U.S. DEPARTMENT OF THE INTERIOR
OFFICE OF SURFACE MINING RECLAMATION AND ENFORCEMENT

FINAL ENVIRONMENTAL IMPACT STATEMENT AND RECORD OF DECISION
BULL MOUNTAINS MINE NO. 1
FEDERAL MINING PLAN FOR FEDERAL LEASE MTM-97988 AMENDMENT 3

EISX-010-08-000-1732112615

June 2025

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United States Department of the Interior

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Dear Reader,

Enclosed is your copy of the Record of Decision (ROD) and Final Environmental Impact Statement (EIS) for the Bull Mountains Mine No. 1, Amendment 3 Federal Mining Plan for Federal Lease MTM-97988. This document is also available online at: https://www.osmre.gov/laws-and-regulations/nepa/projects.

The ROD documents my final decision on the Selected Alternative and the facts considered in reaching the decision. The ROD also specifies the effective date of implementation of the decision.

On January 20, 2025, President Donald J. Trump issued Executive Order (E.O.) 14156 – "Declaring a National Energy Emergency," which declared a national energy emergency and directed Federal agencies to expedite permits and approvals for energy projects, including those on Federal lands, using emergency provisions. During an emergency, a Responsible Official of the Department can adopt alternative arrangements to comply with National Environmental Policy Act (NEPA) before taking "urgently needed actions." (43 CFR 46.150). On April 23, 2025, the Council on Environmental Quality (CEQ) authorized the use of alternative arrangements for projects that respond to the national energy emergency, and the Department subsequently adopted alternative arrangements for qualifying projects to comply with NEPA.

After reviewing Signal Peak Energy's request that the Department apply its alternative arrangements to the proposed mining plan modification for the Bull Mountains Mine, the Assistant Secretary for Land and Mineral Management (ASLM) approved the use of the Department's alternative arrangements for NEPA compliance for this energy-related project on May 12, 2025. In reaching this determination, the ASLM relied on SPE's request for alternative arrangement, E.O. 14156, E.O. 14154 ("Unleashing American Energy"), E.O. 14261 ("Reinvigorating America's Beautiful Clean Coal Industry"), Secretary's Order (S.O.) 3417, S.O. 3418, various documents related to the ongoing NEPA analysis for this proposed mining plan modification, and consultations with Office of Surface Mining Reclamation and Enforcement (OSMRE). Importantly, the ASLM concluded that this proposed project seeks to advance energy production and would export nearly all its coal to Japan and South Korea, important defense allies of the United States. Finally, the ASLM also determined that additional public comment was unnecessary due to the prior robust opportunities for public participation and the fact that another 10-day comment period on another NOI was unlikely to yield substantive comments.

In addition, the analysis in the EIS was largely drafted before the Supreme Court's decision in *Seven County Infrastructure Coalition v. Eagle County, Colorado*, 2025 U.S. LEXIS 2068 (May 29, 2025) (*Seven County*). As a result, the EIS contains significantly more analysis than is required under NEPA. In light of the national energy emergency, the extensive prior litigation over this Project, and the efficient use of agency resources, OSMRE decided to leave this extraneous analysis in the EIS rather than taking the time and resources to remove it. However, OSMRE maintains that under *Seven County*, much of the analysis contained in the EIS, particularly, those that are attenuated in time and geography from the Project, are not required to be analyzed under NEPA because those downstream impacts are related to activities for which the Department has no control.

For additional information, please contact the OSMRE at 303-236-2929 during regular business hours, Monday-Friday, 8:00 am to 4:30 pm.

As the Acting Regional Director, U.S. Department of Interior, Regions 5 & 7-11, I am responsible for this decision.

Thank you for your interest in this Project.

Sincerely,

MARCELO CALLE

Digitally signed by MARCELO CALLE
Date: 2025.06.05 08:37:33 -06'00'

Marcelo Calle
Acting Regional Director
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Office of Surface Mining Reclamation and Enforcement

U.S. Department of the Interior
Office of Surface Mining Reclamation and Enforcement

Bull Mountains Mine No. 1 Federal Mining Plan for Federal Lease MTM-97988 Amendment 3

Record of Decision

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Acronyms and Abbreviations

Acronym	Definition
AM	Amendment
BA	biological assessment
BLM	Bureau of Land Management’s
CEQ	Council on Environmental Quality
CPW	Coal Processing Waste
Department or DOI	Department of the Interior
EO	Executive Order
EA	environmental assessment
EIS	environmental impact statement
ESA	Endangered Species Act
GHG	greenhouse gas
IWG	Interagency Working Group
MAQP	Montana Air Quality Permits
MCWPCS	Montana Ground Water Pollution Control System
MDEQ	Montana Department of Environmental Quality
MEPA	Montana Environmental Policy Act
Mine	Bull Mountains Mine No. 1 underground coal mine
MLA	Mineral Leasing Act of 1920
MPDD	Mining Plan Decision Document
MPDES	Montana Pollutant Discharge Elimination System
MSGP	Multi-Sector General Permit
MSUMRA	Montana Strip and Underground Mine Reclamation Act
Mt	million tons
Mtpy	million tons per year
NCLA	Northern Cheyenne Lands Act
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOI	Notice of Intent
NRHP	National Register of Historic Places
OSMRE	Office of Surface Mining Reclamation and Enforcement
PAP	permit application package
RFFAs	reasonably foreseeable future actions
ROD	Record of Decision
S.O	Secretary’s Order
SMCRA	Surface Mining Control and Reclamation Act of 1977
SPE	Signal Peak Energy, LLC
USFWS	U.S. Fish and Wildlife Service
WDA	waste disposal area

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Chapter 1
Introduction

Signal Peak Energy, LLC (SPE) owns and operates the existing Bull Mountains Mine No. 1 underground coal mine (Mine) located in the Bull Mountains of south-central Montana. The Mine includes a mix of private, state, and federally owned surface and mineral interests. The vast majority of coal is mined using the longwall method; the remaining coal is mined using the room-and-pillar method. All coal is washed to improve coal quality and shipped from an onsite rail car loading facility (tipple). The coal produced from the Mine is predominantly transported via rail to international destinations with a small amount transported for domestic uses.

As described in greater detail in Section 1.2 of the EIS, following a series of legal challenges to the adequacy of the Office of Surface Mining Reclamation and Enforcement's (OSMRE) National Environmental Policy Act (NEPA) analyses, the U.S. District Court for the District of Montana vacated a 2018 mining plan modification approval for the expansion of the Mine into an area known as "Amendment (AM) 3,"[1] which would have allowed part of Federal coal lease MTM-97988 to be mined. The vacatur of this mining plan modification means that Signal Peak Energy, LLC (SPE) is not authorized to mine leased Federal coal within AM 3. In February 2023, at the time of the vacatur, SPE was actively mining within the area of AM 3. In order to continue mining the remaining Federal coal in AM 3, SPE must obtain a new mining plan modification approval from the Department of the Interior's (Department or DOI) Assistant Secretary for Land and Minerals Management (ASLM). Approximately 1,239.6 acres of Federal land and approximately 22.8 million tons (Mt) of saleable Federal coal remains in AM 3.

OSMRE prepared this environmental impact statement (EIS) to reevaluate the potential environmental impacts, including impacts from greenhouse gas (GHG) emissions, from the proposed Mine expansion, in accordance with NEPA. OSMRE's analysis of SPE's Proposed Action will, in part, inform its recommendation to the ASLM to approve, disapprove, or approve with conditions the mining plan modification. The Final EIS addresses the deficiencies identified by the court and considered new information available in analyzing potential impacts to environmental resources that could result from the continued mining of Federal coal from AM 3. Three alternatives are analyzed in this Final EIS: No Action Alternative, Proposed Action, and Partial Mining Alternative. The primary differences among the three alternatives are: (1) the remaining tons of recoverable AM 3 Federal coal, (2) the remaining years of Federal AM 3 coal recovery, and (3) the remaining AM 3 area disturbance.

OSMRE issued a Notice of Intent (NOI) to prepare an EIS on August 7, 2023, initiating a 30-day public scoping period, which also included a public meeting held in Roundup, Montana. In addition, OSMRE provided a second opportunity to comment on the project from May 15, 2024. On May 6, 2025, SPE requested use of the Department's Alternative Arrangements for NEPA Compliance. SPE's request was approved by the Acting ASLM on May 12, 2025.

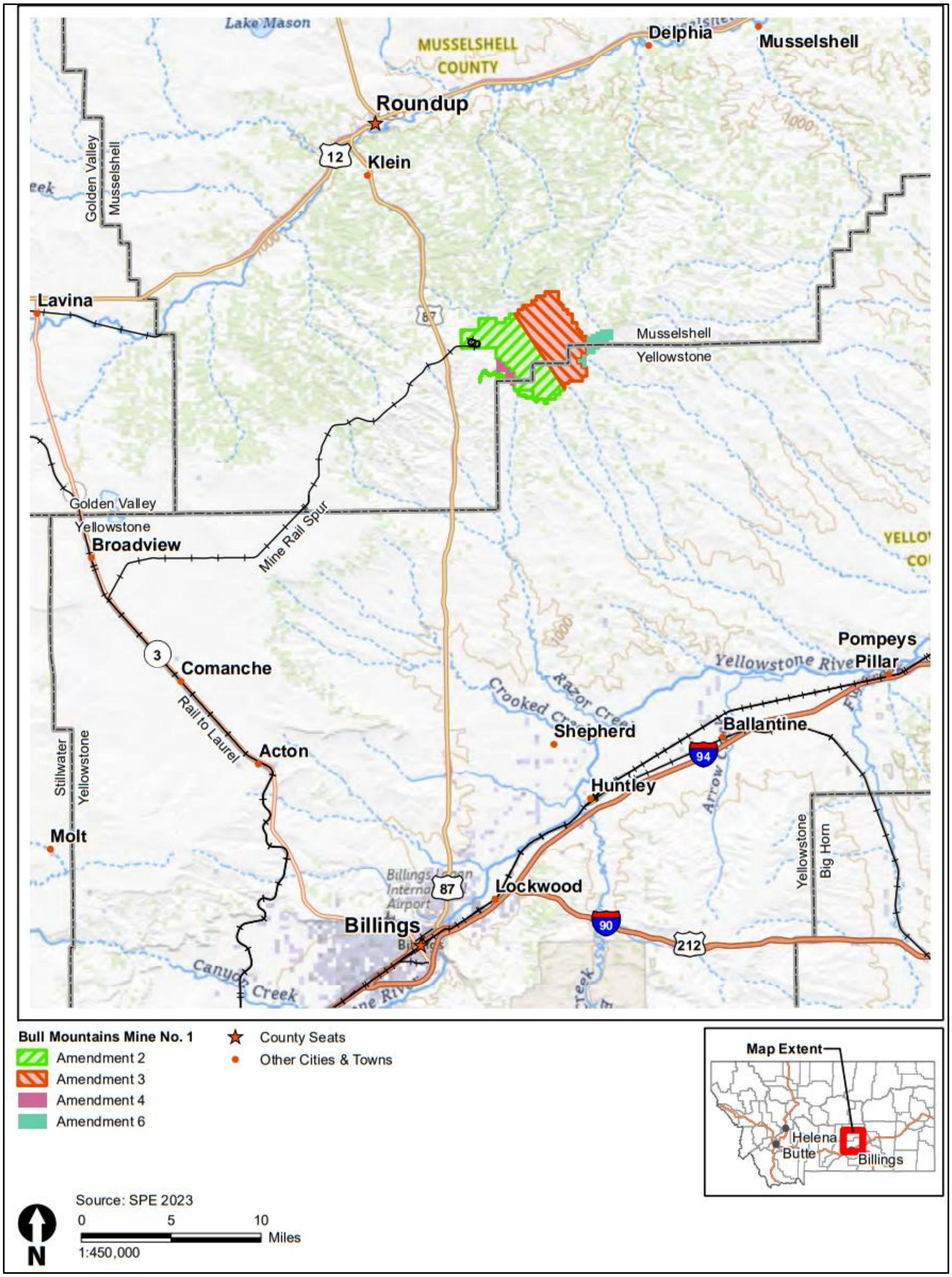
[1] AM 3 is the third amendment to the Mine's permit issued by the Montana Department of Environmental Quality (MDEQ), which has the authority to issue permits and otherwise administer a regulatory program as approved by OSMRE under the Surface Mining Control and Reclamation Act of 1977 (SMCRA).

This Record of Decision (ROD) documents OSMRE's selection of the Proposed Action, which means that OSMRE will prepare and submit a Mining Plan Decision Document (MPDD) for the ASLM with its recommendation that the ASLM approve the proposed mining plan modification for the entire area covered by AM 3, as discussed in the EIS. The ASLM will ultimately decide whether to approve, disapprove, or conditionally approve the modification.

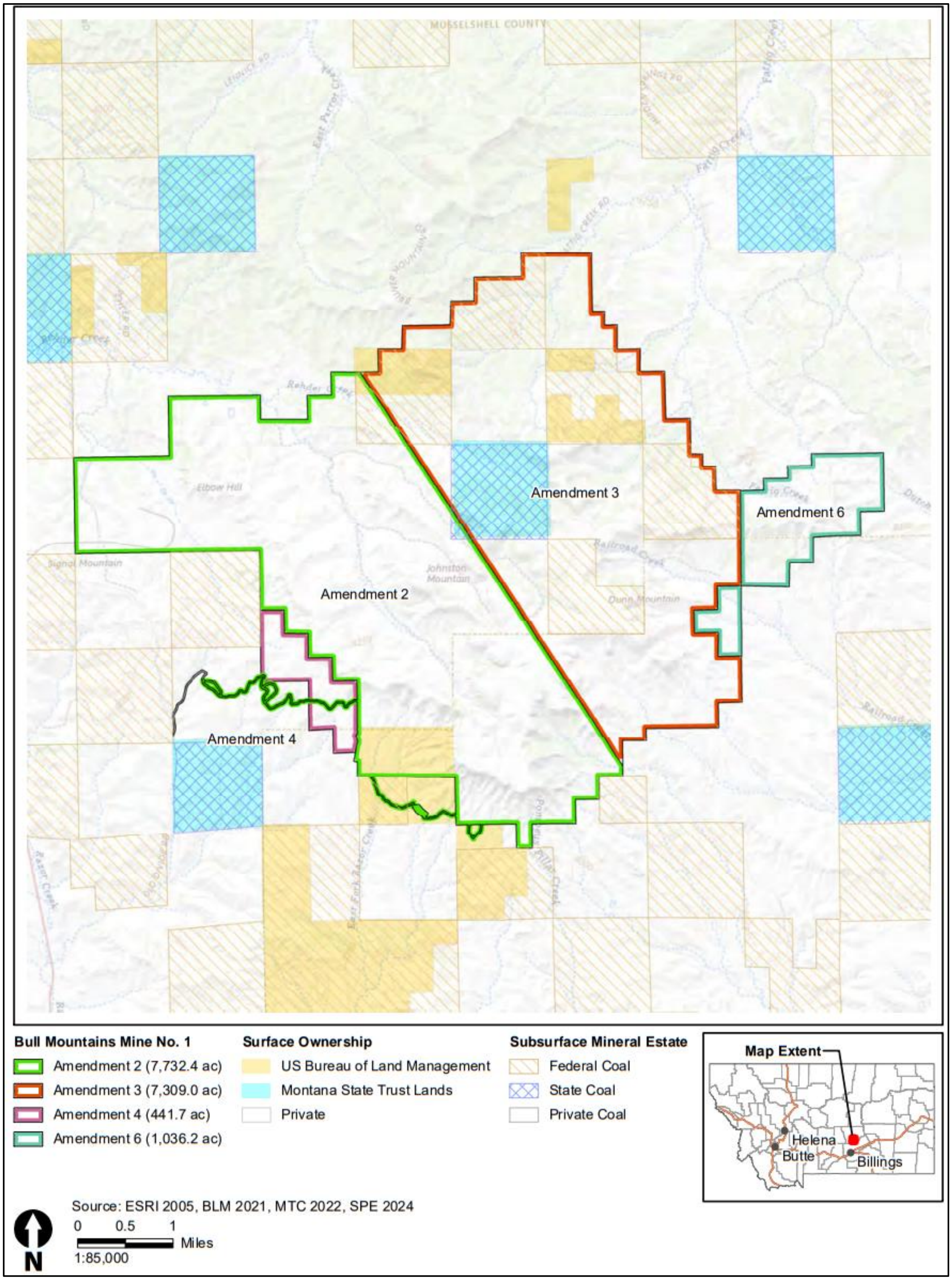
1.1 Project Location and Background

The Bull Mountains Mine No. 1 (Mine) is an existing underground coal mine in Musselshell and Yellowstone Counties, Montana, approximately 30 miles north of Billings and 20 miles southwest of Roundup, Montana (**Map 1**). Coal has been mined on a commercial scale at the Mine since approval of the Bureau of Land Management's (BLM) 2011 Coal Lease EA entitled, "Bull Mountains Mine No. 1, Federal Coal Lease MTM-97988, Musselshell County, Montana, EA," (BLM 2011), which was prepared to satisfy BLM's requirements under NEPA and the Mineral Leasing Act of 1920 (MLA), as amended. Amendment areas within MTM-97988 include AM 2, 3, 4. AM 6, which includes non-Federal coal resources, was subsequently approved by the Montana Department of Environmental Quality (MDEQ) during the OSMRE's review process (**Map 2**).

Map 1. Project Location



Map 2. Surface and Subsurface Ownership



1.2 Project Timeline

An extensive timeline of this mining plan modification and its associated court orders is detailed in the Final EIS (**Section 1.2**).

- 1992 - MDEQ issued a mining permit to Meridian Minerals, a subsidiary of Burlington Northern Resources, pursuant to the Montana equivalent of the Surface Mining Control and Reclamation Act of 1977 (SMCRA).
- 2008 - The Mine was purchased by Boich Companies and FirstEnergy Corporation and was transferred to SPE. SPE filed an application with the BLM to lease approximately 2,679.76 acres of Federal coal (MTM-97988) under the MLA.
- 2011 - The BLM prepared an environmental assessment (EA) in compliance with NEPA, titled "Bull Mountains Mine No. 1, Federal Coal Lease MTM-97988, Musselshell County, Montana, EA," No. DOI-BLM-MT-C010- 2009-0010-EA (BLM 2011) (hereafter BLM Coal Lease EA), that analyzed 5 tracts of Federal coal to satisfy BLM's requirements under NEPA and the MLA. OSMRE participated as a cooperating agency during preparation of the BLM Coal Lease EA. MDEQ approved a mining permit (C1993017) for the Mine (Mine Permit) in accordance with the Montana Strip and Underground Mine Reclamation Act (MSUMRA).
- 2012 - MDEQ approved SPE's application for AM 2 to modify the Mine Permit to include a portion of the Federal coal lease MTM-97988 and adjacent private lands and coal.
- 2012 - SPE submitted an application to MDEQ for AM 3, which would allow the Mine to amend its mining permit to incorporate additional areas of Federal coal lease MTM-97988.
- 2013 - OSMRE adopted the BLM Coal Lease EA, and OSMRE signed a FONSI on July 26, 2013. OSMRE prepared a MPDD, recommending approval.
- 2013 - ASLM signed a mining plan approval authorizing mining of 140 acres of leased Federal coal lands within the AM 2 boundary for the Mine.
- 2013 - MDEQ reviewed the permit application under the Montana State Program, the Federal Lands Program (30 CFR Chapter VII, Subchapter D), and the Montana Cooperative Agreement (30 CFR § 926.30). MDEQ approved the permit application for AM 3 on October 18, 2013.
- 2014 - OSMRE prepared an EA titled "Bull Mountains No. 1 Federal Mining Plan Modification Environmental Assessment" (2015 EA) analyzing potential impacts associated with the AM 3 mining plan modification. OSMRE signed the FONSI on January 27, 2015. OSMRE released a Public Notice of the availability of the Federal Mining Plan Modification EA on October 19, 2014, in the *Billings Gazette* and on October 22, 2014, in the *Roundup Record-Tribune*. Written comments were solicited until November 21, 2014.
- 2015 - OSMRE prepared an MPDD recommending approval, and the ASLM approved the mining plan modification for AM 3 on February 24, 2015.
- 2017 - The ASLM's 2015 decision was challenged and the U.S. District Court for the District of Montana granted summary judgment to the plaintiffs on certain NEPA-related claims and vacated the mining plan modification pending additional NEPA review (see *Mont. Envtl. Info. Ctr. v. OSMRE*, 274 F. Supp. 3d 1074, 1081 (D. Mont. 2017)). Subsequent orders dated October 31, 2017, and November 3, 2017, authorized limited development work displacing and storing no more than 170,000 tons of Federal coal in Section 8 but required the mined Federal coal to be

stockpiled and stored at the Mine and prohibited it from being sold or shipped pending compliance with NEPA.

- 2018 - OSMRE finalized a new EA (2018 EA) and FONSI that addressed the errors identified by the district court in its 2017 ruling. OSMRE announced the availability of the EA on its webpage and published a Public Notice for the EA and unsigned FONSI in *Billings Gazette* and the *Roundup Record-Tribune* on March 13, 2018. The EA and unsigned FONSI were provided to the public for review and comment for a 30-day period, ending on April 11, 2018.
- 2018 - The ASLM approved a new mining plan modification on August 3, 2018. OSMRE's 2018 EA and OSMRE's Endangered Species Act (ESA) compliance were challenged in court.
- 2020 - The district court granted the government's motion for summary judgment on all but one of plaintiffs' claims (*350 Montana v. Bernhardt*, 443 F. Supp. 3d 1185 (D. Mont. 2020)). On the remaining claim, the district court found that OSMRE failed to analyze the risk of increased coal train derailments and directed OSMRE to correct its analysis, but the court did not vacate the 2018 mining plan modification at that time.
- 2020 - OSMRE prepared another EA specifically addressing the potential for train derailment along the rail transportation route. OSMRE announced the availability of the EA on their webpage and published a Public Notice for the EA and unsigned FONSI in *Billings Gazette* and the *Roundup Record-Tribune* on July 1, 2020. The EA and unsigned FONSI were provided to the public for review and comment for a 30-day period, ending on July 27, 2020.
- 2020 - Plaintiffs appealed the March 2020 district court decision on the 2018 EA and ESA compliance to the U.S. Court of Appeals for the Ninth Circuit.
- 2022 - A panel of the Ninth Circuit held that OSMRE's findings related to GHG emissions in its 2018 EA were arbitrary and capricious and remanded the case back to the district court (*350 Montana v. Haaland*, 29 F.4th 1158, 1170-1171).
- 2023 - The district court vacated the 2018 mining plan modification approval (*350 Mont. v. Haaland*, 2023 U.S. Dist. LEXIS 23219, *5 (Mont. Dist. 2023)). Because the 2018 mining plan modification was vacated by the court, SPE was required to immediately stop all mining of leased Federal coal covered by the mining plan modification for AM 3 and obtain a new mining plan modification approval from ASLM before resuming mining leased Federal coal. SPE is currently only allowed to mine non-Federal coal within AM 3 at the Mine.
- 2023 – On June 3, 2023, the Fiscal Responsibility Act established deadlines for the preparation of EISs and EAs, 2 years and 1 year respectively, unless the deadline is extended in writing after consulting with the applicant.
- 2023 – On August 7, 2023, OSMRE published a NOI to prepare an EIS in the *Federal Register*, opened a 30-day public comment period, and held a public scoping meeting.
- 2024 – OSMRE notified the public and stakeholders about project revisions including the addition of AM 6 in the No Action Alternative and the removal of the AM 5 area from the Proposed Action, initiating another 30-day public comment period.
- 2025 - On January 20, 2025, President Donald J. Trump issued Executive Order (EO) 14156 – "Declaring a National Energy Emergency," which declared a national energy emergency and directed Federal agencies to expedite permits and approvals for energy projects, including those on Federal lands, using emergency provisions. During an emergency, a Responsible Official of

the Department can adopt alternative arrangements for projects to comply with NEPA before taking "urgently needed actions" (43 CFR 46.150). On April 23, 2025, the Council on Environmental Quality (CEQ) authorized the use of alternative arrangements for projects that respond to the national energy emergency and the Department subsequently adopted alternative arrangements for qualifying projects to comply with NEPA. See "Alternative Arrangements for Compliance with the National Environmental Policy Act amid the National Energy Emergency," April 23, 2025.

- 2025 – On May 6, 2025, SPE requested that the Department apply its alternative procedures to its proposed mining plan modification and the Acting ASLM approved the alternative arrangements for NEPA compliance for this energy-related project on May 12, 2025. In accordance with the Department's alternative arrangements, OSMRE is publishing the Final EIS and ROD on its website within 28 days of that approval. A Notice of Availability in the *Federal Register* will follow soon thereafter.
- 2025 – On May 29, 2025, the Supreme Court issued a unanimous decision in *Seven County Infrastructure Coalition v. Eagle County, Colorado,* 2025 U.S. LEXIS 2068 (*Seven County*), holding that an agency is entitled to "substantial deference" in determining when an EIS has complied with NEPA "[s]o long as the EIS addresses environmental effects from the project at issue . . . ." and that NEPA does not require an agency to evaluate the environmental effects of activities separate in time or place from the agency's proposed action.

1.3 Purpose and Need

The EIS is being prepared in response to the Ninth Circuit's opinion that OSMRE violated NEPA when it failed to provide a convincing statement of reasons in its 2018 EA and FONSI why GHG emissions were not significant, and the district court's subsequent vacatur of the 2018 mining plan approval for AM 3. Before SPE can continue to mine the leased Federal coal within AM 3, pursuant to the MLA (30 U.S.C. § 207(c)), it must obtain approval of an operations and reclamation plan (known as a "mining plan") from the ASLM. To support the ASLM's decision, OSMRE must prepare a MPDD, which includes environmental documents such as those needed for compliance with NEPA and a recommendation to ASLM to either approve, disapprove, or approve with conditions, the proposed mining plan modification. This NEPA analysis informs OSMRE's recommendation.

SPE's need for this action is to exercise its rights under Federal coal lease MTM-97988 granted by the BLM to access and mine the Federal coal reserves in accordance with the mining and reclamation plan approved by MDEQ as AM 3 to the state surface mining permit. ASLM approval of the Federal mining plan modification is required by the MLA to mine Federal coal reserves within the AM 3 mining area.

1.4 Agency Authority and Actions

OSMRE is the lead agency for the Project. The major statutes relevant to the Proposed Action are:

- Mineral Leasing Act of 1920, as amended by the Federal Coal Leasing Amendments Act of 1975, which authorizes the leasing of coal reserves and conditions of the leasing, and requires the

Secretary's approval of an "operations and reclamation plan" for leased Federal coal, which is referred to as a "mining plan"; and

- SMCRA, which provides a framework under which coal mining and surface uses are regulated.

This EIS was drafted in large part before the Supreme Court's decision in *Seven County*. As a result, the EIS contains significantly more analysis than is required under NEPA because the Department has no control, for example, over the operation of mainline railroad or the combustion of coal. In light of the National Energy Emergency, the extensive prior litigation over this Project, and the efficient use of agency resources, OSMRE decided to leave this extraneous information, including, but not limited to, information on the potential indirect effects of non-GHG emission from downstream combustion, in the EIS rather than taking the time and resources to remove it. However, OSMRE maintains that under *Seven County*, no such analysis of these effects, which are attenuated in time and geography from the mine expansion, is required because the Department has no control, for example, over the operation of mainline railroad or the combustion of coal. As a result, the EIS more than satisfies OSMRE's NEPA obligations to fully disclose the potential direct, indirect, and past, present, and reasonably foreseeable future actions (RFFAs) of the Project, including addressing the deficiencies identified by the Ninth Circuit by fully analyzing impacts from mining and reclamation activities and the transportation effects linked specifically to this Project (i.e., the railroad spur). The EIS was prepared consistent with NEPA and DOI's NEPA regulations at 43 CFR part 46 and the Department's Alternative Arrangements for NEPA Compliance; OSMRE also considered CEQ's NEPA implementing regulations at 40 CFR parts 1500-1508 as guidance (2020 CEQ Guidance), OSMRE's NEPA Handbook, and other current guidance and policy documents.

In addition to this NEPA review, the OSMRE's Federal action requires two other consultations: Section 106 of the National Historic Preservation Act (NHPA) and Section 7 of the Endangered Species Act (ESA). OSMRE conducted these consultations parallel to the NEPA process.

OSMRE also invited the Tribes that could be affected by the Proposed Action at the Mine to participate in government-to-government consultation, including:

- Apache Tribe of Oklahoma
- Crow Tribe of Montana
- Fort Belknap Indian Community of the Fort Belknap Reservation of Montana
- Nez Perce Tribe
- Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation, Montana
- Shoshone-Bannock Tribes of the Fort Hall Reservation

Letters were mailed to Tribes on August 3, 2023, and May 15, 2024, inviting consultation with OSMRE and informing the Tribes of the agency's intent to prepare an EIS in response to the Court's decision. Additional consultation letters were sent to the following Tribes on December 10, 2024:

- Blackfeet Nation;
- Blackfeet Nation THPO;
- Fort Peck Assiniboine & Sioux Tribes;
- Fort Peck Assiniboine & Sioux Tribes THPO;

- Northern Arapaho Tribe of the Wind River Reservation; and
- Northern Arapahoe Tribe of the Wind River Reservation THPO.

This ROD documents OSMRE's selected alternative. Pursuant to 30 U.S.C. § 207(c) and 30 CFR part 746, OSMRE will prepare and submit an MPDD to the ASLM with its recommendation to approve the proposed mining plan modification for the entire AM 3 area. The ASLM will decide whether to approve, disapprove, or conditionally approve the modification.

1.5 Public Involvement

During the development of the EIS, OSMRE issued a NOI to prepare an EIS in the *Federal Register* and announced the NOI through a news release and on its website on August 7, 2023. This NOI described the EIS as considering the remaining leased Federal coal in AM 3 as well as leased Federal coal in a proposed AM 5 area. OSMRE mailed public scoping letters to Federal agencies, State agencies, Tribes, counties, municipalities and conservation districts, non-government organizations, and individuals on August 7, 2023. The scoping period began on August 7, 2023, and ended September 6, 2023.

During the public scoping period, OSMRE hosted a public scoping meeting on August 30, 2023, at the Roundup Community Center in Musselshell County, Montana. The public was provided the opportunity to provide written comment on the Project via mail or email, as well as the opportunity to provide written comment during the public scoping meeting.

Several months after the completion of the public scoping period, SPE submitted an application for the proposed AM 6 to the MDEQ on November 7, 2023, seeking approval to mine additional non-Federal coal outside of AM 3. In addition, SPE submitted a letter to MDEQ on December 20, 2023, requesting a withdrawal of their previously submitted AM 5 application. Due to these state mine permit amendments, OSMRE provided the public a second opportunity to provide scoping comments, from May 15, 2024, through June 14, 2024. This second opportunity was posted to the OSMRE website and previously contacted parties and those that had already provided scoping comments were sent a letter notifying them of the changes and the opportunity to comment.

On June 14, 2024, OSMRE sent a letter to the President of the Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation, Montana, to offer the opportunity to comment on the Proposed Action and mining plan modification for Federal coal that would result in continued underground mining in the AM 3 area. If the mining plan modification is approved, SPE would eventually reach non-Federal coal where the Northern Cheyenne Tribe has royalty interests as codified by the Northern Cheyenne Lands Act (NCLA).

OSMRE received a total of 311 comment submittals (i.e., email, hard copy letter, or handwritten comment at the public meeting) containing 667 individual comments. Consistent with 40 CFR § 1501.9(e), comments received during the scoping process were reviewed to identify additional significant environmental issues for the EIS. Many comments received during the scoping period addressed more than one topic. The topics that received the greatest number of comments during the scoping period were related to air quality and climate change, water resources, and socioeconomics.

When the Acting ASLM approved SPE's request that the Department apply its alternative NEPA procedures to its proposed mining plan modification, the Acting ASLM also determined that additional public comment was unnecessary due to the prior robust opportunities for public participation and the fact that another 10-day comment period on another NOI, as outlined in the Department's alternative arrangement, was unlikely to yield different, substantive comments.

Chapter 2
Ninth Circuit Order

In 2022, the court found that OSMRE's 2018 EA 1) failed to provide a convincing statement of reasons to explain why the Project's impacts are insignificant and 2) that in comparing Mine Expansion emissions to domestic analogues, did not account for the emissions generated by coal combustion, obscuring and grossly understating the magnitude of the Mine Expansion's emissions relative to the domestic sources of greenhouse gases. *350 Mont.*, 50 F.4th at 1259. Although not required in this NEPA analysis under *Seven County*, OSMRE finds that the analysis in the Final EIS adequately addresses the deficiencies in the 2018 EA identified in the Court Order, specifically:

2.1 Impact Analysis

The Final EIS is complete and additional analysis and description was developed to provide greater detail and justification to the impact determinations, while also consider recent Presidential instruction.

EO 14154 and Presidential Memorandum (Ending Illegal Discrimination and Restoring Merit-Based Opportunity) require DOI to strictly adhere to the requirements contained in NEPA, 42 U.S.C. § 4321 *et seq*. As consideration of environmental justice is not required by NEPA, the Final EIS does not include such a discussion.

2.2 Greenhouse Gas Emissions

Effects related to the GHG emissions are addressed in Section 4.3 of the Final EIS.

A protocol to estimate what is referenced as the "social cost of carbon" (SCC) associated with GHG emissions was developed by the Federal Interagency Working Group on the Social Cost of Greenhouse Gases (IWG). NEPA does not require an agency to quantify project impacts through a specific methodology, such as estimating the "social cost of carbon," "social cost of methane," or "social cost of greenhouse gases." The Ninth Circuit recognized that OSMRE was not required to use the SCC protocol for this project. *350 Mont.*, 50 F.4th at 1272.

Moreover, in recognition of the inadequacies of the SCC, EO 14154, *Unleashing American Energy* (Jan. 20, 2025), disbanded the IWG and withdrew any guidance, instruction, recommendation, or document issued by the IWG, including the SCC protocol. Section 6(c) of EO 14154 states:

> The calculation of the "social cost of carbon" is marked by logical deficiencies, a poor basis in empirical science, politicization, and the absence of a foundation in legislation. Its abuse arbitrarily slows regulatory decisions and, by rendering the United States economy internationally uncompetitive, encourages a greater human impact on the environment by affording less efficient foreign energy producers a greater share of the global energy and natural resource market. Consequently, within 60 days of the date of this order, the Administrator of the EPA shall issue guidance to address these harmful and detrimental inadequacies, including consideration of eliminating the "social cost of carbon" calculation from any Federal permitting or regulatory decision.

EO 14154 further directs agencies to ensure consistency with the guidance in OMB Circular A-4 of September 17, 2003, when estimating the value of changes in GHG emissions from agency actions.

In accordance with EO 14154 and the Office of Management and Budget's Office of Information and Regulatory Affairs (OIRA)'s May 5, 2025, guidance (M-25-27) entitled, Guidance Implementing Section 6 of Executive Order 14154, Entitled "Unleashing American Energy", OSMRE would not normally include any estimates for the SCC for this action for multiple reasons. First, this action is not a rulemaking. Rulemakings are the administrative actions for which the IWG originally developed the SCC protocol. Second, EO 14154 clarifies that the IWG has been disbanded and its guidance has been withdrawn. Further, NEPA does not require agencies to conduct a cost-benefit analysis. The inclusion of an SCC analysis without a complete cost-benefit analysis, which would include the social benefits of the proposed action to society as a whole and other potential positive benefits, would be unbalanced, potentially inaccurate, and not useful to foster informed decision-making. Any increased economic activity—in terms of revenue, employment, labor income, total value added, and output—that is expected to occur as a result of the proposed action is simply an economic impact, not an economic benefit, inasmuch as any such impacts might be viewed by another person as a negative or undesirable impact due to a potential increase in the local population, competition for jobs, and concerns that changes in population will change the quality of the local community. “Economic impact” is distinct from “economic benefit,” as understood in economic theory and methodology, and the socioeconomic impact analysis required under NEPA is distinct from a cost-benefit analysis, which NEPA does not require. In addition, many benefits and costs from agency actions cannot be monetized and, even if monetizable, cannot meaningfully be compared directly to SCC calculations for a number of reasons, including because of differences in scale (local impacts vs global impacts).

Finally, purported estimates of SCC would not measure the actual environmental impacts of a proposed action and may not accurately reflect the effects of GHG emissions. Estimates of SCC attempt to identify economic damages associated with an increase in carbon dioxide emissions—typically expressed as a one metric ton increase in a single year—and typically includes, but is not limited to, potential changes in net agricultural productivity, human health, and property damages from increased flood risk over hundreds of years. The estimate is developed by aggregating results across models, over time, across regions and impact categories, and across multiple scenarios. The dollar cost figure arrived at based on consideration of SCC represents the value of damages avoided if, ultimately, there is no increase in carbon emissions. But SCC estimates are often expressed in an extremely wide range of dollar figures, depending on the particular discount rates used for each estimate, and would provide little benefit in informing OSMRE's or the ASLM's decision. For these reasons, DOI has also rescinded its memorandum of October 16, 2024, entitled, “Updated Estimates of the Social Cost of Greenhouse Gases,” which had directed DOI bureaus to calculate SCC using the methodology contained in the EPA's Final Rule of March 8, 2024, 89 Fed. Reg. 16,820.

However, notwithstanding the concerns outlined above, the Final EIS was developed to provide more greenhouse gases analysis, and OSMRE weighed current policy considerations when reviewing the Final EIS, which informed its decision to select the Proposed Action.

Chapter 3
OSMRE Decision

OSMRE's decision is to prepare and submit to the ASLM a MPDD recommending the approval of the proposed Federal mining plan modification, analyzed as the "Proposed Action" in the Final EIS, because this alternative best supports the purpose and need for the Selected Alternative, the goals of the applicant, and national policy to encourage energy exploration and production on Federal lands and waters, especially during the current national energy emergency. OSMRE has based its decision to select the Proposed Action, on a thorough review of the Final EIS, public input, consultation with Federal, state, and local regulatory agencies, and consultation with affected tribes. This section describes the relevant factors considered and balanced by OSMRE in reaching its decision.

OSMRE verifies that, in reaching its decision, it has complied with the requirements of NEPA, including alternative arrangements for qualifying projects to comply with NEPA, and the Department's regulations and procedures implementing NEPA at 43 CFR part 46 and in part 516 of the Departmental Manual. All stakeholders' concerns and comments during the NEPA process have been addressed. OSMRE's decision to select the Proposed Action will be implemented through issuance of this ROD. OSMRE's MPDD will recommend to the ASLM that the Proposed Action be approved.

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Chapter 4
Alternatives

Under NEPA, the agency must evaluate the environmental impacts of a reasonable range of alternatives that meet the purpose and need of the Proposed Action. The DOI's NEPA regulations and CEQ's NEPA guidance define reasonable alternatives as those that are "technically and economically practical or feasible and meet the purpose and need of the proposed action" (43 CFR § 46.420(b); 40 CFR § 1508.1(z)(2020)).

The No Action Alternative, Proposed Action, and Partial Mining Alternative reflect a spectrum of mining ranging from no mining of Federal coal within AM 3, to mining the full amount of Federal coal contemplated in the Proposed Action. Descriptions of these alternatives are in this chapter. Alternatives are provided in **Table 1**. A summary of impacts among the alternatives are provided in **Table 2.**

Table 1. Comparative Summary of Alternatives

		Existing/Authorized Disturbance[1]		No Action Alternative		Proposed Action		Partial Mining Alternative	
		Total		Total		Total		Total	
Condition Evaluated	Units	Federal	Non-Federal	Federal	Non-Federal	Federal	Non-Federal	Federal	Non-Federal
Saleable Coal to be Mined	Mt	8,680,462.2	36,870,810.2	0.0	10,151,240.4	22,830,646.8	34,460,469.9	18,668,228	32,191,669
Other									
Coal Lands	Acres	700.9	7,127.5	0.0	576.8	1,239.6	1,840.7	1,005.2	1,709.1
Subsidence Area[2]	Acres	377.2	5,417.6	0.0	576.8	1,033.4	1,635.8	854.0	1,539.6
Subsidence Reclamation	Acres	0.0	25.1	0.0	0.0	0.0	0.0	0.0	0.0
Surface Disturbance									
Subsidence Repairs	Acres	1.6	27.1	0.0	2.9	5.2	8.2	4.3	7.7
Surface Facilities	Acres	0.0	873.50[2]	0.0	0.0	0.0	0.0	0.0	0.0
Air Portals	Acres	0.0	12.0	0.0	0.0	0.0	2.0	0.0	2.0
Borehole Pads	Acres	0.0	32.9	0.0	0.0	0.0	6.0	0.0	6.0
Roads	Acres	7.1	40.8	0.0	0.0	0.0	3.1	0.0	3.1
Soil Stockpiles	Acres	5.4	40.9	0.0	0.0	0.0	0.0	0.0	0.0
Total	**Acres**	**14.1**	**1,027.2**	0.0	**2.9**	**5.2**	**19.3**	**4.3**	**18.8**

Table 2. Summary of Impacts

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
Transportation and Electrical Transmission	Under the No Action Alternative, mining operations, and associated rail and vehicle transportation would increase slightly from current rates for a period of 1 year. As such, mining operations would have minor short-term impacts including risk of train derailment and the continued increase in traffic along roads, Mine roads, and ranch trails. During the reclamation period that occurs at the conclusion of mining, rail transportation and impacts to traffic associated with the Mine would cease. Similarly, roads and transmission lines would be decommissioned, and roads would be reclaimed to pre-mining conditions unless landowners request that these facilities remain to support post-mining land uses.	Under the Proposed Action, the number of trains operating per day would be fewer than under the No Action Alternative due to the lower volume mined per year. However, operations would occur for up to 8 additional years beyond the No Action Alternative, for a total of up to 9 years. The risk of derailment would be less than one accident of a loaded train per year under the Proposed Action. The Proposed Action would continue to use existing public roads, Mine roads, and ranch trails in a manner comparable to the No Action Alternative, except that mining would continue for up to 8 additional years as compared to the No Action Alternative. Mine-related traffic would continue to have minor impacts on public roads before declining in association with Mine closure. Impacts expected during the reclamation period are expected to be similar to those at the conclusion of mining under the No Action Alternative, they would just occur 8 years later.	Under the Partial Mining Alternative, the number of trains operating per day would remain consistent with rates under the No Action Alternative. However, mining operations, and associated rail transportation would last for only 5 years under the Partial Mining Alternative, which is approximately 4 fewer years than the Proposed Action albeit at a higher rate. Given the similar total volume to be shipped is similar in both cases, the total chance of derailment over the operating period would be about the same as for the Proposed Action, while the annual risk of derailment would be slightly higher for the Partial Mining Alternative at roughly one derailment of a loaded train per year. Impacts from vehicle transportation and electrical transmission would be similar to those described for the Proposed Action, except that the duration of the impacts would be reduced by less than half for the mining period; the length of the reclamation period would be similar to that for the Proposed Action but would be achieved approximately 4 years sooner.
Air Quality	Under the No Action Alternative, mining would continue to recover approximately 10.0 Mt of non-Federal coal over a 1-year period, and additional mining of Federal coal would not be authorized. Direct	Under the Proposed Action, mining would continue for up to 8 additional years as compared to the No Action Alternative. Annual criteria pollutant and HAP	Under the Partial Mining Alternative mining would continue for approximately 5 years. Annual criteria pollutant and HAP emissions under the Partial Mining Action would be the

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
	emissions of criteria pollutants and HAPs would be small relative to the indirect emissions from overseas coal combustion. Direct and indirect emissions are not anticipated to lead to a violation of the National or Montana Ambient Air Quality Standards.	emissions under the Proposed Action would be approximately 71 percent of the annual emissions under the No Action Alternative (reflecting an average saleable coal recovery rate of approximately 7.1 Mtpy for the Proposed Action compared to approximately 10.0 Mtpy for the No Action Alternative). Over the life of the Project, total criteria pollutant and HAP emissions would be approximately 5.7 times higher than the No Action Alternative. Project-related emissions are not anticipated to lead to a violation of the National or Montana Ambient Air Quality Standards.	same as under the No Action Alternative. Over the life of the Project, total emissions criteria pollutant and HAP emissions would be approximately 5.0 times higher than the No Action Alternative. Project-related emissions are not anticipated to lead to a violation of the National or Montana Ambient Air Quality Standards.
Climate Change and Greenhouse Gases	Mining activities under the No Action Alternative would recover approximately 10.0 Mt saleable non-Federal coal over a period of 1 year. Total GHG emissions from all sources (mining, transport and combustion) over the entire life of the Proposed Action (22 Mt CO2e) would be equivalent to about 9 percent of the Montana Federal coal GHG emissions projected short-term life-of-project (254 Mt CO2e).	Under the Proposed Action, mining would continue for up to 8 additional years as compared to the No Action Alternative. The Mine would continue to recover saleable coal at the average recovery rate of approximately 7.1 Mtpy for up to 9 years. GHG emissions over the life of the Proposed Action would be 5.7 times larger in comparison to the No Action Alternative because of the longer period of production. The Proposed Action’s total GHG emissions from all sources (mining, transport and combustion) over the entire life of the Proposed Action (126 Mt CO2e) would be equivalent to 50	Under the Partial Mining, the Mine would recover approximately 10.0 Mtpy of saleable coal over about 5 years. GHG emissions would be approximately 5.0 times larger than the No Action Alternative over the life of the Project. Total GHG emissions from all sources (mining, transport and combustion) over the entire life of the Project (110 Mt CO2e) would be equivalent to 43 percent of the Montana Federal coal GHG emissions projected short-term life-of-project (254 Mt CO2e).

