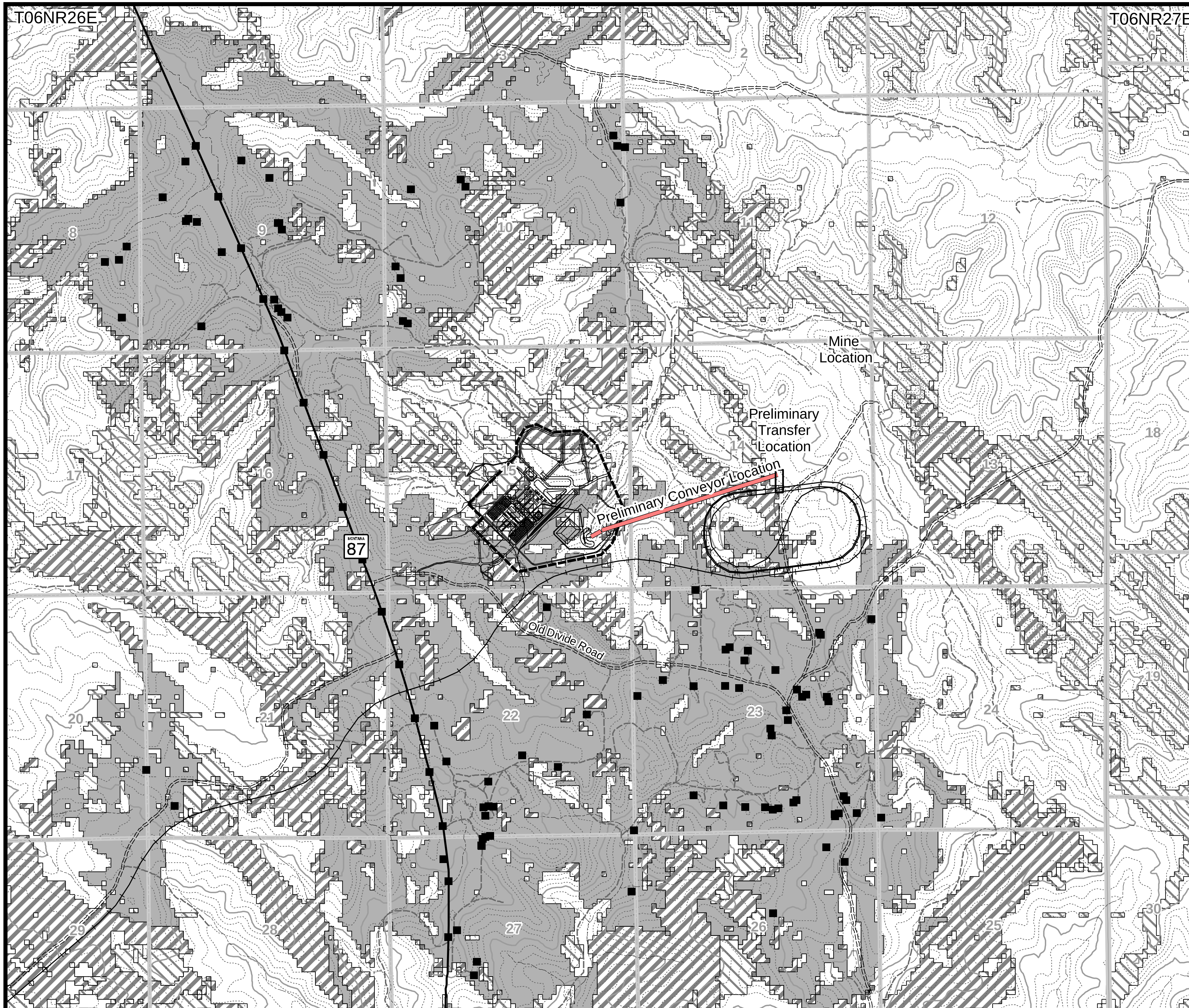
Figure 3-5

Sensitive Views

Roundup Power Project DEIS



Legend

- Sensitive View Points
- 0-0.5 Foreground Distance Zone
- 0.5-1.0 Middle Ground Distance Zone
- 1.0-5.0 Background Distance Zone
- Preliminary Transfer Location
- Fence Line
- State Highway
- Local Road
- Dirt Road
- Proposed Railroad
- Township / Range
- Section Line
- River / Stream

1" : 2,200'

0 1,250 2,500 5,000 Feet

N W E S

Montana Department of Environmental Quality

POWER ENGINEERS

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13122502_Visual_Rev1_102902_BSS