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
		percent of the Montana Federal coal GHG emissions projected short-term life-of-project (254 Mt CO2e).	
Water Resources	Surface Water The No Action Alternative would continue to result in direct impacts to spring flows, ephemeral stream flows, pond levels, water quality and the hydrologic balance that are short-term to permanent, negligible to significant, and adverse depending on location. Groundwater Direct impacts to bedrock groundwater including increased or decreased water levels and changes in quality that are short-term to permanent, minor to significant, localized, and adverse depending on location would continue to occur from the existing mining disturbance and ongoing mining activities in AM 6. Direct impacts to alluvial groundwater quality in PM Draw and the Rheder Creek AVF from coal processing activities and the release of excess mine water would still occur and be similar to currently observed impacts which are short-term, moderate localized, and adverse but predicted to become indistinguishable from natural variation in background water quality after the end of mining and reclamation. Water Uses Direct impacts to water uses would be the same as current conditions. Sources of water for registered water uses would be	Surface Water Under the Proposed Action, mining would continue for up to 8 additional years as compared to the No Action Alternative. The Proposed Action would result in the undermining of 8.9 miles of ephemeral stream channels in the Fattig Creek and Railroad Creek drainages, one additional spring, and one additional pond than the No Action Alternative. Direct impacts to spring flows, ephemeral stream flows, pond levels, and the hydrologic balance would be short-term to permanent, negligible to significant, and adverse depending on location. Some springs may be permanently lost or changed. Direct impacts to undermined ephemeral channels would be short-term, minor, and adverse. Direct impacts to stream, spring, and pond water quality would be short-term to permanent, negligible to minor, localized, and adverse. Groundwater The Proposed Action would result in additional direct impacts to bedrock groundwater including increased or decreased water levels and changes in water quality	Surface Water Under the Partial Mining, mining would occur over about 5 years. Direct impacts to surface water from mining under the Partial Mining Alternative would be similar to those for the Proposed Action, but the length of ephemeral stream channels and area of watershed that would be undermined would be 0.9 miles less. The Partial Mining Alternative would also eliminate undermining of spring 53245, which is rated as having high potential to be impacted by subsidence. Groundwater Direct impacts to bedrock groundwater levels and quality under the Partial Mining Alternative would be similar in magnitude, area, and duration to those under the Proposed Action. Direct impacts alluvial water levels and quality would be the same as for the Proposed Action but would have shorter duration. Water Uses Direct impacts to water uses under the Partial Mining Alternative would be the same as those for the Proposed Action. Sources of water for registered water uses would be replaced if affected by mining and impacts on water uses would not occur.

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
	replaced if affected by mining and impacts on water uses would not occur.	that would be short-term to permanent, minor to significant, localized, and adverse depending on location. Impacts to alluvial groundwater quality in PM Draw and the Rheder Creek AVF are predicted to be similar to the No Action Alternative but longer in duration. Water Uses As required by the mine's permit conditions, SPE would be required to replace water sources impacted by mining and similar to the No Action Alternative, direct impacts to water uses would not occur.	
Land Use	Under the No Action Alternative, mining would continue in the Mine permit area to recover non-Federal coal across 576.8 acres over a 1-year period, and additional mining of Federal coal would not be authorized. Ongoing mining operations would result in 576.8 acres of subsidence and 2.9 acres of surface disturbance from subsidence repairs, on non-Federal land. Ongoing mining would have minor-short term impacts on patterns of use, including livestock grazing, wildlife uses, and hunting. Impacts to existing and future land uses would be negligible following reclamation.	Under the Proposed Action, an additional 1,263.9 acres of non-Federal land and an additional 1,239.6 acres of Federal land would be mined up to 8 additional years, compared to the No Action Alternative. Continued mining operations under the Proposed Action would result in an additional 1,059.0 acres of subsidence on non-Federal land and an additional 1,033.4 acres of subsidence on Federal land, compared to the No Action Alternative. The Proposed Action would also result in an additional 16.4 acres of surface disturbance on non-Federal land and an additional 5.2 acres of surface disturbance on Federal land, compared to the No Action	Under the Partial Mining Alternative, additional mining operations beyond those of the No Action Alternative would be authorized, but for approximately 4 fewer years, and across 234.4 fewer acres of non-Federal land and 131.6 fewer acres of Federal land compared to the Proposed Action. Mining operations under the Partial Mining Alternative would result in 96.2 fewer acres of subsidence on non-Federal land and 179.4 fewer acres of subsidence on Federal land, compared to the Proposed Action. The Partial Mining Alternative would also result in 0.5 fewer acres of surface disturbance on non-Federal land and 0.9 fewer acres of surface disturbance on Federal land compared to the Proposed Action. Impacts to land uses (i.e. livestock

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
		Alternative. Surface disturbing activities under the Proposed Action would include the development of surface facilities, construction of roads, and subsidence repairs. Impacts to land uses (i.e., livestock grazing, wildlife uses, and hunting) from surface disturbance and subsidence would be long term and moderate during the Proposed Action's mining period but would be negligible once reclaimed at the conclusion of mining operations.	grazing, wildlife uses, and hunting) from surface disturbance and subsidence would be consistent with those described under the Proposed Action. However, impacts to land use would be short-term and moderate during the Partial Mining Alternative's mining period. Impacts to land use would be negligible once reclaimed at the conclusion of mining operations, consistent with the No Action Alternative and the Proposed Action.
Topography and Physiography	Under the No Action Alternative, mining would continue in the Mine permit area to recover non-Federal coal remaining within the permit area over a 1-year period, resulting in 576.8 acres of subsidence on non-Federal land, and 2.9 acres of surface disturbance from subsidence repairs. Impacts to topography and physiography, including topographic moderation and subsidence-related failures, would be minor and short-term.	Under the Proposed Action, impacts from longwall mining would occur across an additional 1,263.9 acres of non-Federal land and an additional 1,239.6 acres of Federal land, compared to the No Action Alternative. Continued mining operations under the Proposed Action would result in an additional 1,059.0 acres of subsidence on non-Federal land and an additional 1,033.4 acres of subsidence on Federal land, compared to the No Action Alternative. The Proposed Action would also result in an additional 16.4 acres of surface disturbance on non-Federal land and an additional 5.2 acres of surface disturbance on Federal land, compared to the No Action Alternative.	Under the Partial Mining Alternative, additional mining operations beyond those of the No Action Alternative would be authorized, but for approximately 4 fewer years, and across 234.4 fewer acres of non-Federal land and 131.6 fewer acres of Federal land compared to the Proposed Action. Mining operations under the Partial Mining Alternative would result in 96.2 fewer acres of subsidence on non-Federal land and 179.4 fewer acres of subsidence on Federal land, compared to the Proposed Action. The Partial Mining Alternative would also result in 0.5 fewer acres of surface disturbance on non-Federal land and 0.9 fewer acres of surface disturbance on Federal land compared to the Proposed Action. As a result of continued longwall mining under the Partial Mining Alternative, impacts to topography

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
		As a result of continued longwall mining under the Proposed Action, impacts to topography and physiography, including topographic moderation and subsidence-related features would be minor and long-term during the Proposed Action's mining period. However, impacts to topography and physiography would be negligible once reclaimed at the conclusion of mining operations. Postmining topography and physiography would be achieved up to 8 years later than the No Action Alternative.	and physiography from surface disturbance and subsidence would be similar to those described under the Proposed Action. However, impacts to topography and physiography would be short-term in nature throughout the Partial Mining Alternative's 5-year mining period. Consistent with the No Action Alternative and the Proposed Action, impacts to topography and physiography would be negligible once reclaimed at the conclusion of mining operations. Postmining topography and physiography would be achieved approximately 3 years earlier than the Proposed Action and 4 years later than the No Action Alternative.
Geology, Minerals, and Paleontology	Under the No Action Alternative, mining would continue in the Mine permit area to recover non-Federal coal remaining within the permit area over a 1-year period, resulting in 576.8 acres of subsidence on non-Federal land, and 2.9 acres of surface disturbance from subsidence repairs. Nearly all of the surface disturbance proposed under No Action Alternative would occur in PFYC Class 4 (2.8 acres), with minor impacts occurring in PFYC 2 (0.1 acre). Important vertebrate or invertebrate fossils would be disrupted by surface disturbing activities and within the coal seam removed by longwall mining activities. However, these impacts would be minor under the No Action Alternative. Additionally, collapse features associated	Under the Proposed Action, impacts to geology, minerals and paleontological resources would be similar to those described under the No Action Alternative, but would occur for approximately 8 additional years and across an additional 1,263.9 acres of non-Federal land and an additional 1,239.6 acres of Federal land. Longwall mining activities over a larger area would result in increased removal of the existing coal bed in the permit area, compared to the No Action Alternative, which would increase the likelihood of potential impacts	Under the Partial Mining Alternative, impacts to geology, minerals, and paleontological resources would be similar to those described under the Proposed Action, but would occur over approximately 4 fewer years, and across 234.4 fewer acres of non-Federal land and 131.6 fewer acres of Federal land. Additionally, mining operations under the Partial Mining Alternative would result in 96.2 fewer acres of subsidence on non-Federal land and 179.4 fewer acres of subsidence on Federal land, compared to the Proposed Action. The Partial Mining Alternative would also result in 0.5 fewer acres of surface disturbance on non-Federal land and

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
	with underground mining have the potential to disrupt stratigraphic continuity and data associated with paleontological resources at the surface.	to geology, minerals, and paleontology. Additionally, continued mining operations under the Proposed Action would result in an additional 1,059.0 acres of subsidence on non-Federal land and an additional 1,033.4 acres of subsidence on Federal land, compared to the No Action Alternative, increasing the potential to disrupt stratigraphic continuity. The Proposed Action would also result in an additional 16.4 acres of surface disturbance on non-Federal land and an additional 5.2 acres of surface disturbance on Federal land, compared to the No Action Alternative, increasing the likelihood of impacts to important paleontological resources.	0.9 fewer acres of surface disturbance on Federal land compared to the Proposed Action.
Solid Waste and Hazardous Materials	Under the No Action Alternative, SPE would continue to mine for 1-year to recover approximately 10.0 Mt of saleable non-Federal coal remaining within the permit area that is economically recoverable without accessing Federal coal. Under the No Action Alternative, the types and quantities of solid and hazardous waste would continue to be generated from continued non-Federal coal mining operations. Approximately 2.2 Mt of Coal Processing Waste (CPW) is disposed annually on site in the existing approved Coal Waste Disposal Area (WDA). Generation and disposal of CPW would	Under the Proposed Action, approximately 22.8 Mt of saleable Federal coal and approximately 34.5 Mt of adjacent saleable non-Federal coal would be produced. The Proposed Action would include development of MR279 and additional placement of CPW in WDA 2. Mining would continue for up to 8 additional years as compared to the No Action Alternative. Under the Proposed Action, approximately 14.8 Mt of CPW (6.0 Mt Federal CPW and 8.8 Mt non-	The Partial Mining Alternative would sunset approval to mine leased Federal coal within AM 3 after approximately 5 years, until approximately 2030, at which time no additional Federal coal would be mined unless SPE obtained a separate mining plan authorization to mine the remaining Federal coal. Mining in AM 3 would be sequenced over a 5-year period at a rate of approximately 10.0 Mtpy of saleable coal. The production rate of the Partial Mining Alternative would be similar the production rate of the No Action Alternative and of the

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
	continue for the duration of mining operations under the approved Mine Permit. Approximately 2.5 Mt of CPW would be generated and placed in WDA 1 and WDA 2 under the No Action Alternative. Under the No Action Alternative, transport, storage, and use of hazardous materials at surface facilities and current approved BMPs and procedures for hazardous materials management would continue to be implemented.	Federal CPW) would be placed on WDA 1 and WDA 2. The amount of CPW generated would be approximately a factor of 6 greater than would be generated under the No Action Alternative. WDA 2 would encompass approximately 223 acres and would be constructed, operated, and reclaimed in a manner comparable to existing WDA 1. Similar types and quantities of hazardous materials would be transported, stored, and used as under the No Action Alternative, based on the anticipated Proposed Action average recovery rate of approximately 7.1 Mt saleable coal per year.	Proposed Action. The duration of production would differ from that of the No Action Alternative and the Proposed Action. During the Partial Mining Alternative 5-year operating period approximately 50.9 Mt of coal would be mined from the AM 3 area. Annual generation rates of CPW, non-hazardous solid waste, and hazardous waste would be similar to that of the Proposed Action but of a shorter duration.
Human Health and Safety	Under the No Action Alternative, mining would continue in the Mine permit area to recover non-Federal coal remaining within the permit area over a 1-year period. Air quality effects from particulate matter and coal dust may slightly affect nearby residents but would cease after mining ends. Soil contamination from trace metals poses minor long-term health risks, mitigated by reclamation. Water quality impacts would be minimal due to regulatory compliance and mitigation. Noise and vibration would be noticeable but not harmful to health. Food chain contamination is unlikely due to the short duration and low population density. Indirectly, reduced coal revenues may limit access to health and social services,	Under the Proposed Action, impacts to human health and safety would be similar to those described under the No Action Alternative but would occur over a longer period of time. Both alternatives pose minor, short-term health risks, primarily from air quality, soil contamination, water quality, and noise. The Proposed Action has a greater beneficial impact for jobs and funding for health and social services compared to the No Action Alternative.	Like the No Action Alternative, the Partial Mining Alternative would result in minor, short-term health risks from air emissions, dust, noise, and potential water or soil contamination. However, the Partial Mining Alternative would occur for a 5-year period, leading to greater short-term exposure risks than the No Action Alternative. While both alternatives pose low health risks overall, the Partial Mining Alternative carries a slightly higher direct risk due to increased surface disturbance and emissions intensity in a shorter window.

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
	potentially contributing to minor to moderate long-term health challenges. Overall, health impacts are expected to be minor and short-term.		
Soils	Under the No Action Alternative, mining would continue in the Mine permit area to recover non-Federal coal remaining within the permit area over a 1-year period, resulting in 2.9 acres of surface disturbance from subsidence repairs. Surface disturbance resulting from ongoing mining activities would remove vegetative cover exposing the soil and would also disrupt the existing soil profile. No soil or suitable material salvaging is anticipated for this alternative. Mining activities under the No Action Alternative would result in 576.8 acres of subsidence on non-Federal land in the Mine permit area. Surface soil disturbance may result through subsidence cracks in localized areas and would at a low frequency. Proposed mining activities under the No Action Alternative may further increase the potential of the ground surface directly above the Mine panels and within the angle of draw to be adversely affected by subsidence. Impacts to soils from surface disturbance and subsidence cracks would be minor and short-term. Upon completion of mining, surface disturbance and subsidence cracks that can be safely accessed without causing damage to the existing land surface would be repaired and reclaimed, resulting in negligible long-term impacts to soils.	Under the Proposed Action, an additional 1,263.9 acres of non-Federal land and an additional 1,239.6 acres of Federal land would be mined for up to 8 additional years as compared to the No Action Alternative. Continued mining operations under the Proposed Action would result in an additional 16.4 acres of surface disturbance on non-Federal land and an additional 5.2 acres of surface disturbance on Federal land, compared to the No Action Alternative. Surface disturbing activities under the Proposed Action would include the development of surface facilities, construction of roads, and subsidence repairs. Mining activities under the Proposed Action would result in an additional 1,059.0 acres of subsidence on non-Federal land and an additional 1,033.4 acres of subsidence on Federal land, compared to the No Action Alternative. As a result of increased surface disturbance and area of subsidence, potential for erosion and sediment transport would be greater than under the No Action	Under the Partial Mining Alternative, impacts to soils would be similar to those described under the Proposed Action but would occur approximately 4 fewer years, and across 234.4 fewer acres of non-Federal land and 131.6 fewer acres of Federal land. Additionally, mining operations under the Partial Mining Alternative would result in 0.5 fewer acres of surface disturbance on non-Federal land and 0.9 fewer acres of surface disturbance on Federal land compared to the Proposed Action. The Partial Mining Alternative would also result in an additional 96.2 fewer acres of subsidence on non-Federal land and 179.4 fewer acres of subsidence on Federal land, compared to the Proposed Action. Impacts to soils under the Partial Mining Alternative would result in minor and short-term impacts from erosion and sediment transport throughout the 5-year term for the Partial Mining Alternative. Consistent with the No Action Alternative and the Proposed Action, impacts to soils under this alternative would be negligible once reclaimed at the conclusion of mining operations. Postmining soil conditions would be achieved approximately 3 years

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
		Alternative. As such, impacts to soils from the Proposed Action would be minor, but long-term throughout the Proposed Action's mining period. Upon completion of mining, surface disturbance and subsidence cracks that can be safely accessed without causing damage to the existing land surface would be repaired and reclaimed, resulting in negligible long-term impacts to soils. Postmining soil conditions would be achieved up to 8 years later than the No Action Alternative.	earlier than the Proposed Action and approximately 4 years later than the No Action Alternative.
Vegetation	Under the No Action Alternative, mining would continue in the Mine permit area to recover non-Federal coal remaining within the permit area over a 1-year period, resulting in 2.9 acres of surface disturbance from subsidence repairs. Under the No Action Alternative, impacts from disturbance would occur in the shrubland, burned ponderosa pine, ponderosa pine forest, and grassland habitats. Vegetation removal from surface disturbing activities would result in minor and short-term impacts on livestock forage and wildlife habitat provided by existing vegetative cover. Similarly, surface disturbing activities would allow for the potential introduction of invasive plant species and noxious weeds during the 1-year mining period. However, impacts to vegetation would be negligible following reclamation activities.	Under the Proposed Action, impacts vegetation from ongoing mining operations would occur up to 8 additional years compared to the No Action Alternative. Mining operations under the Proposed Action would result in an additional 16.4 acres of surface disturbance on non-Federal land, and an additional 5.2 acres of surface disturbance on Federal land, compared to the No Action Alternative. Surface disturbing activities under the Proposed Action would include the development of surface facilities, construction of roads, and subsidence repairs. Vegetation removal as a result of surface disturbance under the Proposed Action would result in minor and long-term impacts on	Under the Partial Mining Alternative, impacts vegetation from ongoing mining operations would be similar to those described for the Proposed Action, but would occur over but for approximately 4 fewer years. Additionally, mining activities under the Partial Mining Alternative would result 0.5 fewer acres of surface disturbance on non-Federal land and 0.9 fewer acres of surface disturbance on Federal land, compared to the Proposed Action. Vegetation removal and the introduction of invasive plant species and noxious weed species as a result of surface disturbance would result in minor and short-term impacts on existing vegetative cover under the Partial Mining Alternative's 5-year mining period.

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
		livestock forage and wildlife habitat provided by existing vegetative cover. Similarly, impacts to vegetation from the introduction of invasive plant species and noxious weeds would be minor, but long term over the Proposed Action's mining period. Consistent with the No Action Alternative, impacts to vegetation would be negligible once reclaimed at the conclusion of mining operations. Postmining vegetative conditions would be achieved up to 8 years later than the No Action Alternative.	Consistent with the No Action Alternative and the Proposed Action, impacts to vegetation would be negligible once reclaimed at the conclusion of mining operations. Postmining vegetative conditions would be achieved approximately 3 years earlier than under the Proposed Action and approximately 4 years later than under the No Action Alternative.
Wildlife	Under the No Action Alternative, mining would continue in the Mine permit area to recover non-Federal coal remaining within the permit area over a 1-year period, resulting in 2.9 acres of surface disturbance from subsidence repairs. Under the No Action Alternative, minor short and long-term direct and indirect impacts on wildlife may occur due to changes to vegetation community composition and structure; permanent improvements to roads; or changes to water quality, quantity, and distribution. Wildlife may also experience direct and indirect impacts due to noxious weed infestations and associated changes to habitats and due to displacement from sensitivity to human noise or presence. Minor and short-term indirect impacts to wildlife may occur due to impacts from subsidence and associated changes to	Under the Proposed Action, impacts on wildlife and wildlife habitat from ongoing mining operations would occur up to 8 additional years as compared to the No Action Alternative. Mining operations under the Proposed Action would result in an additional 16.4 acres of surface disturbance on non-Federal land, and an additional 5.2 acres of surface disturbance on Federal land, compared to the No Action Alternative. Surface disturbing activities under the Proposed Action would include the development of surface facilities, construction of roads, and subsidence repairs. Continued mining operations under the Proposed Action would result in an	Under the Partial Mining Alternative, impacts on wildlife and wildlife habitat from ongoing mining operations would be similar to those described for the Proposed Action, but would occur over approximately 4 fewer years. Additionally, mining activities under the Partial Mining Alternative would result 0.5 fewer acres of surface disturbance on non-Federal land and 0.9 fewer acres of surface disturbance on Federal land, compared to the Proposed Action. Most of the direct and indirect impacts of the Partial Mining Alternative, including habitat loss, would be limited to the vicinity of proposed and existing disturbances and would be minor to moderate and short term. Direct and indirect impacts of the

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
	water resources and vegetative communities in association with surface disturbances and reclamation. Minor direct impacts may occur from surface cracks due to subsidence that may create a surface hazard to wildlife that traverse these areas. Impacts on wildlife and wildlife habitat would be negligible following reclamation activities.	additional 1,059.0 acres of subsidence on non-Federal land and an additional 1,033.4 acres of subsidence on Federal land, compared to the No Action Alternative. Impacts on wildlife resulting from the Proposed Action would be similar to those described for the No Action Alternative but would encompass a larger area and timeframe. Most of the direct and indirect impacts of the Proposed Action, including habitat loss, would be limited to the vicinity of proposed and existing disturbances and would be minor to moderate and short term. Direct and indirect impacts of the Proposed Action on bats would be minor and long term.	Proposed Action on bats would be minor and long term.
Threatened, Endangered, and Special Status Species	Under the No Action Alternative, mining would continue in the Mine permit area to recover non-Federal coal remaining within the permit area over a 1-year period, resulting in 2.9 acres of surface disturbance from subsidence repairs. Federally threatened or endangered and special status species have limited potential to occur in the study area and low potential to be affected by currently ongoing mining activities. Impacts on threatened, endangered, and special status species and their habitats would be negligible following reclamation activities.	Under the Proposed Action, impacts vegetation from ongoing mining operations would occur up to 8 additional years compared to the No Action Alternative. Mining operations under the Proposed Action would result in an additional 16.4 acres of surface disturbance on non-Federal land, and an additional 5.2 acres of surface disturbance on Federal land, compared to the No Action Alternative. Surface disturbing activities under the Proposed Action would include the development of surface facilities,	Under the Partial Mining Alternative, impacts on wildlife habitat from ongoing mining operations would be similar to those described for the Proposed Action, but would occur over approximately 4 fewer years. Additionally, mining activities under the Partial Mining Alternative would result in 0.5 fewer acres of surface disturbance on non-Federal land and 0.9 fewer acres of surface disturbance on Federal land, compared to the Proposed Action. Impacts on federally threatened or endangered and special status species under the Partial Mining Alternative

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
		construction of roads, and subsidence repairs. Impacts on federally threatened or endangered and special status species under the Proposed Action would be similar to those described for the No Action Alternative but would encompass a larger area and timeframe. As with the No Action Alternative, most of the direct impacts of the Proposed Action, including habitat loss, would be limited to the vicinity of proposed and existing disturbances. Impacts on federally threatened or endangered and special status species would be minor and short term. Impacts on eagles would be minor with incorporation of mitigation measures and long term.	would be similar to those described for the No Action Alternative but would encompass a larger area and timeframe. As with the No Action Alternative, most of the direct impacts of the Proposed Action, including habitat loss, would be limited to the vicinity of proposed and existing disturbances. Impacts on federally threatened or endangered and special status species would be minor and short term. Impacts on eagles would be minor with incorporation of mitigation measures and long term.
Cultural Resources	Under the No Action Alternative, the proposed mining plan modification would not be approved, and approximately 1,239.6 acres of Federal coal lands and approximately 1,840.7 acres of non-Federal coal lands would not be mined. Approximately 576.8 acres of subsidence on non-Federal land is anticipated from these mining activities. Additionally, approximately 2.9 acres of surface disturbance is anticipated from subsidence repairs on non-Federal lands under the No Action Alternative. Both the 576.8 acres of subsidence area and 2.9 acres of surface disturbance under the No Action Alternative has the potential to	Impacts on cultural resources under the Proposed Action would be the same as those described for the No Action Alternative, except that under the Proposed Action there would be a net increase of approximately 2,092.4 acres of subsidence area, and 21.6 acres of surface disturbance compared to the No Action Alternative. The Proposed Action would result in an approximate total of 24.5 acres of surface disturbance from mining, surface facilities, portals, borehole pads, roads, and soil stockpiles. Approximately 13.4 acres of	Impacts on cultural resources under the Partial Mining Alternative would be the same as those described for the No Action Alternative, except that under the Partial Mining Alternative there would be a net increase of approximately 1,816.8 acres of subsidence area and 20.2 acres of surface disturbance compared to the No Action Alternative. The Partial Mining Alternative would result in an approximate total of 11.1 acres of surface disturbance from mining, surface facilities, portals, borehole pads, roads, and soil stockpiles. Approximately 12.0 acres of surface

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
	affect nine known cultural resources, one of which, site 24YL2144, has previously been recommended as eligible for the NRHP. The other eight sites have either been determined ineligible or are recommended as not eligible for the NRHP and all nine of these sites are on private property.	surface disturbance is anticipated from subsidence repairs. Both the 2,669.2 acres of subsidence area and 24.5 acres of surface disturbance under the Proposed Action have the potential to affect 22 known cultural resources, one of which is recommended eligible for the NRHP (site 24YL2144) and five of which are unevaluated for NRHP eligibility. However, OSMRE, with SHPO concurrence, determined that the undertaking would not adversely affect these sites. The remaining 16 sites are either ineligible or recommended not eligible for the NRHP.	disturbance is anticipated from subsidence repairs. Both the 2,393.6 acres of subsidence area and 23.1 acres of surface disturbance under the Partial Mining Alternative has the potential to affect 18 known cultural resources, one of which is recommended eligible for the NRHP (site 24YL2144) and four of which are unevaluated for NRHP eligibility. However, OSMRE, with SHPO concurrence, determined that the undertaking would not adversely affect these sites. The 13 remaining sites are either ineligible or recommended not eligible for the NRHP.
Noise and Vibration	Recovery of saleable coal would occur at a rate of approximately 10.0 Mtpy of saleable coal over a 1-year period. However, noise and vibration from roads, surface facilities and the mine ventilation fan would continue at existing levels for 1 year. The average daily volume of trains would not increase relative to existing conditions.	Recovery of saleable coal would continue at an average rate of approximately 7.1 Mtpy of saleable coal for approximately 8 additional years as compared to the No Action Alternative. The surface facilities would expand to include a new waste disposal area. Mining would progress northeast, requiring use of heavy equipment to maintain new longwall panels and conduct subsidence repairs. The ventilation fan would be moved to new longwall panel locations as mining progresses to the northeast. Noise from the ventilation fan would potentially result in a noticeable increase in ambient noise at residences.	Recovery of saleable coal would occur at a rate of approximately 10.0 Mtpy over a 5-year term, which would be a longer duration than the 1-year period under the No Action Alternative and approximately 4 fewer years than the Proposed Action. The surface facilities would expand to include a new waste disposal area. Mining would progress northeast, requiring use of heavy equipment to maintain new longwall panels and conduct subsidence repairs. The ventilation fan would be moved to new longwall panel locations as mining progresses to the northeast. Noise from the ventilation fan would potentially result in a noticeable increase in ambient noise at residences.

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
		The average daily volume of trains would represent a negligible increase in noise and vibration levels along transportation corridors compared to the No Action Alternative.	The average daily volume of trains would represent a negligible increase in noise and vibration levels along transportation corridors compared to the No Action Alternative.
Socioeconomics	Under the No Action Alternative, mining would recover approximately 10.0 Mt of saleable non-Federal coal over a 1-year period and additional future mining of Federal coal would not be authorized. Revenue is anticipated to total approximately $173 million (2023$, 2% discount rate). Signal Peak Community Foundation activities and other local charitable contributions would cease immediately. Capital infrastructure investments would fall from $18 million per year to $0 in the last 12 months of operations followed by a final $2.4 million during the 18 months of reclamation. Once the mine ceases operations, OSMRE anticipates that local businesses would experience a decline in revenues and that many residents with mine-dependent jobs would lose employment and move away. Local environmental, health, and safety impacts on residents and businesses from Mine activities and attendant rail traffic would cease as the mine closes and completes reclamation. The decline in government revenues following mine closure would be anticipated to exceed the reduced demand for government facilities and services. Impacts on the local economy would be short-term and moderate during	Under the Proposed Action, impacts would be the same as under the No Action Alternative except that mining would continue for up to approximately 9 years to recover 57.3 Mt of saleable coal. Relative to the No Action Alternative, the revenue and capital investment decline, Mine closure, and associated layoffs and reductions in environmental, health, and safety impacts would be delayed for up to 8 years, and it is anticipated that the Mine would generate an additional $930 million (2023$, 2% discount rate) in revenues as compared to the No Action Alternative. Impacts would be short- and long-term and moderate to the local economy and minor nationwide.	Under the Partial Mining Alternative, impacts would be the same as under the No Action Alternative except that mining would continue for approximately 5 years to recover an anticipated additional 50.9 Mt of saleable coal. Relative to the No Action Alternative, the revenue and capital investment decline, Mine closure, and associated layoffs and reductions in environmental, health, and safety impacts would be delayed approximately 4 years, and the Mine would be anticipated to generate an additional $670 million (2023$, 2% discount rate) in revenues as compared to the No Action Alternative. Impacts would be short- and long-term and moderate to the local economy and minor nationwide.

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
	the remaining 1 year of mining, with minor direct and indirect impacts nationwide.		
Visual Resources	Under the No Action Alternative, mining would continue to recover non-Federal coal over a 1-year period, and additional future mining operations would not be authorized. Visible features associated with the Mine would result in approximately 2.9 acres of additional surface disturbance from subsidence repairs on non-Federal lands and be largely consistent with existing conditions. It is unlikely that areas of subsidence, including new areas of subsidence, would be visible from publicly accessible vantages. Lighting associated with the Mine is anticipated to remain consistent with existing conditions, because no new facilities would be constructed. Site reclamation and removal of lighting would occur within approximately 16 months after the end of mining so that the site better blends with the surrounding landscape. Visual changes associated with the No Action Alternative are consistent with BLM VRM Class III objectives where change may attract attention but is not dominant.	Under the Proposed Action, mining would continue for up to 9 additional years. Visual impacts from new disturbances would be minor under the Proposed Action, as most changes would occur where the visual character is already altered by existing operations. However, new surface disturbances would occur over a larger area than the No Action Alternative. This increases the potential for surface disturbances under the Proposed Action to be more visible to the public from locations east of Highway 87 and south of the surface facilities area than the No Action Alternative. While visual impacts would occur over a longer period of time under the Proposed Action (up to 8 years longer than the No Action Alternative), the duration is still relatively short term. Lighting impacts would be anticipated to be minor depending on the proximity of lights, mitigation would alleviate potential adverse impacts, and lighting would be removed as individual facilities are decommissioned. Impacts would cease after mining concludes and reclamation is performed. Therefore, long-term visual effect impacts of surface disturbances	Under the Partial Mining Alternative mining would continue for up to 4 additional years as compared to the No Action Alternative. Impacts to visual resources under the Partial Mining Alternative would be largely the same as described in the Proposed Action. The primary differences would be that there would be a slight decrease of 1.4 acres in subsidence repair and the duration of mining would be decreased. This difference is considered negligible and would not result in a noticeable change in the landscape given the limited potential for such changes to be visible, due to intervening terrain and vegetation, and because subsidence repairs would ensure that the landscape appears largely intact and consistent with existing conditions. The nature of changes to the visual landscape from surface disturbances and changes in light and glare under the Partial Mining Alternative would be the same as described for the Proposed Action and consistent with BLM VRM Class III objectives where change may attract attention but is not dominant. As such, the direct and indirect impacts related to visual resources would be minor and short term in nature, and mitigation measures for the Partial Mining Alternative would be the same as for the Proposed Action.

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
		would be negligible due to the mitigating impacts of reclamation. Visual changes associated with the Proposed Action are consistent with BLM VRM Class III objectives where change may attract attention but is not dominant.	

4.1 No Action Alternative

Under the No Action Alternative, the proposed mining plan modification for AM 3 would not be approved by the ASLM, and approximately 1,239.6 acres of Federal coal lands including approximately 22.8 million tons (Mt) of saleable Federal coal (AM 3 and Minor Revision (MR) 279) and approximately 1,840.7 acres of non-Federal coal lands including approximately 34.5 Mt (AM 3 and MR 279) of saleable non-Federal coal would not be mined. The 1,840.7 acres of non-Federal coal lands would not be mined because SPE is only able to reach those non-Federal coal by mining through AM 3 Federal coal.

At an estimated 80 percent recovery rate of saleable coal and given equipment and operational constraints SPE's maximum mining rate is approximately 10.1 million tons per year (Mtpy) of saleable coal. SPE has estimated that in the near-term they will operate at this approximate maximum mining rate. As the No Action Alternative will occur in the near-term, this alternative assumes that SPE will mine at the maximum mining rate to recover approximately 10.0 Mt of the remaining saleable coal in the permit area without accessing Federal coal. The non-Federal coal would be recovered within an estimated 1-year period. Approximately 2.5 Mt of coal processing waste rock (CPW) would be generated and placed in waste disposal area (WDA) 1 and WDA 2. Under the No Action Alternative, the LOM would be shortened by approximately 8 years relative to the Proposed Action.

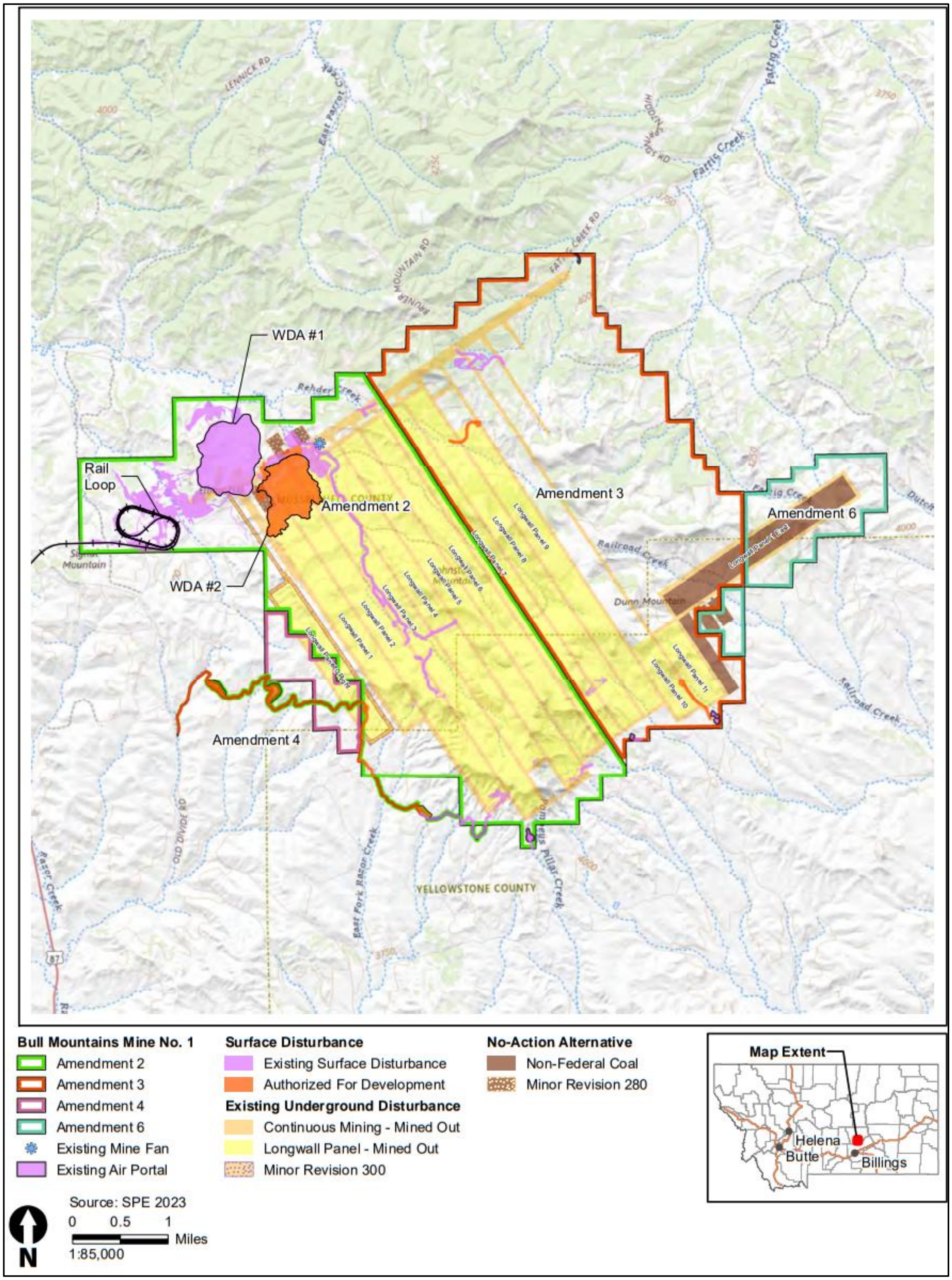
The No Action Alternative would include:

- Development of the east longwall panel (Panel 1 East), and minor blocks (AM 3).
- Continuation of longwall mining Panel 1 East, and minor blocks (AM 6).
- MR 280 – approved by MDEQ on September 24, 2021. MR 280 includes the development of three additional room and pillar mining areas near the entrance of the Mine portal (**Map 3**).

Subsidence repairs on non-Federal lands would result in approximately 2.9 acres of surface disturbance (**Map 3**). Potential surface disturbance would be subject to existing access agreements with surface owners, as needed.

At the conclusion of mining operations, Mine facilities would be removed on a schedule approved by MDEQ, and all surface disturbances would be reclaimed in accordance with the Mine Permit. Under this action, the workforce would be limited primarily to reclamation and closure activities. Reclamation is estimated to take approximately 16 months after the end of mining.

Map 3. No Action Alternative



4.2 Proposed Action: Selected Alternative

Under the Proposed Action, longwall mining would extend to the northeast (**Map 4**). The Proposed Action would authorize SPE to continue coal mining on approximately 1,239.6 acres of Federal coal lands and approximately 1,840.7 acres of adjacent non-Federal coal lands in AM 3. Under the Proposed Action, approximately 22.8 Mt of saleable Federal coal and approximately 34.5 Mt of adjacent saleable non-Federal coal would be produced. Additionally, the Proposed Action would include the development of MR 279 (a shortened-width panel (Panel 15)), additional placement of CPW in WDA 2, and other ancillary surface disturbances. Under this alternative, mining would continue for up to 9 years. Land status, including surface and subsurface ownership, is shown on **Map 2**.

Under this alternative, mining rates would vary from year to year, but the anticipated average mining rate would be approximately 7.1 Mtpy of saleable coal based on annual coal sales between 2018 and 2023. However, actual coal sales would be dependent on several factors including mining conditions and coal markets.

4.2.1.1 Waste Disposal Areas

At the estimated recovery rate of 80 percent, approximately 14.8 Mt of CPW (6.0 Mt Federal CPW and 8.8 Mt non-Federal CPW) would be placed on WDA 1 and WDA 2, as capability allows. CPW would be transferred from the coal processing facilities via conveyor over Fattig Creek Road where it would be handled in the same manner in WDA 1 and WDA 2. Equipment would access WDA 2 from WDA 1 via a private at-grade crossing of Fattig Creek Road. Fly ash (received from Yellowstone Energy) may be placed on WDA 2 and used to accelerate drying of the CPW. Dust suppressants would be applied to WDA 2 to control dust emissions, as necessary. At the conclusion of mining, WDA 2 would be covered with a minimum of 48 inches of stockpiled soil and cover material, and the area would be reclaimed in a manner that allows the post-mining land use to be a combination of grazing land, wildlife habitat, and pastureland, consistent with pre-mining land uses.

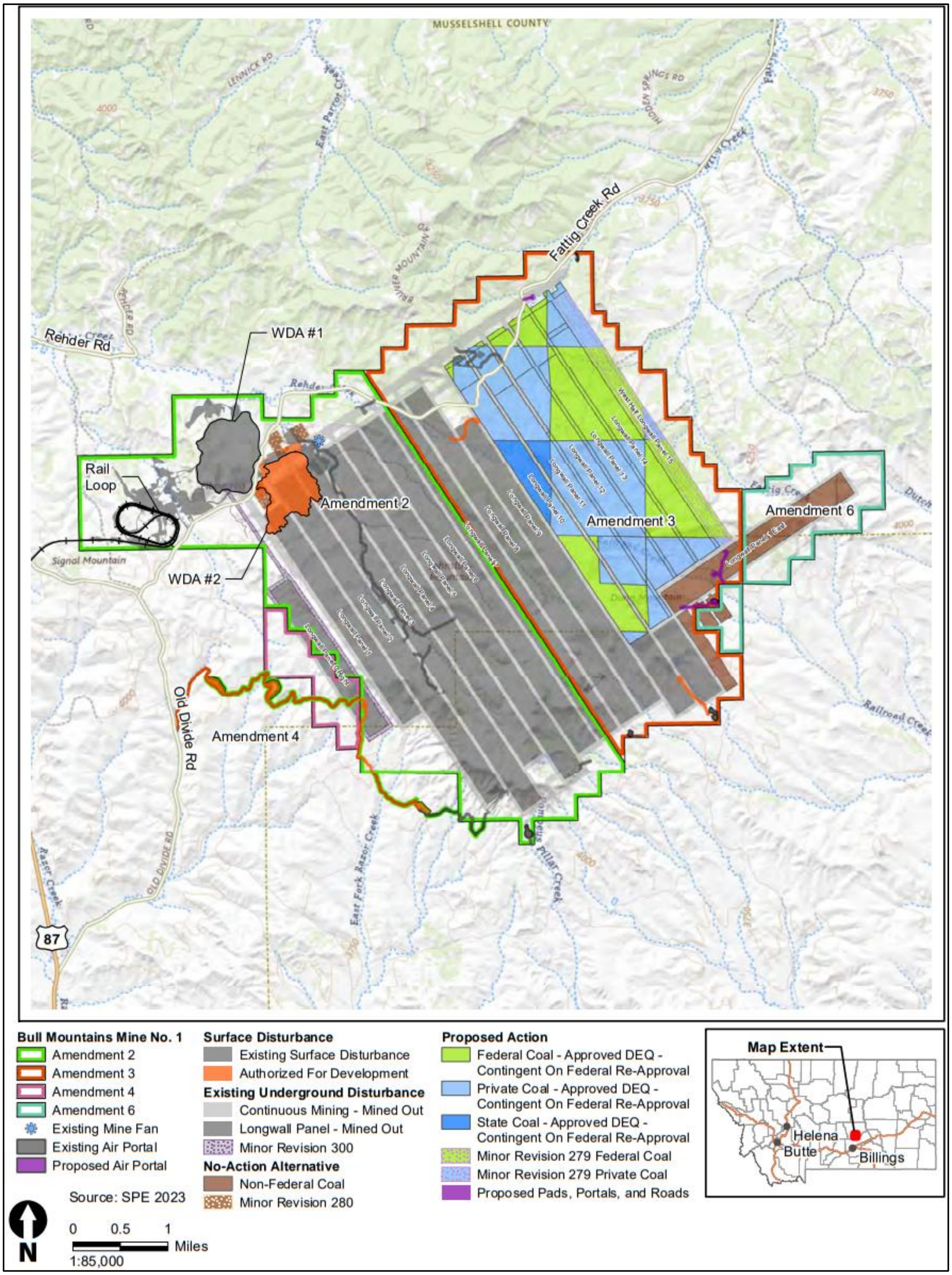
4.2.1.2 Other Facilities and Disturbances

Surface disturbance from subsidence repairs, surface facilities, portals, borehole pads, roads, and soil stockpiles would include approximately 24.5 acres. Potential surface disturbance would be subject to existing access agreements with surface owners, as needed.

Any future boreholes and associated pads and roads would be applied for by SPE and reviewed and permitted as revisions to the State-approved Mine Permit by MDEQ. Once an area is mined out, the existing air portals and associated facilities would be reclaimed in accordance with the Mine Permit.

At the conclusion of mining, Mine facilities would be removed, and all surface disturbances would be reclaimed in accordance with the Mine Permit. Reclamation is estimated to take approximately 16 months after the end of mining.

Map 4. Proposed Action



4.3 Partial Mining Alternative

The Partial Mining Alternative would sunset the mining plan approval for Federal coal within AM 3 after about 5 years from the ASLM's approval of this mining plan modification, until approximately 2030, at which time no additional Federal coal would be mined unless SPE applied for, and obtained, a separate mining plan modification approval to mine the remaining Federal coal. At an estimated 80 percent recovery rate of saleable coal and given equipment and operational constraints SPE's maximum mining rate is approximately 10.1 Mtpy of saleable coal. Under this alternative, based on information received from SPE, it is assumed that SPE will attempt to maximize Federal coal recovery during the life of the 5-year mining plan modification by mining at the maximum rate (approximately 10.1 Mtpy) in AM 3 to recover approximately 10.0 Mtpy of saleable coal (**Map 5**).