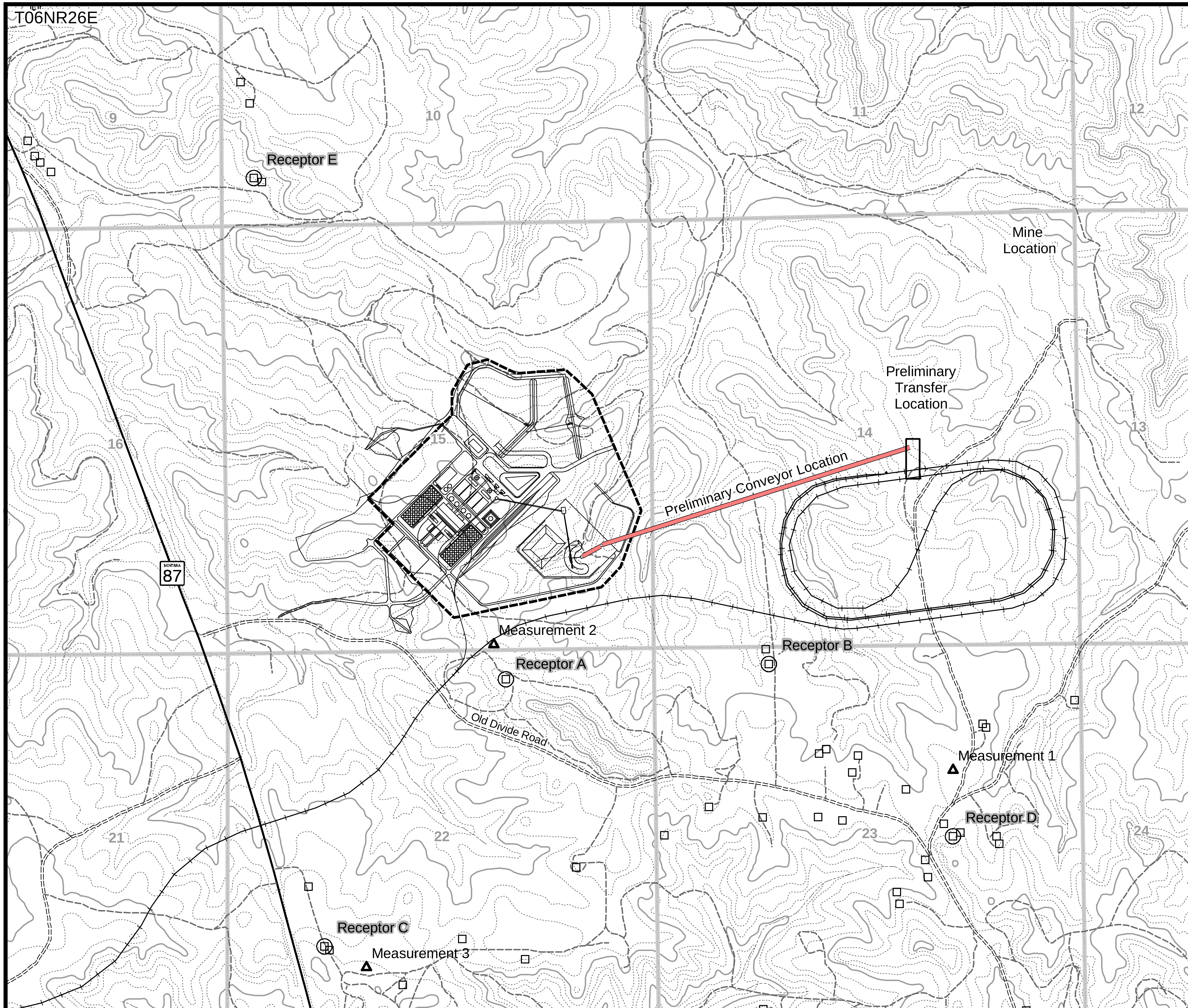

Figure 3-6

Noise

Roundup Power Project DEIS

Legend

- Noise Measurement Location
- Noise Receptor Location
- Residence
- Preliminary Transfer Location
- Fence Line
- State Highway
- Local Road
- Dirt Road
- Proposed Railroad
- Section Line
- River / Stream

1" : 1,250'

0 625 1,250 2,500 Feet

Montana Department of Environmental Quality

N W E S

POWER ENGINEERS

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13122502_Noise_Rev1_102502_BSS

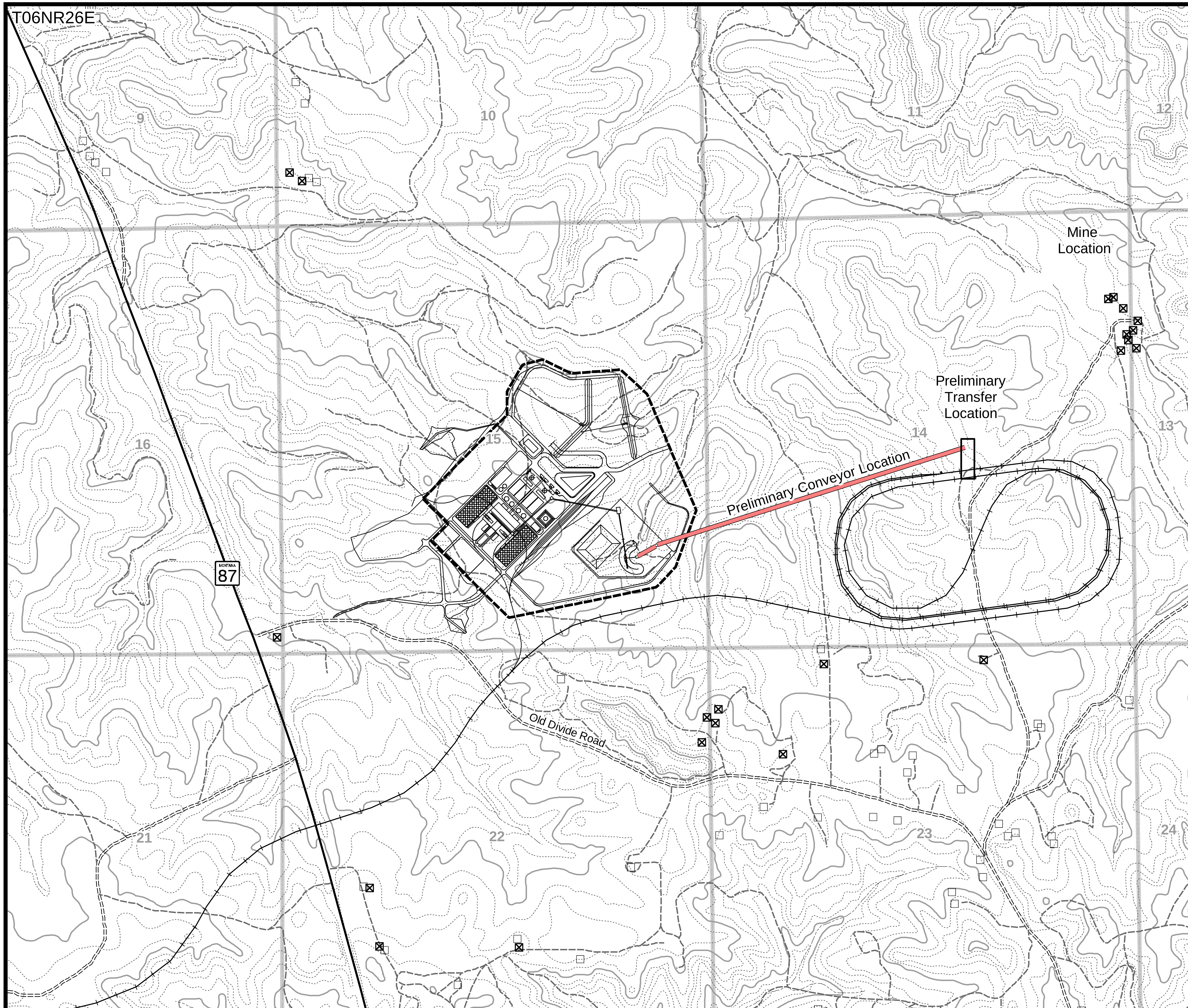

Figure 3-7

Land Use

Roundup Power Project DEIS

Legend

- Residence
- Non-Residential Structure
- Preliminary Transfer Location
- Fence Line
- Proposed Railroad
- State Highway
- Local Road
- Dirt Road
- Section Line
- River / Stream

1" : 1,250'

0 625 1,250 2,500 Feet

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13122502_Landuse_Rev1_102902_BSS