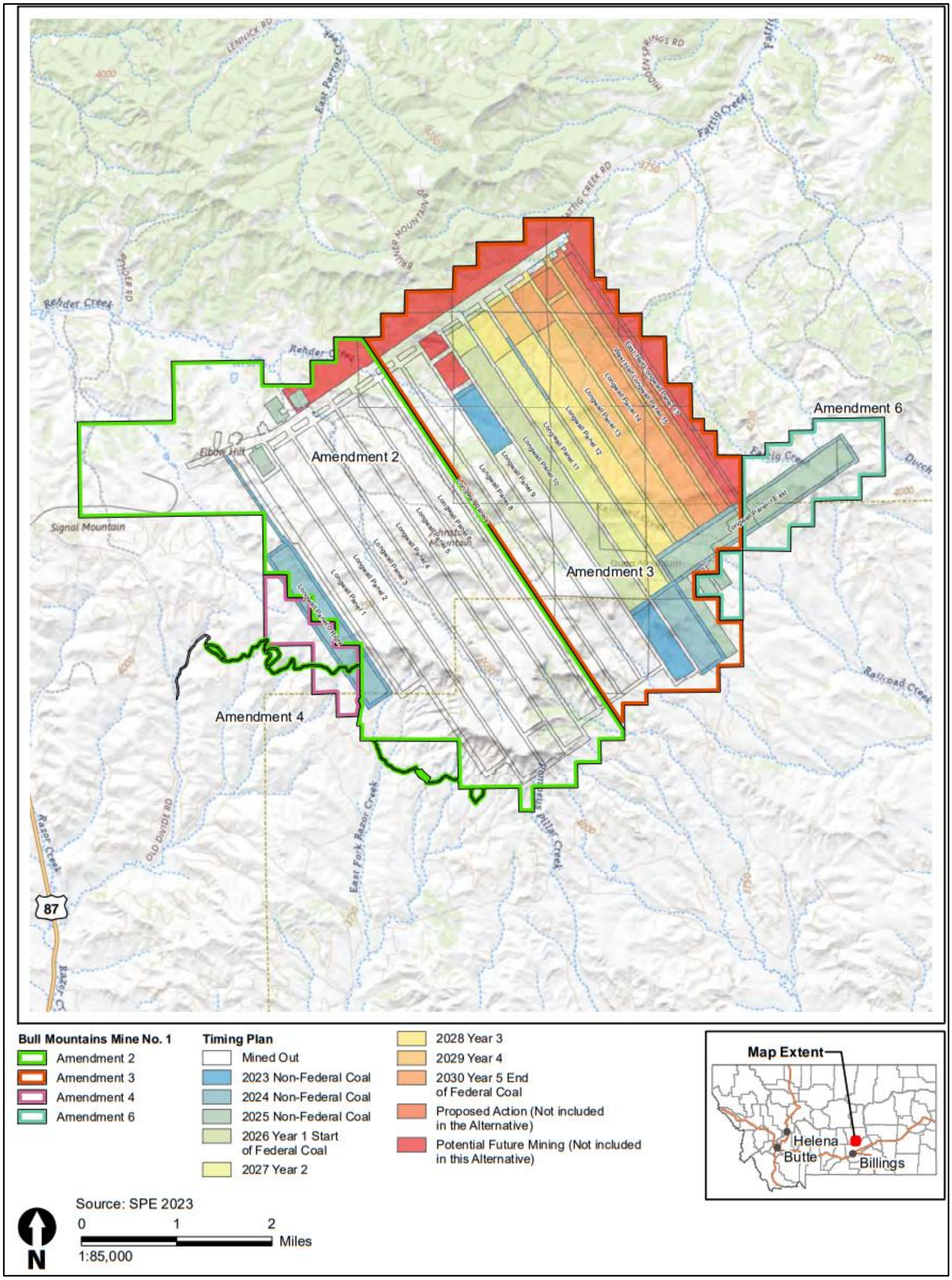
Under the Partial Mining Alternative, the following areas would not be developed as compared to the Proposed Action:

- The northern portion of longwall panel 14 (6N; 27E; S3 and S4) (AM 3).
- MR 279 - The western portion of panel 15 (6N; 27E; S3, 4, 10, 11, 14 and 23) (AM 3).

Under the Partial Mining Alternative, mining of coal in AM 3 would not be authorized after about 5 years, and any mining of the Federal coal in AM 3 beyond the 5 years would require a new mining plan modification approval from ASLM.

OSMRE, in coordination with SPE, used SPE's LOM mining sequence outlined in the approved Mine Permit to estimate how much the Federal coal SPE expects to mine during an approximate 5-year period following an anticipated ASLM approval of the Federal mining plan modification. Under the Partial Mining Alternative, it is assumed that the 5-years would coincide with years 2025 through 2030. During this time approximately 50.9 Mt of saleable coal would be mined from AM 3 including approximately 18.7 Mt of Federal coal and 32.2 Mt of non-Federal coal. Under this alternative, approximately 2,714.3 acres of coal lands including 1,005.2 acres of Federal coal lands and 1,709.1 acres of non-Federal coal lands would be disturbed over 5 years.

Map 5. Partial Mining Alternative



4.4 Alternatives Considered but Eliminated from Detailed Analysis

OSMRE considered additional alternatives that were not analyzed in detail in the Final EIS (Final EIS Section 2.5). OSMRE concluded that that there are no other reasonable action alternatives to the Proposed Action that would reduce or eliminate adverse environmental effects and meet the agency's purpose and need.

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Chapter 5
Basis for Decision

5.1 Environmental Considerations

OSMRE's decision considered the environmental effects of each alternative. The No Action Alternative was identified by OSMRE as the environmentally preferrable alternative because, based on the environmental analysis in the FEIS and summarized in this ROD in Table 2, it would cause the least damage to the biological and physical environment and best protects, preserves, and enhances historical, cultural, and natural resources. However, the No Action Alternative would result in adverse socioeconomic impacts and is contrary to the national policy outlined in EO 14156 (*Declaring a National Energy Emergency*), EO 14154 (*Unleashing American Energy*), and EO 14261 (*Reinvigorating America's Beautiful Clean Coal Industry*), which are discussed in greater detail in **Section 5.3.8** below. OSMRE determined that the Partial Mining Alternative would not significantly reduce the intensity of the environmental effects resulting from the Proposed Action and would not as effectively realize national policy or socioeconomic benefits. Instead, OSMRE determined that the Proposed Action is the alternative that best supports national policy with minimal impacts to the environment.

All direct and indirect impacts, and impacts from past, present, and reasonably foreseeable future actions are described fully in **Chapter 4** of the Final EIS. The Proposed Action would have a greater environmental impact than the No Action Alternative for most resource areas, but most environmental impacts are limited to the duration of the mining and reclamation activities and will resolve after reclamation is complete. While the duration of impacts will be longest for the Proposed Action, the intensity of those impacts is anticipated to be similar to the other alternatives in most resource areas. For air quality impacts, annual emissions under the Proposed Action are anticipated to be less intense than the No Action Alternative but continue for 8 additional years, making the total project-related emissions greater than the No Action but without any anticipated exceedances of National or Montana Ambient Air Quality Standards. Similarly, the Proposed Action will contribute more GHG emissions over the entire life of the project than the No Action or Partial Mining Alternatives. Impacts to surface water and groundwater will be similar to the Partial Mining Alternative and will range from short-term to permanent and negligible to significant, depending on the location. Impacts to land uses will be moderate during the active mining period but, once reclaimed, will be negligible and similar to the other alternatives. Impacts to topography and physiography will occur during mining activities but will be negligible after reclamation. The Proposed Action has the greatest potential to disturb soils, geology, minerals, and paleontological resources. While WDA 1 and WDA 2 are already constructed and would be used for waste disposal under all three alternatives, the Proposed Action will create the greatest amount of CPW for disposal at these sites. Impacts to human health and safety would be similar under all three alternatives but would occur over a longer period of time in the Proposed Alternative. However, the Proposed Action has greater beneficial impact on jobs and funding for health and social services as compared to the other two alternatives. Impacts to vegetation, wildlife, threatened and endangered species, visual resources and cultural resources would be similar across the three alternatives but would occur over a larger area and for a longer time under the Proposed Action. Noise and vibration from mining activities would occur over the life of the mine but are expected to be negligible and similar to the other alternatives.

5.1.1 Finding

OSMRE is deciding to select the Proposed Action instead of the No Action or Partial Mining Alternatives, as the preferred alternative. Although the Proposed Action is not the environmentally preferrable alternative and will result in some direct, indirect, and other effects, as discussed, the Proposed Action is the alternative that best meets the project's purpose and need as well as other relevant considerations.

5.2 Socioeconomic Considerations

OSMRE's decision considered the socioeconomic effects of each alternative. The Proposed Action and the Partial Mining Alternative would extend the duration of employment for current employees and extend the economic benefits related to mining the Federal coal, including both state and Federal revenues, for longer than the No Action Alternative. The Partial Mining Alternative, however, would extend the employment benefits for a much shorter duration than the Proposed Action. The Partial Mining Alternative would extend the employment and economic benefits for the 5-year term of approval, but beyond that term, economic impacts would be uncertain because it is unknown if the ASLM would approve an additional mining plan modification for the remaining Federal coal. The No Action Alternative would not result in the employment or economic benefits associated with the Mine due to its limited duration as compared to the Proposed Action.

5.2.1 Finding

Direct and indirect socioeconomic impacts and other effects are described in Sections 4.16.1 and 4.16.2 of the Final EIS. OSMRE finds that the decision to select the Proposed Action was based in part on the information contained in these sections on the direct, indirect, and other effects impacts of this alternative as compared to other alternatives.

5.3 Considerations of Law and National Policy

In accordance with section 101(b) of NEPA, in addition to the environmental and economic considerations summarized above, OSMRE's decision included essential considerations of law and national policy.

5.3.1 National Environmental Policy Act of 1969

NEPA declares a national environmental policy and promotes consideration of environmental concerns by Federal agencies in decision making. DOI NEPA regulations are promulgated at 43 CFR part 46. The OSMRE NEPA Handbook also provided guidance for the Final EIS.

5.3.1.1 Finding

OSMRE finds that the Final EIS analyzes more impacts than is required under NEPA (see **Section 1.4**), and it complies with the procedural and analytical requirements of NEPA, including the Department's regulations and procedures implementing NEPA at 43 CFR part 46 and in part 516 of the Departmental Manual and with the Alternative Arrangements for NEPA Compliance. OSMRE's selection of Proposed Action is consistent with 42 U.S.C. § 4332(2)(B) because OSMRE has insured "that presently unquantified environmental amenities and values [were] given appropriate consideration in decision making along with economic and technical considerations."

5.3.2 Mineral Leasing Act of 1920

The BLM's authority to manage the public's coal resources comes from two laws: the MLA, as amended, and the Mineral Leasing Act for Acquired Lands of 1947, as amended. These Acts provide for the leasing of minerals from public lands, including coal, and require that a royalty be paid on amounts mined and sold. The BLM's role is to conduct lease sales to ensure the public receives fair market value and to administer and ensure compliance with the terms and conditions of those leases. The BLM also monitors production to ensure maximum economic recovery of the public's coal resource and verifies that production for royalty collection by the DOI's Office of Natural Resources Revenue.

Before conducting any Federal coal development or mining operations on Federal leases or licenses, the operator/lessee must submit and obtain approval of a resource recovery and protection plan (R2P2) to the BLM. On August 11, 2012, the BLM received an R2P2 for the Mine, which included Federal coal lease MTM-97988. Following review, the BLM found the application to be complete and in conformance with the requirements of the MLA, as amended, and the applicable regulations at 43 CFR part 3480.

5.3.2.1 Finding

BLM's competitive lease sale and associated 2011 Coal Lease EA, and its review and approval of the R2P2 constituted compliance with the MLA. In addition, the MLA, as amended, also requires an approved mining plan before a significant disturbance of the environment may occur. 30 U.S.C. § 207(c). OSMRE's recommendation of the Proposed Action of this mining plan modification, if approved by the ASLM, will be consistent with the R2P2 and will complete compliance with the MLA.

5.3.3 Surface Mining Control and Reclamation Act of 1977

Before the commencement of any coal development or mining operations on a Federal lease or license, a permit application package (PAP) containing, among other documents, a R2P2 and a permit application must be submitted to the regulatory authority responsible for issuing SMCRA permits.

SMCRA establishes a program of cooperative Federalism that allows a state or tribe to enact and administer its own SMCRA regulatory program on non-Federal and, for states, non-Indian lands within its borders and subject to limits established by Federal minimum standards and with prescribed oversight and enforcement authority by OSMRE (30 U.S.C. § 1253). The Montana permanent program was approved by the Secretary in 1982. 30 CFR § 926.10. MDEQ administers the Montana Strip and Underground Mine Reclamation Act (MSUMRA), which is the state equivalent of SMCRA, and the Montana Environmental Policy Act (MEPA). In addition, DOI and Montana entered into a State-Federal Cooperative Agreement in 1998 that allows Montana to be the primary SMCRA regulatory authority on Federal lands within Montana.

On October 5, 2012, SPE submitted a PAP to MDEQ for Mining Permit C1993017 (AM 3) for Federal coal future mining. MDEQ found the PAP to be administratively complete in October 18, 2013. A PAP notice was published in the local newspaper for four consecutive weeks followed by a 30-day public comment period.

In 2016, MDEQ completed a checklist EA pursuant to the MEPA to assess potential environmental impacts of the PAP. The MDEQ published the EA and a Determination of Acceptability, followed by a public notice period. MDEQ approved the permit revision on May 24, 2016.

5.3.3.1 Finding

OSMRE finds that MDEQ's review and approval of the permit revision, which covers all of the Proposed Action, constitutes compliance with SMCRA.

5.3.4 National Historic Preservation Act of 1966

Section 106 of the National Historic Preservation Act (NHPA) and its implementing regulations under 36 CFR part 800 require all Federal agencies to consider the effects of Federal actions on cultural resources eligible for or listed in the National Register of Historic Places (NRHP). Traditional cultural properties are also protected under Section 106 of the NHPA.

Multiple cultural resources surveys have been conducted within the direct and indirect effects study area and past, present, and RFFA effects study area. In 2024, a Class I survey was performed within the permit boundaries plus a 0.25-mile buffer of AM 3, 4, 5, and 6 areas and within waste disposal area 2 identified in AM 2. The Class I report provides a consolidated summary of the cultural resources previously identified within these areas from the Class III cultural resources surveys.

Within the direct and indirect effects study area, which are the areas subject to this Federal undertaking, a total of 22 cultural resources have been identified. Of these, 20 are precontact sites and 2 are post-contact sites. None of these sites have been determined eligible for the NRHP, one site is recommended eligible for the NRHP, 5 sites have not been evaluated for NRHP eligibility, 3 sites are recommended as not eligible for the NRHP, and 13 sites have been determined ineligible for the NRHP.

Sites that are recommended or determined eligible for listing in the NRHP must be avoided by surface-disturbing activities. Sites that are recommended eligible for the NRHP or have unresolved or undetermined NRHP eligibility are treated as NRHP eligible sites and must be avoided by surface-disturbing activities until such time as additional investigation and evaluation can be performed upon these sites and NRHP eligibility can be determined by SHPO. Per Section 106 of the NHPA, if avoidance of surface-disturbing activities is not possible, minimization and mitigation measures to resolve or reduce adverse effects to these sites must be developed and agreed upon within a Memorandum of Agreement between OSMRE, SHPO, and the Project lessee as signatories. Other consulting parties may sign as concurring parties to review and agree to the terms of the agreement. Sites recommended and determined not eligible for listing in the NRHP require no further treatment or consideration, and avoidance is not necessary.

5.3.4.1 Finding

OSMRE finds that the Section 106 process is complete and complies with the NHPA. Per Section 106 of the NHPA, if avoidance of surface-disturbing activities is not possible, minimization and mitigation measures to resolve or reduce adverse effects to these sites must be developed and agreed upon within a Memorandum of Agreement between OSMRE, SHPO, and the Project lessee as signatories. Other consulting parties may sign as concurring parties to review and agree to the terms of the agreement. Sites recommended and determined not eligible for listing in the NRHP require no further treatment or consideration, and avoidance is not necessary.

5.3.5 Endangered Species Act of 1973

Section 7(a)(2) of the Endangered Species Act (ESA) requires each Federal agency to ensure that its activities are not likely to jeopardize the continued existence of listed species or adversely modify designated critical habitats.

On May 9, 2025, the U.S. Fish and Wildlife Service (USFWS) provided an official letter and species list to OSMRE for the Project. The species list included the Rufa Red Knot (*Calidris canutus rufa*) (Federally Threatened), monarch butterfly (*Danaus Plexippus*) (Federally Proposed Threatened), and Suckley's cuckoo bumble bee (*Bombus suckleyi*) (Federally Proposed Endangered). A biological assessment (BA) was submitted to the USFWS on May 9, 2025. The USFWS concurred with OSMRE's findings on May 23, 2025.

5.3.5.1 Finding

OSMRE finds that the selection of the Proposed Action complies with the ESA based on the analysis outlined above and satisfies OSMRE's obligations under the ESA. OSMRE's determination for the three species are as follows:

- **Rufa Red Knot -** OSMRE has determined the Proposed Action may affect, but is not likely to adversely affect, the rufa red knot. In addition, OSMRE determined the Proposed Action will have "no effect" on rufa red knot proposed critical habitat. Critical habitat for the rufa red knot is approximately 1,375 miles away on the east coast shoreline.
- **Monarch Butterfly -** OSMRE has determined the Proposed Action "is not likely to jeopardize the continued existence" of the monarch butterfly. In addition, OSMRE determined the Proposed Action will have "no effect" on monarch butterfly proposed critical habitat. The closest critical habitat for monarch butterfly is 890 miles away in California.
- **Suckley's Cuckoo Bumble Bee -** OSMRE has determined the Proposed Action "is not likely to jeopardize the continued existence" of the Suckley's cuckoo bumble bee. No critical habitat or proposed critical habitat has been designated for the Suckley's cuckoo bumble bee.

5.3.6 Clean Air Act of 1970

The State of Montana administers the Federal Clean Air Act and the Montana Clean Air Act. Montana Air Quality Permits (MAQP) are issued by the MDEQ. The Mine's current MAQP #3179-13 limits the Mine to producing a maximum of 15 Mt of raw coal per year to ensure that all potential sources of air pollutants from mining operations comply with the Montana Clean Air Act. Under the Proposed Action, mining rates would vary from year to year, but the anticipated average mining rate would be approximately 7.1 Mtpy of saleable coal based on annual coal sales between 2018 and 2023; thus, the Mine should be well under the required limits under the Proposed Action.

5.3.6.1 Finding

OSMRE finds that the Proposed Action is within the production rate limitations of the Mine's current air quality permit and complies with the Clean Air Act.

5.3.7 Clean Water Act 1972

MDEQ is responsible for administering the Federal Clean Water Act and the Montana Water Quality Act, which prevents degradation of surface water and groundwater due to discharges of mine wastewater and storm water. The Montana Pollutant Discharge Elimination System (MPDES) permit is required for surface water and storm water discharges, while the Montana Ground Water Pollution Control System (MCWPCS) permit is required for ground water discharge.

Mining operations in Montana must be designed and conducted in a way to minimize disturbance of the hydrologic balance within the permit and adjacent areas and prevent material damage to the hydrologic balance outside the permit area. Discharges of water from areas disturbed by underground mining activities will be made in compliance with all applicable State and Federal water quality laws and regulations and with the effluent limitations for coal mining promulgated by the U.S. Environmental Protection Agency set forth in 40 CFR part 434. Mine discharges are regulated and monitored in accordance with MPDES Permit MT0028983. In addition, SPE has a Multi-Sector General Permit (MSGP) for storm water discharges associated with industrial activity (MTR000499) and general permits for storm water discharges associated with construction activity (MTR106575, MTR110051, MTR110025, and MTR109874).

The Final EIS analyzes the direct, indirect, and other effects to surface and groundwater resources from the proposed mining plan modification (Section 4.4.2 and 4.4.3).

5.3.7.1 Finding

OSMRE finds that the Proposed Action, under Mine's current water quality permits, complies with the Clean Water Act.

5.3.8 Applicable Executive Orders

EO 14156 (Declaring a National Energy Emergency) recognized the essential need for the production of energy minerals, such as coal, and prioritized the national and economic security considerations that underly the need to expand the country's energy infrastructure. Furthermore, it recognized:

> [T]he United States has the potential to use its unrealized energy resources domestically, and to sell to international allies and partners a reliable, diversified, and affordable supply of energy. This would create jobs and economic prosperity for Americans forgotten in the present economy, improve the United States' trade balance, help our country compete with hostile foreign powers, strengthen relations with allies and partners, and support international peace and security. Accordingly, our Nation's dangerous energy situation inflicts unnecessary and perilous constraints on our foreign policy.

EO 14154 (*Unleashing American Energy*), as reinforced by Secretary's Order (S.O.) 3418, directs Federal agencies, such as OSMRE, to protect national economic, security, and military preparedness by ensuring that an abundant supply of reliable energy is readily accessible in every State and territory of the United States; to ensure that all regulatory requirements related to energy are grounded in clearly applicable law; and to ensure that the global effects of a rule, regulation, or action shall, whenever evaluated, be reported separately from its domestic costs and benefits, in order to promote sound regulatory decision making and prioritize the interests of the American people; and to guarantee that all executive departments and agencies provide opportunity for public comment and rigorous, peer-reviewed scientific analysis.

EO 14154 also requires Federal agencies to adhere to only the relevant legislated requirements for environmental considerations and requires agencies to use the most robust methodologies of assessment at their disposal and shall not use methodologies that are arbitrary or ideologically motivated. As noted above, this EO withdrew any guidance, instruction, recommendation, or document issued by the IWG.

EO 14261 (*Reinvigorating America's Beautiful Clean Coal Industry*) recognized that "America's coal resources are vast, with a current estimated value in the trillions of dollars, and are more than capable of substantially contributing to American energy independence with excess to export to support allies and our economic competitiveness. . . . We must encourage and support our Nation's coal industry to increase our energy supply, lower electricity costs, stabilize our grid, create high-paying jobs, support burgeoning industries, and assist our allies." Section 2 of EO 14261 clearly stated that it is the policy of the United States remove regulatory barriers to increase coal exports.

5.3.8.1 Finding

OSMRE finds that selection of the Proposed Action best meets the policy goals identified in the Executive Orders. OSMRE recognizes that almost all of the coal that the Mine produces is exported to Japan and South Korea. This Mine's exports help strengthen our relationship with these two important partners of the United States and make them more resilient in deterring aggression by China in the Indo-Pacific. In addition, the production of coal at this Mine helps support high-paying American jobs and reduces America's trade deficit.

Moreover, nothing in the MLA requires OSMRE to consider any specific environmental resource areas or metrics. Section 5(c) of EO 14154 requires all agencies, which includes OSMRE, to "prioritize efficiency and certainty over any other objectives . . . ." Selection of the Proposed Action is more efficient and certain than the No Action Alternative, which would leave a lot of beautiful clean coal unmined, or the Partial Mining Alternative, which would leave the mine in limbo after 5 years.

5.4 Tribal Consultation

On August 3, 2023, and May 15, 2024, letters were mailed to the Tribes inviting consultation with OSMRE and informing the Tribes of OSMRE's intent to prepare an EIS in response to the Court's decision. Letters were sent to additional Tribes on December 10, 2024. OSMRE did not receive any responses from the Tribes.

On June 14, 2024, OSMRE sent a letter to the President of the Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation, Montana, to offer the opportunity to comment on the

Proposed Action and mining plan modification for Federal coal that would result in continued underground mining in the AM 3 area. If the mining plan modification is approved, SPE would eventually reach non-Federal coal where the Northern Cheyenne Tribe has royalty interests as codified by the Northern Cheyenne Lands Act (NCLA). No comments were received.

5.4.1.1 Finding

OSMRE finds it has made a good faith and reasonable effort to invite any tribes that may be affected by the Proposed Action to consult on OSMRE's decision and that it has satisfied all tribal consultation obligations when selecting the Proposed Action.

Chapter 6
Approval

In consideration of the information presented above, I approve this OSMRE ROD and the selection of the Proposed Action, as described in **Section 4.2** of this ROD. The State of Montana has approved the Montana Strip and Underground Mine Reclamation Act (MSUMRA) permit, which sets forth requirements to minimize environmental impacts that could potentially occur as a result of the Proposed Action. Accordingly, I recommend approval of the mining plan modification to the ASLM, consistent with the Proposed Action. This action can be implemented following approval of the mining plan modification by the ASLM.

This ROD is effective on signature.

MARCELO CALLE

Digitally signed by MARCELO CALLE
Date: 2025.06.04 19:24:36 -06'00'

Marcelo Calle, Acting Regional Director
U.S. Department of Interior, Regions 5 & 7-11
Office of Surface Mining Reclamation and Enforcement

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U.S. Department of the Interior
Office of Surface Mining Reclamation and Enforcement

Bull Mountains Mine No. 1 Federal Mining Plan for Federal Lease MTM-97988 Amendment 3

Final Environmental Impact Statement

EISX-010-08-000-1732112615

June 2025

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Acronyms and Abbreviations

Acronym	Definition
µm	per meter
µS/cm	microSiemens/cm
ACHP	Advisory Council on Historic Preservation
ACS	American Community Survey
AM	Amendment
AML	abandoned mine land
AMRF	Abandoned Mine Reclamation Fund
amsl	above mean sea level
ANWR	Aransas National Wildlife Refuge
AR6	Sixth Assessment Report
ARM	Administrative Rules of Montana
asl	above sea level
ASLM	Assistant Secretary for Land and Minerals Management
BACT	Best Available Control Technology
BCC	Birds of Conservation Concern
BCR	Badlands and Prairies
BGEPA	Bald and Golden Eagle Protection Act
BLM	Bureau of Land Management
BLM Coal Lease EA	Bull Mountains Mine No. 1, Federal Coal Lease MTM-97988, Musselshell County, Montana, EA No. DOI-BLM-MT-C010- 2009-0010-EA
BMCM	Bull Mountain Coal Mining, Inc.
BNSF	BNSF Railway
BRWL	blue-rich white light lamps
BTUs	British Thermal Units
CAA	Clean Air Act
CAPs	Criteria Air Pollutants
Catena	Catena Consulting, LLC
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfs	cubic feet per second
CH_4	methane
CHIA	cumulative hydrologic impact analysis
CHM	conceptual hydrologic model
CII	carbon intensity indicator
Clean Water Act	Federal Water Pollution Control Act
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalents

Acronym	Definition
COPCs	Chemicals of Potential Concern
Corps	U.S. Army Corps of Engineers
COVID-19	coronavirus
CPW	Coal Processing Waste
CRP	Conservation Reserve Program
CWA	Clean Water Act
dBA	A-weighted decibels
DEQ	Department of Environmental Quality
DNL	Day-night average noise level
DNRC	Department of Natural Resources and Conservation
DOT	U.S. Department of Transportation
DPM	Diesel Particulate Matter
DV	design value
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESI	Environmental Solutions & Innovations, Inc.
FO	Field Office
FONSI	Finding of No Significant Impact
FPBO	Final Programmatic Biological Opinion
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
FWP	Fish, Wildlife and Parks
FY	fiscal year
GHG	greenhouse gas
GHGRP	Greenhouse Gas Reporting Program
gpm	gallons per minute
Gt CO_2e	gigatons of CO2e
GTMC/G	gross-ton miles of cars per gallon of fuel
GWIC	Groundwater Information Center
GWP	global warming potential
H_2S	hydrogen sulfide
HAPs	hazardous air pollutants
HD	Hunting District
HD	Hunting District
HELP	Hydrologic Evaluation of Landfill Performance
IM	instruction memoranda
IMO	International Maritime Organization
in/sec	inches per second
INDC	Intended Nationally Determined Contribution

Acronym	Definition
IPaC	Information for Planning and Consultation
IPCC	Intergovernmental Panel on Climate Change
IWG	Interagency Working Group
K	Kelvin
lb/mile	pounds per mile
LBA	Lease by Application
L_{dn}	day-night level
L_{ED}	light-emitting diode
L_{eq}	Equivalent Sound Level
LOM	Life-of-Mine
MAAQS	Montana's Ambient Air Quality Standards
MAQP	Montana Air Quality Permit
MATS	Maximum Achievable Control Technology Standards
MBTA	Migratory Bird Treaty Act
MDA	Montana Department of Agriculture
MDEQ	Montana Department of Environmental Quality
MDSL	Montana Department of State Lands
MEPA	Montana Environmental Policy Act
MFP	Management Framework Plan
MFWP	Montana Department of Fish, Wildlife & Parks
Mine	Bull Mountains Mine No.1 underground coal mine
MLA	Mineral Leasing Act of 1920, as amended
MMT	million metric tons
MOU	Memorandum of Understanding
MPDD	mining plan decision document
MPDES	Montana Pollutant Discharge Elimination System
MR	Minor Revision
MSGP	Multi-Sector General Permit
MSHA	Mine Safety and Health Administration
MSHA	Mine Safety and Health Administration
MSUMRA	Montana Strip and Underground Mine Reclamation Act
Mt	million tons
MT	Montana
MTNHP	Montana Natural Heritage Program
Mtpy	million tons of raw coal per year
MWQA	Montana Water Quality Act
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NCLA	Northern Cheyenne Lands Act
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NHPA	National Historic Preservation Act

Acronym	Definition
NIOSH	National Institute for Occupational Safety and Health
NO_2	nitrogen dioxide
NOI	Notice of Intent
NON	Notice of Noncompliance
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
OHWM	ordinary high-water mark
OSHA	Occupational Safety and Health Administration
OSMRE	Office of Surface Mining Reclamation and Enforcement
Panel 15	a shortened-width panel
PFYC	Potential Fossil Yield Classification
PHC	Probable Hydrologic Consequences
PM	particulate matter
PM_{10}	particulate matter with aerodynamic diameters less than or equal to 10 microns
$PM_{2.5}$	particulate matter with less than or equal to 2.5 microns
PPE	personal protective equipment
PPV	peak particle velocity
PRB	Powder River Basin
PRPA	Paleontological Resources Preservation Act of 2009
RCRA	Resource Conservation and Recovery Act
RFFAs	reasonably foreseeable future actions
RMP	Resource Management Plan
ROD	Record of Decision
ROK	Republic of Korea
ROM	Run of mine
SARA	Superfund Amendment and Reauthorization Act
SC	specific conductance
SDWA	Safe Drinking Water Act
SHPO	State Historic Preservation Office

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Chapter 1

Purpose and Need

1.1 Introduction

Signal Peak Energy, LLC (SPE) owns and operates the existing Bull Mountains Mine No.1 underground coal mine (Mine) located in the Bull Mountains of south-central Montana (**Figure 1.1-1**). The Mine includes a mix of private, state, and federally owned surface and mineral interests. Land status, including surface and subsurface ownership, is shown on **Figure 1.1-2**. The Mine is located in Musselshell and Yellowstone Counties between the Musselshell River and the Yellowstone River, approximately 30 miles north of Billings and 20 miles southeast of Roundup, Montana. The vast majority of coal is mined using the longwall method; the remaining development coal is mined using the room-and-pillar method. All coal is washed to improve coal quality and shipped from an onsite rail car loading facility (tipple). The coal produced from the Mine is predominantly transported via rail to the Westshore shipping port in Vancouver, British Columbia, Canada (**Figure 1.1-3**), and to a much lesser extent, to Superior, Wisconsin (**Figure 1.1-4**). The remaining coal is trucked to local and other U.S. destinations (see **Section 2.2.8**). It is anticipated that future shipments will continue to follow this general distribution pattern.

As described in greater detail below in **Section 1.2**, following a series of legal challenges to the adequacy of Office of Surface Mining Reclamation and Enforcement's (OSMRE) National Environmental Policy Act (NEPA) analysis, the District Court for the District of Montana vacated a 2018 mining plan modification approval for the expansion of the Mine into an area known as "Amendment (AM) 3," which would have allowed part of Federal coal lease MTM-97988 to be mined. The vacatur of this mining plan modification means that SPE is not authorized to mine leased Federal coal within AM 3. At the time of the vacatur, SPE was actively mining within the area of AM 3. In order to continue mining the remaining Federal coal in AM 3, SPE must obtain a new mining plan modification approval from the Department of the Interior's (DOI's) Assistant Secretary for Land and Minerals Management (ASLM); approximately 1,239.6 acres of Federal lands and approximately 22.8 million tons (Mt) of saleable Federal coal remains in AM 3. The Proposed Action is described in greater detail in **Section 2.3.2**. OSMRE prepared this environmental impact statement (EIS) to reevaluate the environmental impacts, including impacts from greenhouse gas (GHG) emissions, from the proposed Mine expansion, in accordance with NEPA. OSMRE's analysis of SPE's Proposed Action will, in part, inform its recommendation to the ASLM to approve, disapprove, or approve with conditions the mining plan modification.

Figure 1.1-1. Project Location

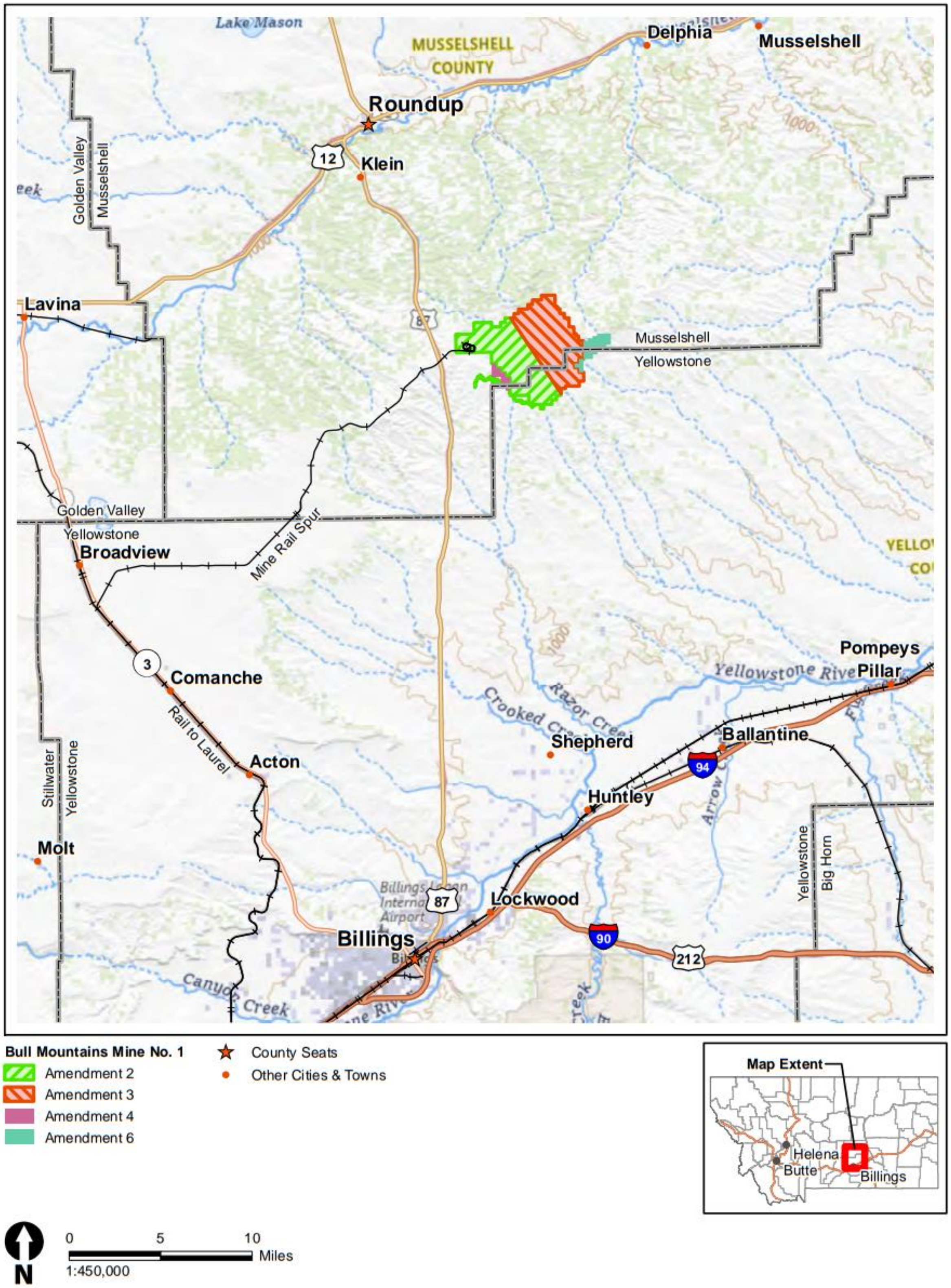


Figure 1.1-2. Surface and Subsurface Ownership

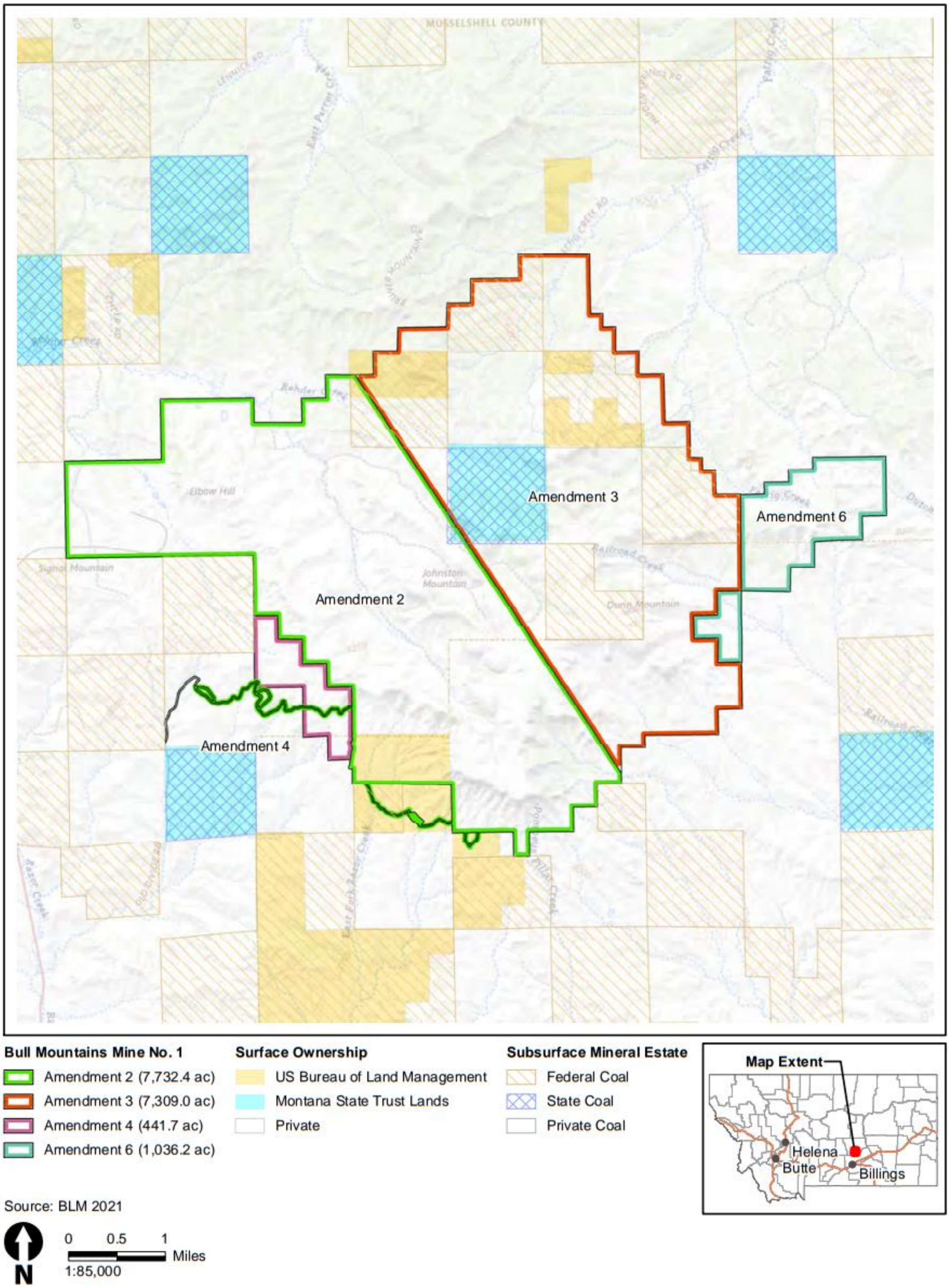


Figure 1.1-3. Westshore Shipping Port, Vancouver, British Columbia

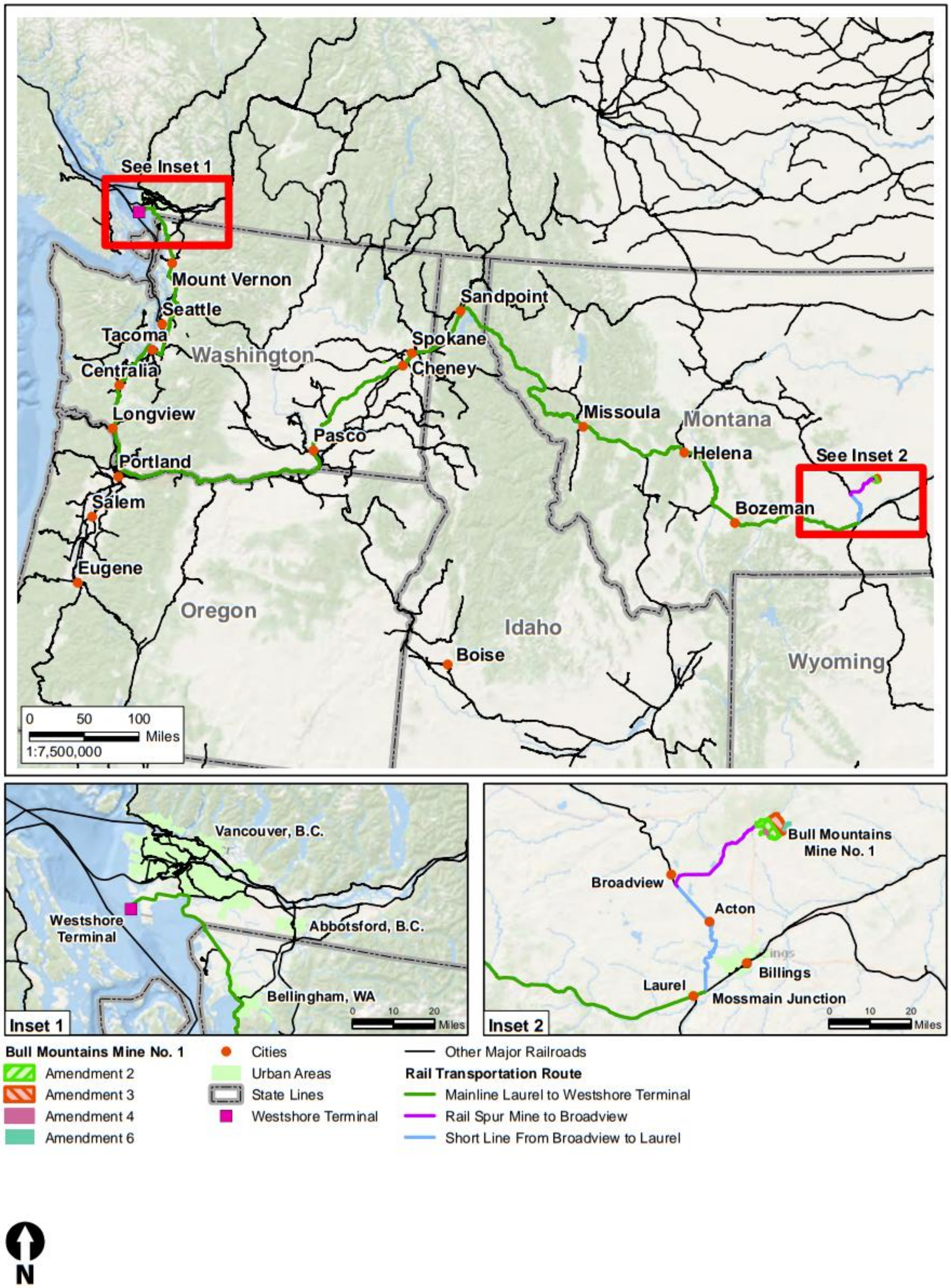
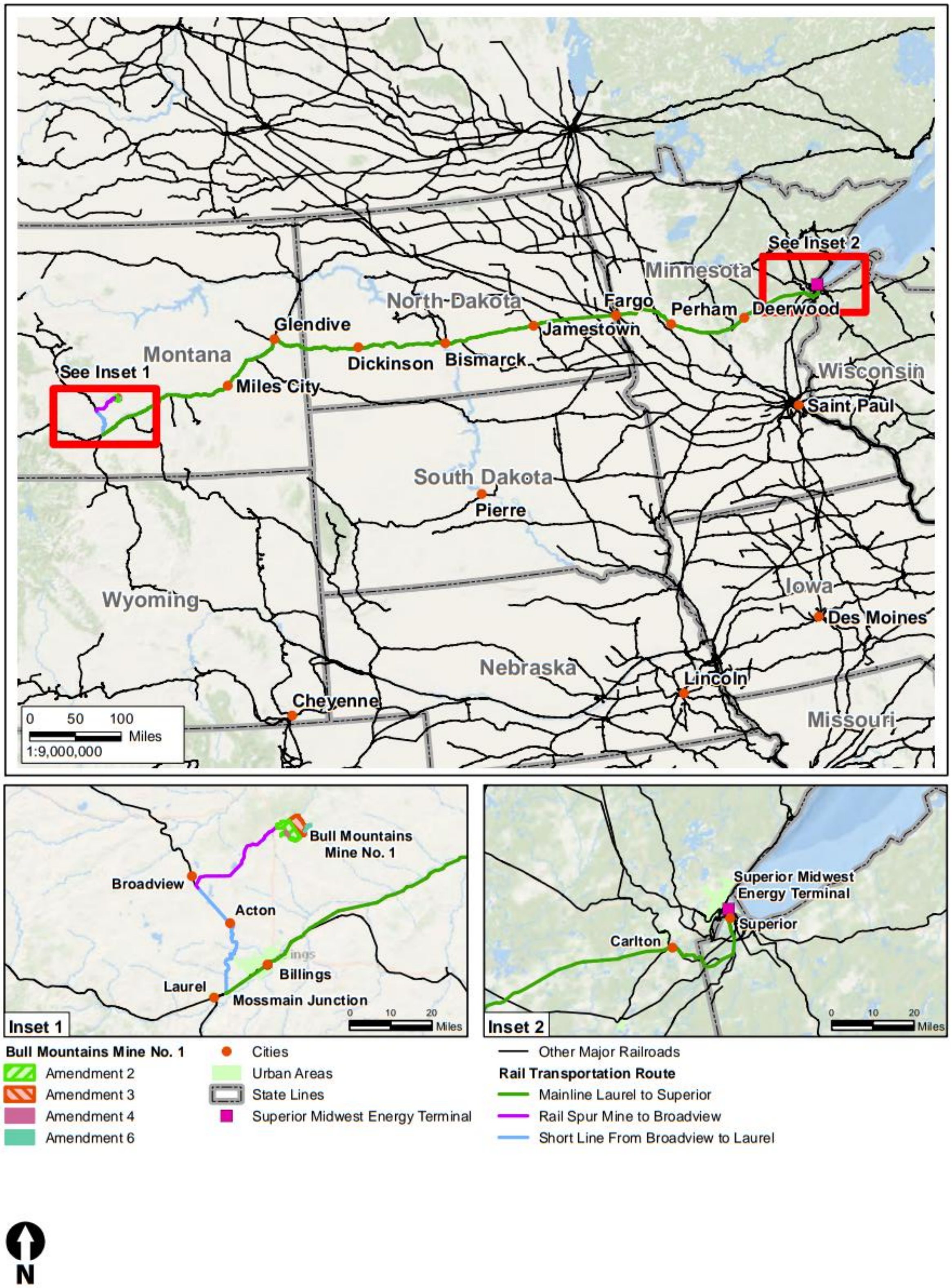


Figure 1.1-4. Superior Shipping Port, Wisconsin



1.2 Project Background

In 1992, the Montana Department of Environmental Quality (MDEQ) issued a mining permit to Meridian Minerals, a subsidiary of Burlington Northern Resources, pursuant to the Montana equivalent of the Surface Mining Control and Reclamation Act of 1977 (SMCRA). In 2008, the Mine was purchased by Boich Companies and FirstEnergy Corporation and was transferred to SPE. On March 19, 2008, SPE filed an application with the Bureau of Land Management (BLM) to lease approximately 2,679.76 acres of Federal coal (MTM-97988) in Sections 4, 8, 10, 14, and 22, Township 6 North, Range 27 East, Musselshell County. BLM processed the Lease by Application (LBA) in accordance with regulations found at 43 Code of Federal Regulations (CFR) Subpart 3425. The environmental assessment (EA), titled "*Bull Mountains Mine No. 1, Federal Coal Lease MTM-97988, Musselshell County, Montana, EA*," No. DOI-BLM-MT-C010- 2009-0010-EA (BLM 2011) (hereafter BLM Coal Lease EA), was prepared to satisfy BLM's requirements under NEPA and the Mineral Leasing Act of 1920, as amended. OSMRE participated as a cooperating agency during preparation of the BLM Coal Lease EA.

The BLM Coal Lease EA analyzed potential impacts associated with leasing five tracts of Federal coal, totaling 2,679.76 acres, which would allow the Mine to continue producing coal instead of ceasing production as recoverable private coal reserves were exhausted. The BLM Coal Lease EA addressed two alternatives, the No Action Alternative and the Proposed Action. On April 15, 2011, based on a review of the BLM Coal Lease EA, BLM's Billings Field Office issued a Finding of No Significant Impact (FONSI) for implementing the proposed leasing action. The FONSI was based on the information contained in the BLM Coal Lease EA and consideration of the Council on Environmental Quality's (CEQ) regulations in effect at that time related to the criteria for significance (40 CFR § 1501.3(d)). BLM issued the Notice of Coal Lease Application MTM-97988-Bull Mountain Coal Properties on July 30, 2008.

As authorized by the Surface Mining Control and Reclamation Act of 1977 (SMCRA) (30 United States Code [U.S.C.] 1201 *et. seq*.), the State of Montana has a Federally approved coal regulatory program (hereafter "Montana State Program") administered by MDEQ, which allows Montana primary jurisdiction over the regulation of surface coal mining operations on non-Federal, non-Indian lands within its borders with oversight enforcement authority provided by OSMRE. As also authorized by SMCRA, OSMRE has entered into a State-Federal Cooperative Agreement with Montana, which allows Montana primary jurisdiction to regulate surface coal mining operations on Federal lands, subject to Federal law and the terms of that agreement (30 CFR § 926.30). Under this authority, MDEQ approved a mining permit (C1993017) for the Mine (Mine Permit) in accordance with the Montana Strip and Underground Mine Reclamation Act (MSUMRA). Mining and reclamation methods specified in the permit must be consistent with requirements of SMCRA, the implementing Federal regulations (30 CFR Chapter VII), and the State-Federal Cooperative Agreement.

On October 4, 2012, MDEQ approved SPE's application for AM 2 to modify the Mine Permit to include a portion of the Federal coal lease MTM-97988 and adjacent private lands and coal. Although under SMCRA and the State-Federal Cooperative Agreement, MDEQ has primary jurisdiction to regulate surface coal mining operations, that jurisdiction does not extend to the issuance of a mining plan for leased Federal coal as required by Section 7(c) of the Mineral Leasing Act of 1920, as amended (MLA) (30 U.S.C. 207(c)). For leased Federal coal, before any mining disturbance can occur, the ASLM must approve a mining plan, after receiving a recommendation from OSMRE (30 CFR Parts 740-746). OSMRE adopted the BLM Coal Lease EA, and OSMRE signed a FONSI on July 26,

2013. OSMRE prepared a mining plan decision document (MPDD) recommending approval, and, on August 2, 2013, the ASLM signed a mining plan approval authorizing mining of 140 acres of leased Federal coal lands within the AM 2 boundary for the Mine.

On October 5, 2012, SPE submitted an application to MDEQ for AM 3, which would allow the Mine to amend its mining permit to incorporate additional areas of Federal coal lease MTM-97988. MDEQ reviewed the permit application under the Montana State Program, the Federal Lands Program (30 CFR Chapter VII, Subchapter D), and the Montana Cooperative Agreement (30 CFR § 926.30). MDEQ approved the permit application for AM 3 on October 18, 2013. The boundaries of AM 2 and AM 3 are shown in **Figure 1.1-2**.

In 2014, OSMRE prepared an EA titled "Bull Mountains No. 1 Federal Mining Plan Modification Environmental Assessment" (2015 EA) analyzing potential impacts associated with the AM 3 mining plan modification. OSMRE signed the FONSI on January 27, 2015. OSMRE prepared an MPDD recommending approval, and the ASLM approved the mining plan modification for AM 3 on February 24, 2015. SPE continued mining in accordance with the amended Mine Permit and approved mining plan modification and crossed the AM 2 boundary into the AM 3 area in approximately May 2015 (OSMRE 2018).

The ASLM's 2015 decision was challenged, and, on August 14, 2017, the U.S. District Court for the District of Montana granted summary judgment to the plaintiffs on certain NEPA-related claims and vacated the mining plan modification pending additional NEPA review (*see Mont. Envtl. Info. Ctr. v. OSMRE*, 274 F. Supp. 3d 1074, 1081 (D. Mont. 2017)). Subsequent orders dated October 31, 2017, and November 3, 2017, authorized limited development work displacing and storing no more than 170,000 tons of Federal coal in Section 8 but required the mined Federal coal to be stockpiled and stored at the Mine and prohibited it from being sold or shipped pending compliance with NEPA.

In 2018, OSMRE finalized a new EA (2018 EA) and FONSI that addressed the errors identified by the district court in its 2017 ruling. The ASLM approved a new mining plan modification on August 3, 2018. OSMRE's 2018 EA and OSMRE's Endangered Species Act (ESA) compliance were challenged in court and on March 9, 2020, the district court granted the government's motion for summary judgment on all but one of plaintiffs' claims (*350 Montana v. Bernhardt*, 443 F. Supp. 3d 1185 (D. Mont. 2020)). On the remaining claim, the district court found that OSMRE failed to analyze the risk of increased coal train derailments and directed OSMRE to correct its analysis, the court did not vacate the 2018 mining plan modification at this time. To address the court order, OSMRE prepared another EA in 2020 (2020 EA) specifically addressing the potential for train derailment along the rail transportation route.

Plaintiffs appealed the March 2020 district court decision on the 2018 EA and ESA compliance to the U.S. Court of Appeals for the Ninth Circuit. On April 4, 2022, a panel of the Ninth Circuit held that OSMRE's findings related to GHG emissions in its 2018 EA were arbitrary and capricious and remanded the case back to the district court (*350 Montana v. Haaland*, 29 F.4th 1158, 1170-1171). On February 10, 2023, the district court vacated the 2018 mining plan modification approval (*350 Mont. v. Haaland*, 2023 U.S. Dist. LEXIS 23219, *5 (Mont. Dist. 2023)). Because the 2018 mining plan modification was vacated by the court, SPE was required to immediately stop all mining of leased Federal coal covered by the mining plan modification for AM 3 and obtain a new mining plan modification approval from ASLM before resuming mining leased Federal coal. SPE is currently only allowed to mine non-Federal coal within AM 3 at the Mine.

SPE is currently seeking a new mining plan modification to continue coal mining on approximately 1,239.6 acres of leased Federal coal lands within AM 3. Without authorization from the ASLM to mine the leased Federal coal, SPE is unable to access most of the non-Federal coal resources within AM 3 due to the checkerboard mineral ownership pattern. Under the Proposed Action, approximately 22.8 Mt of saleable Federal coal and approximately 34.5 Mt of adjacent saleable non-Federal coal would be produced (**Table 2.3-1**). The Proposed Action also includes the development of MR279 (a shortened-width panel [Panel 15]), Waste Disposal Area (WDA) 2, and other ancillary surface disturbance (**Figure 2.3-2**).

This EIS was prepared, in accordance with the requirements of NEPA, DOI NEPA regulations and guidance, OSMRE's NEPA Handbook, and Executive Orders (EOs), including EO 14154[1] to fully analyze environmental impacts from the Proposed Action, including but not limited to GHG emissions generated by coal combustion to address deficiencies identified by the court in the 2018 EA. The EIS also considers new information available in analyzing potential environmental impacts that could result if mining of Federal coal lease MTM-97988 continues.

1.3 Purpose and Need

The EIS is being prepared in response to the Ninth Circuit's opinion that OSMRE violated NEPA when it failed to provide a convincing statement of reasons in its 2018 EA and FONSI why GHG emissions were not significant, and the district court's subsequent vacatur of the 2018 mining plan approval for AM 3. Before SPE can continue to mine the leased Federal coal within AM 3 pursuant to the MLA (30 U.S.C. § 207(c)), it must obtain approval of an operations and reclamation plan (known as a "mining plan") from the ASLM. To support the ASLM's decision, OSMRE must prepare a MPDD, which includes environmental documents such as those needed for compliance with NEPA and a recommendation to ASLM to either approve, disapprove, or approve with conditions, the proposed mining plan modification. This NEPA analysis informs OSMRE's recommendation.

SPE's need for this action is to exercise its rights under Federal coal lease MTM-97988 granted by the BLM to access and mine the Federal coal reserves in accordance with the mining and reclamation plan approved by MDEQ as AM 3 to the state surface mining permit. ASLM approval of the Federal mining plan modification is required by the MLA to mine Federal coal reserves within the AM 3 mining area.

1.4 Agency Authority and Actions

The major statutes relevant to the Proposed Action are:

[1] EO 14154, Unleashing American Energy (Jan. 20, 2025), and a Presidential Memorandum, Ending Illegal Discrimination and Restoring Merit-Based Opportunity (Jan. 21, 2025), require the Department to strictly adhere to NEPA, 42 U.S.C. §§ 4321 *et seq*. Further, such EO and Memorandum repeal EOs 12898 (Feb. 11, 1994) and 14096 (Apr. 21, 2023). Because EOs 12898 and 14096 have been repealed, complying with such EOs is a legal impossibility. OSMRE verifies that it has complied with the requirements of NEPA, including the Department's regulations and procedures implementing NEPA at 43 CFR Part 46 and Part 516 of the Departmental Manual, consistent with the President's January 2025 Order and Memorandum, as well as the Department's Alternative Arrangements for NEPA Compliance. OSMRE has also voluntarily considered the Council on Environmental Quality's (CEQ) rescinded regulations implementing NEPA, previously found at 40 CFR Parts 1500–1508, as guidance to the extent appropriate and consistent with the requirements of NEPA and EO 14154.

- Mineral Leasing Act of 1920, as amended by the Federal Coal Leasing Amendments Act of 1975, which authorizes the leasing of coal reserves and conditions of the leasing, and requires the Secretary's approval of an "operations and reclamation plan" for leased Federal coal, which is referred to as a "mining plan"; and
- SMCRA, which provides a framework under which coal mining and surface uses are regulated.

This EIS was drafted in large part before the Supreme Court's decision in *Seven County Infrastructure Coalition v. Eagle County, Colorado,* 2025 U.S. LEXIS 2068 (May 29, 2025) (*Seven County*). As a result, this EIS contains significantly more analysis than is required under NEPA because the Department has no control, for example, over the operation of mainline railroad or the combustion of coal. In light of the National Energy Emergency, the extensive prior litigation over this Project, and the efficient use of agency resources, OSMRE decided to leave this extraneous information, including, but not limited to, information on the potential indirect effects of non-GHG emission from downstream combustion, in this EIS rather than taking the time and resources to remove it. However, OSMRE maintains that under *Seven County*, no such analysis of these effects, which are attenuated in time and geography from the Mine expansion, is required because the Department has no control, for example, over the operation of mainline railroad or the combustion of coal. As a result, this EIS more than satisfies OSMRE's NEPA obligations to disclose the potential direct, indirect, and past, present, and reasonably foreseeable future actions (RFFAs) of the Project, including addressing the deficiencies identified by the Ninth Circuit by fully analyzing impacts from mining and reclamation activities and the transportation effects linked specifically to this Project (i.e., the railroad spur). This EIS was prepared consistent with NEPA DOI's NEPA regulations at 43 CFR part 46 and the Department's Alternative Arrangements for NEPA Compliance; OSMRE also considered CEQ's NEPA implementing regulations at 40 CFR parts 1500-1508 as guidance (2020 CEQ Guidance), OSMRE's NEPA Handbook, and other and current guidance and policy documents.

In addition to this NEPA review, the OSMRE's Federal action requires two other consultations: Section 7 of the ESA and Section 106 of the National Historic Preservation Act (NHPA) (see **Section 3.14**). OSMRE conducted these consultations parallel to the NEPA process.

OSMRE also invited the Tribes that could be affected by the Proposed Action at the Mine to participate in government-to-government consultation, including:

- Apache Tribe of Oklahoma
- Crow Tribe of Montana
- Fort Belknap Indian Community of the Fort Belknap Reservation of Montana
- Nez Perce Tribe
- Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation, Montana
- Shoshone-Bannock Tribes of the Fort Hall Reservation

Letters were mailed to Tribes on August 3, 2023, and May 15, 2024, inviting consultation with OSMRE and informing the Tribes of the agency's intent to prepare an EIS in response to the Court's decision. Additional consultation letters were sent to the following Tribes on December 10, 2024:

- Blackfeet Nation;
- Blackfeet Nation THPO;

- Fort Peck Assiniboine & Sioux Tribes;
- Fort Peck Assiniboine & Sioux Tribes THPO;
- Northern Arapaho Tribe of the Wind River Reservation; and
- Northern Arapahoe Tribe of the Wind River Reservation THPO.

1.4.1 Lead Agency – Office of Surface Mining Reclamation and Enforcement

OSMRE is the Lead Agency directing the preparation of this EIS for the Project (40 CFR § 1501.7(a)). OSMRE will make a recommendation whether to approve, approve with conditions, or disapprove the proposed mining plan modification to the ASLM after completing this NEPA analysis and compiling its MPDD.

1.4.2 Cooperating Agency

As defined in the NEPA regulations, (40 CFR § 1508.1(e)), "cooperating agency" means any Federal, State, Tribal, or local agency with jurisdiction by law or special expertise with respect to any environmental impact involved in a proposal that has been designated by the lead agency. OSMRE mailed letters to Federal agencies, State agencies, Tribes, counties, municipalities and conservation districts, non-government organizations, and individuals on March 17, 2023, informing them of the Project and inviting consultation with OSMRE. BLM and EPA are cooperating agencies on this Project. As defined in the NEPA regulations, (40 CFR § 1508.1(w)), "participating agency" means a Federal, State, Tribal, or local agency participating in an environmental review or authorization of an action. As the State regulatory authority for coal mining in Montana, the MDEQ is a participating agency on this Project.

1.4.3 Permits and Approvals

Table 1.4-1 provides a summary of the State and Federal permits, licenses, approvals, and analyses and their purposes. **Table 1.4-1** is not a comprehensive list of all permits, certificates, or approvals needed, but includes the primary Federal and State agencies with permitting responsibilities.

Table 1.4-1. Federal and State Permits, Licenses and Approvals Required for the Project

Agency	Permit/License	Approval Purpose
DOI – ASLM (with recommendation from OSMRE)	Approval of Mining Plan (30 CFR Part 746)	To allow SPE to mine Federal coal leases. Review of the proposed mining plan is coordinated with MDEQ and Federal agencies such as BLM. OSMRE recommends approval, disapproval, or conditional approval of the mining plan to ASLM.
DOI - BLM	Resource Recovery and Protection Plan (30 CFR § 746.13)	To allow SPE to mine Federal coal leases. BLM must make a finding and recommendation to OSMRE with respect to SPE's Resource Recovery and Protection Plan and other requirements of SPE's lease.

Agency	Permit/License	Approval Purpose
DOI - U.S. Fish and Wildlife Service (USFWS)	Endangered Species Act of 1973 (ESA) Section 7 Consultation (16 U.S.C. § 1536)	To protect threatened and endangered species and designated critical habitat.
MDEQ	Montana Strip and Underground Mine Reclamation Act (MSUMRA; Section 82-4-201, et seq., MCA) Surface Mine Operating Permit	To regulate surface coal mining. Proposed activities must comply with State environmental standards and criteria. Approval may include stipulations for final design of facilities and monitoring plans. A sufficient reclamation bond must be posted with MDEQ before implementing an operating permit modification. MDEQ will coordinate with OSMRE.
	Clean Air Act of Montana (Section 75-2-102, et seq., MCA) Air Quality Permit	To control particulate emissions of more than 25 tons per year.
	Montana Water Quality Act (Section 75-5-201 et seq., MCA) Montana Pollutant Discharge Elimination System (MPDES) Permit No MT0024619 and storm water MTR000514	To establish effluent limits, treatment standards, and other requirements for point source discharges, which includes storm water discharges to State waters. Coordinate with the U.S. Environmental Protection Agency (EPA).
	Hazardous Waste and Solid Waste Registration (various laws)	To ensure safe storage and transport of hazardous materials to and from the site and proper storage, transport, and disposal of solid wastes.
Montana State Historic Preservation Office	NHPA Cultural Resource Clearance (Section 106 Review) (16 U.S.C. § 470)	To review and comment on Federal compliance with the NHPA.

1.5 Public Participation

Public participation is an integral part of the NEPA process. OSMRE issued a Notice of Intent (NOI) to prepare an EIS in the *Federal Register* and announced the NOI through a news release and on its website on August 7, 2023. This NOI described the EIS as considering the remaining leased Federal coal in AM 3 as well as leased Federal coal in a proposed AM 5 area. OSMRE mailed public scoping letters to Federal agencies, State agencies, Tribes, counties, municipalities and conservation districts, non-government organizations, and individuals on August 7, 2023. The scoping period began on August 7, 2023, and ended September 6, 2023.

During the public scoping period, OSMRE hosted a public scoping meeting on August 30, 2023, at the Roundup Community Center in Musselshell County, Montana. The public was provided the opportunity to provide written comment on the Project via mail or email, as well as the opportunity to provide written comment during the public scoping meeting.

Several months after the completion of the public scoping period, SPE submitted an application for the proposed AM 6 to the MDEQ on November 7, 2023, seeking approval to mine additional non-Federal coal outside of AM 3. In addition, SPE submitted a letter to MDEQ on December 20, 2023, requesting a withdrawal of their previously submitted AM 5 application. Due to these state mine permit amendments, OSMRE provided the public a second opportunity to provide scoping comments, from May 15, 2024, through June 14, 2024. This second opportunity was posted to the OSMRE website and previously contacted parties and those that had already provided scoping comments were sent a letter notifying them of the changes and the opportunity to comment.

On June 14, 2024, OSMRE sent a letter to the President of the Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation, Montana, to offer the opportunity to comment on the Proposed Action and mining plan modification for Federal coal that would result in continued underground mining in the AM 3 area. If the mining plan modification is approved, SPE would eventually reach non-Federal coal where the Northern Cheyenne Tribe has royalty interests as codified by the Northern Cheyenne Lands Act (NCLA).

OSMRE received a total of 311 comment submittals (i.e., email, hard copy letter, or handwritten comment at the public meeting) containing 667 individual comments. Consistent with 40 CFR § 1501.9(e), comments received during the scoping process were reviewed to identify additional significant environmental issues for the EIS. Many comments received during the scoping period addressed more than one topic. The topics that received the greatest number of comments during the scoping period were related to air quality and climate change, water resources, and socioeconomics.

When the Acting ASLM approved SPE's request that the Department apply its alternative NEPA procedures to its proposed mining plan modification (see Record of Decision), the Acting ASLM also determined that additional public comment was unnecessary due to the prior robust opportunities for public participation and the fact that another 10-day comment period on another NOI, as outlined in the Department's alternative arrangements, was unlikely to yield different, substantive comments.

Chapter 2
Proposed Action and Alternatives

2.1 Proposed Action and Alternatives

This chapter describes the three alternatives evaluated in this EIS; the No Action Alternative, the Proposed Action, and the Partial Mining Alternative. This chapter also describes alternatives that were considered but not analyzed in detail.

Underground mining and reclamation activities have continued at the Mine since the 2011 BLM Coal Lease EA was prepared and Federal coal lease MTM-97988 was granted (see **Section 1.2**). The current Mine plan encompasses a permit area of approximately 16,519.3 acres and includes AMs 2, 3, 4, and 6 (see **Figure 1.1-2**).

Figure 2.1-1 identifies the area that has been disturbed or mined through 2023 (SPE 2024a) and approved disturbances, including:

- Minor Revision (MR) 300. MR300 was approved by the MDEQ in March 2023. MR300 includes the room and pillar mining adjacent to Panel "Zero" Right;
- AM 4. AM 4 was approved by MDEQ in September 2023 and includes development of Panel "Zero" Right;
- AM 3. Portions of AM 3 that were mined before vacatur of the 2018 mining plan modification, including the northern segment along Panel 9 and two (2) southern segments along panels 10 and 11.
- WDA 2. In 2017, MDEQ approved WDA 2 (State-approved Mine Permit (C1993017), which is permitted to be constructed, and is partially constructed. WDA 2 would have a capacity of 24.5 Mt of coal processing waste rock (CPW). As approved, WDA 2 would encompass approximately 223 acres and would be constructed, operated, and reclaimed in a manner comparable to existing WDA 1.

SPE is authorized to produce up to 15 million tons of raw coal per year (Mtpy) under Montana Air Quality Permit (MAQP) #3179-13). Before 2016, SPE mined approximately 14.3 Mtpy of raw coal, producing approximately 10.0 Mtpy of saleable coal (about 70 percent recovery). The remaining 30 percent, produced as coal processing waste (CPW), was transferred to the waste disposal area. Since 2016, saleable coal yields have increased to 80 percent.

Approximately 67.4 Mt of saleable coal (44.6 Mt of saleable non-Federal coal and approximately 22.8 Mt of saleable Federal coal) is expected to remain in the Mining Plan Area at the end of 2024 (see **Table 2.3-1**). SPE continues to mine using the longwall and room-and-pillar mining methods described in the BLM Coal Lease EA. All royalties are paid based on saleable tons. Total saleable coal recovery for the past 5 years is provided in **Table 2.1.1**.

Figure 2.1-1. Existing Mining Operations

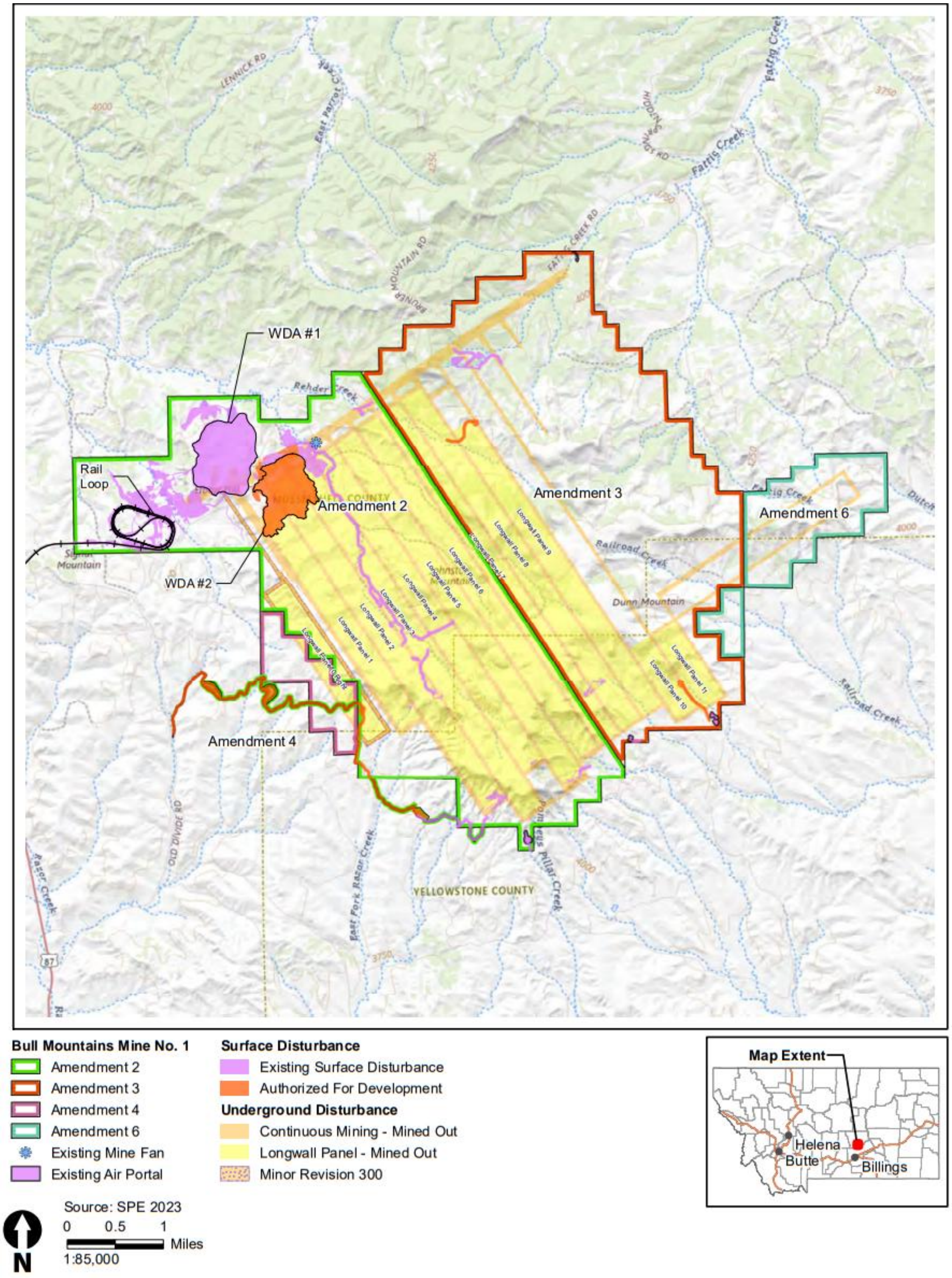


Table 2.1-1. Annual Saleable Coal Production

Year	Saleable Coal (Mt)
2012	5.72
2013	7.50
2014	8.03
2015	6.49
2016	5.96
2017	6.24
2018	7.52
2019	7.00
2020	5.91
2021	7.41
2022	7.25
2023	7.56

Sources: SPE 2024b

2.2 Existing Condition (Conditions Common to All Alternatives)

2.2.1 Surface Facilities Area

The majority of the surface activities related to underground mining occur within the surface facilities area (**Figure 2.2-1**). Surface facilities that occur in the Mine permit area include mine portals, run of mine (ROM) and clean coal stockpiles, coal processing facilities, a coal loadout facility and railroad loop, WDA 1, WDA 2 (WDA 2 was approved by MDEQ in 2017, authorized under the 2018 mining plan modification approval and is partially constructed), mine shop and offices, surface water control facilities, and other associated facilities.

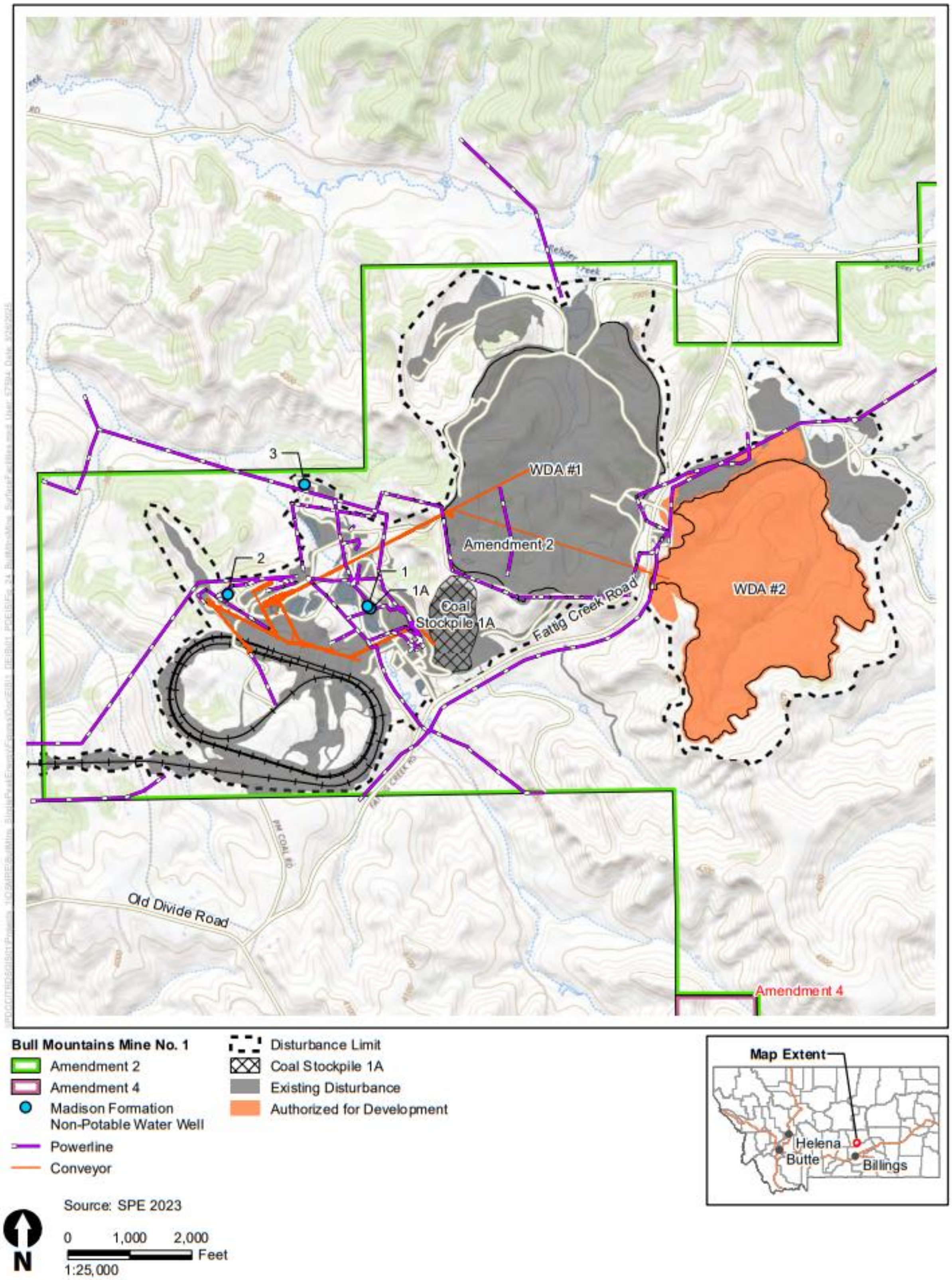
2.2.1.1 Underground Mining Process

The underground mining process is discussed in detail in the BLM Coal Lease EA (BLM 2011) and is incorporated by reference. The process of mining and extracting coal includes continuous and longwall mining methods as approved by MDEQ under the State-approved Mine Permit (C1993017) (BLM 2011). Continuous mining methods are used for development of production mains and longwall panels. The existing layout of the longwall panels are shown in **Figure 2.1-1**.

Longwall equipment is used to extract coal in panels between the development entries. This combination of mining methods is the most efficient in the underground coal mining industry and results in the highest coal recovery with the lowest costs while providing a safe working environment for mine personnel (BLM 2011).

ROM raw coal is crushed underground to a size of minus 6-inch. The coal is transferred from the underground conveyance system and discharged onto a belt conveyor. This conveyor discharges ROM coal into the stockpile. A collection ditch is maintained around the perimeter of this stockpile to keep coal sediment from washing onto the adjacent natural ground. Coal is stored in the stockpile area until it is ready to be moved by a conveyor to surface coal crushing and cleaning facilities for further processing, storage, and shipping. The entire surface facilities complex is involved in storage and processing of the coal and loading the coal for shipment.

Figure 2.2-1. Surface Facility Area



2.2.1.2 Waste Disposal Areas

Waste disposal operations are conducted as described in the BLM Coal Lease EA (BLM 2011) except for minor changes in waste handling described in OSMRE's 2018 EA (OSMRE 2018) and both are incorporated by reference. In 2010, SPE revised the State-approved Mine Permit and received a beneficial use determination to allow for the addition of fly ash (received from Yellowstone Energy) to accelerate drying of the CPW. MDEQ reviewed a chemical analysis of representative fly ash and concluded that the addition of ash to the CPW would not pose a risk to surface water, groundwater, or other environmental conditions.

WDA 1 has an approved design capacity of approximately 44.0 Mt, of which approximately 8.0 Mt is still available. In 2017, MDEQ approved WDA 2, which is permitted to be constructed southeast of WDA 1 and across Fattig Creek Road. WDA 2 has an approved design capacity of approximately 24.5 Mt and is partially constructed. The combined permitted capacity of WDA 1 and WDA 2 is sufficient to store all anticipated coal waste from the permitted operations for the remaining LOM.

2.2.1.3 Coal Storage

In 2014, SPE submitted an application to the MDEQ Coal Program and MDEQ Air Program to expand coal Stockpile 1A east of the Mine office and north of Fattig Creek Road (**Figure 2.2-1**). Stockpile 1A is used to store excess coal when longwall operations are paused, such as during a longwall equipment move. Haul trucks are used to transport coal between Stockpile 1A and the other coal stockpile areas. Stockpile 1A potential particulate matter $(PM)_{10}$ and $PM_{2.5}$ emissions are estimated at 8.17 and 1.23 tons per year, respectively. The MDEQ revised the MAQP (MDEQ 2016) to address emissions associated with this stockpile in October 2014.

2.2.1.4 Mine Ventilation Fan

One mine ventilation fan was installed in the surface facilities area over the East Mains, immediately north of Longwall Panel 4 (**Figure 2.1-1**). This fan operates continuously to ventilate the underground mine to prevent the buildup of dangerous gases in the underground working, which is necessary for worker safety. The fan is installed on a large borehole pad.

2.2.2 Other Surface Facilities

Since 2011, SPE added several facilities not contemplated at the time the BLM Coal Lease EA was prepared. The most notable facilities are identified in this section, all of which are subject to the requirements of MSMURA and were added to the State-approved Mine Permit (C1993017) which specifies environmental protection measures and reclamation requirements.

2.2.2.1 Air Portal

Air portals are added to underground mines to provide critical ventilation to the underground workings, which is necessary for worker safety. Air portals allow air from the underground workings to be vented outside, although the air portal may also be used for infrequent access to the underground mine or delivery of equipment and supplies. Air portals are not intended to serve as a primary entry to the underground mine, and delivery of equipment and supplies through the air portal rarely occurs. As of July 2023, Portals 1 and 2, located at the south end of longwall panels 3 and 8, respectively, have been reclaimed. Portal 3 (located at the south end of longwall panel 11) and Portal 4 (located at the east end of the East Mains Development Entries) remain active.

2.2.2.2 Borehole Pads

Borehole pads are necessary at various locations above the Mine entries to provide surface support to underground operations. Pads are located at the end of linear disturbances overlying the underground Mine plan area. These facilities consist of one or more boreholes (borehole types described below) from the surface into the Mine entries. Construction of these pads provide laydown areas for equipment and materials. Typical equipment may include pickups, forklifts, pumps, trash bins, portable toilets, high pressure air compressors, electrical distribution and related equipment, generators, bulk rock dust bins, pallets of bagged materials, and other necessary support material(s). Surface installations may include semi-permanent (concrete) foundations for high-capacity air compressors, electrical sub-stations, storage hoppers and batch systems, fuel storage, and other necessary equipment. Pads are reclaimed when they are no longer needed.

2.2.2.3 Boreholes

Three types of boreholes are typically used to support underground workings: (1) emergency breathable air boreholes, (2) utility boreholes, and (3) mitigation boreholes. Each type is described in more detail below (not shown on figures). All boreholes are installed with casings as required to control surface water and groundwater inflow. All boreholes include caps when not actively injecting or supplying materials into underground workings. When the boreholes are no longer needed, they will be reclaimed according to applicable regulations and procedures.

Emergency Breathable Air Boreholes. Emergency breathable air boreholes are constructed based on Mine Safety and Health Administration (MSHA) regulations to provide breathable air to underground workings. Breathable air boreholes are typically not required by MSHA when other rescue equipment such as rescue chambers are provided at specific underground locations. SPE may apply for emergency breathable air boreholes through the MR process from the MDEQ.

Utility Boreholes. These boreholes are constructed to provide surface access to the underground workings. This access may include injection or supply of pumpable cribbing material (material used for underground support), rock dust, communications, electricity, neat oil, concrete, compressed air, or other material or equipment essential to on-going operations. Typically, utility boreholes are approved as part of the construction of a borehole pad.

Mitigation Boreholes. These boreholes are constructed to maintain compliance with MSHA ventilation and/or roof control plans, or other site-specific MSHA plans. Mitigation boreholes may be constructed for injection of nitrogen or other inert gas, breathable air, or concrete. Mitigation boreholes may also include MSHA-directed boreholes for monitoring underground conditions with testing equipment such as air sampling equipment or thermal cameras. These boreholes typically require a developed pad.

2.2.2.4 Soil Stockpiles

SPE salvages and stores in stockpiles a minimum of 6 inches of the first lift soil, where available, during construction of secondary roads outside the surface facilities area. Soil stockpiles are used for interim and long-term reclamation purposes.

2.2.2.5 Powerlines

Powerlines are present in the surface facilities area. An overhead powerline also extends from the surface facilities area to a borehole pad at the north end of Panel 6 and along the north end of the Mine panels over the East Mains to Crib Pad 7.

2.2.2.6 Roads

The Mine is accessed from public roads including US Highway 87, Old Divide Road, and Fattig Creek Road. From these primary roads, a combination of secondary and tertiary roads have been constructed in the Mine permit area. Secondary roads (typically 20-foot lane width) are used for access to mine facilities such as the train loadout, conveyors, substations, well pads, and major borehole pads. Tertiary roads (typically 15-foot-wide lane width) are used infrequently in the area and for temporary activities elsewhere in the permit area, such as installing boreholes, emergency surface support facilities, or reclamation activities. Tertiary roads outside the surface facilities area are temporary. SPE salvages soil by windrowing or storing a minimum of 6 inches of the first lift soil where available. Dust suppressants (e.g., water) are applied to all active roadways and parking areas to control dust emissions, as necessary.

Borehole pads, boreholes, associated roads, and other small surface support facilities are required with the development of longwall panels. Traffic to the general location of these large borehole pads or other surface support facilities normally use secondary roads. Tertiary roads branch off from secondary roads to actual boreholes and surface support facilities. If boreholes can be safely constructed by driving on existing ground, then tertiary roads are not constructed.

As mining of Panel 2 began, ventilation and roof control concerns required unanticipated surface disturbances at the southern end of the Panel. Since completion of Panel 2, SPE has revised its mine roof control and mine ventilation plans to minimize the likelihood of future disturbances associated with inert gas injections. As a result, Panels 3, 4, and 5 did not require similar surface disturbances. While SPE anticipates no future surface disturbances similar to those that were created at the southern end of Panel 2, a secondary road from Old Divide Road to the southern portion of the permit area was permitted to support surface activities related to potential subsidence repair and borehole installations but will not be developed unless necessary (see **Figure 2.3-1**).

2.2.3 Subsidence and Associated Surface Repairs

Subsidence is the gradual sinking, or sometimes abrupt collapse, of the rock and soil layers above an underground mine. In some cases, structures and surface features above the subsidence area can be impacted by subsidence. Subsidence features generally include minor surface cracks (typically less than 6 inches in width) that do not require mitigation. Subsidence features that require mitigation typically occur in areas of steep slopes (i.e., surface gradient exceeding 60 percent), in areas over the start or finish of a longwall panel where the subsided land meets the natural contours, and in areas where there is less overburden. In proposed mining areas of the Federal coal lease, overburden thickness ranges from approximately 200 feet to 800 feet.

Before 2024, subsidence repair activities were conducted on approximately 28.7 acres, and an additional 16.3 acres of subsidence repairs are projected. Efforts completed to date are compliant with regulations pertaining to subsidence control (i.e., Administrative Rules of Montana (ARM) 17.24.911).

To date, subsidence features resulting from mining have been reclaimed as necessary under the Montana SMCRA regulatory program to eliminate hazards and restore the pre-mining land use. Where the disturbance necessary for repair is determined to exceed the level of severity and hazard attributed to the feature, no repairs are made unless the features are inconsistent with SMCRA or State regulations pertaining to subsidence control (ARM 17.24.911). If subsidence features substantially disrupt the surface water or groundwater hydrologic balance, those impacts are mitigated using methods described in the permit. Similarly, if subsidence features, such as cracks, concentrate flow and lead to excessive erosion, they are corrected in accordance with the State-approved Mine Permit and applicable regulations. Although some minor cracks have been repaired (e.g., overlying Panels 3 and 4), due to the disturbance necessary for repair, minor surface cracks or cracks on slopes greater than 20 percent are not typically repaired unless directed by MDEQ.

Where repairs are undertaken, the method varies according to the specific feature and specific site conditions. In general, topsoil is salvaged and replaced where possible or steps are taken to avoid displacement or loss of additional topsoil into the crack. Cracks of sufficient width and length up-gradient of a drainage path are repaired to prevent excess loss of topsoil into the crack. Heavy equipment is required for most repairs. The method of repair and type of equipment used are selected to minimize damage to the land caused by access routes, material storage, or incidental activities.

Cracks sometimes open as an area is undermined and then generally close again as the longwall progresses. Additional cracks close or fill naturally a short time after mining. Repair of cracks generally does not begin until mining of the next adjacent panel is complete to ensure full subsidence has occurred and allow time for cracks to naturally close or fill without intrusive repair. Exceptions include situations where repair is needed to facilitate mining or where delaying the repair has the potential to exacerbate erosion or negatively affect water resources. To the extent possible, before extensive surface disruption, MDEQ and SPE conduct a visual survey of the surface above the panel to be repaired to establish agreement on which features are to be repaired and the methods to be used.