Figure 4-1

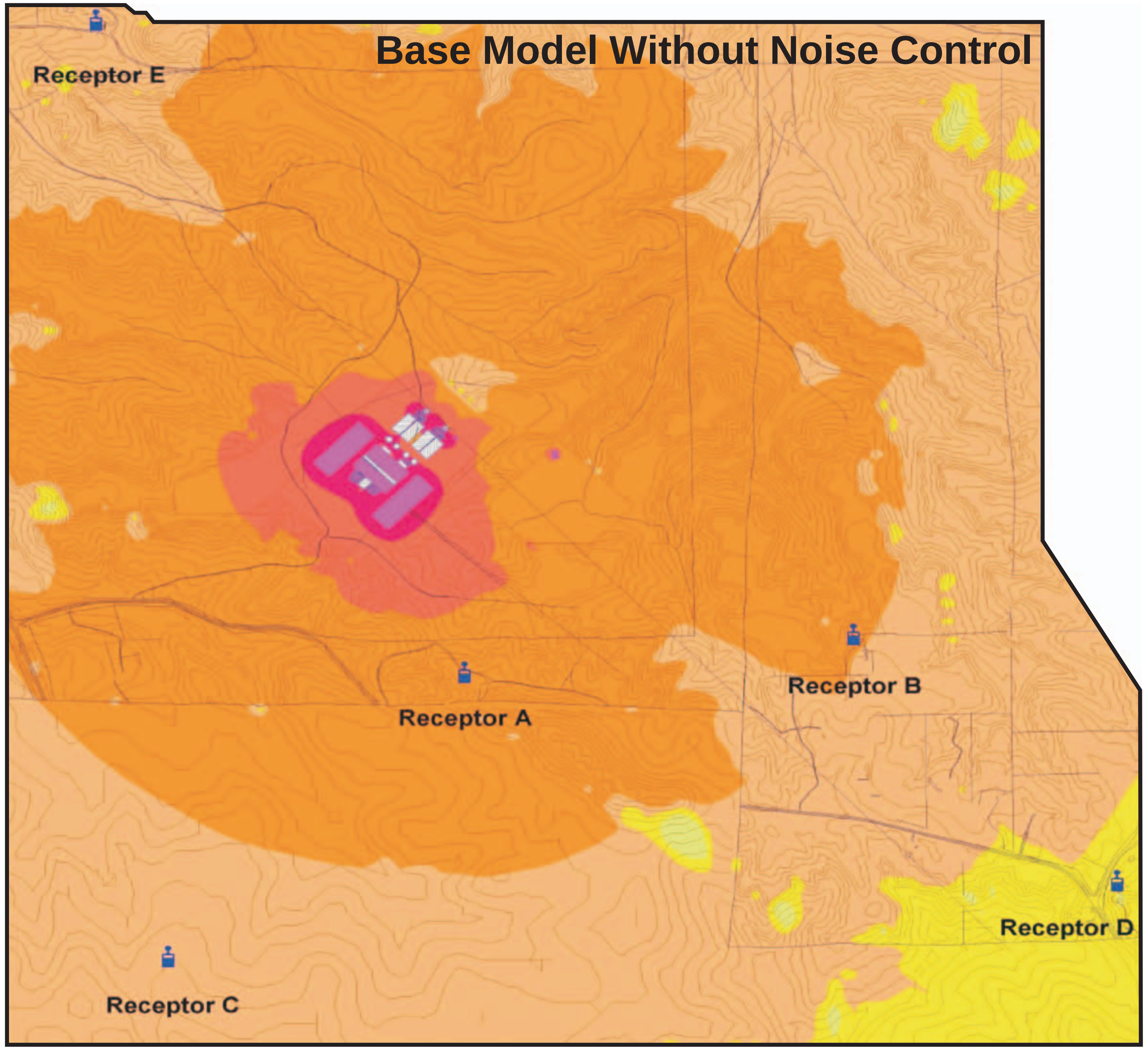
Noise Contours

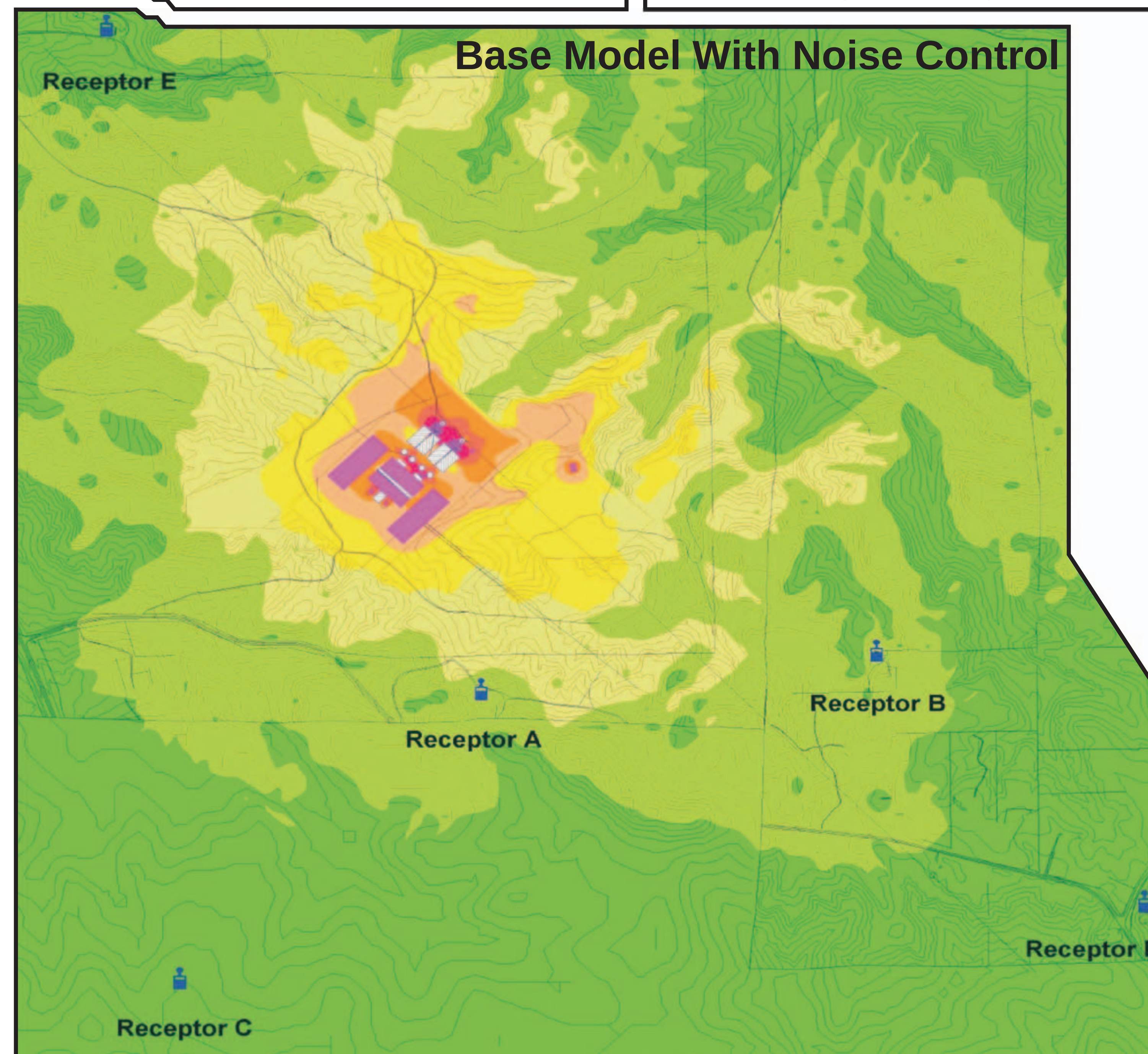
Roundup Power Project DEIS

Concawe Model
Downwind 8m/s
Hard Ground

Modeling performed with SoundPLAN Software Version 6.0

0 500 1000 2000 Feet





Noise Level Ldn in dB(A)