2.2.4 Hydrological Impacts and Mitigation

SPE's State-approved Mine Permit requires SPE to monitor wells, springs, ponds, and streams to identify potential impacts. If the beneficial use of a water right is adversely impacted, SPE is required to mitigate those impacts (SPE 2017a). Mitigation may be temporary, interim, or long-term, depending on type of impact. Long-term mitigation, if necessary, could include installation of replacement water sources. In addition to financial assurance for temporary and interim mitigation, the bond also includes $1.7 million for potential permanent mitigation and an additional $500,000 "trust fund" (SPE 2017b) to cover potential long-term costs associated with maintenance and operation of any necessary water replacement facilities. After identifying hydrological water quantity impacts at Spring 17145, SPE completed interim mitigation in August 2019; flow returned to normal conditions at Spring 17145 in the fall of 2018. Interim mitigation plans were approved by MDEQ in July 2023 and implemented by SPE for Springs 14325, 72115, 72125, 72135, 72155, 16755, and 71115 (SPE 2023a).

2.2.5 Mining-Related Stipulations and Mitigation Measures

Mitigation measures incorporated as State-approved Mine Permit conditions are summarized in the BLM Coal Lease EA (see **Section 2.1.3**) and are also discussed in **Section 2.4**, Stipulations or

Approved Mitigation Measures. The mitigation measures and stipulations presented in the BLM Coal Lease EA remain in effect and have been considered as part of the impact assessment for this EIS. Additional Best Management Practices are located in the Stormwater Pollution Prevention Plan (SWPPP), in the Multi-sector General Permit for Storm Water Discharges Associated with Industrial Activity (Permit Number MTR000499) (MDEQ 2023).

2.2.6 Bonding Status

SMCRA requires that, as a prerequisite for obtaining or modifying a coal mining permit, permittees post a reclamation bond to ensure that the regulatory authority will have sufficient funds to reclaim the site if the permittee fails to complete obligations set forth in the approved reclamation plan in the State-approved Mine Permit C1993017. As of August 1, 2024, MDEQ holds a $26.16 million reclamation bond for Permit C1993017. The acres of reclamation at the Mine from 2016 through 2023 are provided in **Table 2.2-1**. To date, SPE has not applied for or received bond release for reclamation.

Table 2.2-1. Cumulative Total Mine Disturbance and Reclamation, 2016 through 2023

Year	Total Disturbance (acres)	Facility Disturbance (acres)	Available for Seeding (acres)	Soiled & Seeded (acres)
2016	618	588	30	8
2017	623	588	35	23
2018	650	610	40	33
2019	659	610	49	33
2020	737	688	49	33
2021	742	693	49	43
2022	742	691	51	45
2023	756	705	51	45

Sources: SPE2024b

2.2.7 Coal Loadout

Coal is loaded on trains owned and operated by BNSF Railway (BNSF) at the mine tipple in the surface facilities area. Trains typically consist of 125 cars (although trains can be up to 135 cars) with a total train capacity of 15,250 tons of saleable coal. This equates to approximately 1.4 loaded trains per day for the 7.56 Mt shipped in 2023. Based on the annual saleable coal recovery rates (**Table 2.1-1**), average loaded trains-per-day in the past 5 years ranged from a low of approximately 1.1 in 2020 to a high of 1.4 in 2023, equating to between 2.0 and 2.8 trains for round-trip travel (empty and full).

As part of the coal loadout process, SPE profiles (i.e., shapes) loaded coal to improve aerodynamics and then applies a biodegradable in-transit dust suppressant agent (i.e., topper agent) to loaded coal cars to reduce coal dust emissions during transport. Profiling and application of the suppressant agent are coal dust mitigation requirements imposed by BNSF (2015, 2017b) to reduce coal dust emissions. These measures are expected to continue for the LOM.

The tipple and rail loop are within the Mine permit area.

2.2.8 Coal Destinations

According to SPE, coal sales from this mine are typically spot sales or short-term contracts rather than long-term contracts. Over the last 5 years, and for the foreseeable future, the vast majority of coal was and is likely to continue to be shipped to destinations overseas. Over 96 percent of SPE shipments are expected to be sent overseas; primarily to electric power generation facilities in Japan and Republic of Korea (ROK), and to a lesser extent, Chile and Hong Kong (**Table 2.2-2**). These customers typically purchase coal with 1-year contracts that are signed in quarters 3 and 4 of each year for the following calendar year. For the international coal market, a 1-year contract is standard practice.

No more than 4 percent of shipped coal is expected to be used domestically. Historic rail and truck shipping locations are shown in **Table 2.2-2**. Domestic locations for future shipments are unknown at this time, and it would be too speculative to complete any further analysis of potential domestic sales.

Table 2.2-2. Coal Rail and Truck Sales Between 2018 and 2023

U.S. Destination[1]	2018	2019	2020	2021	2022	2023	Average
Total Annual Coal Sold	7.52 Mt	7.00 Mt	5.91 Mt	7.41 Mt	7.25 Mt	7.56 Mt	7.11 Mt
Westshore, BC (Railed)	96.69%	96.23%	98.73%	98.56%	95.08%	98.48%[2]	97.27%
Duluth-Superior, WI (Railed)	2.36%	1.88%	0.53%	0.00%	3.00%	0.00%	1.31%
Other Domestic (Railed)[1]	0.40%	1.34%	0.10%	0.97%	1.39%	0.58%	0.81%
Graymont, MT (Trucked)	0.50%	0.51%	0.59%	0.45%	0.52%	0.39%	0.49%
Roundup, MT (Trucked)	0.04%	0.04%	0.04%	0.02%	0.02%	0.02%	0.03%
Hardin, MT (Trucked)	0.00%	0.00%	0.00%	0.00%	0.00%	0.53%	0.09%

[1] Other infrequent domestic coal rail destinations include Three Forks MT, Green Bay WI, John P. Madgett WI, Avon Lake OH, and TES Filer City Station MI, (shipped from Duluth-Superior WI Port).
[2] Of the 2023 Tons Railed to Westshore: 72.4% shipped to Japan, 13.1% shipped to ROK, 9.8% shipped to Chile, and 4.7% shipped to Hong Kong.
Sources: EIA 2023, SPE 2023b, 2024b

Coal exports to Japan, ROK, Chile, and Hong Kong are shipped through Westshore Terminal (Westshore), which is part of the Roberts Bank Port at Port Metro Vancouver, British Columbia, Canada. After leaving the Mine permit area, coal is first hauled southwest along a 30-mile rail spur (Class III short line)[2] (MDT 2017) to Broadview, Montana. At Broadview, the rail joins a Class I railroad[3] (MDT 2017) between the cities of Laurel and Great Falls, Montana, and is thereby connected to the railway system with alternative routes that may be used in response to weather, maintenance issues, or other factors (BNSF 2017a). Most coal transported to Westshore is expected to be hauled along BNSF's Main Line[4] (identified as "Main Coal Line" in BNSF 2013), a Class I railroad the nearest segment of which is at Laurel, Montana, approximately 27 miles southwest (33 miles by rail) of Broadview. The Main Line between Laurel and Westshore traverses Montana, Idaho,

[2] Short Line railroads operate over a relative short distance relative to larger, national railroad networks.
[3] The railroad at Broadview is a Class I railroad connecting Great Falls to Laurel, Montana and would be considered a "main line", but, for purposes of this analysis, the term "Main Line" is reserved for the "Main Coal Line".
[4] The Main Line joined at Laurel is a Class I railroad identified as the Main Line for Coal Transport by BNSF (2015).

Washington, and British Columbia (see **Figure 1.1-3**). In total, the rail transport route between the Mine and Westshore Terminal is estimated to be 1,390 miles one-way.

At Westshore, coal is loaded onto ocean-going vessels for overseas transport to ports in Japan, ROK, Chile, and Hong Kong. The average ocean transport distance between Westshore and possible coal ports in Japan, ROK, Chile, and Hong Kong is estimated to be approximately 5,300 miles (4,600 nautical miles) one-way (Marine Traffic 2017). Specific customers, combustion locations/facilities, and ports used are not known and would be too speculative to analyze further.

2.2.9 Reclamation

Mining and reclamation methods specified in the permit are consistent with requirements of SMCRA and the implementing Federal regulations (30 CFR Chapter VII) as required by the Montana cooperative agreement with OSMRE (30 CFR § 926.30) and are located in section 17.24.313 (Reclamation Plan) of the State-approved Mine Permit (SPE 2017b).

Following mining, reclamation activities associated with Federal coal lease MTM-97988 would be conducted in accordance with the State-approved Mine Permit.

Interim- and post-mining reclamation will be achieved through the implementation of the following plans and monitoring activities:

- Grading Plan
- Regraded Spoil Monitoring Plan
- Coal Processing Waste Disposal Areas Monitoring Plan
- Surface Stabilization Plan
- Soil, Removal, Storage, and Redistribution Plan
- Revegetation Plan
- Management of Mine Openings, Wells, and Shafts
- Seeps/Spring Mitigation Plan
- Stream Restoration Plan

Table 2.3-2, below in **Section 2.3.2.3**, provides a conceptual timetable for the Project, including reclamation.

2.3 Description of the Alternatives

Under NEPA, the agency must evaluate the environmental impacts of a reasonable range of alternatives that meet the purpose and need of the Proposed Action. The DOI's NEPA regulations and CEQ's NEPA guidance define reasonable alternatives as those that are "technically and economically practical or feasible and meet the purpose and need of the proposed action" (43 CFR § 46.420(b); 40 CFR § 1508.1(z)(2020)).

The No Action Alternative, Proposed Action, and Partial Mining Alternative reflect a spectrum of mining ranging from no mining of Federal coal within AM 3, to mining the full amount of Federal coal contemplated in the Proposed Action. Descriptions of these alternatives are presented in the following sections. The descriptions herein are consistent with the Plan For Protection of the Hydrologic Balance (SPE 2017a) and are supported by supplemental information provided by SPE (2017c, 2017d, 2018a, 2018b). Estimated acreage and tonnage values for existing disturbance, No Action Alternative, Proposed Action (including connected actions) and the Partial Mining Alternative are provided in **Table 2.3-1.** An expanded version of estimated acreage and tonnage values are provided in **Appendix A**.

Table 2.3-1. Comparative Summary of the Existing Disturbance, No Action Alternative, Proposed Action, and Partial Mining Alternative

Condition Evaluated	Units	Existing/Authorized Disturbance[1] Total		No Action Alternative Total		Proposed Action Total		Partial Mining Alternative Total	
		Federal	Non-Federal	Federal	Non-Federal	Federal	Non-Federal	Federal	Non-Federal
Saleable Coal to be Mined	Mt	8,680,462.5	36,870,810.2	0.0	10,151,240.4	22,830,646.8	34,460,469.9	18,668,228	32,191,669
Other									
Coal Lands	Acres	700.9	7,127.5	0.0	576.8	1,239.6	1,840.7	1,005.2	1,709.1
Subsidence Area[2]	Acres	377.2	5,417.6	0.0	576.8	1,033.4	1,635.8	854.0	1,539.6
Subsidence Reclamation	Acres	0.0	25.1	0.0	0.0	0.0	0.0	0.0	0
Surface Disturbance									
Subsidence Repairs	Acres	1.6	27.1	0.0	2.9	5.2	8.2	4.3	7.7
Surface Facilities	Acres	0.0	873.50[2]	0.0	0.0	0.0	0.0	0.0	0.0
Air Portals	Acres	0.0	12.0	0.0	0.0	0.0	2.0	0.0	2.0
Borehole Pads	Acres	0.0	32.9	0.0	0.0	0.0	6.0	0.0	6.0
Roads	Acres	7.1	40.8	0.0	0.0	0.0	3.1	0.0	3.1
Soil Stockpiles	Acres	5.4	40.9	0.0	0.0	0.0	0.0	0.0	0.0
Total	**Acres**	**14.1**	**1,027.2**	**0.0**	**2.9**	**5.2**	**19.3**	**4.3**	**18.8**

[1] Existing disturbance through 2024.
[2] Includes 223 acres from the authorized WDA 2.

2.3.1 No Action Alternative

Under the No Action Alternative, the proposed mining plan modification for AM 3 would not be approved by the ASLM, and approximately 1,239.6 acres of Federal coal lands including approximately 22.8 Mt of saleable Federal coal (AM 3 and Minor Revision[5] (MR) 279) and approximately 1,840.7 acres of non-Federal coal lands including approximately 34.5 Mt (AM 3 and MR 279) of saleable non-Federal coal would not be mined. The 1,840.7 acres of non-Federal coal lands would not be mined because SPE is only able to reach the non-Federal coal by mining through AM 3 Federal coal.

At an estimated 80 percent recovery rate of saleable coal and given equipment and operational constraints SPE's maximum mining rate is approximately 10.1 Mtpy of saleable coal (see **Section 2.1**). SPE has estimated that in the near-term they will operate at this approximate maximum mining rate. As the No Action Alternative will occur in the near-term, this alternative assumes that SPE will mine at the maximum mining rate to recover approximately 10.0 Mt of the remaining saleable coal in the permit area without accessing Federal coal (**Table 2.3-1**). The non-Federal coal would be recovered within an estimated 1-year period. Approximately 2.5 Mt of CPW would be generated and placed in WDA 1 and WDA 2. Under the No Action Alternative, the LOM would be shortened by approximately 8 years relative to the Proposed Action.

The No Action Alternative would include:

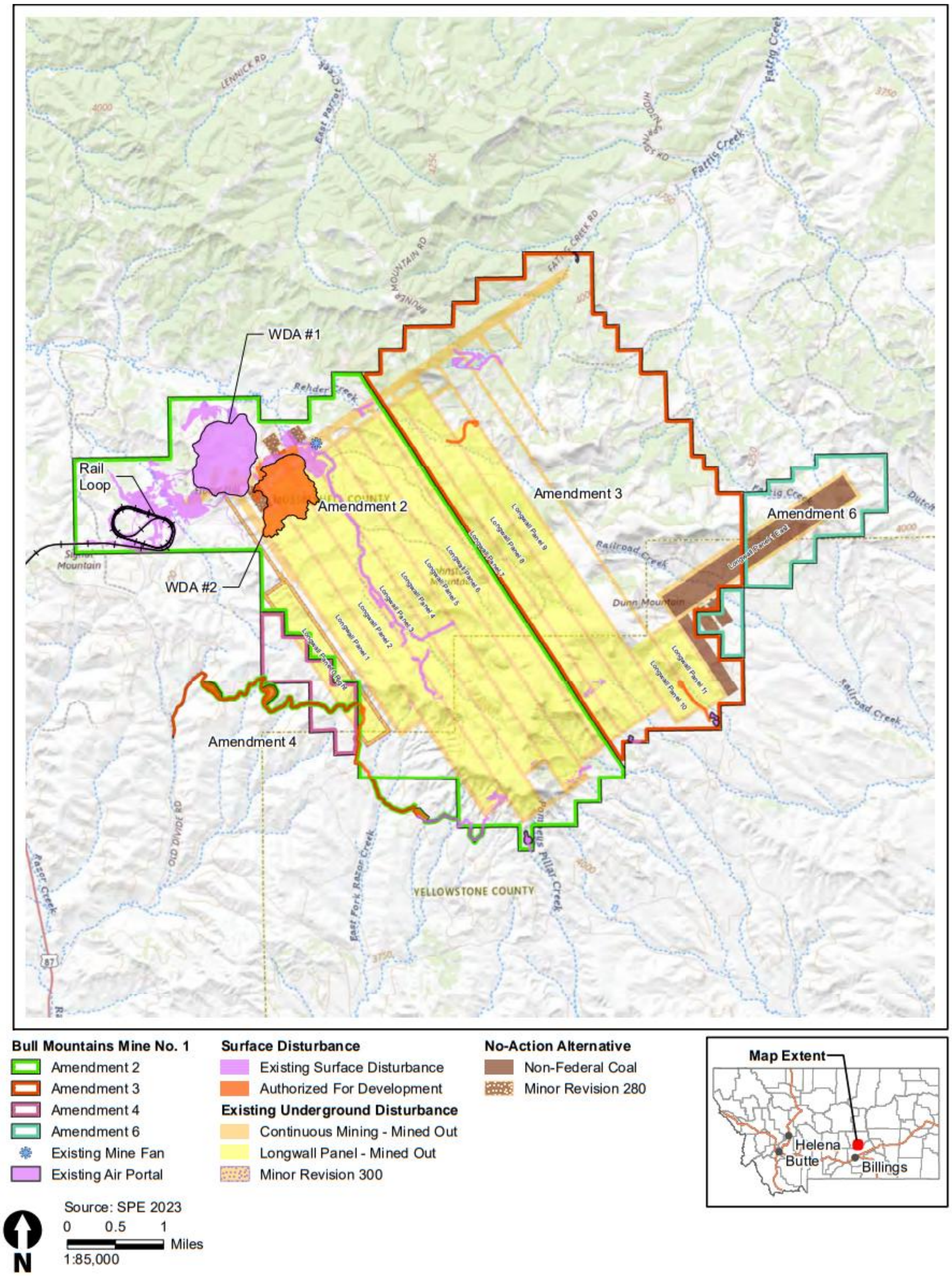
- Development of the east longwall panel (Panel 1 East), and minor blocks (AM 3).
- Continuation of longwall mining Panel 1 East, and minor blocks (AM 6).
- MR 280 – approved by MDEQ on September 24, 2021 (MDEQ 2021). MR 280 includes the development of three additional room and pillar mining areas near the entrance of the Mine portal (**Figure 2.3-1**).

Subsidence repairs on non-Federal lands would result in approximately 2.9 acres of surface disturbance (**Table 2.3-1**). Potential surface disturbance would be subject to existing access agreements with surface owners, as needed.

At the conclusion of mining operations, Mine facilities would be removed on a schedule approved by MDEQ, and all surface disturbances would be reclaimed in accordance with the Mine Permit. Under this action, the workforce would be limited primarily to reclamation and closure activities. Reclamation is estimated to take approximately 16 months after the end of mining (SPE 2017b).

[5] MDEQ has a definition of *Minor Revision* in their regulations, Montana Code Annotated 2023 TITLE 82. MINERALS, OIL, AND GAS CHAPTER 4. RECLAMATION Part 2. Coal and Uranium Mine Reclamation (39) "Minor revision" means a change to the mining or reclamation plan that increases the area of land affected by mining activities within a permitted area by a total of less than 320 acres from the amount initially approved and does not significantly increase the impact of the permitted disturbance. The term includes expansion into an adjacent permitted area provided the expansion does not significantly increase the impact from either permitted area.

Figure 2.3-1. No Action Alternative



2.3.2 Proposed Action

Under the Proposed Action, longwall mining would extend to the northeast and is shown in **Figure 2.3-2**. The Proposed Action would authorize SPE to continue coal mining on approximately 1,239.6 acres of Federal coal lands and approximately 1,840.7 acres of adjacent non-Federal coal lands in AM 3. Under the Proposed Action, approximately 22.8 Mt of saleable Federal coal and approximately 34.5 Mt of adjacent saleable non-Federal coal would be produced (**Table 2.3-1**). Additionally, the Proposed Action would include the development of MR279 (a shortened-width panel (Panel 15)), additional placement of CPW in WDA 2, and other ancillary surface disturbances (**Figure 2.3-2**). Under this alternative, mining would continue for up to 9 years. Land status, including surface and subsurface ownership, is shown on **Figure 1.1-2**.

Under this alternative, mining rates would vary from year to year, but the anticipated average mining rate would be approximately 7.1 Mtpy of saleable coal based on annual coal sales between 2018 and 2023 (see **Table 2.2-2**). However, actual coal sales would be dependent on several factors including mining conditions and coal markets.

2.3.2.1 Waste Disposal Areas

At the estimated recovery rate of 80 percent, approximately 14.8 Mt of CPW (6.0 Mt Federal CPW and 8.8 Mt non-Federal CPW) would be placed on WDA 1 and WDA 2, as capability allows. CPW would be transferred from the coal processing facilities via conveyor over Fattig Creek Road where it would be handled in the same manner in WDA 1 and WDA 2. Equipment would access WDA 2 from WDA 1 via a private at-grade crossing of Fattig Creek Road. Fly ash (received from Yellowstone Energy) may be placed on WDA 2 and used to accelerate drying of the CPW. Dust suppressants would be applied to WDA 2 to control dust emissions, as necessary. At the conclusion of mining, WDA 2 would be covered with a minimum of 48 inches of stockpiled soil and cover material, and the area would be reclaimed in a manner that allows the post-mining land use to be a combination of grazing land, wildlife habitat, and pastureland, consistent with pre-mining land uses (SPE 2017b).

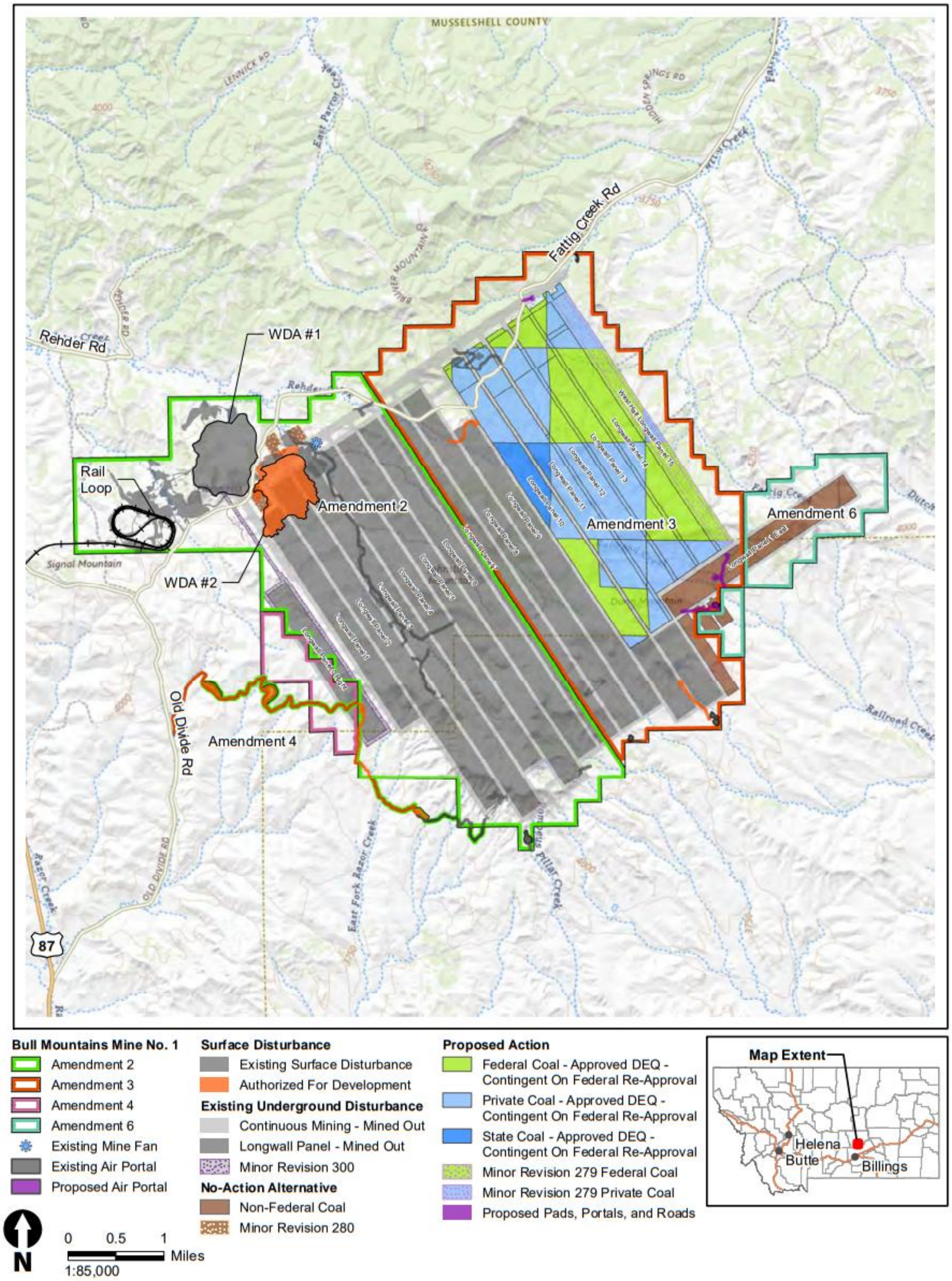
2.3.2.2 Other Facilities and Disturbances

Surface disturbance from subsidence repairs, surface facilities, portals, borehole pads, roads, and soil stockpiles would include approximately 24.5 acres (**Table 2.3-1)**. Potential surface disturbance would be subject to existing access agreements with surface owners, as needed.

Any future boreholes and associated pads and roads would be applied for by SPE and reviewed and permitted as revisions to the State-approved Mine Permit by MDEQ. Once an area is mined out, the existing air portals and associated facilities would be reclaimed in accordance with the Mine Permit.

At the conclusion of mining, Mine facilities would be removed, and all surface disturbances would be reclaimed in accordance with the Mine Permit. Reclamation is estimated to take approximately 16 months after the end of mining (SPE 2017b).

Figure 2.3-2. Proposed Action



2.3.2.3 Project Schedule and Workforce

The Mine currently employs approximately 250 full-time employees and 40 short-term contractors. No significant changes to the Mine's workforce are anticipated to support mining operations; however, extension of the Mine life by 9 years would result in corresponding extension of the workforce at the Mine. The conceptual Proposed Action Project schedule is presented in **Table 2.3-2.**

Table 2.3-2. Conceptual Proposed Action Project Schedule

Facility	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10+ (Until Bond Release)
WDA 1										
Placement of CPW (and other Material)										
Reclamation										
WDA 2[1]										
Construction										
Placement of CPW (and other Material)										
Reclamation										
Longwall Panel Mining										
Panel 10[2]										
Panel 11[2]										
Panel 12										
Panel 13										
Panel 14										
Panel 15										
Panel 1 East										
Subsidence Reclamation										
Other Surface Facilities (Powerlines, Roads, Stockpile and Storage Areas, Ponds, Coal Crushing and Cleaning Facilities, Sumps, Buildings, etc.)										
Salvage and Removal of Buildings and Mine Equipment										
Reclamation										
Reclamation and Restoration of Water Features										
Reclamation and Restoration										
Rail Loop										
Decommisioning and Removal										
Reclamation										

[1] WDA 2 is currently authorized for disturbance and placement of CPW per the 2018 EA.
[2] The southern portions of Panels 10 and 11 have been developed (see **Figure 2.1-1**).

2.3.3 Partial Mining Alternative

The Partial Mining Alternative would sunset the mining plan approval for Federal coal within AM 3 after 5 years, until approximately 2030, at which time no additional Federal coal would be mined unless SPE applied for, and obtained, a separate mining plan modification approval to mine the remaining Federal coal. At an estimated 80 percent recovery rate of saleable coal and given equipment and operational constraints SPE's maximum mining rate is approximately 10.1 Mtpy of saleable coal (see **Section 2.1**). Under this alternative, based on information received from SPE, it is assumed that SPE will attempt to maximize Federal coal recovery of the 5-year mining term by mining at the maximum rate (approximately 10.1 Mtpy) in AM 3 to recover approximately 10.0 Mtpy of saleable coal (see **Section 2.1**) (**Figure 2.3-3**).

Under the Partial Mining Alternative, the following areas would not be developed as compared to the Proposed Action:

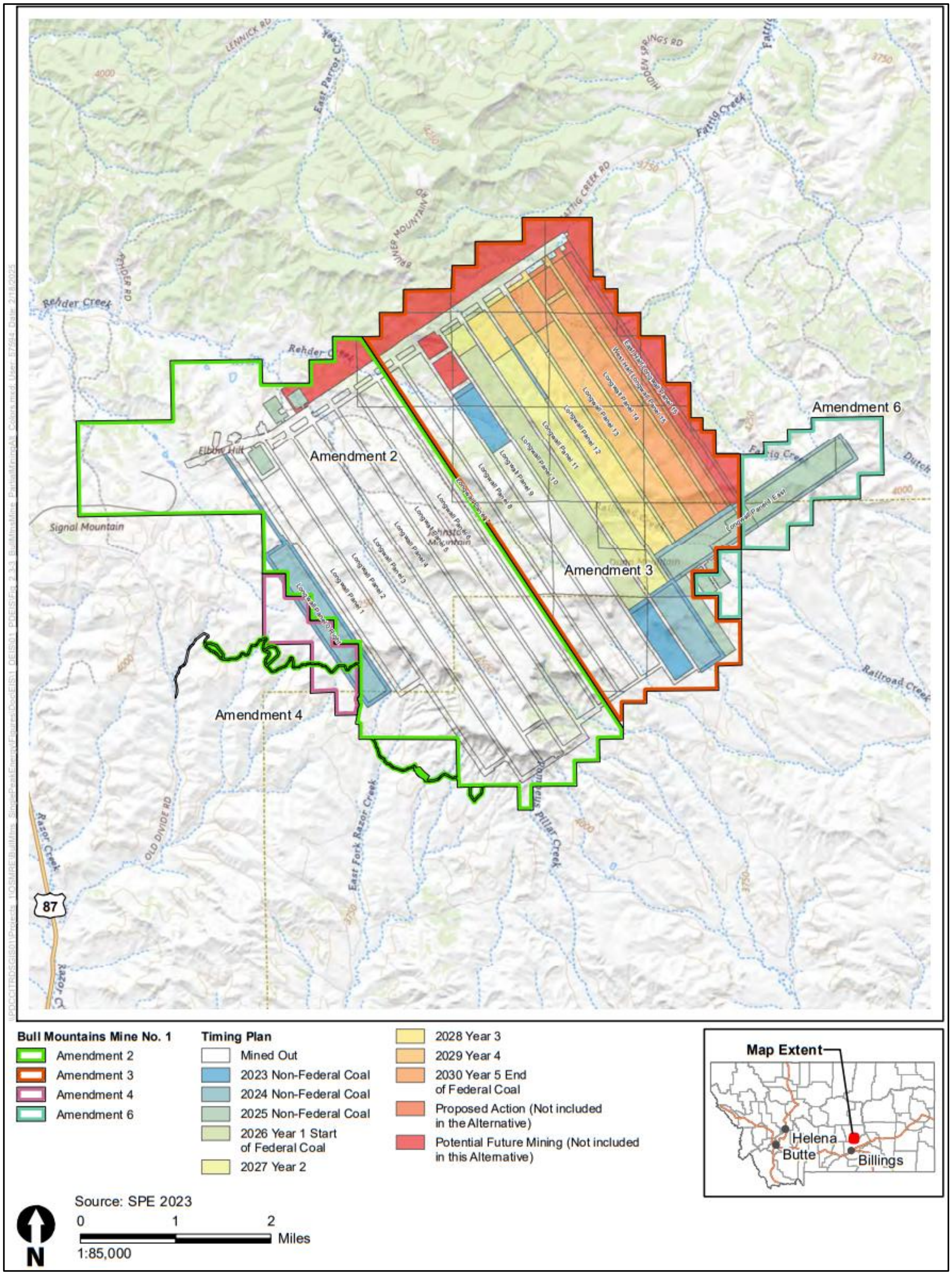
- The northern portion of longwall panel 14 (6N; 27E; S3 and S4) (AM 3).
- MR 279 - The western portion of panel 15 (6N; 27E; S3, 4, 10, 11, 14 and 23) (AM 3).

Under the Partial Mining Alternative, mining of coal in AM 3 would not be authorized after 5 years, and any mining of the Federal coal in AM 3 beyond the 5 years would require a new mining plan modification approval from ASLM. This alternative was developed to address recent NEPA caselaw highlighting the importance of identifying and evaluating a reasonable range of alternatives and acknowledge the volatility of the coal industry by evaluating an alternative that authorizes mining less than the full amount of leased Federal coal.

The coal market has been in a state of flux in recent years, with production in the United States peaking in 2011 only to fall by almost half by 2023 (Feaster 2023). The reasons for the volatility are varied and include, but are not limited to, competition from natural gas and renewable energy sources, the closure of coal fired power plants, and changes in international coal markets. As these trends are expected to continue into the foreseeable future, it has become difficult to predict what the landscape of coal demand will be over the life of a mine, which is expected to operate until 2030. This 5-year timeframe is consistent with the approval periods under Federal surface mining regulations.

OSMRE, in coordination with SPE, used SPE's LOM mining sequence outlined in the approved Mine Permit to estimate how much of the Federal coal SPE expects to mine during a 5-year term following ASLM approval of the Federal mining plan modification. Under the Partial Mining Alternative, it is assumed that the 5-year term would coincide with years 2025 through 2030. During this time approximately 50.9 Mt of saleable coal would be mined from AM 3 including approximately 18.7 Mt of Federal coal and 32.2 Mt of non-Federal coal. Under this alternative, approximately 2,714.3 acres of coal lands including 1,005.2 acres of Federal coal lands and 1,709.1 acres of non-Federal coal lands would be disturbed over 5 years.

Figure 2.3-3. Partial Mining Alternative, Annual Mining Layout



2.4 Permit Stipulations and Approved Mitigation Measures

Table 2.4-1 provides a list of existing permit stipulations and mitigation measures to mitigate Mine impacts that are specified in the State-approved Mine Permit held by SPE for the Mine. Additional permit stipulations, mitigation measures, and best management practices are found in the following Mine Permit documents:

- Stormwater Pollution Prevention Plan (SWPPP), in the Multi-sector General Permit for Storm Water Discharges Associated with Industrial Activity (Permit Number MTR000499) (MDEQ 2023)
- Stream Function Impact and Restoration Plan, Bull Mountains Mine No. 1, Appendix 313-3 (SPE 2024c)
- Bull Mountains Mine No. 1 Spring and Livestock Well Mitigation Plan Appendix 313-2 (SPE 2023c)
- Spring Impact Detection and Mitigation Bull Mountains Mine No. 1 Appendix 314-3 (SPE 2023d)
- Monitoring and Quality Assurance Plan Bull Mountains Mine No. 1, Appendix 314-4 (SPE 2021)
- Plan for Protection of the Hydrologic Balance (SPE 2017a)
- Reclamation Plan (SPE 2017b)

Table 2.4-1. Permit Stipulations and Approved Mitigation Measures

Resource	Issue or Potential Impact	Permit Stipulations and Approved Mitigation Measures
Topography and Physiography	Subsidence of topography over mined areas	The ground surface would be surveyed before mining in accordance with ARM and Surface Mine Permit (SMP) conditions. The area over the Mine would be inspected regularly. If evidence of impacts from subsidence are observed, the area would be monitored closely. If evidence of damage is observed, treatment measures would be developed and implemented.
	Areas of short-term slope instability or rock toppling resulting from subsidence over mined areas	Surface owners would be notified before mining would occur under their land. Areas of potential risk for slope instability or rock toppling would be identified to the landowner, and measures would be implemented to minimize the potential risk to humans and livestock.
Geology, Mineral Resources and Paleontology	Impacts of subsidence	Subsidence would be limited to small areas of cracking, sloughing of some steep slopes and rock toppling. Geological strata and mineral resources would subside as a unit.
Air Quality	Gaseous Pollutants	Emissions from the Mine surface facilities would continue for the LOM. Approved best management practices (BMPs) and mitigation measures would continue. BMPs for pollutants include equipping below ground vehicles with scrubbers, ventilation sufficient to maintain acceptable NO_x and CO levels, and proper operation and maintenance of on-site sources. Air

Resource	Issue or Potential Impact	Permit Stipulations and Approved Mitigation Measures
		quality would meet MDEQ Montana Air Quality Permit (MAQP) #3179 requirements and all State and Federal standards.
	Particulates	Permitted surface facilities would continue to generate fugitive dust from ROM storage, coal processing, train loading, and other activities. Air quality would meet MAQP #3179 requirements and all State and Federal standards.
Water Resources	Changes in surface drainage resulting from subsidence over mined areas	Subsidence may affect surface drainage patterns. Surface drainage at selected sites in stream drainages, at ponds, and at small wetland areas would be monitored throughout the mining and post-mining stages. Monitoring frequency would vary depending on the size, use and location of the feature or area. Long-term mitigation to restore drainage patterns would be implemented after subsidence effects stabilize.
	Impacts to flow and quality of springs and wells (groundwater) from subsidence over mined areas	All wells, springs, and seeps in the LOM area would be monitored throughout the pre-mining, mining, and post-mining stages. Additional groundwater monitoring wells have also been developed. If flow or supply is affected, approved mitigation measures would be implemented in consultation with MDEQ. Surface water mitigation plans are in the current Mine Permit. The plans include restoring springs, stream reaches, and ponds by opportunistic development of springs where they appear, guzzler emplacements, horizontal wells, vertical wells, pipeline systems, deepening or rehabilitating existing wells, reclamation of stream reaches and function, and water treatment where appropriate or necessary for post-mining land uses. Surface water impacts would need to be evaluated and site-specific replacement or mitigation plans developed by SPE, in cooperation with the landowner, to ensure adequate long-term replacement of the surface water source.
Wetlands	Impacts from changes in surface and groundwater flow	Subsidence over mined areas may result in alteration of surface water and groundwater flow, which may alter the flow of water to wetlands. Surface water and groundwater flow would be monitored on a regular basis, and if water flow to wetlands is disrupted, the water flow would be restored or replaced.
Soils	Erosion	Subsidence may alter surface drainage and accelerate degradation of erosive or unstable soils in some locations. In consultation with MDEQ, soil salvage, regrading, soil replacement, and seeding may be necessary to maintain stream profiles, minimize erosion, and ensure continuation of pre-mine land use.
	Ground disturbance - surface facilities	Surface disturbance would be in previously approved facilities areas. The area is already disturbed and currently permitted. Conditions of the existing reclamation plan that conforms to the ARM would be followed.

Resource	Issue or Potential Impact	Permit Stipulations and Approved Mitigation Measures
	Ground disturbance - subsidence over mined areas	Mining would result in subsidence of the overlying surface. Subsidence would be gradual and uniform and may create undulations and cracking in some areas. Soil profiles would remain intact and retain their chemical and physical characteristics. In consultation with MDEQ, mitigation of effects of surface subsidence would be evaluated on a site-specific basis.
Vegetation	Erosion and slope instability	No threatened, endangered, or candidate plant species have been identified in the LOM area. Subsidence would result in localized areas of erosion and slope instability which could disrupt the distribution of vegetation communities. Soil profiles would generally subside in-place with limited areas of cracking (see Soils). Vegetation would naturally re-colonize disturbed areas. Areas of surface disturbance would be evaluated and, if the extent of disturbance warranted, a site- specific repair and mitigation plan would be developed and implemented in consultation with MDEQ.
	Changes in surface drainage	Subsidence would result in areas of altered surface drainage which could affect the distribution of plant communities. Stabilization or reclamation of surface drainage is discussed underwater resources. Areas of altered drainage would be evaluated and, if the extent of displacement of plant species warranted, a site- specific repair and mitigation plan would be developed and implemented.
Wildlife	Local changes in wildlife habitat	Subsidence may result in local changes to surface and groundwater flow and to the distribution of vegetation communities. This may affect the distribution of resources available to wildlife. A number of species use these areas, including those that are dependent on surface water and the associated vegetation (e.g., waterfowl, shorebirds, and several songbirds) and those that are wider ranging and use the water during their movements throughout a larger home range (e.g., bats, upland game birds, raptors, deer and elk). Affects to water resources and vegetation would be mitigated as described in those sections.
Ownership and Use of Land	Impacts to buildings and structures	Impacts to existing buildings and structures over mined areas may occur as a result of subsidence. ARM and SMP conditions require that damage to structures be mitigated. SPE would repair damage to existing buildings and structures resulting from subsidence.
	Impacts to infrastructure (roads, fences, utilities, communication tower)	Impacts to existing infrastructure over mined areas such as roads, fences and utilities may occur as a result of subsidence. Subsidence related damage is expected to be minimal. Surface cracking is expected in some areas. Minor damage to roads and fences is possible. State regulations require the Mine operator to promptly

Resource	Issue or Potential Impact	Permit Stipulations and Approved Mitigation Measures
		repair damage to private property. SPE would repair damage to existing infrastructure.
	Livestock Grazing	For a short period (within a few months) after areas have been mined there may be a potential for slope failure and rock toppling as a result of subsidence. This would create a potential risk for grazing livestock. To minimize the potential risk to humans and livestock, SPE is required to publish the mining schedule at least six months prior to mining under an individual's land, in accordance with the ARM.
Cultural Resources	Rock toppling (rock art or rock shelters); erosion or slope instability.	All areas of steep slope (greater than 25 percent) have been surveyed for cultural resources. No potentially affected archaeological resources were identified.
Native American Religious and Traditional Concerns	Effects to Native American religious and traditional concerns	No Native American religious and traditional concerns have been identified in the LOM area. If religious and traditional concerns are identified through consultation between OSMRE and interested Tribes, appropriate mitigation measures would be developed through government-to-government consultation and implemented.
Visual Resources	Impacts to natural landscape	Key observation points for the Mine surface facilities and LOM area are along U.S. Highway 87. The view of the approved surface facilities would be largely shielded from U.S. Highway 87 by topographic features during operation and the approved reclamation plan would minimize visual impacts after completion of mining. Impacts of dust and haze during mine operation would be minimized by air quality control measures specified in MAQP # 3179. Areas of the LOM area that would subside over mined areas are several miles from key locations along U.S. Highway 87. The overall character of the visual landscape would not change.
Noise	Noise of surface facility operation	Principal noise sources during operation of the surface facilities include the preparation plant, ventilation fans, trucks, conveyors, load-out equipment, and trains. Facilities are approximately 4,500 feet from the nearest residences. Noise control measures include maintenance of equipment and screening to contain or deflect noise.
Transportation	Employee and equipment traffic	SPE would maintain mine-related infrastructure for traffic. Mine tax revenue would contribute to maintenance of public roads. If issues requiring mitigation are identified, SPE would participate in planning.
	Railroad	Railroad traffic would not affect other traffic. There are no at-grade crossings in high-traffic areas. No need for mitigation has been identified.

Resource	Issue or Potential Impact	Permit Stipulations and Approved Mitigation Measures
Hazardous Materials and Solid Waste	Continued generation of solid/liquid waste at surface facilities; continued use of hazardous materials at surface facilities.	Currently approved BMPs and procedures for solid/liquid waste management and hazardous materials management would continue to be implemented.
Socioeconomics	Employment	Mine operation would improve local job opportunities during the LOM. No need for mitigation has been identified.
	Tax base and tax revenues	Permitted mining operations would provide coal severance taxes and continued employment would contribute to continued Federal and State income taxes for the LOM. Tax revenues from mine would contribute to state, county, and nearby communities for the LOM. No need for mitigation has been identified.

2.5 Alternatives Considered but Eliminated from Detailed Analysis

OSMRE considered alternative scenarios to the approval or denial of the Federal mining plan modification. However, because OSMRE's decision is limited to recommending the approval, approval with conditions, or denial of the mining plan modification, OSMRE concluded that there are no additional reasonable alternatives besides the Proposed Action and the Partial Mining Alternative that would meet the agency's purpose and need. The following alternatives were considered but eliminated from detailed analysis. The discussions include reasons the alternatives were eliminated from detailed analysis.

2.5.1 Development Mining of Federal Coal Only to Access Non-Federal Coal (No Approval of Longwall Mining of Federal Coal)

Under this alternative, SPE would mine Federal coal in AM 3 using continuous mining only to access and support the mining of non-Federal coal sources. This alternative would not authorize the mining of Federal coal using longwall mining methods. Based on the sequential order and engineering of longwall mining, orientation and checkerboard pattern of mixed Federal and non-Federal coal in AM 3 this alternative would not be technically or economically feasible. Additionally, the sequential mining of panels 10 through 15 is needed for proper ventilation and to eliminate unnecessary roof hazards and other safety concerns to workers that would result from additional longwall setup and recovery. Consequently, this alternative was eliminated from further analysis in this EIS.

2.5.2 Renewable Energy to Offset Mine GHG Emissions

Under this alternative, SPE would develop renewable energy to offset proposed GHG emissions from the proposed Project. Energy produced from this facility would prioritize power requirements of the Mine during operation and closure activities and may provide potential long-term power benefits to the electrical grid following mine closure. Because this does not satisfy the purpose and need of the proposed agency action and because of technical, environmental, and economic feasibility uncertainties to conduct a credible analysis in this EIS, it was determined that this alternative would not be carried forward. Consequently, this alternative was eliminated from further analysis in this EIS.

However, it should be noted that SPE is in the early stages of conducting feasibility studies and analyzing the potential for wind and solar resources in the vicinity of the Mine.

2.5.3 Evaluate Different Methods of Transportation of coal to the Westshore Terminal to Reduce GHG Emissions

Under this alternative, SPE would use alternative methods of transporting coal to the Westshore Terminal in British Columbia, Canada. Potential methods include electric trains and the use of trucks to offset conventional railroads to transport coal to the Westshore Terminal. While the use of electric trains to transport coal to the Westshore might reduce the amount of greenhouse gas (GHG) emissions related to coal transport, SPE does not have leverage or control to require that coal be transported on electric trains by the railroad and the use of electric trains for coal transport was determined not to be a feasible option.

Movement of freight by rail is widely recognized as more fuel efficient than hauling by truck. This issue has been examined in several studies (Tolliver, Lu and Benson, 2013; Kruse, Warner and Olson, 2017; Kruse et al., 2022). This analysis concerns the overall efficiency of rail versus truck freight; therefore the EIS uses the efficiency metric of gross-ton miles of cars per gallon of fuel (GTMC/G) as it reflects the weights of containers, trailers, freight cars and cargo rather than just revenue ton-miles which only reflects cargo weight. In Kruse et al. (2022), they report for 2019 the nationwide fuel efficiency for rail as 472 GTMC/G for rail and 151 GTMC/G for truck freight, a ratio of 3:1 more efficient for rail.

Efficiency expressed in terms of grams of CO_2 emitted per gross ton-mile rail nationwide shows that only 21.6 grams of CO_2 is emitted per gross ton-mile while truck freight emits 140.7. **Table 2.5-1** shows the historical trend between truck and rail emissions. For the reasons discussed above, this alternative was eliminated from further analysis in this EIS.

Table 2.5-1. Nationwide Average Freight CO_2 Emissions by Rail Versus Truck

	Emissions (grams of CO_2 per gross ton-mile)			
Mode	2005	2009	2014	2019
Railroad	24.4	21.1	21.2	21.6
Truck	171.9	171.8	154.8	140.7
Ratio	7.0	8.1	7.3	6.5

2.5.4 Sell More Coal Domestically to Reduce Transportation GHG Emissions to Asia

Under this alternative, this EIS would evaluate conditioning the mining plan modification on domestic sale of the coal to support domestic energy security. While SMCRA was enacted, in part, to “assure that the coal supply essential to the Nation’s energy requirements, and to its economic and social well-being is provided and strike a balance between protection of the environment and agricultural productivity and the Nation's need for coal as an essential source of energy," (30 U.S.C. 1202(f)), SMCRA does not direct the Department to control or enforce where or how an operator sells the coal produced from a mine. Further, EO 14156, *Declaring a National Energy Emergency*, recognizes that US energy resources should be used domestically and sold internationally to allies and partners to "create jobs and economic prosperity for Americans forgotten in the present economy, improve the United States' trade balance, help our country compete with hostile foreign powers, strengthen relations with allies and partners, and support international peace and security." Conditioning the mining plan modification on domestic sales would be contrary to EO 14156. Finally, any decision to condition a mining plan approval on domestic sale of the coal to support domestic energy security would require a complex market analysis to determine what effect, if any, the condition on the sale of coal might have on domestic energy markets. That type of analysis is beyond the scope of this EIS and beyond OSMRE's technical expertise and would require a time-consuming, outside analysis. Therefore, because a condition on where and how coal can be sold would be contrary to national policy and OSMRE is not able to conduct the type of analysis necessary to evaluate the impacts of this type of condition, this potential alternative was eliminated from further consideration. OSMRE analyzed the reasonably foreseeable coal destinations based on historic sales and information provided from SPE regarding potential future sales under the Proposed Action.

2.5.5 Carbon Offset

Under this alternative, SPE would purchase carbon offsets to offset impacts including past, present, and RFFAs and connected climate impacts of its mining operation. The creation, monitoring, and enforcement of carbon offset markets or opportunities for carbon offset projects is beyond the scope of this EIS and outside the technical expertise of OSMRE. Until there is established National or State-level cap and trade legislation to oversee the development, monitoring, and enforcement of carbon credits, it is not reasonable for OSMRE to consider a carbon offset because OSMRE does not have the staff or resources to ensure that any carbon offset that might be established as a condition of mining plan approval is implemented correctly. Therefore, this alternative does not satisfy the purpose and need of the proposed agency action and was eliminated from further consideration in this EIS.

2.6 Summary of Impacts and Identification of Preferred Alternative

Pursuant to 40 CFR § 1502.14, **Table 2.6-1** below summarizes impacts of the alternatives described in the preceding sections. Detailed impact discussions are provided in **Chapter 4**. Assumptions for each alternative, which informed the scope of the effects analyses in this EIS, are presented in **Section 2.3.1**, **Section 2.3.2**, and **Section 2.3.3**, below.

2.6.1 Preferred Alternative

Consistent with 40 CFR § 1502.14(d) (2020), which OSMRE relied on for guidance in preparing this EIS, an agency is encouraged to identify the "preferred alternative or alternatives, if one or more exists, in the draft statement and identify such alternative in the final EIS unless another law prohibits the expression of such a preference."

OSMRE determined the Proposed Action is the preferred alternative because this alternative best supports the purpose and need for the Proposed Action and national policy, including EO 14156, to encourage energy exploration and production on Federal lands and waters. Based on the analyses in this EIS (summarized in **Table 2.6-1**) OSMRE concluded the Partial Mining Alternative would not appreciably reduce the environmental effects as compared to the Proposed Action and the No Action Alternative would result in an unacceptable level of socioeconomic impact.

Table 2.6-1. Summary of Direct and Indirect Impacts

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
Transportation and Electrical Transmission	Under the No Action Alternative, mining operations, and associated rail and vehicle transportation would increase slightly from current rates for a period of 1 year. As such, mining operations would have minor short-term impacts including risk of train derailment and the continued increase in traffic along roads, Mine roads, and ranch trails. During the reclamation period that occurs at the conclusion of mining, rail transportation and impacts to traffic associated with the Mine would cease. Similarly, roads and transmission lines would be decommissioned, and roads would be reclaimed to pre-mining conditions unless landowners request that these facilities remain to support post-mining land uses.	Under the Proposed Action, the number of trains operating per day would be fewer than under the No Action Alternative due to the lower volume mined per year. However, operations would occur for up to 8 additional years beyond the No Action Alternative, for a total of up to 9 years. The risk of derailment would be less than one accident of a loaded train per year under the Proposed Action. The Proposed Action would continue to use existing public roads, Mine roads, and ranch trails in a manner comparable to the No Action Alternative, except that mining would continue for up to 8 additional years as compared to the No Action Alternative. Mine-related traffic would continue to have minor impacts on public roads before declining in association with Mine closure. Impacts expected during the reclamation period are expected to be similar to those at the conclusion of mining under the No Action Alternative, they would just occur 8 years later.	Under the Partial Mining Alternative, the number of trains operating per day would remain consistent with rates under the No Action Alternative. However, mining operations, and associated rail transportation would last for only 5 years under the Partial Mining Alternative, which is approximately 4 fewer years than the Proposed Action albeit at a higher rate. Given the similar total volume to be shipped is similar in both cases, the total chance of derailment over the operating period would be about the same as for the Proposed Action, while the annual risk of derailment would be slightly higher for the Partial Mining Alternative at roughly one derailment of a loaded train per year. Impacts from vehicle transportation and electrical transmission would be similar to those described for the Proposed Action, except that the duration of the impacts would be reduced by less than half for the mining period; the length of the reclamation period would be similar to that for the Proposed Action but would be achieved approximately 4 years sooner.
Air Quality	Under the No Action Alternative, mining would continue to recover approximately	Under the Proposed Action, mining would continue for up to 8	Under the Partial Mining Alternative mining would continue

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
	10.0 Mt of non-Federal coal over a 1-year period, and additional mining of Federal coal would not be authorized. Direct emissions of criteria pollutants and HAPs would be small relative to the indirect emissions from overseas coal combustion. Direct and indirect emissions are not anticipated to lead to a violation of the National or Montana Ambient Air Quality Standards.	additional years as compared to the No Action Alternative. Annual criteria pollutant and HAP emissions under the Proposed Action would be approximately 71 percent of the annual emissions under the No Action Alternative (reflecting an average saleable coal recovery rate of approximately 7.1 Mtpy for the Proposed Action compared to approximately 10.0 Mtpy for the No Action Alternative). Over the life of the Project, total criteria pollutant and HAP emissions would be approximately 5.7 times higher than the No Action Alternative. Project-related emissions are not anticipated to lead to a violation of the National or Montana Ambient Air Quality Standards.	for approximately 5 years. Annual criteria pollutant and HAP emissions under the Partial Mining Action would be the same as under the No Action Alternative. Over the life of the Project, total emissions criteria pollutant and HAP emissions would be approximately 5.0 times higher than the No Action Alternative. Project-related emissions are not anticipated to lead to a violation of the National or Montana Ambient Air Quality Standards.
Climate Change and Greenhouse Gases	Mining activities under the No Action Alternative would recover approximately 10.0 Mt saleable non-Federal coal over a period of 1 year. Total GHG emissions from all sources (mining, transport and combustion) over the entire life of the Proposed Action (22 Mt CO2e) would be equivalent to about 9 percent of the Montana Federal coal GHG emissions projected short-term life-of-project (254 Mt CO2e).	Under the Proposed Action, mining would continue for up to 8 additional years as compared to the No Action Alternative. The Mine would continue to recover saleable coal at the average recovery rate of approximately 7.1 Mtpy for up to 9 years. GHG emissions over the life of the Proposed Action would be 5.7 times larger in comparison to the No Action Alternative because of the longer period of production. The Proposed Action's total GHG emissions from all sources (mining, transport and combustion) over the entire life of	Under the Partial Mining, the Mine would recover approximately 10.0 Mtpy of saleable coal over about 5 years. GHG emissions would be approximately 5.0 times larger than the No Action Alternative over the life of the Project. Total GHG emissions from all sources (mining, transport and combustion) over the entire life of the Project (110 Mt CO2e) would be equivalent to 43 percent of the Montana Federal coal GHG emissions projected short-term life-of-project (254 Mt CO2e).

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
		the Proposed Action (126 Mt CO2e) would be equivalent to 50 percent of the Montana Federal coal GHG emissions projected short-term life-of-project (254 Mt CO2e).	
Water Resources	Surface Water The No Action Alternative would continue to result in direct impacts to spring flows, ephemeral stream flows, pond levels, water quality and the hydrologic balance that are short-term to permanent, negligible to significant, and adverse depending on location. Groundwater Direct impacts to bedrock groundwater including increased or decreased water levels and changes in quality that are short-term to permanent, minor to significant, localized, and adverse depending on location would continue to occur from the existing mining disturbance and ongoing mining activities in AM 6. Direct impacts to alluvial groundwater quality in PM Draw and the Rheder Creek AVF from coal processing activities and the release of excess mine water would still occur and be similar to currently observed impacts which are short-term, moderate localized, and adverse but predicted to become indistinguishable from natural variation in background water quality after the end of mining and reclamation. Water Uses Direct impacts to water uses would be the same as current conditions. Sources of water for registered water uses would be	Surface Water Under the Proposed Action, mining would continue for up to 8 additional years as compared to the No Action Alternative. The Proposed Action would result in the undermining of 8.9 miles of ephemeral stream channels in the Fattig Creek and Railroad Creek drainages, one additional spring, and one additional pond than the No Action Alternative. Direct impacts to spring flows, ephemeral stream flows, pond levels, and the hydrologic balance would be short-term to permanent, negligible to significant, and adverse depending on location. Some springs may be permanently lost or changed. Direct impacts to undermined ephemeral channels would be short-term, minor, and adverse. Direct impacts to stream, spring, and pond water quality would be short-term to permanent, negligible to minor, localized, and adverse. Groundwater The Proposed Action would result in additional direct impacts to bedrock groundwater including	Surface Water Under the Partial Mining, mining would occur over about 5 years. Direct impacts to surface water from mining under the Partial Mining Alternative would be similar to those for the Proposed Action, but the length of ephemeral stream channels and area of watershed that would be undermined would be 0.9 miles less. The Partial Mining Alternative would also eliminate undermining of spring 53245, which is rated as having high potential to be impacted by subsidence. Groundwater Direct impacts to bedrock groundwater levels and quality under the Partial Mining Alternative would be similar in magnitude, area, and duration to those under the Proposed Action. Direct impacts alluvial water levels and quality would be the same as for the Proposed Action but would have shorter duration. Water Uses Direct impacts to water uses under the Partial Mining Alternative would be the same as those for the

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
	replaced if affected by mining and impacts on water uses would not occur.	increased or decreased water levels and changes in water quality that would be short-term to permanent, minor to significant, localized, and adverse depending on location. Impacts to alluvial groundwater quality in PM Draw and the Rheder Creek AVF are predicted to be similar to the No Action Alternative but longer in duration. Water Uses As required by the mine's permit conditions, SPE would be required to replace water sources impacted by mining and similar to the No Action Alternative, direct impacts to water uses would not occur.	Proposed Action. Sources of water for registered water uses would be replaced if affected by mining and impacts on water uses would not occur.
Land Use	Under the No Action Alternative, mining would continue in the Mine permit area to recover non-Federal coal across 576.8 acres over a 1-year period, and additional mining of Federal coal would not be authorized. Ongoing mining operations would result in 576.8 acres of subsidence and 2.9 acres of surface disturbance from subsidence repairs, on non-Federal land. Ongoing mining would have minor-short term impacts on patterns of use, including livestock grazing, wildlife uses, and hunting. Impacts to existing and future land uses would be negligible following reclamation.	Under the Proposed Action, an additional 1,263.9 acres of non-Federal land and an additional 1,239.6 acres of Federal land would be mined up to 8 additional years, compared to the No Action Alternative. Continued mining operations under the Proposed Action would result in an additional 1,059.0 acres of subsidence on non-Federal land and an additional 1,033.4 acres of subsidence on Federal land, compared to the No Action Alternative. The Proposed Action would also result in an additional 16.4 acres of surface disturbance on non-Federal land and an additional 5.2 acres of surface disturbance on Federal land,	Under the Partial Mining Alternative, additional mining operations beyond those of the No Action Alternative would be authorized, but for approximately 4 fewer years, and across 234.4 fewer acres of non-Federal land and 131.6 fewer acres of Federal land compared to the Proposed Action. Mining operations under the Partial Mining Alternative would result in 96.2 fewer acres of subsidence on non-Federal land and 179.4 fewer acres of subsidence on Federal land, compared to the Proposed Action. The Partial Mining Alternative would also result in 0.5 fewer acres of surface disturbance on non-Federal land and 0.9 fewer acres of

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
		compared to the No Action Alternative. Surface disturbing activities under the Proposed Action would include the development of surface facilities, construction of roads, and subsidence repairs. Impacts to land uses (i.e., livestock grazing, wildlife uses, and hunting) from surface disturbance and subsidence would be long term and moderate during the Proposed Action's mining period but would be negligible once reclaimed at the conclusion of mining operations.	surface disturbance on Federal land compared to the Proposed Action. Impacts to land uses (i.e. livestock grazing, wildlife uses, and hunting) from surface disturbance and subsidence would be consistent with those described under the Proposed Action. However, impacts to land use would be short-term and moderate during the Partial Mining Alternative's mining period. Impacts to land use would be negligible once reclaimed at the conclusion of mining operations, consistent with the No Action Alternative and the Proposed Action.
Topography and Physiography	Under the No Action Alternative, mining would continue in the Mine permit area to recover non-Federal coal remaining within the permit area over a 1-year period, resulting in 576.8 acres of subsidence on non-Federal land, and 2.9 acres of surface disturbance from subsidence repairs. Impacts to topography and physiography, including topographic moderation and subsidence-related failures, would be minor and short-term.	Under the Proposed Action, impacts from longwall mining would occur across an additional 1,263.9 acres of non-Federal land and an additional 1,239.6 acres of Federal land, compared to the No Action Alternative. Continued mining operations under the Proposed Action would result in an additional 1,059.0 acres of subsidence on non-Federal land and an additional 1,033.4 acres of subsidence on Federal land, compared to the No Action Alternative. The Proposed Action would also result in an additional 16.4 acres of surface disturbance on non-Federal land and an additional 5.2 acres of surface disturbance on Federal land,	Under the Partial Mining Alternative, additional mining operations beyond those of the No Action Alternative would be authorized, but for approximately 4 fewer years, and across 234.4 fewer acres of non-Federal land and 131.6 fewer acres of Federal land compared to the Proposed Action. Mining operations under the Partial Mining Alternative would result in 96.2 fewer acres of subsidence on non-Federal land and 179.4 fewer acres of subsidence on Federal land, compared to the Proposed Action. The Partial Mining Alternative would also result in 0.5 fewer acres of surface disturbance on non-Federal land and 0.9 fewer acres of

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
		compared to the No Action Alternative. As a result of continued longwall mining under the Proposed Action, impacts to topography and physiography, including topographic moderation and subsidence-related features would be minor and long-term during the Proposed Action's mining period. However, impacts to topography and physiography would be negligible once reclaimed at the conclusion of mining operations. Postmining topography and physiography would be achieved up to 8 years later than the No Action Alternative.	surface disturbance on Federal land compared to the Proposed Action. As a result of continued longwall mining under the Partial Mining Alternative, impacts to topography and physiography from surface disturbance and subsidence would be similar to those described under the Proposed Action. However, impacts to topography and physiography would be short-term in nature throughout the Partial Mining Alternative's 5-year mining period. Consistent with the No Action Alternative and the Proposed Action, impacts to topography and physiography would be negligible once reclaimed at the conclusion of mining operations. Postmining topography and physiography would be achieved approximately 3 years earlier than the Proposed Action and 4 years later than the No Action Alternative.
Geology, Minerals, and Paleontology	Under the No Action Alternative, mining would continue in the Mine permit area to recover non-Federal coal remaining within the permit area over a 1-year period, resulting in 576.8 acres of subsidence on non-Federal land, and 2.9 acres of surface disturbance from subsidence repairs. Nearly all of the surface disturbance proposed under No Action Alternative would occur in PFYC Class 4 (2.8 acres), with minor impacts occurring in PFYC 2 (0.1 acre). Important vertebrate or	Under the Proposed Action, impacts to geology, minerals and paleontological resources would be similar to those described under the No Action Alternative, but would occur for approximately 8 additional years and across an additional 1,263.9 acres of non-Federal land and an additional 1,239.6 acres of Federal land. Longwall mining activities over a larger area would result in	Under the Partial Mining Alternative, impacts to geology, minerals, and paleontological resources would be similar to those described under the Proposed Action, but would occur over approximately 4 fewer years, and across 234.4 fewer acres of non-Federal land and 131.6 fewer acres of Federal land. Additionally, mining operations under the Partial Mining Alternative would

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
	invertebrate fossils would be disrupted by surface disturbing activities and within the coal seam removed by longwall mining activities. However, these impacts would be minor under the No Action Alternative. Additionally, collapse features associated with underground mining have the potential to disrupt stratigraphic continuity and data associated with paleontological resources at the surface.	increased removal of the existing coal bed in the permit area, compared to the No Action Alternative, which would increase the likelihood of potential impacts to geology, minerals, and paleontology. Additionally, continued mining operations under the Proposed Action would result in an additional 1,059.0 acres of subsidence on non-Federal land and an additional 1,033.4 acres of subsidence on Federal land, compared to the No Action Alternative, increasing the potential to disrupt stratigraphic continuity. The Proposed Action would also result in an additional 16.4 acres of surface disturbance on non-Federal land and an additional 5.2 acres of surface disturbance on Federal land, compared to the No Action Alternative, increasing the likelihood of impacts to important paleontological resources.	result in 96.2 fewer acres of subsidence on non-Federal land and 179.4 fewer acres of subsidence on Federal land, compared to the Proposed Action. The Partial Mining Alternative would also result in 0.5 fewer acres of surface disturbance on non-Federal land and 0.9 fewer acres of surface disturbance on Federal land compared to the Proposed Action.
Solid Waste and Hazardous Materials	Under the No Action Alternative, SPE would continue to mine for 1-year to recover approximately 10.0 Mt of saleable non-Federal coal remaining within the permit area that is economically recoverable without accessing Federal coal. Under the No Action Alternative, the types and quantities of solid and hazardous waste would continue to be generated from continued non-Federal coal mining	Under the Proposed Action, approximately 22.8 Mt of saleable Federal coal and approximately 34.5 Mt of adjacent saleable non-Federal coal would be produced. The Proposed Action would include development of MR279 and additional placement of CPW in WDA 2. Mining would continue for up to 8 additional years as	The Partial Mining Alternative would sunset approval to mine leased Federal coal within AM 3 after approximately 5 years, until approximately 2030, at which time no additional Federal coal would be mined unless SPE obtained a separate mining plan authorization to mine the remaining Federal coal. Mining in AM 3 would be sequenced over a 5-year period at

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
	operations. Approximately 2.2 Mt of Coal Processing Waste (CPW) is disposed annually on site in the existing approved Coal Waste Disposal Area (WDA). Generation and disposal of CPW would continue for the duration of mining operations under the approved Mine Permit. Approximately 2.5 Mt of CPW would be generated and placed in WDA 1 and WDA 2 under the No Action Alternative. Under the No Action Alternative, transport, storage, and use of hazardous materials at surface facilities and current approved BMPs and procedures for hazardous materials management would continue to be implemented.	compared to the No Action Alternative. Under the Proposed Action, approximately 14.8 Mt of CPW (6.0 Mt Federal CPW and 8.8 Mt non-Federal CPW) would be placed on WDA 1 and WDA 2. The amount of CPW generated would be approximately a factor of 6 greater than would be generated under the No Action Alternative. WDA 2 would encompass approximately 223 acres and would be constructed, operated, and reclaimed in a manner comparable to existing WDA 1. Similar types and quantities of hazardous materials would be transported, stored, and used as under the No Action Alternative, based on the anticipated Proposed Action average recovery rate of approximately 7.1 Mt saleable coal per year.	a rate of approximately 10.0 Mtpy of saleable coal. The production rate of the Partial Mining Alternative would be similar the production rate of the No Action Alternative and of the Proposed Action. The duration of production would differ from that of the No Action Alternative and the Proposed Action. During the Partial Mining Alternative 5-year operating period approximately 50.9 Mt of coal would be mined from the AM 3 area. Annual generation rates of CPW, non-hazardous solid waste, and hazardous waste would be similar to that of the Proposed Action but of a shorter duration.
Human Health and Safety	Under the No Action Alternative, mining would continue in the Mine permit area to recover non-Federal coal remaining within the permit area over a 1-year period. Air quality effects from particulate matter and coal dust may slightly affect nearby residents but would cease after mining ends. Soil contamination from trace metals poses minor long-term health risks, mitigated by reclamation. Water quality impacts would be minimal due to regulatory compliance and mitigation. Noise and vibration would be noticeable but not harmful to health. Food chain	Under the Proposed Action, impacts to human health and safety would be similar to those described under the No Action Alternative but would occur over a longer period of time. Both alternatives pose minor, short-term health risks, primarily from air quality, soil contamination, water quality, and noise. The Proposed Action has a greater beneficial impact for jobs and funding for health and social	Like the No Action Alternative, the Partial Mining Alternative would result in minor, short-term health risks from air emissions, dust, noise, and potential water or soil contamination. However, the Partial Mining Alternative would occur for a 5-year period, leading to greater short-term exposure risks than the No Action Alternative. While both alternatives pose low health risks overall, the Partial Mining Alternative carries a slightly higher

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
	contamination is unlikely due to the short duration and low population density. Indirectly, reduced coal revenues may limit access to health and social services, potentially contributing to minor to moderate long-term health challenges. Overall, health impacts are expected to be minor and short-term.	services compared to the No Action Alternative.	direct risk due to increased surface disturbance and emissions intensity in a shorter window.
Soils	Under the No Action Alternative, mining would continue in the Mine permit area to recover non-Federal coal remaining within the permit area over a 1-year period, resulting in 2.9 acres of surface disturbance from subsidence repairs. Surface disturbance resulting from ongoing mining activities would remove vegetative cover exposing the soil and would also disrupt the existing soil profile. No soil or suitable material salvaging is anticipated for this alternative. Mining activities under the No Action Alternative would result in 576.8 acres of subsidence on non-Federal land in the Mine permit area. Surface soil disturbance may result through subsidence cracks in localized areas and would at a low frequency. Proposed mining activities under the No Action Alternative may further increase the potential of the ground surface directly above the Mine panels and within the angle of draw to be adversely affected by subsidence. Impacts to soils from surface disturbance and subsidence cracks would be minor and short-term. Upon completion of mining, surface disturbance and subsidence cracks that can be safely accessed without causing damage to the existing land surface would be	Under the Proposed Action, an additional 1,263.9 acres of non-Federal land and an additional 1,239.6 acres of Federal land would be mined for up to 8 additional years as compared to the No Action Alternative. Continued mining operations under the Proposed Action would result in an additional 16.4 acres of surface disturbance on non-Federal land and an additional 5.2 acres of surface disturbance on Federal land, compared to the No Action Alternative. Surface disturbing activities under the Proposed Action would include the development of surface facilities, construction of roads, and subsidence repairs. Mining activities under the Proposed Action would result in an additional 1,059.0 acres of subsidence on non-Federal land and an additional 1,033.4 acres of subsidence on Federal land, compared to the No Action Alternative. As a result of increased surface disturbance and area of	Under the Partial Mining Alternative, impacts to soils would be similar to those described under the Proposed Action but would occur approximately 4 fewer years, and across 234.4 fewer acres of non-Federal land and 131.6 fewer acres of Federal land. Additionally, mining operations under the Partial Mining Alternative would result in 0.5 fewer acres of surface disturbance on non-Federal land and 0.9 fewer acres of surface disturbance on Federal land compared to the Proposed Action. The Partial Mining Alternative would also result in an additional 96.2 fewer acres of subsidence on non-Federal land and 179.4 fewer acres of subsidence on Federal land, compared to the Proposed Action. Impacts to soils under the Partial Mining Alternative would result in minor and short-term impacts from erosion and sediment transport throughout the 5-year term for the Partial Mining Alternative.

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
	repaired and reclaimed, resulting in negligible long-term impacts to soils.	subsidence, potential for erosion and sediment transport would be greater than under the No Action Alternative. As such, impacts to soils from the Proposed Action would be minor, but long-term throughout the Proposed Action's mining period. Upon completion of mining, surface disturbance and subsidence cracks that can be safely accessed without causing damage to the existing land surface would be repaired and reclaimed, resulting in negligible long-term impacts to soils. Postmining soil conditions would be achieved up to 8 years later than the No Action Alternative.	Consistent with the No Action Alternative and the Proposed Action, impacts to soils under this alternative would be negligible once reclaimed at the conclusion of mining operations. Postmining soil conditions would be achieved approximately 3 years earlier than the Proposed Action and approximately 4 years later than the No Action Alternative.
Vegetation	Under the No Action Alternative, mining would continue in the Mine permit area to recover non-Federal coal remaining within the permit area over a 1-year period, resulting in 2.9 acres of surface disturbance from subsidence repairs. Under the No Action Alternative, impacts from disturbance would occur in the shrubland, burned ponderosa pine, ponderosa pine forest, and grassland habitats. Vegetation removal from surface disturbing activities would result in minor and short-term impacts on livestock forage and wildlife habitat provided by existing vegetative cover. Similarly, surface disturbing activities would allow for the potential introduction of invasive plant species and noxious weeds during the 1-year mining period. However, impacts to vegetation	Under the Proposed Action, impacts vegetation from ongoing mining operations would occur up to 8 additional years compared to the No Action Alternative. Mining operations under the Proposed Action would result in an additional 16.4 acres of surface disturbance on non-Federal land, and an additional 5.2 acres of surface disturbance on Federal land, compared to the No Action Alternative. Surface disturbing activities under the Proposed Action would include the development of surface facilities, construction of roads, and subsidence repairs. Vegetation removal as a result of surface disturbance under the	Under the Partial Mining Alternative, impacts vegetation from ongoing mining operations would be similar to those described for the Proposed Action, but would occur over but for approximately 4 fewer years. Additionally, mining activities under the Partial Mining Alternative would result 0.5 fewer acres of surface disturbance on non-Federal land and 0.9 fewer acres of surface disturbance on Federal land, compared to the Proposed Action. Vegetation removal and the introduction of invasive plant species and noxious weed species as a result of surface disturbance would result in minor and short-

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
	would be negligible following reclamation activities.	Proposed Action would result in minor and long-term impacts on livestock forage and wildlife habitat provided by existing vegetative cover. Similarly, impacts to vegetation from the introduction of invasive plant species and noxious weeds would be minor, but long term over the Proposed Action's mining period. Consistent with the No Action Alternative, impacts to vegetation would be negligible once reclaimed at the conclusion of mining operations. Postmining vegetative conditions would be achieved up to 8 years later than the No Action Alternative.	term impacts on existing vegetative cover under the Partial Mining Alternative's 5-year mining period. Consistent with the No Action Alternative and the Proposed Action, impacts to vegetation would be negligible once reclaimed at the conclusion of mining operations. Postmining vegetative conditions would be achieved approximately 3 years earlier than under the Proposed Action and approximately 4 years later than under the No Action Alternative.
Wildlife	Under the No Action Alternative, mining would continue in the Mine permit area to recover non-Federal coal remaining within the permit area over a 1 year period, resulting in 2.9 acres of surface disturbance from subsidence repairs. Under the No Action Alternative, minor short and long-term direct and indirect impacts on wildlife may occur due to changes to vegetation community composition and structure; permanent improvements to roads; or changes to water quality, quantity, and distribution. Wildlife may also experience direct and indirect impacts due to noxious weed infestations and associated changes to habitats and due to displacement from sensitivity to human noise or presence. Minor and short-term indirect impacts to wildlife may occur due to impacts from	Under the Proposed Action, impacts on wildlife and wildlife habitat from ongoing mining operations would occur up to 8 additional years as compared to the No Action Alternative. Mining operations under the Proposed Action would result in an additional 16.4 acres of surface disturbance on non-Federal land, and an additional 5.2 acres of surface disturbance on Federal land, compared to the No Action Alternative. Surface disturbing activities under the Proposed Action would include the development of surface facilities, construction of roads, and subsidence repairs. Continued mining operations under the	Under the Partial Mining Alternative, impacts on wildlife and wildlife habitat from ongoing mining operations would be similar to those described for the Proposed Action, but would occur over approximately 4 fewer years. Additionally, mining activities under the Partial Mining Alternative would result 0.5 fewer acres of surface disturbance on non-Federal land and 0.9 fewer acres of surface disturbance on Federal land, compared to the Proposed Action. Most of the direct and indirect impacts of the Partial Mining Alternative, including habitat loss, would be limited to the vicinity of proposed and existing

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
	subsidence and associated changes to water resources and vegetative communities in association with surface disturbances and reclamation. Minor direct impacts may occur from surface cracks due to subsidence that may create a surface hazard to wildlife that traverse these areas. Impacts on wildlife and wildlife habitat would be negligible following reclamation activities.	Proposed Action would result in an additional 1,059.0 acres of subsidence on non-Federal land and an additional 1,033.4 acres of subsidence on Federal land, compared to the No Action Alternative. Impacts on wildlife resulting from the Proposed Action would be similar to those described for the No Action Alternative but would encompass a larger area and timeframe. Most of the direct and indirect impacts of the Proposed Action, including habitat loss, would be limited to the vicinity of proposed and existing disturbances and would be minor to moderate and short term. Direct and indirect impacts of the Proposed Action on bats would be minor and long term.	disturbances and would be minor to moderate and short term. Direct and indirect impacts of the Proposed Action on bats would be minor and long term.
Threatened, Endangered, and Special Status Species	Under the No Action Alternative, mining would continue in the Mine permit area to recover non-Federal coal remaining within the permit area over a 1-year period, resulting in 2.9 acres of surface disturbance from subsidence repairs. Federally threatened or endangered and special status species have limited potential to occur in the study area and low potential to be affected by currently ongoing mining activities. Impacts on threatened, endangered, and special status species and their habitats would be negligible following reclamation activities.	Under the Proposed Action, impacts vegetation from ongoing mining operations would occur up to 8 additional years compared to the No Action Alternative. Mining operations under the Proposed Action would result in an additional 16.4 acres of surface disturbance on non-Federal land, and an additional 5.2 acres of surface disturbance on Federal land, compared to the No Action Alternative. Surface disturbing activities under the Proposed Action would include the development of surface facilities,	Under the Partial Mining Alternative, impacts on wildlife habitat from ongoing mining operations would be similar to those described for the Proposed Action, but would occur over approximately 4 fewer years. Additionally, mining activities under the Partial Mining Alternative would result in 0.5 fewer acres of surface disturbance on non-Federal land and 0.9 fewer acres of surface disturbance on Federal land, compared to the Proposed Action.

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
		construction of roads, and subsidence repairs. Impacts on federally threatened or endangered and special status species under the Proposed Action would be similar to those described for the No Action Alternative but would encompass a larger area and timeframe. As with the No Action Alternative, most of the direct impacts of the Proposed Action, including habitat loss, would be limited to the vicinity of proposed and existing disturbances. Impacts on federally threatened or endangered and special status species would be minor and short term. Impacts on eagles would be minor with incorporation of mitigation measures and long term.	Impacts on federally threatened or endangered and special status species under the Partial Mining Alternative would be similar to those described for the No Action Alternative but would encompass a larger area and timeframe. As with the No Action Alternative, most of the direct impacts of the Proposed Action, including habitat loss, would be limited to the vicinity of proposed and existing disturbances. Impacts on federally threatened or endangered and special status species would be minor and short term. Impacts on eagles would be minor with incorporation of mitigation measures and long term.
Cultural Resources	Under the No Action Alternative, the proposed mining plan modification would not be approved, and approximately 1,239.6 acres of Federal coal lands and approximately 1,840.7 acres of non-Federal coal lands would not be mined. Approximately 576.8 acres of subsidence on non-Federal land is anticipated from these mining activities. Additionally, approximately 2.9 acres of surface disturbance is anticipated from subsidence repairs on non-Federal lands under the No Action Alternative. Both the 576.8 acres of subsidence area and 2.9 acres of surface disturbance under the No Action Alternative has the potential to affect nine known cultural resources, one of	Impacts on cultural resources under the Proposed Action would be the same as those described for the No Action Alternative, except that under the Proposed Action there would be a net increase of approximately 2,092.4 acres of subsidence area, and 21.6 acres of surface disturbance compared to the No Action Alternative. The Proposed Action would result in an approximate total of 24.5 acres of surface disturbance from mining, surface facilities, portals, borehole pads, roads, and soil stockpiles. Approximately 13.4 acres of surface disturbance is anticipated	Impacts on cultural resources under the Partial Mining Alternative would be the same as those described for the No Action Alternative, except that under the Partial Mining Alternative there would be a net increase of approximately 1,816.8 acres of subsidence area and 20.2 acres of surface disturbance compared to the No Action Alternative. The Partial Mining Alternative would result in an approximate total of 11.1 acres of surface disturbance from mining, surface facilities, portals, borehole pads, roads, and soil stockpiles. Approximately 12.0

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
	which, site 24YL2144, has previously been recommended as eligible for the NRHP. The other eight sites have either been determined ineligible or are recommended as not eligible for the NRHP and all nine of these sites are on private property.	from subsidence repairs. Both the 2,669.2 acres of subsidence area and 24.5 acres of surface disturbance under the Proposed Action have the potential to affect 22 known cultural resources, one of which is recommended eligible for the NRHP (site 24YL2144) and five of which are unevaluated for NRHP eligibility. However, OSMRE, with SHPO concurrence, determined that the undertaking would not adversely affect these sites. The remaining 16 sites are either ineligible or recommended not eligible for the NRHP.	acres of surface disturbance is anticipated from subsidence repairs. Both the 2,393.6 acres of subsidence area and 23.1 acres of surface disturbance under the Partial Mining Alternative has the potential to affect 18 known cultural resources, one of which is recommended eligible for the NRHP (site 24YL2144) and four of which are unevaluated for NRHP eligibility. However, OSMRE, with SHPO concurrence, determined that the undertaking would not adversely affect these sites. The 13 remaining sites are either ineligible or recommended not eligible for the NRHP.
Noise and Vibration	Recovery of saleable coal would occur at a rate of approximately 10.0 Mtpy of saleable coal over a 1-year period. However, noise and vibration from roads, surface facilities and the mine ventilation fan would continue at existing levels for 1 year. The average daily volume of trains would not increase relative to existing conditions.	Recovery of saleable coal would continue at an average rate of approximately 7.1 Mtpy of saleable coal for approximately 8 additional years as compared to the No Action Alternative. The surface facilities would expand to include a new waste disposal area. Mining would progress northeast, requiring use of heavy equipment to maintain new longwall panels and conduct subsidence repairs. The ventilation fan would be moved to new longwall panel locations as mining progresses to the northeast. Noise from the ventilation fan would potentially result in a noticeable increase in ambient noise at residences.	Recovery of saleable coal would occur at a rate of approximately 10.0 Mtpy over a 5-year term, which would be a longer duration than the 1-year period under the No Action Alternative and approximately 4 fewer years than the Proposed Action. The surface facilities would expand to include a new waste disposal area. Mining would progress northeast, requiring use of heavy equipment to maintain new longwall panels and conduct subsidence repairs. The ventilation fan would be moved to new longwall panel locations as mining progresses to the northeast. Noise from the ventilation fan would potentially

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
		The average daily volume of trains would represent a negligible increase in noise and vibration levels along transportation corridors compared to the No Action Alternative.	result in a noticeable increase in ambient noise at residences. The average daily volume of trains would represent a negligible increase in noise and vibration levels along transportation corridors compared to the No Action Alternative.
Socioeconomics	Under the No Action Alternative, mining would recover approximately 10.0 Mt of saleable non-Federal coal over a 1-year period and additional future mining of Federal coal would not be authorized. Revenue is anticipated to total approximately $173 million (2023$, 2% discount rate). Signal Peak Community Foundation activities and other local charitable contributions would cease immediately. Capital infrastructure investments would fall from $18 million per year to $0 in the last 12 months of operations followed by a final $2.4 million during the 18 months of reclamation. Once the mine ceases operations, OSMRE anticipates that local businesses would experience a decline in revenues and that many residents with mine-dependent jobs would lose employment and move away. Local environmental, health, and safety impacts on residents and businesses from Mine activities and attendant rail traffic would cease as the mine closes and completes reclamation. The decline in government revenues following mine closure would be anticipated to exceed the reduced demand for government facilities and services. Impacts on the local economy would be short-term and moderate during	Under the Proposed Action, impacts would be the same as under the No Action Alternative except that mining would continue for up to approximately 9 years to recover 57.3 Mt of saleable coal. Relative to the No Action Alternative, the revenue and capital investment decline, Mine closure, and associated layoffs and reductions in environmental, health, and safety impacts would be delayed for up to 8 years, and it is anticipated that the Mine would generate an additional $930 million (2023$, 2% discount rate) in revenues as compared to the No Action Alternative. Impacts would be short- and long-term and moderate to the local economy and minor nationwide.	Under the Partial Mining Alternative, impacts would be the same as under the No Action Alternative except that mining would continue for approximately 5 years to recover an anticipated additional 50.9 Mt of saleable coal. Relative to the No Action Alternative, the revenue and capital investment decline, Mine closure, and associated layoffs and reductions in environmental, health, and safety impacts would be delayed approximately 4 years, and the Mine would be anticipated to generate an additional $670 million (2023$, 2% discount rate) in revenues as compared to the No Action Alternative. Impacts would be short- and long-term and moderate to the local economy and minor nationwide.

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
	the remaining 1 year of mining, with minor direct and indirect impacts nationwide.		
Visual Resources	Under the No Action Alternative, mining would continue to recover non-Federal coal over a 1-year period, and additional future mining operations would not be authorized. Visible features associated with the Mine would result in approximately 2.9 acres of additional surface disturbance from subsidence repairs on non-Federal lands and be largely consistent with existing conditions. It is unlikely that areas of subsidence, including new areas of subsidence, would be visible from publicly accessible vantages. Lighting associated with the Mine is anticipated to remain consistent with existing conditions, because no new facilities would be constructed. Site reclamation and removal of lighting would occur within approximately 16 months after the end of mining so that the site better blends with the surrounding landscape. Visual changes associated with the No Action Alternative are consistent with BLM VRM Class III objectives where change may attract attention but is not dominant.	Under the Proposed Action, mining would continue for up to 9 additional years. Visual impacts from new disturbances would be minor under the Proposed Action, as most changes would occur where the visual character is already altered by existing operations. However, new surface disturbances would occur over a larger area than the No Action Alternative. This increases the potential for surface disturbances under the Proposed Action to be more visible to the public from locations east of Highway 87 and south of the surface facilities area than the No Action Alternative. While visual impacts would occur over a longer period of time under the Proposed Action (up to 8 years longer than the No Action Alternative), the duration is still relatively short term. Lighting impacts would be anticipated to be minor depending on the proximity of lights, mitigation would alleviate potential adverse impacts, and lighting would be removed as individual facilities are decommissioned. Impacts would cease after mining concludes and reclamation is performed. Therefore, long-term visual effect impacts of surface disturbances would be negligible due to the	Under the Partial Mining Alternative mining would continue for up to 4 additional years as compared to the No Action Alternative. Impacts to visual resources under the Partial Mining Alternative would be largely the same as described in the Proposed Action. The primary differences would be that there would be a slight decrease of 1.4 acres in subsidence repair and the duration of mining would be decreased. This difference is considered negligible and would not result in a noticeable change in the landscape given the limited potential for such changes to be visible, due to intervening terrain and vegetation, and because subsidence repairs would ensure that the landscape appears largely intact and consistent with existing conditions. The nature of changes to the visual landscape from surface disturbances and changes in light and glare under the Partial Mining Alternative would be the same as described for the Proposed Action and consistent with BLM VRM Class III objectives where change may attract attention but is not dominant. As such, the direct and indirect impacts related to visual resources would be minor and short term in nature, and

Resource	No Action Alternative	Proposed Action	Partial Mining Alternative
		mitigating impacts of reclamation. Visual changes associated with the Proposed Action are consistent with BLM VRM Class III objectives where change may attract attention but is not dominant.	mitigation measures for the Partial Mining Alternative would be the same as for the Proposed Action.

Chapter 3
Affected Environment

3.0 Introduction

This chapter discusses the existing conditions of the affected environment, including physical, biological, cultural, and human resources that could be affected by implementation of the Proposed Action, No Action Alternative, and Partial Mining Alternative, described in Chapter 2. This chapter includes resource-specific analyses, including the area of analysis, regulatory framework (State and Federal laws and regulations) applicable to each resource, and existing conditions within the study area. Resources analyzed in this Environmental Impact Statement (EIS) are listed in **Section 3.0.1**. The general setting for the Project area is described in **Section 3.0.2**, to provide context for the resource-specific discussions in this chapter.

The environmental baseline information summarized in this chapter was obtained from the review of published sources, unpublished data, communication with government agencies, and review of field studies of the study area. This chapter provides the scientific and analytic basis for the comparison of the Proposed Action and alternatives as presented in Chapter 2 of this EIS. Additionally, aspects of the affected environment described in this chapter relate to the issues presented in **Chapter 1** of this EIS.

Where baseline information pertaining to the Mine, and presented in the BLM Coal Lease EA, has not substantively changed, it is incorporated by reference. More recent information pertaining to the baseline and existing condition at the Mine is presented in this chapter, where available, along with baseline data supporting analysis of coal transport and combustion which occur indirectly as a result of mining.

As mentioned in **Section 1.4**, this analysis was prepared before the Supreme Court's decision in *Seven County*. Simply because a resource is analyzed in this section is not indicative as to whether an analysis is required under NEPA.

3.0.1 Resources Analyzed in Detail

Based on internal agency scoping and comments received during public scoping, 18 resources (listed below) were identified for detailed assessment in this EIS. Throughout this chapter, the affected environment and existing conditions for each resource are analyzed within both the direct and indirect effects study area. Direct and indirect effects study areas are defined based on characteristics unique to each individual resource as outlined in **Table 3.1-1** below. **Table 3.0-1** also defines the past, present, and RFFA effects study area for each resource.