<=50	50<=55	55<=60	60<=65	65<=70	70<=75	75<=80	80<=85	85<=90	90<=95	95<=100	100<

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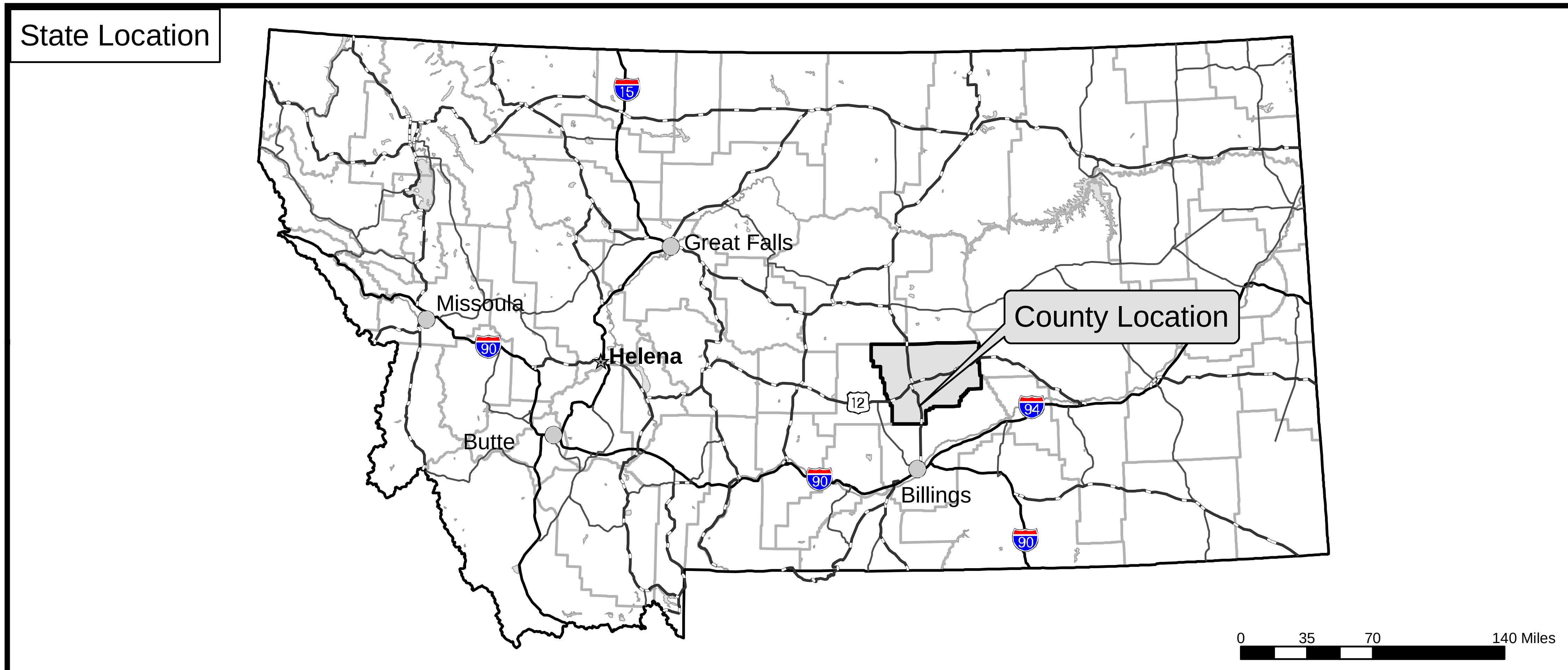
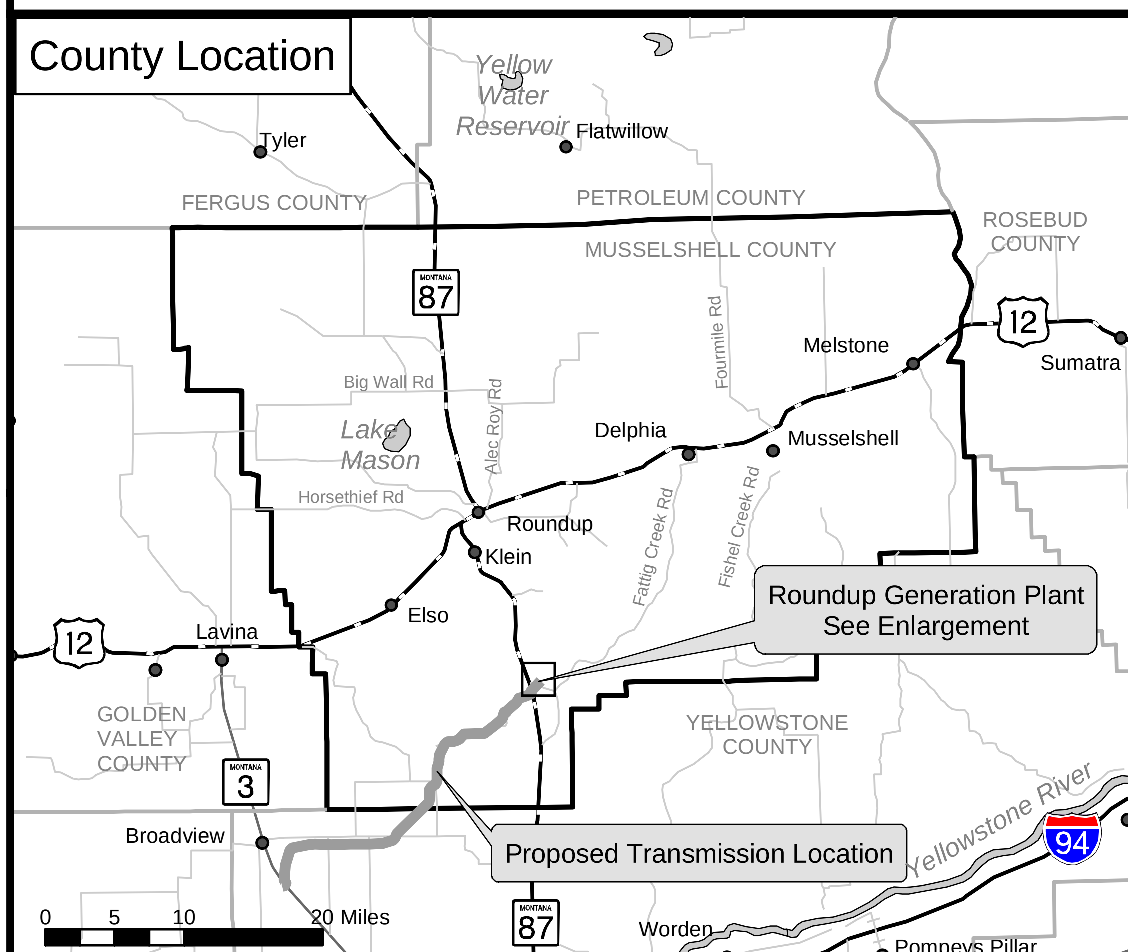
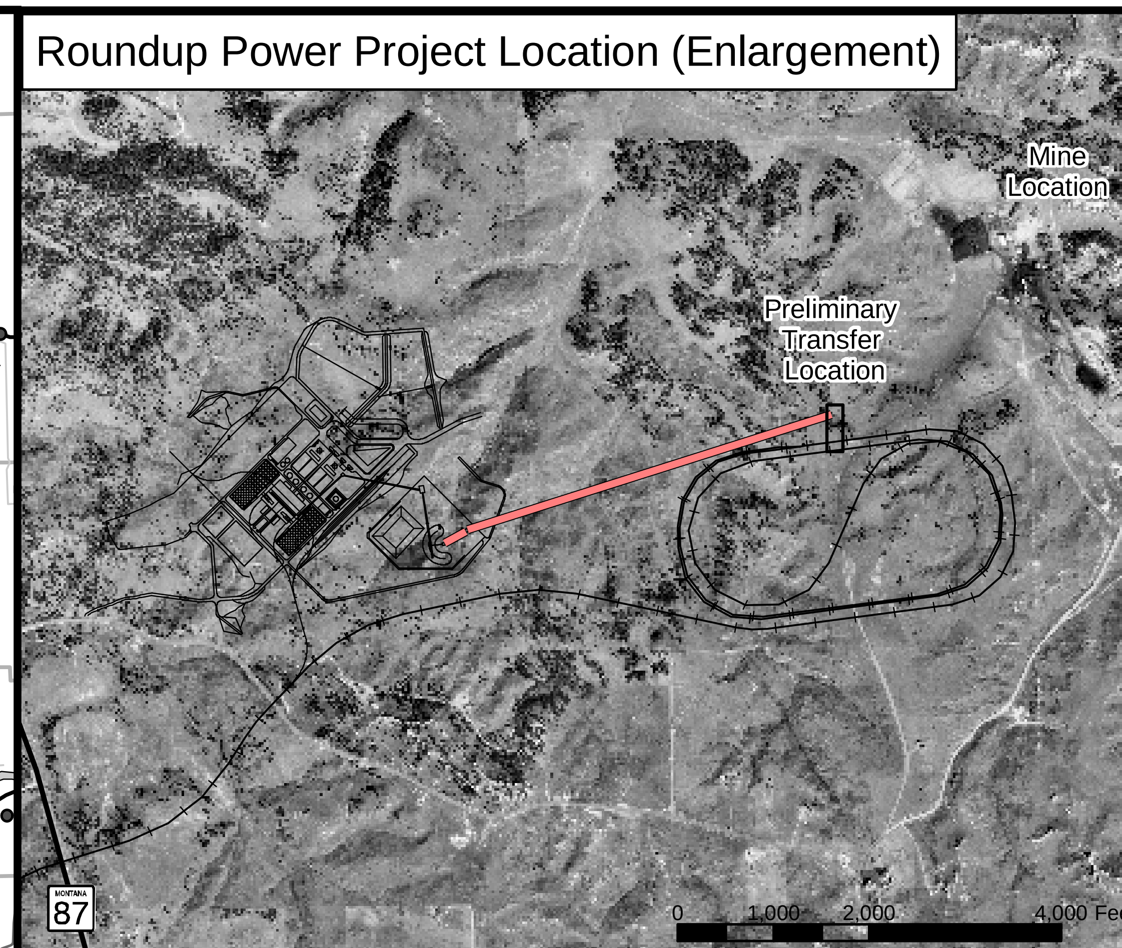
Figure ES-1

Vicinity Map

Roundup Power Project DEIS







Legend

- Preliminary Transfer Location
- Towns
- Cities
- State Capital
- Conveyor Location
- Proposed Transmission
- Interstate Highway
- U.S. Highway
- State Highway
- County Road
- Proposed Railroad
- County Line
- Lake / Stream

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Table ES-1 Summary of Alternatives Considered But Eliminated

Energy Sources & Conveyance

Screening Criteria	Alternative Fuel Sources				
	Lower Sulfur Coal	Synthetic Fuels (e.g., shale oil, tar sands, etc.)	Coal Bed Methane	Gases	Fuel Cells
Technical	Technically feasible, however coal-fired powerplants are designed to burn specific coal. Therefore, not technically feasible using the current design.	Technically feasible, but would not be feasible under current design. It is doubtful that the source could not solely support proposed load	Technically feasible, but would not be feasible under current design. Source may not be available as fuel supply after 2008	Technically feasible, but not feasible under the current design. There are many gas facilities planned throughout the country competing for limited supplies of gas.	Techically feasible, however not feasible under current design and for this size facility. Design is totally different and tied to gas or hydrogen.
Logistics	Cost would be much higher to transport coal from other mines.	There are no conveyances available for fuel supply.	There are no conveyances available for fuel supply.	There are no conveyances available for fuel supply.	There are no conveyances available for fuel supply.
Economics	Ecomonics of the facility dependent upon an abundant supply of coal in the immediate vicinity as a mine-mouth project	Ecomonics of the facility rely upon an abundant supply in the immediate vicinity, of which there are none.	Ecomonics of the facility rely upon an abundant supply in the immediate vicinity, of which there are none.	Ecomonics of the facility rely upon an abundant supply in the immediate vicinity, of which there are none.	Ecomonics of the facility are infeasible and cost prohibitive.
Regulatory Considerations	No expected changes in regulation except that new emission rates would have to be calculated and modeled	No expected changes in regulation except that new emission rates would have to be calculated and modeled	No expected changes in regulation except that new emission rates would have to be calculated and modeled	No expected changes in regulation except that new emission rates would have to be calculated and modeled	No regulations.
Potential Resource Impacts	Similar to Proposed Action	Similar to Proposed Action	Similar to Proposed Action	Similar to Proposed Action	Water Resource impacts. Air impacts would be minimized or eliminated.
Reasonable/ Feasible	Not reasonable because of fuel transportation costs, increased cost of logistics, and would not meet the purpose and need for the Proposed Action.	Not economically feasible and would not meet the stated purpose and need for the Proposed Action.	Not economically feasible and would not meet the stated purpose and need for the Proposed Action.	Not economically feasible and would not meet the stated purpose and need for the Proposed Action.	Not economically feasible and would not meet the stated purpose and need for the Proposed Action.