Resources Analyzed in Detail:

- Transportation and Electrical Transmission
- Air Quality
- Climate Change and Greenhouse Gases
- Water Resources

- Land Use
- Topography and Physiography
- Geology, Minerals, and Paleontology
- Solid Waste and Hazardous Materials
- Human Health and Safety
- Soils
- Vegetation
- Wildlife
- Threatened, Endangered, and Special Status Species
- Cultural Resources
- Noise and Vibration
- Socioeconomics
- Visual Resources

Table 3.0-1. Resource Study Areas for Direct and Indirect Effects and Past, Present, and Reasonably Foreseeable Future Actions Effects

Resource	Direct Effects Study Area	Indirect Effects Study Area	Past, Present, and RFFA Effects Study Area
Transportation	Permit area and the rail transportation route to Laurel.	Permit area, 200-mile radius truck transportation routes and rail transportation routes to ports at Westshore (Vancouver – British Columbia, Canada) and Superior (Wisconsin).	Permit area, 200-mile radius truck transportation routes and rail transportation routes to ports at Westshore (Vancouver – British Columbia, Canada) and Superior (Wisconsin), including other domestic locations (Three Forks, MT, Green Bay, WI, and Avon Lake, OH).
Air Quality	Permit area and a 31-mile (50-km) radius around the permit area.	Permit area and a 31-mile (50-km) radius around the permit area, truck routes, and rail transportation route to Laurel.	Permit area, truck routes, and rail transportation routes to the Westshore Port Westshore (Vancouver – British Columbia, Canada) and Superior (Wisconsin), including other domestic locations (Three Forks, MT, Green Bay, WI, and Avon Lake, OH), and regional airsheds. Also includes quantification of emissions from ocean/lake shipping and coal combustion. The study area also includes the global contributions of non-GHG sources (e.g., mercury).
Greenhouse Gases and Climate Change	Permit area.	Permit area, employee commute from Roundup and Billings, and rail transportation route to ports at Westshore (Vancouver – British Columbia, Canada) and Superior (Wisconsin), including other domestic locations (Three Forks, MT, Green Bay, WI, and Avon Lake, OH), port operations (just for this coal), ocean/lake shipping, and coal combustion.	GHG contributions and climate change for Montana, US, and global sources.
Water Resources (including wetlands)	Half-mile radius around the combined permit area and modeled five-foot groundwater drawdown	Half-mile radius around the permit area and modeled five-foot groundwater drawdown contour plus HUC 12 subwatershed for Rehder Creek.	Hydrologic Unit Codes (HUC) 12 subwatershed boundaries: Halfbreed Creek, Parrot Creek, Upper Fattig Creek, Rehder Creek, Upper Razor

Resource	Direct Effects Study Area	Indirect Effects Study Area	Past, Present, and RFFA Effects Study Area
	contour plus HUC 12 subwatershed for Rehder Creek.		Creek, Middle Razor Creek, Upper Pompeys Pillar Creek, and Upper Railroad Creek.
Geology, Minerals, and Paleontology	Permit area.	Permit area.	Permit area plus AM 5.
Soils	Permit area.	Permit area.	Same as Water Resources.
Vegetation (including grazing and rangeland)	Permit area.	Permit area.	Same as Water Resources.
Wildlife	Permit area, 1-mile buffer around the permit area, and 600-meter buffer centered on the rail transportation route to Laurel.	Permit area, 1-mile buffer around the permit area, and 600-meter buffer centered on the rail transportation route to Laurel.	Same as Water Resources and a 600-meter buffer centered on the rail transportation route to Laurel.
Threatened, Endangered, and Special Status Species	Permit area, 1-mile buffer around the permit area, and 600-meter buffer centered on the rail transportation route to Laurel.	Permit area, 1-mile buffer around the permit area, and 600-meter buffer centered on the rail transportation route to Laurel.	Same as Water Resources and 600-meter buffer centered on the rail transportation route to Laurel.
Topography and Physiography	Permit area.	Permit area.	Permit area.
Noise & Vibration	Permit area.	Permit area and a 1-mile buffer around the permit and rail transport to Laurel.	Permit area and a 1-mile buffer around the permit and rail transport to Laurel.
Visual Resources	Permit area.	Permit area and a 1-mile buffer around the permit and rail transport to Laurel.	Permit area and a 1-mile buffer around the permit and rail transport to Laurel.
Hazardous and Solid Waste	Permit area.	Permit area.	Permit area.
Lands and Realty	Permit area.	Permit area.	Permit area.
Cultural Resources	Permit area.	Permit area.	Permit area and a 0.25-mile buffer around the permit area.
Socioeconomics	Musselshell and Yellowstone Counties.	Musselshell and Yellowstone Counties.	Musselshell and Yellowstone Counties.
Human Health and Safety	Permit area.	Musselshell and Yellowstone Counties.	Musselshell and Yellowstone Counties.

Figure 3.0-1. Study Areas

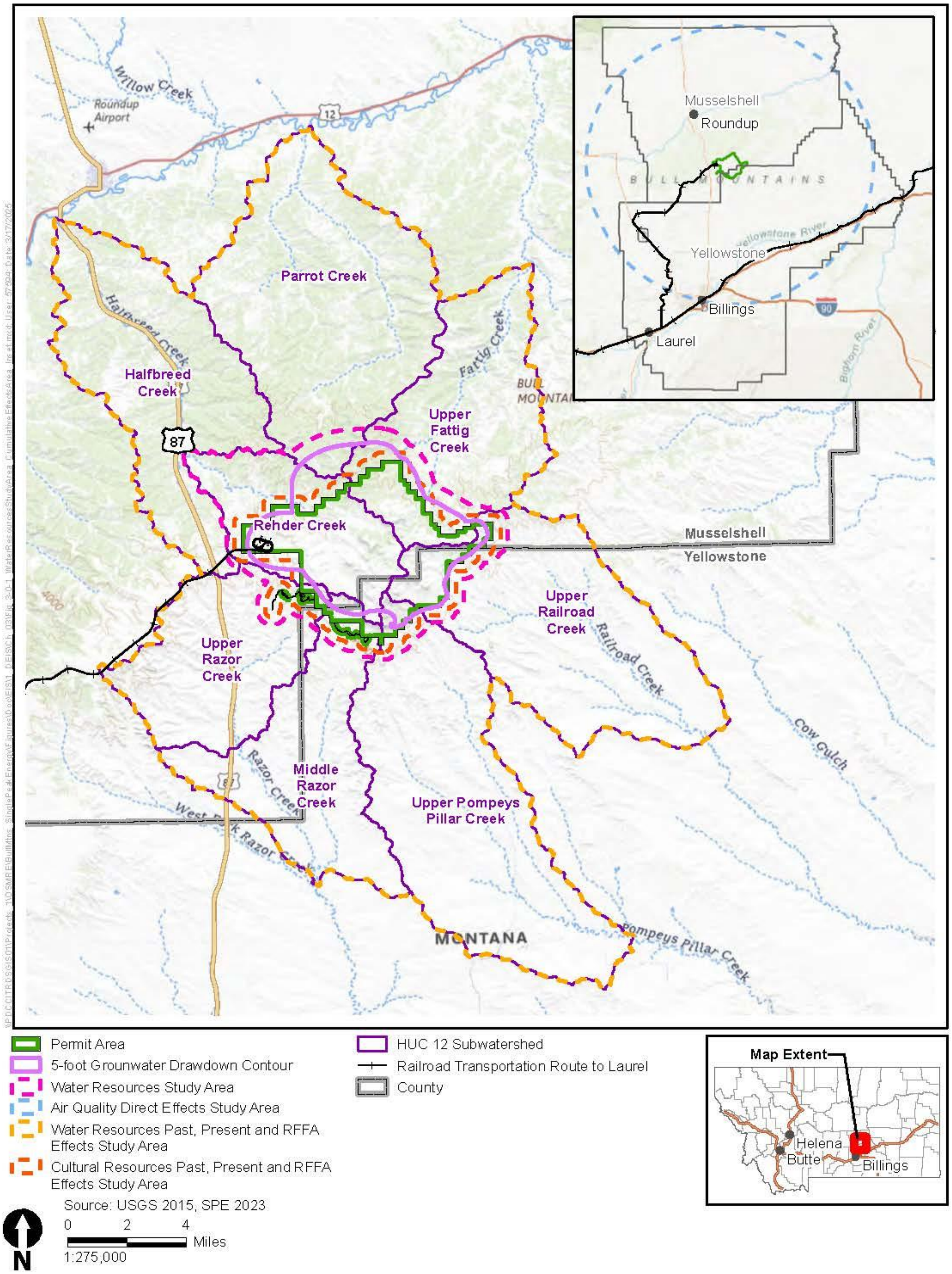


Figure 3.0-2. Wildlife and Threatened and Endangered Species Study Areas

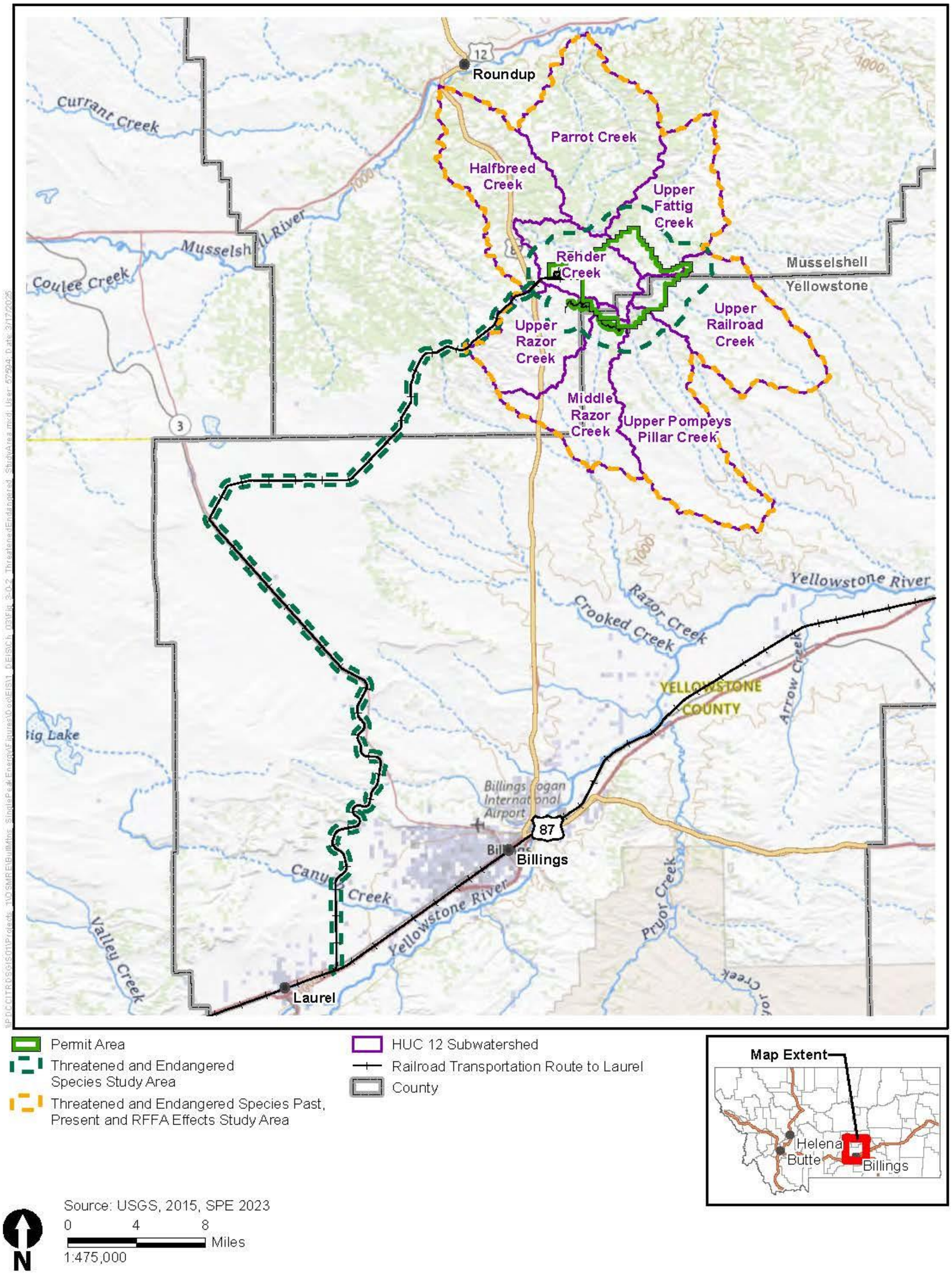
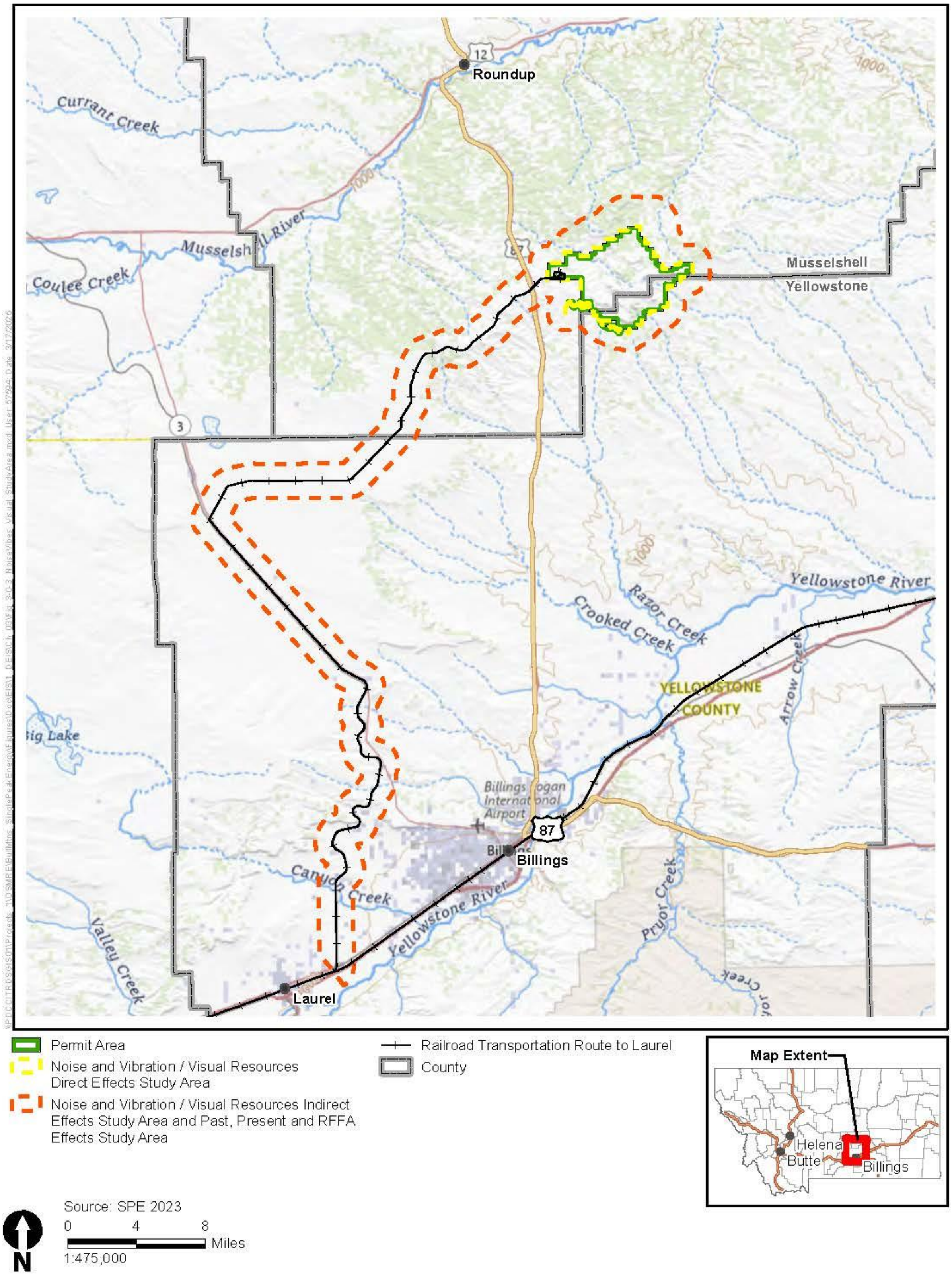


Figure 3.0-3. Noise and Vibration and Visual Resources Study Areas



3.0.2 General Setting

The proposed Project area is located in south-central Montana (MT) and straddles the border of Musselshell and Yellowstone Counties, approximately 30 miles north of Billings and 20 miles southeast of Roundup, Montana (MT) (**Figure 1.1-1**). The Crow Indian Reservation is southeast of Billings in Big Horn and Yellowstone Counties about 40 miles south of the Project area. The Northern Cheyenne Indian Reservation is 75 miles southeast of the Project area in Big Horn and Rosebud Counties.

The Project is situated within the Bull Mountains, which are part of the Northern Great Plains physiographic province. The topography of the study area consists of gently sloping valleys bounded by moderately steep, to steep ridges, capped by isolated sandstone and clinker mesas. Elevations in the study area range from approximately 3,700 to 4,700 feet above mean sea level. The underlying rocks are composed of interbedded shales, claystones, siltstones, coals, and sandstones.

The Project area has a semi-arid climate and is characterized by wooded rolling hills and low mountains, and areas of open, flat grasslands and farmlands. Vegetation of the Project area is characteristic of the Eastern Sedimentary Plains of Montana in the 10-to-14-inch precipitation zone (Scow 2009). Vegetation cover varies from ponderosa pine and Rocky Mountain juniper forests at higher elevations, to sagebrush and mixed prairie grassland communities on benches, slopes, and valley drainages where soils are deeper. Cropland and pastureland only make up a small portion of the study area (approximately 2 percent).

Most of the Project Area lies within the Rehder Creek Drainage, while limited portions of the Mine overlie the Fattig Creek drainage, both of which are tributaries of the Musselshell River. Portions of Railroad Creek, Pompey's Pillar Creek and Razor Creek drainages lie beneath southern/southeastern portions of the proposed Project footprint, each of which are tributaries of the Yellowstone River.

3.1 Transportation and Electrical Transmission

3.1.1 Introduction

Based on historical data and future projections, over 96 percent of SPE shipments would likely be transported approximately 1,390 miles from the Mine through Montana, Idaho, and Washington to the Westshore Terminal in the Port of Vancouver, British Columbia, Canada. This part of the overall saleable coal recovery would then be shipped overseas to ports in Japan, ROK, Chile, and Hong Kong. The average ocean transport distance between Westshore and possible coal ports in Japan, ROK, Chile, and Hong Kong is estimated to be approximately 5,300 miles (4,600 nautical miles) one-way (MarineTraffic 2017). Specific customers, combustion locations/facilities, and ports used are not known and would be too speculative to analyze further.

The 2018-2023 averages by shipment destinations and modes are shown in **Table 3.1-1**.

Table 3.1-1. Coal Shipment Destinations: 2018 to 2023 Averages

U.S. Power Plant Destination and Shipping Mode	Average
Westshore, BC (Rail)	97.27%
Duluth-Superior, WI (Rail)	1.31%
Other Domestic (Rail) 1	0.81%
Graymont, MT (Truck)	0.49%
Roundup, MT (Truck)	0.03%
Hardin, MT (Truck)	0.09%

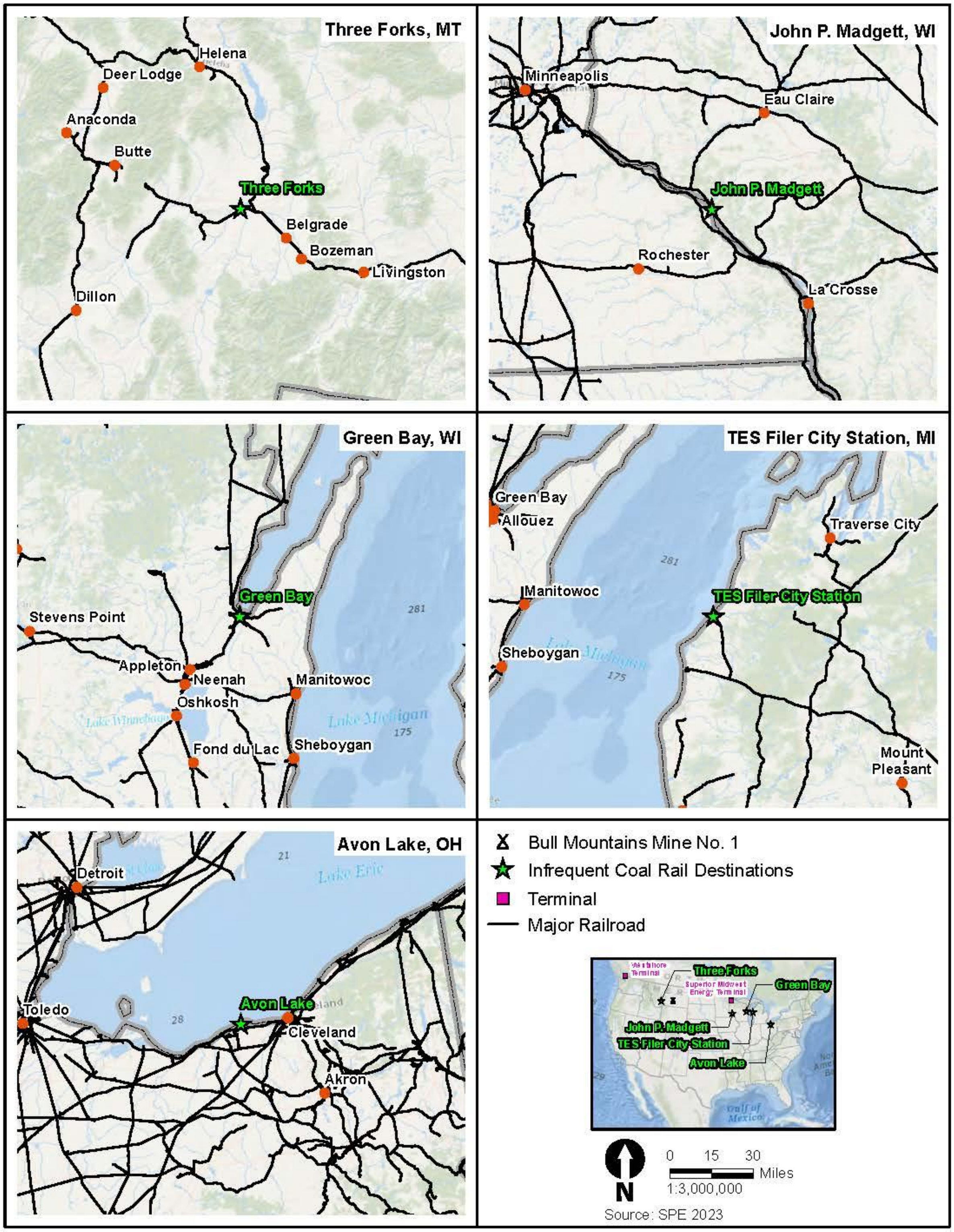
[1] Other infrequent domestic coal rail destinations include Three Forks MT, Green Bay WI, John P. Madgett WI, Avon Lake OH, and TES Filer City Station MI (shipped from Duluth-Superior WI Port).
Sources: EIA 2023, SPE 2023b and 2024b

No more than four percent of the transported coal is anticipated to be used domestically. As the Surface Transportation Board (STB) applies a threshold of an increase of eight trains per day—or a 100 percent increase in rail traffic when assessing the need to evaluate freight rail safety (STB 2015a)—the small number of trains headed to various domestic locations was not analyzed further. Further, domestic locations for future shipments via rail or trucking are unknown at this time, and it would be too speculative to complete any further analysis due to variations in coal market conditions.

3.1.2 Study Area

The study area for transportation includes both a direct effects study area and an indirect effects study area. The direct effects study area includes the permit area plus the rail transportation route to Laurel and the indirect effects study area includes the permit area plus the truck routes within a 200-mile radius, and rail transportation route to ports at Westshore (Vancouver – British Columbia, Canada) and Superior (**Table 3.0-1, Figure 1.1-3** and **Figure 1.1-4**). The past, present, and RFFA effects study area for transportation includes the permit area, the truck routes within a 200-mile radius, and the rail transportation routes to ports at Westshore (Vancouver – British Columbia, Canada) and Superior (Wisconsin) including other domestic locations (Three Forks, MT, Green Bay, WI, John P. Madgett, WI, TES Filer City Station, MI, and Avon Lake, OH) (**Figure 3.1-1**). Direct, indirect, and past, present, and RFFA impacts are discussed in detail in **Chapter 4**.

Figure 3.1-1. Other Domestic Locations



3.1.3 Regulatory Framework

3.1.3.1 Federal Requirements

Railroads are regulated by two separate Federal agencies, each with their own responsibilities.

- Surface Transportation Board (STB) – STB is an independent adjudicatory and economic-regulatory agency charged by Congress with resolving railroad rate and service disputes and reviewing proposed railroad mergers. STB has jurisdiction over railroad rate and service issues and rail restructuring transactions (e.g., mergers, line sales, line construction, and line abandonments). STB also has authority to investigate rail service matters of regional and national significance. STB regulations preempt State and local laws (e.g., noise ordinances) that would otherwise manage or govern rail transportation.
- Federal Railroad Administration (FRA) – As part of the US Department of Transportation (USDOT), FRA formulates and enforces rail safety regulations, administers rail funding, and researches rail improvement strategies and technologies. FRA also facilitates national and regional rail planning to maintain current services and infrastructure and to expand and improve the rail network. For example, the Passenger Rail Investment and Improvement Act of 2008 requires states to develop FRA-accepted State rail plans and encourages State involvement in rail policy, planning, and development. For the most part, all railroad operational procedures are subject to FRA regulations, including highway-railroad crossing signals, train speeds, train horn use, track condition, and crew requirements.

STB and FRA conduct reviews required by NEPA and consider environmental impacts before making final decisions pertaining to actions under their jurisdiction. STB’s Office of Environmental Analysis is responsible for directing the environmental review process, conducting independent analyses of environmental data, and making environmental recommendations to the STB. STB's environmental rules are found at 49 CFR Part 1105. FRA conducts environmental reviews according to FRA's Environmental Procedures (FRA 1999).

In addition to the regulations administered by STB and FRA, railroad activities must comply with other Federal laws pertaining to environmental protection such as the Clean Water Act (CWA) and the Clean Air Act (CAA) administered by EPA and the Endangered Species Act administered by the US Fish and Wildlife Service and the National Marine Fisheries Service.

3.1.3.2 State Requirements

As authorized by Surface Mining Control and Reclamation Act of 1977 (SMCRA), OSMRE has entered into a State-Federal Cooperative Agreement with the State of Montana, which allows Montana primary jurisdiction to regulate surface coal mining operations on Federal lands, subject to Federal law and the terms of that agreement (30 CFR § 926.30). Under this authority, MDEQ regulates permitting and operation of surface coal mines on Federal lands within Montana under the authority of MSUMRA (Section 82-4-221 et seq., MCA) and its implementing rules (ARM 17.24.301-1309).

Requirements under MSUMRA include:

- Provisions for the relocation of use of public roads (ARM 17.24.319). Each mine application must describe the measures to be used to ensure that the interests of the public and landowners affected are protected if the applicant is seeking approval of: (1) conducting the proposed mining activities within 100 feet of the right-of-way line of each public road, except where mine access or haul roads join that right-of-way; or (2) relocating or closure of a public road.

- Requirements to develop a transportation facilities plan (ARM 17.24.321); each mine application must contain a description of each road, conveyor, and railroad loop to be constructed, used, or maintained within the proposed permit area.
- General requirements for road and railroad loop construction (ARM 17.24.601).
- Requirements for the location of roads and railroad loops (ARM 17.24.602).
- Requirements for the location of roads and railroad loop embankments (ARM 17.24.603).
- Requirements to account and design for the hydrologic impact of roads and railroad loops (ARM 17.24.605).
- Requirements for the maintenance of roads and railroad loops (ARM 17.24.607).
- Provisions for permanent roads (ARM 17.24.610).
- Provisions for areas upon which coal mining is prohibited that address how to obtain permission to mine near public roads (ARM 17.24.1134); whenever a proposed mining operation is to be conducted within 100 feet measured horizontally to the outside right-of-way line of any public road (except where mine access roads or haul roads join such right-of-way), MDEQ may permit mining to occur if the applicant:
    - obtains the necessary approval of the authority with jurisdiction over the public road,
    - gives appropriate notice of a public hearing,
    - holds a public hearing with the purpose of determining whether the interests of the public and affected landowners will be protected, and
    - produces a written finding based on the information from the public hearing.
- Areas upon which coal mining is prohibited that address the relocation or closure of a public road (ARM 17.24.1135); whenever any mine application proposes to relocate or close a public road to facilitate surface- or underground-mining operations, the road may not be relocated or closed until:
    - the permit authorizing the operation is granted,
    - the applicant obtains the necessary approval from the authority with jurisdiction over the public road,
    - a notice of a public hearing in a newspaper of general circulation in the affected locale is provided at least two weeks before the hearing,
    - an opportunity for a public hearing at which any member of the public may participate is provided in the locality of the proposed mining operations for the purpose of determining whether the interests of the public and affected landowners will be protected, and
    - a written finding based upon information received at the public hearing is made within 30 days after completion of the hearing as to whether the interests of the public and affected landowners will be protected from the proposed mining operations.

3.1.3.3 Local Requirements

Provisions to mine near public roads or that address the relocation or closure of a public road would require approval from the authority with jurisdiction over the public road. The local regulatory framework is provided under MSUMRA, specifically in 82-4-227(7)(d), MCA, and in its implementing rules, ARM 17.24.1134 and ARM 17.24.1135.

3.1.4 Existing Conditions

3.1.4.1 Rail Transportation

Rail transportation is and would be used for shipping coal to various destinations and to return empty rail cars to fill for additional trips. The railroad traffic is not expected to affect other onsite traffic as there are no at-grade crossings in high-traffic areas.

Coal exports to Japan, ROK, Chile, and Hong Kong are shipped through Westshore Terminal (Westshore), within the Roberts Bank Port at Port Metro Vancouver, British Columbia, Canada—1,390 miles away. After leaving the Mine area, coal moves southwest along a 30-mile rail spur (a Class III short line) to Broadview, Montana (MDT 2017). Loaded and empty coal trains travelling to and from the Mine constitute all traffic on the rail spur. Based on the annual saleable coal recovery rates (see **Table 2.1-1**), average loaded trains per day in the past 5 years ranged from a low of approximately 1.0 in 2020 to a high of 1.4 in 2023, equating to between 2.0 and 2.8 trains per day (empty and full).

From Broadview, trains travel a Class I railroad 33 miles to Laurel, Montana (MDT 2017) where they join the railway system (**Figure 1.1-3**), with alternative routes that may be used in response to inclement weather, maintenance issues, or other factors (BNSF 2017a). Most coal transported to Westshore would be hauled along BNSF's Main Line (**Figure 1.1-3**), as the northern route through Glacier Park involves higher gradients and would thereby only be used by a fraction of the returning empty trains (10 percent of all trains, which is 20 percent of empty trains).

Train count data reported for a rail crossing (088439S) near Acton, Montana, midway on the Broadview to Laurel (Mossmain Junction) segment (**Figure 1.1-3**), estimated 6 trains per 24-hour period in 2013 (USDOT 2016). Based on the saleable coal recovery rates and train size presented in **Section 2.1** and **Section 2.2.7** round-trip rail traffic associated with the Mine averaged approximately 2.7 trains per day in 2013. This suggests that rail traffic excluding the Mine-related rail traffic was approximately three trains per day in 2013 and that Mine-related traffic in the past 10 years may comprise approximately half of traffic on that segment. With an average of 2.6 trains per day under the Proposed Action (1.3 round-trip trains per day), this distribution of usage remains approximately the same.

The Main Line between Laurel and Westshore Terminal traverses Montana, Idaho, Washington and enters British Columbia (**Figure 1.1-3**). Baseline traffic (average number of trains per day) estimates of train traffic on the United States segments range from 14.5 (2012 estimate for Mossmain Junction to Sandpoint, Idaho [STB 2015a]) trains per day to 70 (2015 estimate for segments in Washington east of Spokane [Cowlitz County and WDOE 2017]) trains per day. The portion of existing rail traffic related to the Mine's coal transport (2.8 trains per day in 2023) is highest from Laurel, Montana to Sandpoint, Idaho. Mine-related rail traffic on that segment is estimated to be less than 15 percent of all rail traffic

Rail Traffic

Rail segment utilization, the ratio of demand to available capacity, is a metric related to rail congestion where utilization near or over 100 percent may cause delays. Recent State rail plans report that the utilization of Main Line segments in Montana (MDT 2010) and Washington (WSDOT 2020) used for westbound coal from the Mine is less than 100 percent. In Idaho, several segments with an estimated 48 trains per day in 2012 were above their 39-train capacity (ITD 2013). However, according to the Idaho Department of Transportation (2013), despite deficiencies, double-track segments in northern Idaho provide a "comfortable [level of service] under current conditions." Given that the train volumes on Idaho's network by 2040 were expected to increase by 143 percent, the Idaho Transportation Department expected that the rail operators on these lines would implement operational and physical improvements to address the demand and provide the needed capacity and efficiency.

Coal from all sources is a substantial portion of statewide rail freight tonnage in all three states: 71 percent in Montana (MDT 2010), 14 percent in Idaho (ITD 2013) and 10 percent in Washington (WSDOT 2020).

Montana, Idaho, and Washington rail plans analyze the current capacity of the lines in each state relative to forecasted conditions extended to 2035 or 2040, which extends beyond the estimated Mine life (i.e., roughly 2035 under the Proposed Action). The rail plans project increased rail traffic and utilization on all Main Line segments.

Montana Main Line utilization will not exceed 100 percent by 2035 for the track used by westbound coal shipments from the Mine (MDT 2010).

Idaho Main Line utilization in 2040 (ITD 2013):

- Montana border to Sandpoint (Ponderay) – 90 percent.
- Sandpoint to the Washington border – 270 percent.

Washington Main Line utilization in 2040 (WSDOT 2020):

- All segments below full utilization under low growth scenario.
- Most segments at or over 100 percent utilization under moderate growth scenario.
- Most segments over 100 percent utilization under high growth scenario.

The rail plans' analyses are based on anticipated freight and passenger rail growth relative to capacity. The volume that can be accommodated depends not only on infrastructure but also on the railroad's scheduling strategy, use of technology (e.g., signal timing optimization and signal coordination to improve efficiency) and many other business decisions. Projected volumes do not consider productivity improvements that may be achieved with longer trains, or other strategies continuously explored by railroad operators to improve operations and throughput. In Washington, Idaho, and Montana, as elsewhere, it is anticipated the railroads and other infrastructure owners will address key capacity issues by implementing capacity and efficiency improvements (WSDOT 2020, ITD 2013, MDT 2010).

Coal Dust Impacts on Railroads

Coal dust, a form of particulate matter, originates from loaded coal trains during transit. BNSF has conducted research since 2005 about the impacts of coal dust escaping from loaded coal cars on rail lines in the Powder River Basin (PRB). Results of these studies show that potential deposition of coal dust poses a threat to the stability of the track structure and the operational integrity of its lines in, and close to, the mines in the PRB (BNSF 2017b).

In March 2011, STB confirmed that coal dust is a “particularly harmful contaminant” that can degrade the integrity of railroad ballast, which distributes the load from the rail ties (STB 2011). Coal dust can interfere with the normal drainage of the ballast, causing tracks to be less stable and potentially increasing the risk of train derailments on heavily used rail.

Item 100 of BNSF Price List 6041-B (BNSF 2015) contains BNSF's coal dust mitigation requirements; also known as the Coal Loading Rule. The current Coal Loading Rule has been in effect since October 2011 and requires all shippers loading coal at any Montana or Wyoming mine to take measures to load cars in such a way that ensures coal dust losses in transit are reduced by at least 85 percent compared to cars where no remedial measures have been taken.

The Coal Loading Rule also has a "safe harbor" provision stating that a shipper will be deemed to be in compliance with BNSF's Coal Loading Rule if it loads cars in compliance with BNSF's published Load Profile Template and applies an approved in-transit dust suppressant agent to the loaded cars in the specified manner. Alternatively, the BNSF allows coal shippers to use other methods to reduce dust emissions if the shipper is able to show that its methods reduce emissions of fugitive coal dust by at least 85 percent. In May 2015, the STB issued a decision which affirmed the reasonableness of the Coal Loading Rule and upheld its enforceability (STB 2015b).

Accident History

As of March 31, 2020, SPE had transported 4,399 trains of coal, representing approximately 549,875 loaded train cars (SPE 2020). There were also 4,399 unloaded trains. Other than minor incidents involving mechanical issues to train engines and/or to train cars that may have occurred, only one SPE loaded or unloaded train is known to have been involved in an accident or incident of any type. In that one incident, SPE’s records indicate that a minor derailment may have occurred on February 28, 2017. A train, with a destination listed as RBG009, indicated “derail” and had -119.08 tons listed in the records. SPE currently does not have any additional information related to this possible incident (SPE 2020). The amount of coal listed is approximately the same amount of coal that could be loaded into one rail car, indicating that it may have been a derailment of one car that slipped off the track, but remained upright, and that was the volume that effectively left the train when the car left the track. The available information does not indicate that any coal was spilled, and none would be expected in a derailment where the car remained upright.

Montana experiences train accidents each year defined by the FRA as:

> Collisions, derailments, fires, explosions, acts of God, or other events involving the operation of railroad on-track equipment (standing or moving) and causing reportable damages greater than the reporting threshold for the year in which the accident/incident occurred.

The FRA reporting threshold was $10,700 in 2020 and $11,500 for 2023; it has increased to $12,000 for 2024. With thresholds for reporting this low, accidents include a wide variety of incidents and are not limited to the types of collisions or derailments that may be reported in the media.

Montana's accident experience for the last 4 years is shown in **Table 3.1-2**; this covers all trains operating in the state (passenger and freight).

Table 3.1-2. Rail Accidents in Montana

	Number of					
Year	Accidents on All Track Types[1]	Accidents on Mainline Track	Derailments on All Track Types[1]	Derailments on Mainline Track	Collisions on All Track Types[1]	Collisions on Mainline Track
2020	14	11	12	10	0	0
2021	13	1	10	1	0	0
2022	18	8	14	6	1	0
2023	13	5	11	5	1	0

Source: FRA 2024
[1] Includes mainlines, industry tracks, sidings, and yards.

Across all track types there were no collisions in 2020 and 2021 and one collision each year in 2022 and 2023; each of these occurred Yellowstone County on Track Class 1 and Track Class 2, both of which operate at low speeds. As shown in **Table 3.1-2**, the number of accidents of all types on mainline track varied between 1 and 11 per year, of which 1 to 10 were derailments. No mainline collisions occurred during the 4-year period. **Table 3.1-2** also shows that on average Montana experienced less than half of its accidents on mainline track, with the remainder occurring on sidings, industry track, and yard track. Derailments were the major cause of accidents for all track types combined and for mainline track.

As a comparison, the total number of accidents on all track types in Idaho varied from 11 to 24 per year over the same 4-year period. For Washington, the range was 31 to 46 accidents per year (FRA 2024) overall with 4 to 8 accidents per year having occurred on mainline track.

3.1.4.2 Vehicle Transportation

The Mine facilities are served by U.S. Highway 87, which connects to Billings and Interstate 94 and Roundup, which is along U.S. Highway 12. Principal local roads include Fattig Creek Road, which connects U.S. Highway 87 by way of Old Divide Road near the Mine facilities to U.S. Highway 12 to the northeast at Delphia. Mine employees travelling to work and other Mine-related traffic use these roads. U.S. Highway 87 and Old Divide Road are asphalt, all-weather, two-lane highways maintained by the Montana Department of Transportation, and Fattig Creek Road is an unpaved two-lane road maintained by Musselshell County. Additionally, several smaller local roads connect to these main roads.

Portions of the Mine permit area away from public roads are accessed via existing ranch trails and Mine roads. A combination of secondary and tertiary roads have been constructed in the Mine permit area. Secondary roads (typically 20-foot lane width) are used for access to Mine facilities such as the train loadout, conveyors, substations, well pads, and major borehole pads. Tertiary roads (typically 15-foot-wide lane width) are infrequently used in the surface facilities area and for temporary activities (e.g., installing boreholes, emergency surface support facilities, or reclamation activities) elsewhere in the permit area. Tertiary roads outside the surface facilities area are temporary. Dust suppressants (e.g., water) are applied to all active roadways and parking areas to control dust emissions, as necessary. Traffic to boreholes and surface support facilities normally use secondary roads. Tertiary roads branch off from secondary roads to actual boreholes and surface support facilities. Where boreholes can be safely constructed by driving on existing ground, tertiary roads were not constructed.

A small percentage (historically less than 1 percent) of coal has been transported via truck to Graymont, Roundup, and Hardin, Montana (see **Table 3.1-1**). As discussed in **Section 3.1.1**, future domestic trucking locations for future coal shipments are unknown at this time, and it would be too speculative to complete any further analysis due to variations in coal market conditions.

3.1.4.3 Electrical Transmission

Electricity is currently supplied to the Mine by existing overhead transmission lines. With the exception of electrical distribution lines in the surface facilities area, most of which are associated with Mine-related facilities, no other electrical transmission lines are present in the Mine permit area. In the Mine vicinity, other distribution lines provide power to local residences and farmsteads.

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3.2 Air Quality

3.2.1 Introduction

Air quality can be affected by emissions from naturally occurring and anthropogenic sources. Air pollutant emissions in and around the Project area occur from natural sources, such as windblown dust and wildfires, and anthropogenic air pollutant emissions occur from industrial facilities, vehicle exhaust, fugitive dust from vehicle traffic, and residential activities, such as wood-burning fireplaces. The Project area is in a rural setting with few industrial sources that would contribute to air pollutant emissions. The industrial activities in the Project area include mining operations, and there is limited agriculture and grazing.

Unless otherwise noted, baseline (existing) air quality described herein reflects 2023 conditions, including direct impacts from mining and indirect impacts of rail transport, seaport handling, ocean transport, and combustion (referred to as components) of 10 million U.S. tons (Mt) of saleable coal shipped in 2023 (see **Table 3.2-1**). Air quality considerations, baseline conditions, and applicable regulations and jurisdictions differ for each component, from mining to combustion. Relevant information is summarized in this section with additional supporting details provided in **Appendix B**. Estimated emissions from all components in 2023 are summarized in **Table 3.2-1**. Details regarding information sources and assumptions used to calculate emissions on a 1.0 Mt basis are provided in **Appendix C**.

Table 3.2-1. Total Estimated Emissions from Mining, Transport, and Combustion of Approximately 10.0 Mt of Saleable Coal in 2023

Component	PM_{10} (tons)	$PM_{2.5}$ (tons)	NO_X (tons)	SO_X (tons)	CO (tons)	VOC (tons)	Pb (lb)	Hg (lb)	As (lb)
Mining Operations	348.7	51.3	104.0	22.7	73.0	8.6	0	0	0
Rail Transport	57.7	57.7	2,111	2.4	615	91.3	0	0	0
Seaport Handling	33.2	6.7	52.6	2.5	14.3	2.9	0	0	0
Ocean Transport	301	277	12,017	1,672	872	412	0	0	0
Coal Combustion (high range) [1]	1494	1,445	970	3,971	50.0	7.0	30	30	26
Coal Combustion (low range) [1]	2,938	2,287	38,750	19,855	625	87.5	592	182	520
Haul Truck Transport	12.5	1.9	1.7	0.003	0.9	0.04	0	0	0

[1] High range refers to higher emissions control efficiency and hence lower emissions from power plants; low range refers to lower emissions control efficiency and hence higher emissions from power plants.
Mt = million U.S. tons; PM_{10} = particulate matter less than 10 microns diameter; $PM_{2.5}$= particulate matter less than 2.5 microns diameter; NOx = nitrogen oxides; SOx = sulfur oxides; CO = carbon monoxide, VOC = volatile organic compounds; Pb = lead; Hg = mercury; As = arsenic

3.2.2 Study Area

The study area for air quality includes both a direct effects study area and an indirect effects study area. The direct effects study area includes the permit area plus a 31-mile (50-km) buffer. The indirect effects study area includes the direct effects study area plus the truck routes within a 200-

mile radius, and rail transportation route to Laurel (**Table 3.0-1; Figure 3.0-1**). The past, present, and reasonably foreseeable future action (RFFA) effects study area for air quality includes the permit area, the truck routes within a 200-mile radius, and the rail transportation routes to Westshore Terminal (Port of Vancouver – British Columbia, Canada) and Superior (Wisconsin) including other domestic locations (Three Forks, MT, Green Bay, WI, and Avon Lake, OH), and regional airsheds. The past, present, and RFFA effects study area also includes quantification of emissions from ocean/lake shipping and coal combustion and the global contributions of non-GHG sources (e.g., mercury). Direct, indirect, and past, present, and RFFA impacts are discussed in detail in **Chapter 4.**

3.2.3 Regulatory Framework

3.2.3.1 Federal Requirements

The Clean Air Act (CAA) is a Federal law designed to regulate and protect the air quality in the United States and is administered by the EPA. Under the CAA, EPA is required to establish National Ambient Air Quality Standards (NAAQS), which are concentration levels for common air pollutants judged "necessary, with an adequate margin of safety, to protect the public health" and "necessary to protect the public welfare from any known or anticipated adverse effects" (40 CFR § 50.2(b)). The EPA establishes NAAQS for six criteria pollutants deemed harmful to public health and the environment, including carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), ozone, lead, and particulate matter with aerodynamic diameters less than or equal to 10 microns (PM_{10}) and less than or equal to 2.5 microns ($PM_{2.5}$). The NAAQS include both primary standards to protect public health (including the health of sensitive populations), and secondary standards to protect public welfare (including protection against decreased visibility and damage to animals, crops, vegetation, and buildings).

EPA has delegated authority to MDEQ to administer and enforce the rules set forth under the CAA in the State of Montana, including the NAAQS. In addition to the NAAQS, individual states have the option to adopt more stringent standards and to include additional pollution sources. Under Montana's implementation of the CAA, MDEQ established air quality regulations under the ARM, Title 17, Chapter 8, Subchapters 1 through 17 (ARM 17.8.101-17.8.1713). The NAAQS and Montana's Ambient Air Quality Standards (MAAQS) are presented in **Appendix B**.

To determine compliance and assess progress against the NAAQS, the EPA uses a statistic referred to as a *design value* (DV), which describes the status of a given location's air quality relative to the NAAQS. The DV of each criteria pollutant at a given location is calculated using ambient monitoring data following the form of the respective NAAQS. The calculated DVs are then used to officially designate the status of each area as either "attainment" (demonstrates compliance with NAAQS), "nonattainment" (exceeds the NAAQS), "maintenance" (in the process of redesignating to attainment by continuing to show compliance with the NAAQS after having initially been in nonattainment), or "unclassifiable" (insufficient data for compliance determination).

Once a nonattainment designation occurs, State and local air agencies must develop a federally enforceable State Implementation Plan (SIP) to outline the control measures and strategies that will be used to attain and maintain compliance with the NAAQS (40 CFR Part 51). In developing a SIP, states are required to demonstrate that the plans adequately provide for timely attainment and maintenance of the NAAQS. In addition, states are encouraged to investigate alternative strategies and assess the cost and benefit of each with respect to achieving and maintaining attainment.

As described in **Appendix B**, Musselshell and Yellowstone Counties, within which the Mine is located, are designated "unclassifiable/attainment" for all criteria pollutants. The Mine does not meet applicability criteria for rules related to Class I areas,[6] including regional haze; the Title V Operating Permit Program; and New Source Review/Prevention of Significant Deterioration permitting.