Power Plant Processes

Screening Criteria	Alternative Water Sources			Cooling Systems	Alternative Combustion Systems				Generation Sites
	Yellowstone River	Musselshell River	Shallow Aquifers	Wet Cooling	Stoker	IGCC	Alternative Boiler Types	Gas Turbines / Combined Cycle	
Technical	Technically feasible - a pipeline could be constructed and water rights may be available.	Technically feasible, although there is not likely enough water consistently available from the Musselshell to make it a reasonable alternative water source.	Technically feasible, although not enough water is likely available from the shallow acquifer to make it aq reasonable water source.	Technically feasible, although this would increase the amount of water needed and would result in additional water resource impacts.	Technically feasible, but not practical economically.	Technically feasible.	Cyclone and CFB boilers would be used to burn higher sulfur coal and use smaller boilers. Three CFB units would be needed. Solid waste would increase.	Technically feasible in one of many different configurations being used around the country.	Other sites are not feasible in order to utilize Bull Mountain coal.
Logistics	Require pipelines, pump stations, and easements	Require pipelines, pump stations, and easements	Would require additional wells. Wouldldrawdown local wells in the area	Would require different design and increase water use.	Would require completely new facility design. This system would burn more coal for same MW output.	Would require completely new facilty design.	Would require completely new facility design. This system would burn more coal for same MW output.	Would require completely new facility design. No gas lines are within the area that could supply the fuel requirements. Facility would burn more gas for same MW output.	The handling logistics of transporting coal to another site would make the plan uneconomical and therefore infeasible.
Economics	Would be much more expensive and would likely result in the costs being prohibitive.	Would be more expensive due to conveyance costs. Also, insufficient supplies of water would be available.	May or may not be more expensive, but supply is not likely to be sufficient.	Cost of additional water could increase costs.	More reasonable cost s but could not meet the expected outputs	No data, but costs per MW output would be expected to substantially increase.	No cost analyses were performed for these types of designs.	No cost analyses were performed for these types of designs	Other generation sites would not be as cost effective as a mine-mouth concept, and would therefore be infeasible.
Regulatory Considerations	Would require water right acquistion.	Would require water right acquistion (e.g., purchase from irrigators).	Would require water right acquistion. Also, insufficient supplies would likely be available on a consistent basis.	Fugitive PM10 emissions from wet cooling towers would have to be calculated and included in modeling analysis.	No expected changes in regulation except that new emission rates would have to be calculated and modeled	No expected changes in regulation except that new emission rates would have to be calculated and modeled	No expected changes in regulation except that new emission rates would have to be calculated and modeled	No expected changes in regulation except that new emission rates would have to be calculated and modeled	Regulatory requirements could be somewhat different to accommodate transport of coal and water.
Potential Resource Impacts	Additional impacts to water resources, fisheries, and other resources from a pipeline.	Additional impacts to water resources, fisheries, and other resources from a pipeline.	Would likely result in impacts to wetlands and water resources, and could affect well production in the area.	Additional impacts to water quality and quantity.	Additional air, solids and water resource impacts would likely result.	Additional air, solids and water resource impacts would likely result.	Air emissions would likely be higher and solid wastes would be increased.	Similar to Proposed Action after air quality mitigation.	More impacts would result to air quality because of transportation costs for the fuel.
Reasonable/ Feasible	Not reasonable because increased costs of pipeline and treatment would make the project infeasible.	Not reasonable because of increased costs of pipeline and treatment, and insufficient water supplies available.	Not reasonable because of insufficient water supplies available.	Common design, but increase in water usage would result in higher construction and operation costs and increased water resources impacts. Alternative is not reasonable.	Not reasonable because increased costs would make the project infeasible, thus not meeting the stated purpose and need.	Not reasonable because increased costs would make the project infeasible, thus not meeting the stated purpose and need.	Not reasonable because these boiler types are designed for different fuel not available at this location.	Not reasonable because turbines are designed for different fuel and since adequate supplies of gas are not available, this alternative is not feasible.	Would not reasonably meet the purpose and need for the Proposed Action because increased costs would make the project infeasible.

Waste Stream Treatment & Disposal

Screening Criteria	Alternative Pollution Control and Solid Waste Treatment			Alternative Solid Waste Disposal Methods		
	Ash & Wet FGD	Wet FGD	Separate Bottom Ash from Waste	Waste Rock Landfill	Off-Site Landfill for Life of Project	On-Site Landfill for Life of Project
Technical	Dewatering and treating.	Waste streams would have to be separated and treated	Process would include keeping bottom ash separate from the fly ash and flu gas wastes. Disposal would be segregated.	Would need to modify Waste Rock Repository to accommodate and isolate Ash Lens	Would require additional permits.	Would likely be difficult to accommodate waste disposal on-site for the life of the project due to limited space available.
Logistics	Would require adding slurry pipeline and pumps.	Would require adding slurry pipeline and pumps.	Would not affect air emissions. Would require separate handling and segregated disposal, thus increasing costs.	Would need to truck at least 20 loads of ash to waste rock area per day.	TSDF construction.	TSDF construction.
Economics	Most economical, but water supply is an issue for this project.	Most economical, but water supply is an issue for this project.	Additional handling and segregated disposal would likely be somewhat more expensive.	Assume costs are similar or somewhat higher because of additional logistics to coordinate waste rock and solid waste disposal.	Would be more expensive because of handling and transportation costs.	Would likely be more expensive for special design and handling to accommodate the solid waste on-site in limited space.
Regulatory Considerations	Air permit would need to be modified.	Air permit would need to be modified.	Solid waste permit would need to be modified to accommodate logistics and handling with waste rock.	Would have to modify permit to accommodate this type of disposal.	TSDF permit.	Would have to permit expanded facility to accommodate off-site disposal.
Potential Resource Impacts	Solid waste treatment would be more difficult and would result in more impacts to water quality and quanitity.	Solid waste treatment would be more difficult and would result in more impacts to water quality and quanitity.	Likely would result in similar impacts as the Proposed Action.	Would increase size of Waste Rock Repository	Could aggravate exposure to groundwater impacts	Solid waste off-site would result in slightly higher environmental impacts, although waste stream not expected to have measurable effect on groundwater resources.
Reasonable/ Feasible	Not reasonable since this technology would require additional water and would result in higher impacts to water resources.	Not reasonable since this technology would require additional water and would result in higher impacts to water resources.	Additional handling and segregated disposal would likely be somewhat more expensive, and was eliminated from further consideration because of increased costs and handling with no benefit.	Not a reasonable alternative because additional logistics and costs with no benefit, and is considered and eliminated.	Is not reasonable because increased costs would result in no benefit.	Not reasonable because of space limitations.

Table ES-2 Alternatives Comparison Summary

		Proposed Action	Waste Disposal Alternatives		Transmission System Alternatives		No Action
			Proposed Action - Waste Disposal in Mine After 10 Years	Alternative - Expand Landfill After 10 Years (Preferred Alternative)	Proposed Action - 3 Circuits of 161kV Transmission	Alternative - Double Circuit 230kV Transmission Line	
		Roundup Power Project, as proposed	More information would be required for in-mine storage of waste ash with long-wall coal mining method.	Designed same as Proposed Action landfill; 3 times larger landfill area	161kV would require more circuits, shorter poles and shorter spans between poles than a higher voltage system to transport 750MW	230kV would require fewer circuits and larger conductors, taller poles but wider spans between poles, and different hardware than a lower voltage system to transport 750MW	Generation facility would not be constructed or operated. Transmission System and Waste Storage proposed action or alternatives would not be constructed and operated.
Resource Impacts	Ground Disturbance	208 acres of ground disturbance.	208 acres of ground disturbance	Additional ~70 acres would be disturbed to develop the waste disposal landfill and the road	Use existing roads; would need some new roads and upgrades to existing roads pending railroad spur construction; Ground disturbance on right-of-way (300 feet x 28 miles) for structures and access roads; most disturbance temporary.	Use existing roads; would need some new roads and upgrades to existing roads pending railroad spur construction; fewer circuits than lower voltage would require less labor and materials; Ground disturbance on right-of-way (300 feet x 28 miles) for structures and access roads; most disturbance temporary; Less ground disturbance because of fewer	Ground disturbance resulting from constructing and operating the generating facility and transmission lines would not occur.
	Water Resource	Impacts to ground water from in-mine storage of waste unknown; more studies would be required to assess impacts; zero discharge minimizes impacts on ground water resources from wastewater ponds and solid waste landfill	Impacts unknown and will require additional investigation, however could include elevated concentrations of TDS and metals and impacts to spring and well production.	Similar to Proposed Action.	Impacts would occur from access road construction, maintenance activities, and clearing of right-of-way, structure and work areas. Crosses several ephemeral drainages. No perennial streams crossed. Crosses the Hay Basin lakebed.	Similar to Proposed Action.	Water Resource impacts resulting from construction and operation of the generating facility and transmission lines would not occur.
	Earth Resources	Soil erosion impacts would be minimal due to control of runoff from the generation site.	Minor soil erosion would result from transport of waste from generating facility to mine site.	Minor soil erosion would result from transport of waste from generating facility to expanded landfill site.	Minor displacement of earth materials. Direct impacts to soils from access roads, and clearing of right-of-way, structure locations and work areas.	Similar to the Proposed Action; slightly less because of fewer expected structures.	Earth Resource impacts resulting from construction and operation of the generating facility and transmission lines would not occur.
	Biological and Wetland	Loss of ~207 acres of grass/shrubland for wildlife habitat, grazing and agriculture; no impacts to T&E species	No impacts to T&E species	Expanding the landfill would result in additional ~70 acres habitat loss. No impacts to T&E species	No impacts to T&E species	No impacts to T&E species	Biological impacts resulting from construction and operation of the generating facility and transmission lines would not occur.
	Cultural Resource	Archaeological site within the plant site would be impacted. 51 cultural resources within 3 miles of the 574-foot chimneys, of which 8 are considered visually sensitive.	Solid waste disposal haul road and conveyor belt could potentially affect a prehistoric lithic scatter.	Could have greater impacts than Proposed Action due to greater ground disturbance.	Three cultural resources identified within or near transmission route.	Similar to the Proposed Action, however the potential to disturb undiscovered resources may be slightly lower due to increased span length.	Cultural Resource impacts resulting from construction and operation of the generating facility and transmission lines would not occur.
	Visual	Visual impacts to residents and travelers from chimneys.	Low to non-identifiable impacts.	The expansion of the landfill would be more noticeable than the Proposed Action, but would result in only low visual resource impacts.	Visual impacts at road crossings and from scattered residences resulting from transmission lines.	Similar to the Proposed Action - Visual impacts at road crossings and from scattered residences resulting from transmission lines.	Visual impacts of constructing and operating the generating facility and transmission lines would not occur.
	Land Use	Conversion of currently available grazing and agricultural land to heavy industrial use. Recreation use at the plant site would be permanently lost.	Conversion of currently available grazing and agricultural land to heavy industrial use. Recreation use would be permanently lost.	Similar to the Proposed Action.	Crossing of non-irrigated cropland, livestock grazing land, and CRP land.	Similar to the Proposed Action.	Existing land uses would continue. No impacts to land uses from the generating facility and transmission lines would occur.
	Socioeconomic Benefits	Full economic benefits realized from implementation of the Proposed Action, including tax benefits to Musselshell County and the State of Montana, jobs created during construction and during the life of the project to operate and maintain the generating facility and to mine the coal.	Socioeconomic benefits would result from construction jobs, taxes for government agencies and social services, and long-term jobs from operation and maintenance of the facility.	Similar to the Proposed Waste Disposal - Socioeconomic benefits would result from construction jobs, taxes for government agencies and social services, and long-term jobs from operation and maintenance of the facility.	Socioeconomic benefits would result from construction jobs, taxes for government agencies and social services, and long-term jobs from operation and maintenance of the facility.	Similar to the Proposed Transmission Line System - Socioeconomic benefits would result from construction jobs, taxes for government agencies and social services, and long-term jobs from operation and maintenance of the facility.	Musselshell County and the State of Montana would not gain the tax benefits, jobs, and other socioeconomic benefits from operating the generation facility and transmission line, and would not gain the jobs and economic benefits from operating the Bull Mountain Mine to support the fuel needs of the generating facility.

CERTIFICATE OF SERVICE

I, Dale Schowengerdt, hereby certify that I have served true and accurate copies of the foregoing Affidavit - Affidavit in Support to the following on 10-16-2023:

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