3.2.3.2 State Requirements

The MAAQS are promulgated under ARM 17.8.201-230. These are presented along with the NAAQS in **Appendix B**.

The Montana Settleable PM standard was designed for much larger particles than those covered under the Federal NAAQS for PM_{10} and $PM_{2.5}$. Montana uses a number of measures through permitting and enforcement that serve to provide reasonable precautions against excess PM generation. These include ARM 17.8.308 which includes but is not limited to the following requirements:

- No person shall cause or authorize the production, handling, transportation, or storage of any material unless reasonable precautions to control emissions of airborne particulate matter are taken. Such emissions of airborne particulate matter from any stationary source shall not exhibit an opacity of 20 percent or greater averaged over six consecutive minutes, except for emission of airborne particulate matter originating from any transfer ladle or operation engaged in the transfer of molten metal which was installed or operating prior to November 23, 1968.
- No person shall cause or authorize the use of any street, road, or parking lot without taking reasonable precautions to control emissions of airborne particulate matter. In addition, when Montana PM, PM_{10}, and $PM_{2.5}$ sources trigger permitting, they must go through a Best Available Control Technology (BACT) analysis and controls that, while reducing PM_{10} and $PM_{2.5}$ would also provide total PM reductions.

The standard for fluoride in forage addresses excess fluoride in vegetation that is foraged. The other two Montana-specific standards are a 1-hour standard for hydrogen sulfide (H_2S) and a standard for visibility that is applicable to Class I areas.

3.2.3.3 Local Requirements

There are no applicable local regulations related to air quality within, or near, the study area.

3.2.4 Existing Conditions

3.2.4.1 Mine-Related Emissions

Based on information included in MDEQ's Emission Inventory Detail document for MAQP #3179-12 (MDEQ 2023), the Mine's annual PM10 emission rate is estimated to be approximately four times greater than the rate for any other criteria pollutant. Approximately 98 percent of mine-related

[6] The CAA defines Class I areas as certain national parks and wilderness areas where very little degradation of air quality is allowed. Class I areas consist of national parks larger than 6,000 acres (2,428 hectares) and wilderness areas larger than 5,000 acres (2,023 hectares) that were in existence before August 1977.

PM_{10} emissions results from fugitive sources,[7] such as haul truck traffic and wind erosion of exposed surfaces and, as a result, air quality impacts tend to be localized to areas near these sources. From 2010 to 2016, SPE was required to operate three monitoring stations at two sites (two stations co-located) proximal to the Mine to measure concentrations of PM_{10}.[8] In February 2017, MDEQ allowed SPE to discontinue this 7-year monitoring effort because no $PM_{10,}$ MAAQS, or NAAQS exceedance attributed to Mine operations was recorded during the monitoring period (MDEQ 2017). The Mine is subject to several opacity limits which effectively limit fugitive dust emissions and is subject to the Federal Coal Preparation and Processing Plants New Source Performance Standards (40 CFR Part 60, Subpart Y).

MDEQ (2023) estimated the Mine's potential maximum annual emissions of criteria pollutants of concern. **Appendix C** summarizes the results of those estimates, and the portion attributed to each 1.0 Mt of saleable coal produced for reference in this analysis. **Table 3.2-1** and **Appendix B** present estimated annual emissions (tons per year) (tpy) from Mine operations in 2023, for an annual saleable coal recovery rate of approximately 10.0 Mt of saleable coal.

3.2.4.2 Rail Transport

Section 3.1 describes the rail transport route considered in this analysis. From the Mine, coal is hauled approximately 1,390 miles (one way) through Montana, Idaho, and Washington to Westshore Terminal at the Port of Vancouver, British Columbia, Canada. Under the CAA, EPA has issued emission standards for locomotives (40 CFR 92.8). Additional details regarding Federal locomotive emission-related standards and other State and local considerations are provided in **Appendix B**.

Baseline criteria air pollutant emission rates for each 1.0 Mt of coal transported by rail between the Mine and Westshore Terminal were estimated using methods described in **Appendix C**. Those estimated emissions were used to estimate the total emissions from transporting approximately 10.0 Mt of saleable coal in 2023 (**Table 3.2-1** and **Appendix B**). Emission rates for each pollutant are estimated in tons per year as well as average pounds per mile (lb/mile) over the 2,780 miles trains travel round-trip, with the latter reflecting the transitory and distributed nature of locomotive emissions.

In addition to potential impacts related to rail safety as discussed in **Section 3.1**, coal dust is identified as having potential to affect human health and environmental quality. Particulate emissions (i.e., PM_{10} and $PM_{2.5}$) can affect the heart and lungs and cause serious health effects (EPA 2022), and trace elements in coal could potentially affect the environment where coal dust deposition occurs. **Appendix B** summarizes existing literature and information pertaining to coal dust emissions, including generation, dispersion, and deposition, as well as human health and ecological concerns.

[7] Fugitive emissions are emissions that are not emitted from a stack, vent, or other specific point that controls the discharge. For example, windblown dust is fugitive particulate matter.

[8] One monitoring station was located on the Mine permit area boundary about 6,300 feet northwest of the administration building in the surface facilities area, and the two co-located monitoring stations were located on the Mine permit area boundary about 3,000 feet southeast of the administration building.

3.2.4.3 Seaport Handling

As discussed in **Section 3.1**, nearly all coal from the Mine is shipped overseas from Westshore Terminal. Context on the existing regulatory environment and existing conditions associated with Westshore Terminal is provided in **Appendix B**.

In 2013, an air quality study was conducted to evaluate local and regional baseline conditions and potential environmental impacts related to Westshore Terminal's proposed port improvement and expansion project (Westshore Terminal LP 2013). **Appendix C** discusses emissions estimates from that study and presents estimated port-wide criteria pollutant emissions attributed to handling 1.0 Mt of coal based on existing port capacity and emission rates as this reflects the more conservative (i.e., highest) estimated emission rates of the two scenarios analyzed by Westshore Terminal (Westshore Terminal LP 2013). These emission rates were used to estimate emissions attributed to transferring approximately 10.0 Mt of coal from the Mine in 2023 (**Table 3.2-1** and **Appendix B**).

3.2.4.4 Ocean Transport

Appendix B summarizes the existing regulatory structure related to oceanic transport, including relevant regulations contained within the United Nations International Maritime Organization (IMO) International Convention for the Prevention of Pollution from Ships, known as MARPOL 73/78.

Appendix C presents estimated criteria pollutant emissions from ocean transport of 1.0 Mt of coal. Estimates reflect round-trip travel assuming the same emissions in both directions (i.e., emissions occurring over an average of approximately 9,600 miles, in sum, to and from Westshore Terminal and Japan, ROK, Chile, or Hong Kong). Estimated baseline criteria air pollutant emissions from ocean transport of approximately 10.0 Mt of coal in 2023 are presented in **Table 3.2-1** and **Appendix B**. Emission rates for each pollutant are estimated in total tons as well as lb/mile, with the latter reflecting the transitory and distributed nature of cargo vessel emissions.

3.2.4.5 Overseas Combustion

As discussed in **Section 3.1**, nearly all coal is sold to power generators in Japan, ROK, Chile, and Hong Kong. These countries, therefore, comprise the affected environment for analysis of overseas combustion impacts on air quality. **Appendix B** outlines the regulatory framework implemented by each country to maintain or improve air quality by limiting pollutant emissions from industrial and other emitting sources.

Appendix C presents estimated emissions of criteria pollutants and heavy metals hazardous air pollutants (HAPs) (i.e., lead, mercury, and arsenic), generated from combusting 1.0 Mt of coal at utility-scale power plants in Japan, ROK, Chile, and Hong Kong (separately or collectively). Estimated ranges of baseline pollutant emissions from combusting approximately 10.0 Mt of coal in 2023 are presented in **Table 3.2-1** and **Appendix B**.

Impacts of most industrial source air pollutants are limited to the immediate area or, at most, the region surrounding the source. However, mercury emissions can also have a global impact. Exposure to mercury threatens human health, with developing fetuses and young children most at risk. Mercury pollution can also harm wildlife and ecosystems (EPA 2023). Estimated 2015 mercury emissions from the United States, Chile, Hong Kong, Japan, and ROK are summarized in **Appendix B**.

3.3 Climate Change and Greenhouse Gases

3.3.1 Introduction

This discussion on climate change and greenhouse gases responds to the Ninth Circuit's order *350 Mont.*, 50 F.4th at 1259. The Intergovernmental Panel on Climate Change (IPCC) describes climate change as "a change in the state of the climate that can be identified (for example, by using statistical tests) by changes in the mean and/or the variability of its properties, and persists for an extended period, typically decades or longer. Climate change may be due to natural processes or external forcings such as change in the earth's axial tilt, orbital variation around the sun, volcanic eruptions, and persistent anthropogenic changes in the composition of the atmosphere or in land use" (IPCC 2023). Climate change encompasses both increases and decreases in temperature, as well as shifts in location and/or frequency of precipitation, changing risk of certain types and frequency of severe weather events as well as changes in ocean temperature and currents, resulting in some areas warming more than others, while other areas experience cooling.

3.3.2 Study Area

The study area for climate change and GHGs includes both a direct effects study area and an indirect effects study area. The direct effects study area includes the permit area, and the indirect effects study area encompasses the permit area, plus the employee commute routes from Roundup and Billings, rail transportation routes to ports at Westshore and Superior (including other domestic locations), port operations, ocean/lake shipping routes, and coal combustion activities (**Table 3.0-1**, **Figure 1.1-3**, **Figure 1.1-4**, and **Figure 3.1-1**). The past, present, and the RFFA effects study area for climate change and GHGs includes GHG contributions and climate change for Montana, the United States, and global sources. Direct, indirect, and past, present, and RFFA impacts are discussed in detail in **Chapter 4**.

3.3.3 Regulatory Framework

3.3.3.1 Federal Requirements

Greenhouse gases are considered air pollutants under the CAA (42 U.S.C. § 7401 *et seq.*). In 2009, the EPA published a rule for the mandatory reporting of GHGs (40 CFR Part 98, Subpart C), referred to as the Greenhouse Gas Reporting Program (GHGRP). It generally requires large emitters (any facility emitting over 25,000 metric tons of carbon dioxide equivalent [CO_2e] annually) to report their emissions annually. The facility-level emission information reported under the GHGRP is published and accessible through the Facility Level Information on Greenhouse Gases Tool (EPA 2022). Facility Level Information on Greenhouse Gases Tool data reported by large emitters is estimated to represent 85 percent to 90 percent of the total U.S. emissions (EPA 2022).

MSHA requires that underground mines conduct methane (CH_4) monitoring and set limits on CH_4 concentrations to protect life, health and safety of the miners, but it does not limit CH_4 emissions amounts.

Recent Federal climate policy changes include recission of several executive orders (EOs) related to climate change, renewable energy sources, energy efficiency, climate resiliency, NEPA procedures, and the role of the Council of Environmental Quality (CEQ). Notably, on January 20, 2025, the

Administration issued *EO 14148: Initial Rescissions of Harmful Executive Orders and Actions* and EO 14154, *Unleashing American Energy*. Among other provisions, EO 14148 rescinded CEQ's January 9, 2023, guidance for consideration of GHG emissions and effects of climate change in NEPA reviews.

EO 14154, establishes a policy to, among other things, encourage energy exploration and production on Federal lands and waters, protect the United States' economic and national security and military preparedness by ensuring that an abundant supply of reliable energy is readily accessible in every state and territory, and ensure that all regulatory requirements related to energy are grounded in clearly applicable law. The EO directs all agencies to review existing regulations, orders, guidance documents, policies, settlements, consent orders, and any other agency actions to identify actions that impose an undue burden on the identification, development, or use of domestic energy resources such as coal. EO 14154 calls for EPA to consider the legality and applicability of the 2009 EPA *Endangerment Finding for Greenhouse Gases*, which is the legal basis for regulation of GHG emissions under the CAA.

EO 14154 also rescinded the Carter Administration's 1977 EO 11991, *Related to Protection and Enhancement of Environmental Quality*, that directed CEQ to issue NEPA implementing regulations. Pursuant to EO 14154, on February 19, 2025, CEQ sent a memorandum to heads of Federal departments and agencies entitled *Implementation of the National Environmental Policy Act*, providing guidance on implementing NEPA to expedite and simplify the permitting process, setting out a process for revising agency NEPA procedures, and providing guidance to agencies on interim practice while the agency procedures are being revised and content for revised (or new) agency NEPA procedures.

Also pursuant to EO 14154, on February 25, 2025, CEQ published an interim final rule (90 Federal Register 10610) to remove the CEQ regulations implementing NEPA from the Code of Federal Regulations (40 CFR Parts 1500-1508), effective April 11, 2025. CEQ concluded that it lacks the authority to issue binding rules in the absence of the now-rescinded EO 11991 and withdrew its NEPA implementing regulations in their entirety. In the absence of the CEQ NEPA implementing regulations, the CEQ memo directed that until agencies complete revisions to their own NEPA implementing procedures, agencies are to continue to follow their existing practices and procedures for implementing NEPA consistent with NEPA, EO 14154, and the February 19 CEQ Memorandum.

Additional discussion of laws and policies relevant to GHGs and climate change can be found in the *National BLM Specialist Report on Annual Greenhouse Gas Emissions and Climate Trends* (BLM 2024) and is incorporated by reference, specifically climate change science and trends (**Section 4.0**), global, national, and State emissions (**Section 5.0**), and projected climate change (**Section 8.0**).

As presented in **Section 3.4.4.1**, over 97 percent of GHG (i.e., CO_2e) emissions related to SPE's mining activities are attributed to combustion. Only mining activities (about 0.2 percent of GHG emissions) and some transportation activities (about 1.3 percent) occurs within the United States which includes the Exclusive Economic Zone extending 200 nautical miles from the U.S. coastline. Regulating combustion and associated emissions would fall to the country in which those activities occur.

In the United States, there are no specific regulations or thresholds pertaining to GHG emissions although improvements in some mining equipment and electrification along with locomotive engine efficiency are expected to reduce emissions over time. In Canada, the province of British Columbia charges a carbon tax on gasoline, diesel, and natural gas that has reduced emissions despite population growth. On April 1, 2023, British Columbia carbon tax rate rose from $50 to $65 per ton of CO_2e. British Columbia has committed to reducing GHG emissions by 40 percent below 2007 levels by 2030. The Clean British Columbia Roadmap to 2030 maps out the most promising routes to reach this target and set the course to fulfill a net-zero commitment by 2050.

Canada has a regulatory framework for establishing a clean fuels standard, which includes requirement to reduce carbon intensity for a range of fuels with decreasing intensity over time based on their life-cycle emissions. Regulations were last registered under Canada's Environmental Protection Act of 1999 in June of 2022 detailing the requirement for liquid fuels and Canada's carbon intensity compliance schedule (Ministry of Environment 2022).

Starting 1 January 2023, it is mandatory for all ships to calculate their attained Energy Efficiency Existing Index to measure their energy efficiency and to initiate the collection of data for the reporting of their annual operational carbon intensity indicator (CII) and CII rating. The measures are part of the International Maritime Organization's (IMO) commitment under its 2018 Initial Strategy on Reduction of GHG Emissions from ships to reduce their carbon intensity from all ships by 40 percent by 2030 compared to 2008. These are incorporated into the revised 2021 Revised International Convention for the Prevention of Pollution from Ships (MARPOL Annex VI) and 2022 related guideline (IMO 2022). Therefore, GHG emissions from cargo vessels should decrease over time.

ROK and Japan have both submitted Intended Nationally Determined Contribution (INDC) GHG emissions reduction plans for achieving United Nations Framework Convention on Climate Change objectives (Japan 2021 and ROK 2021). ROK plans to reduce GHG emissions by 40 percent from 2018 levels by 2030 (ROK 2021). This reduction is in accordance with ROK's updated Framework Act on Low Carbon, Green Growth which in December 2019 legislated through the amendment the Enforcement Decree of the Framework Act on Low Carbon, Green Growth through emission reduction targets, cap-and-trade, carbon tax, carbon labelling, carbon disclosure, and the expansion of new and renewable energy. Japan plans to reduce GHG emissions by 46 percent by 2030 compared to 2013 levels which is aligned with their long-term goal of net zero emissions by 2050. This goal is supported by Japan's *Sixth Strategic Energy Plan* developed by the Agency for Natural Resources and Energy (JANRE 2021).

In addition, Canada, ROK, and Japan are all a party to, and have ratified the Paris Agreement (entered into force in 2016) which requires all Parties to put forward their best efforts through "nationally determined contributions" to respond to the threat of climate change and strengthen these efforts in the years ahead (UNFCCC 2022).

3.3.3.2 State Requirements

There are no applicable State regulations related to climate change and GHGs in Montana.

3.3.3.3 Local Requirements

There are no applicable local regulations related to climate change and GHGs within, or near, the analysis area.

3.3.4 Existing Conditions

3.3.4.1 GHG Emissions

There are three GHGs [carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O)] that are associated with mining, transportation, and combustion of coal. GHG emissions are also summarized in terms of CO_2e using their global warming potential (GWP) for each GHG and are calculated based on how long each GHG remains in the atmosphere, on average, and how strongly each absorbs energy. The combined effects enable equivalency comparison in the emission changes from different types of GHGs. The most recent IPCC *Climate Change 2023: Synthesis Report, the Sixth National Climate Assessment* (AR6) updates the GWP for CH_4 and N_2O (IPCC 2023).

Global Emissions

Total net anthropogenic GHG emissions have continued to rise during the period 2010 to 2019 and have had added to the total net CO_2 emissions since 1850. The average annual GHG emissions from 2010 to 2019 were higher than in any previous decade, but the rate of growth between 2010 and 2019 was lower than that between 2000 and 2009 (IPCC 2023). Growth in anthropogenic emissions has persisted across all major groups of GHGs since 1990. Net anthropogenic GHG emissions have increased since 2010 across all major sectors globally. In 2019, atmospheric CO_2 concentration (410 parts per million) was higher than at any time in at least 2 million years (IPCC 2023). Emissions reductions in CO_2 from fossil fuels and industrial processes, due to improvements in energy intensity, have been less than emissions increases from rising global activity levels in industry, energy supply, transportation, agriculture, and heating and cooling for buildings. In 2019, approximately 34 percent of the total net anthropogenic GHG emissions came from the power generation sector, 24 percent from industry, 22 percent from agriculture, forestry, and other land use, 15 percent from transportation sources (vehicles, trains, ships, and aircraft) and 6 percent from buildings (IPCC 2023). If emissions from electricity and heat production are attributed to the sectors that use the final energy, 90 percent of these indirect emissions are allocated to the industry and buildings sectors, increasing their relative GHG emissions shares from 24 percent to 34 percent, and from 6 percent to 16 percent, respectively. After reallocating emissions from electricity and heat production, the energy supply sector accounts for 12 percent of global net anthropogenic GHG emissions (IPCC 2023).

The United Nations Environment Program (UNEP) (2023) reports that total global GHG emissions in 2022 reached a record high of 57.4 gigatons of CO_2e (Gt CO_2e), and apart from transportation GHG, have rebounded from the drop in emissions induced by the coronavirus (COVID-19) pandemic and now exceed 2019 levels. Global energy consumption expanded in 2022 from 2021, an expansion mainly met by a growth in coal, oil, and renewable electricity supply, whereas gas consumption declined by 3 percent following the energy crisis and the war in Ukraine. Overall, net electricity demand growth in 2022 was primarily met by renewable sources (excluding hydropower), principally due to a record increase in solar capacity additions (UNEP 2023). The IPCC (2023) AR6 estimates that global GHG emissions will need to be approximately 43 percent lower than 2019 emissions by 2030 to limit global warming to 1.5 degrees Celsius (°C).

U.S. Emissions

While activities and land uses can act as a source of GHG emissions, land areas can also act as a sink, absorbing CO_2 from the atmosphere (EPA 2024). In the United States, since 1990, managed forests and other lands have absorbed more CO_2 from the atmosphere than they emit. In 2015, GHG emissions were partly offset by carbon sequestration in forests, trees in urban areas, agricultural soils, landfilled yard trimmings and food scraps, and coastal wetlands, which, in aggregate, offset nearly 12 percent of U.S. emissions (EPA 2024).

The EPA estimates total U.S. emissions in its annual *Inventory of US Greenhouse Gases and Sinks* (EPA 2024) (inventory report). It is intended to represent all GHG emissions in the United States, including those sources that are not required to report annual emissions under the Greenhouse Gas Reporting Protocol. The latest inventory report was published by EPA in April 2024 and provides emissions estimates for 1990 to 2022. The EPA (2024) estimates that total gross U.S. GHG emissions (excluding land use, land-use change, and forestry emissions and sinks) were 6,343.2 million metric tons (MMT) of CO_2e in 2022, an increase of less than 1 percent from 2021 but a decrease of approximately 3 percent since 1990. Between 2021 and 2022, the increase in total GHG emissions was driven largely by an increase in CO_2 emissions from fossil fuel combustion across most end-use sectors due in part to increased energy use from the continued rebound in economic activity after the height of the COVID-19 pandemic. In 2022, CO_2 emissions from fossil fuel combustion increased by 1 percent relative to the previous year, but 1.1 percent below emissions in 1990.

Approximately 44 percent of the total U.S. emissions in 2022 were from the combustion of petroleum primarily used for transportation, 36 percent from the combustion of natural gas primarily for the generation of electricity, and 19 percent from coal combustion almost exclusively for electricity generation. More information on recent trends in U.S. GHG emissions can be found in the EPA 2024 inventory report (EPA 2024) and the National BLM Specialist Report (BLM 2024).

Montana Emissions

EPA published a *Draft Inventory of US Greenhouse Gas Emissions and Sinks by State* that is derived from the national inventory report using the same methodologies (EPA 2024). In 2021, the gross total emissions from Montana were approximately 52.3 MMT CO2e, which is approximately an 11 percent reduction from 2019 levels and a 16 percent reduction from peak emissions in 2007. Agriculture and the electric power industry are the largest sources of GHG emissions in the state, followed by industry and transportation. Between 1990 and 2021, agriculture and transportation emissions in the state increased by approximately 18.9 percent and 39.7 percent, respectively, while emissions from the electric power industry and other industry decreased by approximately 22 percent and 21 percent, respectively.

Mine Emissions

Table 3.3-1 summarizes direct and indirect GHG emissions resulting from all activities related to mining, transporting, and combusting coal from the Mine, most of which occur downstream of the mining extraction. Over 98 percent of this total GHG emissions are associated with coal combustion, and nearly all coal is used for power generation with the exception of the coal used at Graymont (see **Table 2.2-1**), which is used in production of lime. About 1 percent of the GHG emissions are associated with coal transport and 0.2 percent due to the mining of coal.

Appendix C describes calculations, data, and additional assumptions underlying estimates for each source, which are consistent with the assumptions used to calculate non-GHG emissions as discussed in **Section 3.2**.

Table 3.3-1. Estimated GHG Emissions from Mining, Transporting, and Combusting Coal from the Mine at a Nominal 10 million tons per year

Segment	GHG Emissions (tons-CO_2e)
Mining Operations	39,850
Rail Transport	239,234
Haul Truck Transport	902
Port Operation	6,145
Ocean Vessel Transport	480,208
Coal Combustion	21,280,283
Total GHG Emissions	22,046,622
Total GHG Emissions Per 1.0 Mt of Saleable Coal	2,204,662

Source: Appendix C
CO_2e = carbon dioxide equivalent; Mt = million tons

3.3.4.2 Climate Change

Recent findings and predictions about climate change and its impacts on a global, national, and regional (Montana) scale are presented in the following reports and web applications: The IPCC AR6 report (IPCC 2023), the *Montana Climate Assessment* (Whitlock et al. 2017), the U.S. Geological Survey (USGS) Climate Change Viewer for specific counties (USGS 2023), NOAA's *State Climate Summary: Montana* (NOAA 2022), and the U.S. Global Change Research Program (USGCRP) report describing the state of science relating to climate change and its physical impacts (USGCRP 2023). Each of these documents and web applications are hereby incorporated by reference.

Regional considerations regarding climate changes in Montana over the period of 1950 to 2015 are presented in the Montana Climate Assessment (Whitlock et al. 2017). Major findings focus on spatial and temporal changes in temperature and precipitation across the State, including a focus on historic trends between 1950 and 2015 and projected changes into the future, typically 2040 to 2069 and 2070 to 2099. The report also focuses on impacts on water, forests, and agriculture, which have been, and will continue to be, affected by changes in climate.

Key Findings

The *Fifth National Climate Assessment: Impacts, Risks, and Adaptation in the United States* discusses projected climate change in the Northern Great Plains (consisting of Montana, Wyoming, North Dakota, South Dakota, and Nebraska) in Chapter 25. The impacts of climate change throughout the Northern Great Plains include changes in flooding and drought, rising temperatures, and the spread of invasive species (USGCRP 2023).

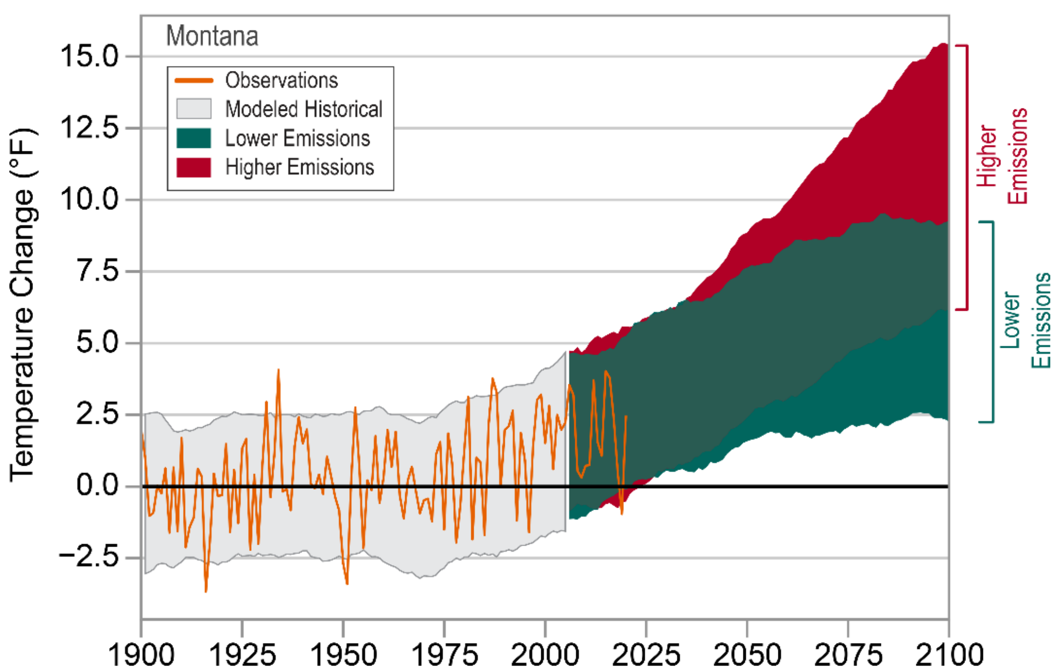
Projected temperature changes for the region for global warming of 2°C above preindustrial levels for the Northern Great Plains region shows a 2 to 4 degrees Fahrenheit (°F) increase in average temperature relative to 30-year average temperature from 1991 to 2020, while a 4°C increase in global warming above preindustrial levels shows a 4 to 8°F increase in average temperature. Current and projected values demonstrate distinctive gradients of temperature from southeast to northwest (USGCRP 2023).

The assessment notes that the annual precipitation will be relatively stable across the region but shifts in the form and timing of precipitation are expected. More intense precipitation events highlighting the projected increased variability in precipitation are expected to occur in all seasons, but especially in the spring.

Hail size, frequency of large hail, and length of hail season are projected to increase through the rest of this century in the Northern Great Plains. By 2071 to 2100, under a very high scenario (RCP8.5), projections for the Northern Great Plains estimate a 27 percent increase in moderate-size hail days and a 49 percent increase in large hail days. Also, an increase in the length of the hail season is projected (USGCRP 2023).

According to NOAA's State Climate Summary (NOAA 2022), Montana identifies recent climate trends and projections statewide. Temperatures in Montana have risen almost 2.5°F since the beginning of the twentieth century, higher than the warming for the contiguous United States as a whole. The first 21 years of this century represent the warmest period on record for Montana. Temperatures have warmed in all seasons. Montana rarely experiences warm nights due to its dry air and high average elevation. However, the number of warm nights during the 2000s averaged about 50 percent higher than during the 1940s through the 1990s. Future conditions under a high emissions scenario (RCP8.5) show dramatic warming is projected to occur within this century (**Figure 3.3-1**). Even under a lower emissions pathway, annual average temperatures are projected to exceed historical record levels by the middle of the century. Projected rising temperatures will also raise the snow line—the average lowest elevation at which snow falls. This will increase the likelihood that precipitation will fall as rain instead of snow, reducing water storage in the snowpack. Higher spring temperatures will also result in earlier melting of the snowpack, decreasing water availability during the summer months. The intensity of future droughts is projected to increase as rising temperatures will increase the rate of soil moisture loss during dry spells. Summer droughts are likely to become more intense, potentially leading to increases in the frequency and severity of wildfires (NOAA 2022).

Figure 3.3-1. Observed and Projected Temperature Changes



Source: NOAA 2022

The USGS Climate Viewer (2023) allows county specific temperature, precipitation, and snowpack for both the middle of the road emission pathway (SSP245) and the high emission fossil fuel development pathway (SSP585). For Musselshell County, projections show that maximum mean daily temperatures will increase by 1.7° to 8.5°F projected for the 2025 through 2049 period relative to 1981 through 2010 for the middle-of-the-road pathway. Under the higher fossil fuel emissions pathway, the viewer shows that the mean daily temperatures may increase by 0.4 to 9.1°F above the 1981 through 2010 period. Temperature increases are projected for all seasons. This warming is predicted to occur throughout the year but with a slight change in precipitation amounts over the year.

3.4 Water Resources

3.4.1 Introduction

This section describes the existing conditions of surface water and groundwater resources, including wetlands, alluvial valley floors, and public and private water usage, in the study area.

3.4.2 Study Area

The study area for water resources includes both a direct effects study area and an indirect effects study area. Both the direct and indirect effects study areas encompass a half-mile radius around the permit area, the modeled five-foot groundwater drawdown contour, and the HUC 12 subwatershed for Rehder Creek (**Table 3.0-1, Figure 3.0-1**). The past, present, and RFFA area for water resources encompasses the HUC 12 sub-watersheds for Rehder Creek, Halfbreed Creek, Parrot Creek, Upper Fattig Creek, Upper Railroad Creek, Upper Pompeys Pillar Creek, Upper Razor Creek, and Middle Razor Creek (**Table 3.0-1, Figure 3.0-1**). Direct, indirect, and past, present, and RFFA impacts are discussed in detail in **Chapter 4**.

3.4.3 Regulatory Framework

3.4.3.1 Federal Laws

Federal surface water quantity and quality regulations applicable to the analysis area include the Clean Water Act of 1972 and Clean Water Act Amendments of 1977, which require Federal agencies to “restore and maintain the chemical, physical, and biological integrity of the Nation’s waters.” The Clean Water Act (CWA), 33 U.S.C. §§ 1251 *et seq*., requires that applicants for Federal permits or licenses for activities that may result in a discharge to waters of the United States obtain certification from the State under Section 401 of the CWA that the discharge would comply with State water quality standards. Section 404 permits, issued by the U.S. Army Corps of Engineers (USACE), require 401 certification. MDEQ provides Section 401 certification pursuant to State regulations pursuant to an agreement between the State and EPA.

Waters of the United States are defined broadly in the USACE regulations to include a variety of waters and wetlands. Waterbodies covered under this definition include streams (perennial, intermittent, and ephemeral), ponds, and lakes (33 CFR § 328.3(a)). Habitats included under this definition are deep-water habitats (non-wetland) and special aquatic sites, which include wetlands (Environmental Laboratory 1987). USACE defines “wetlands” as 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 (33 CFR § 328.3).

Agencies have responsibilities to avoid, minimize, and mitigate unavoidable impacts on wetlands under EO 11990—Protection of Wetlands. EO 11990 requires Federal agencies to “consider factors relevant to a proposal’s effect on the survival and quality of the wetlands” (42 Federal Register 26961). Agencies also have the responsibility to avoid, minimize, and mitigate unavoidable effects on wetlands and waters of the United States under Section 404(b)(1) of the CWA. All activities that result in the discharge of fill material into wetlands or waters of the United States are regulated by USACE.

USACE's Regulatory Program in Montana has a stream mitigation procedure to quantify the adverse impacts and acceptable compensatory mitigation in relation to a project that would result in more than minimal adverse impacts on a stream (USACE 2013). OSMRE, USACE, EPA, and the U.S. Fish and Wildlife Service (USFWS) developed a Memorandum of Understanding (MOU) to improve coordination and information sharing among the agencies responsible for reviewing and processing SMCRA and CWA Section 404 permits (USACE et al. 2005). The purpose of the MOU is to provide a framework for establishing more coordinated procedures to improve the decision-making process for surface coal-mining permit applications received pursuant to SMCRA and CWA Section 404. The MOU encourages development of joint procedures between USACE districts and SMCRA regulatory agencies to facilitate concurrent and coordinated review and processing of surface coal mining permit applications.

3.4.3.2 State Requirements

Potential impacts on water resources from the Project are regulated under the MSUMRA and the Montana Water Quality Act (MWQA), which are administered by MDEQ. Under MSUMRA, MDEQ must prepare a cumulative hydrologic impact analysis (CHIA) as part of the permitting decision for the Mine. The purpose of the CHIA is to determine if the Project meets requirements to minimize disturbance to the hydrologic balance in the permit area and to assess the potential for impacts to water resources in the permit and surrounding area. MWQA is the primary basis for water quality protection in Montana. Rules promulgated under MWQA designate beneficial uses for surface water and groundwater and establish standards to protect State waters.

Surface water resources within the study area are classified as C-3 type waters (MDEQ 2023, 2024a). C-3 waters are to be maintained suitable for bathing, swimming, recreation, growth and propagation of non-salmonid fishes and associated aquatic life, waterfowl, and furbearers. The naturally occurring quality of C-3 waters is marginal for drinking, culinary, and food processing purposes, agriculture, and industrial water supply.

Streams in the study area are ephemeral. Applicable water quality standards for C-3 ephemeral streams are narrative and include general treatment standards (ARM 17.30.635), general operational standards (ARM 17.30.636), and general prohibitions (ARM 17.30.637). Ephemeral streams are not subject to standards in ARM 17.30.629, including numeric water quality standards in Circular MDEQ-7 (MDEQ 2019, 2023, and 2024a).

Several springs and ponds in the study area maintain water for several months during typical years. These resources are considered State waters and are subject to all standards for water classified as C-3 including numeric water quality standards in Circular MDEQ-7 (MDEQ 2019, 2023, 2024a). Applicable numeric standards for springs and ponds that maintain water for several months during typical years are summarized in **Table 3.4-1**. Guideline values for beneficial use as irrigation water and livestock drinking water are summarized in **Table 3.4-2.**

Groundwater in the study area exhibits natural chemical variability that spans Class I, II, and III, groundwater with Classes II and III being most common. Groundwater classes and beneficial uses are defined in ARM 17.30.1006 and include:

- Class I groundwater that has natural specific conductance (SC) of less than or equal to 1,000 microSiemens/cm (µS/cm). Class I groundwater must be maintained so that with little or no treatment the water is suitable for public and private water supplies, culinary and food processing purposes, irrigation, livestock and wildlife drinking water, and commercial and industrial purposes.
- Class II groundwater that has natural SC greater than 1,000 µS/cm and less than or equal to 2,500 µS/cm. Class II groundwater must be maintained so the water is at least marginally suitable for public and private water supplies, culinary and food processing purposes, irrigation of some agricultural crops, livestock and wildlife drinking water, and most commercial and industrial uses.
- Class III groundwater has natural SC greater than 2,500 µS/cm and less than or equal to 15,000 µS/cm. Class III groundwater must be maintained so the water is at least marginally suitable for drinking, culinary, and food processing purposes where SC is less than 7,000 µS/cm, irrigation of some salt tolerant agricultural crops, livestock and wildlife drinking water, and some commercial and industrial uses.

Protection of groundwater quality for beneficial uses is based on narrative standards set forth in ARM 17.30.1006 and numeric standards in Circular MDEQ-7. Applicable standards for all groundwater in the study area include human health standards listed in Circular MDEQ-7. For unlisted parameters, any changes to water quality cannot render the water harmful, detrimental, or injurious to established beneficial uses (ARM 17.30.1006). Relevant criteria for groundwater also include Federal secondary maximum contaminant levels (SMCLs) for drinking water, and guidelines for livestock drinking water and irrigation water quality. The human health-based standards in MDEQ-7 are enforceable limits that cannot be exceeded. SMCLs and criteria for livestock and irrigation are non-enforceable reference values that are used to evaluate the suitability of water for the intended beneficial use (**Tables 3.4-1** and **Table 3.4-2**).

Table 3.4-1. Numeric Standards for Surface Water and Groundwater

	MDEQ-7 Human Health Standard		MDEQ-7 Surface Water Aquatic Life Standard		Federal	
Parameter	Surface Water	Groundwater	Acute	Chronic[1]	SMCL[5]	Units
Aluminum[2]	--	--	0.75	0.087	0.05-0.2	mg/L
Arsenic	0.01	0.01	0.34	0.15	--	mg/L
Barium	1	1	--	--	--	mg/L
Cadmium[3]	0.005	0.005	0.0074	0.0024	--	mg/L
Chloride	--	--	--	--	250	mg/L
Chromium	0.1	0.1	--	--	--	mg/L
Copper[3]	1.3	1.3	0.057	0.03	1	mg/L
Fluoride	4	4	--	--	2	mg/L
Iron	--	--	--	1	0.3	mg/L
Lead[3]	0.015	0.015	0.48	0.019		mg/L
Manganese	--	--	--	--	0.05	mg/L
Mercury	0.00005	0.002	0.0017	0.00091	--	mg/L
Nickel[3]	0.1	0.1	1.5	0.17	--	mg/L
pH	--	--	--	--	6.5-8.5	s.u.
Selenium	0.05	0.05	0.02	0.005	--	mg/L
Silver	0.1	0.1	0.044	--	--	mg/L
Sulfate	--	--	--	--	250	mg/L
Zinc[3]	7.4	2	0.39	0.39	5	mg/L
TDS	--	--	--	--	500	mg/L
Nitrate-Nitrite	10	10	--	--	--	mg/L
Total Ammonia[4]	--	--	24.1	3.65	--	mg/L

Source: MDEQ 2024a
Notes:
[1] Day Minimum value, which should be considered as the instantaneous concentration to be achieved at all times.
[2] Aquatic Life Standard only applies to the dissolved fraction and for pH 6.5 - 9.0.
[3] Metals standards are hardness-dependent; for this table, values presented are based on a hardness of 400 mg/L. Hardness concentrations in surface water are greater than 400 mg/L, but MDEQ-7 uses 400 mg/L to calculate hardness-dependent metals standards when hardness is greater than or equal to 400 mg/L.
[4] Aquatic standards shown calculated at 22°C, 7.0 pH with early fish life stages present.
[5] SMCL are Federal drinking water secondary maximum contaminant levels based on aesthetic considerations.
mg/L = milligrams per liter; s.u. = standard unit

Table 3.4-2. Guidelines for Livestock Drinking Water and Irrigation Water Quality

Guidelines for Livestock Water Quality			Guidelines For Irrigation Water Quality				
Parameter	Unit	Value	Parameter	Unit	Threshold Limit	Upper Limit	Comment
Aluminum	mg/L	5	SC	µS/cm	2,000	--	Alfalfa
Arsenic	mg/L	0.01	SC	µS/cm	6,000	--	Wheat
Barium	mg/L	10	SC	µS/cm	3,000	--	Grasses
Boron	mg/L	5	SAR	--	4.8	17	SC = 1,000 µS/cm
Cadmium	mg/L	0.05	SAR	--	16.8	35	SC = 2,500 µS/cm
Calcium	mg/L	500	Boron	mg/L	2	3.7	Alfalfa
Chloride	mg/L	1,500	Boron	mg/L	1.3	2.5	Wheat
Chromium	mg/L	0.05	Chloride	mg/L	700	--	Alfalfa
Copper	mg/L	0.05	Chloride	mg/L	2,100	--	Wheat
Fluoride	mg/L	1	Chloride	mg/L	1,225	--	Grasses
Iron	mg/L	0.3	Nitrate	mg/L	5	30	--
Lead	mg/L	0.05	Aluminum	mg/L	5	20	--
Magnesium	mg/L	125	Arsenic	mg/L	0.1	2	--
Manganese	mg/L	0.05	Cadmium	mg/L	0.01	0.05	--
Mercury	mg/L	0.003	Chromium	mg/L	0.1	1	--
Molybdenum	mg/L	0.3	Copper	mg/L	0.2	5	--
Nickel	mg/L	1	Fluoride	mg/L	1	15	--
Nitrate	mg/L	23	Iron	mg/L	5	20	--
Nitrite	mg/L	2.3	Manganese	mg/L	0.2	10	--
pH	pH units	7.5	Molybdenum	mg/L	0.01	0.05	--
Selenium	mg/L	0.05	Nickel	mg/L	0.2	2	--
Sodium	mg/L	1000	Lead	mg/L	5	10	--
Sulfate	mg/L	500 – 1,000	Selenium	mg/L	0	0	--
TDS	mg/L	3,000	Vanadium	mg/L	0	1	--
Vanadium	mg/L	0.1	Zinc	mg/L	2	10	--
Zinc	mg/L	24	--	--	--	--	--

Source: MDEQ 2024a
Note: Presented guidelines for livestock water quality are the lowest value recommended for each parameter in Table 2-2 of the AM 6 CHIA.
mg/L = milligrams per liter; SC = specific conductance; SAR = sodium absorption rate; µS/cm = microSiemens/cm

3.4.3.3 Local Requirements

There are no applicable local regulations for water resources within or near the study area.

3.4.4 Existing Conditions

The Mine is located on the drainage divide between the Musselshell River and Yellowstone River basins. The region typically receives between 12 and 16 inches of precipitation annually. There is very little winter precipitation and elevations are too low to accumulate snowpack such that provides baseflow of streams elsewhere in Montana. Instead, spring snowmelt in the Bull Mountains typically occurs in April and snow is typically absent after mid-May, impeding extended snowmelt-related stream contributions in the late spring and summer months. Aside from the short periods of snowmelt in the study area and adjacent areas, surface water flow is typically associated with precipitation events or spring discharge, where springs are present (SPE 2023).

3.4.4.1 Physiographic Setting

The Mine is located in Northern Great Plains physiographic province in the watersheds of the Musselshell and Yellowstone Rivers.

To date, surface infrastructure and most of the underground workings for the Mine have been developed in the Rheder Creek drainage. Rehder Creek is ephemeral throughout the study area and is a tributary to the Musselshell River via Halfbreed Creek. Portions of the underground workings also extend into the drainages for Fattig Creek, Razor Creek, Pompeys Pillar Creek, and Railroad Creek. Fattig Creek is ephemeral within the study area and is tributary to the Musselshell River. Razor Creek, Pompeys Pillar Creek, and Railroad Creek are also ephemeral and drain to the Yellowstone River. The Project would primarily extend mining in the Fattig Creek drainage, with smaller areas of new development occurring in the Rehder, Razor and Railroad Creek drainages (**Figure 3.4-1**).

3.4.4.2 Hydrographic Basins

The study area includes portions of two USGS HUC 4 Subregions: the Missouri-Musselshell Subregion (1004) and the Upper Yellowstone Subregion (1007). The Project is primarily located within the Missouri-Musselshell Subregion with a portion of the existing and proposed underground workings extending below the watershed divide into the Upper Yellowstone Subregion.

The Missouri-Musselshell Subregion encompasses an area of 23,700 square miles and is locally subdivided into the HUC-6 Musselshell Basin (100402), HUC-8 Upper Musselshell (10040201) and Middle Musselshell (10040202) subbasins, HUC 10 Halfbreed Creek (1004020122) Parrot Creek-Musselshell River (1004020204), and Fattig Creek (1004020202) watersheds, and HUC 12 Rehder Creek (100402012201), Parrot Creek (100402020402), and Upper Fattig Creek (100402020201) subwatersheds (USGS 2018). The Rehder Creek and Upper Fattig Creek subwatersheds would contain components of the Proposed Action.

The Upper Yellowstone Subregion encompasses an area of 14,400 square miles and is locally subdivided into the HUC-6 Upper Yellowstone Basin (100700), HUC-8 Upper Yellowstone-Pompeys Pillar Subbasin (10070007), HUC 10 Razor Creek (1007000703), Pompeys Pillar Creek (1007000705), and Cow Gulch (1007000709) watersheds, and HUC 12 Upper Razor Creek

(100700070302), Middle Razor Creek (100700070303), Upper Pompeys Pillar Creek (100700070502), and Upper Railroad Creek (100700070902) subwatersheds. The Upper Razor Creek, Middle Razor Creek, Upper Pompeys Pillar Creek, and Upper Railroad Creek subwatersheds would all contain components of the Proposed Action. USGS hydrographic units in the study area and past, present and RFFA study area are shown on **Figure 3.4-1** and summarized in **Table 3.4-3**.

Figure 3.4-1. USGS Hydrographic Basins

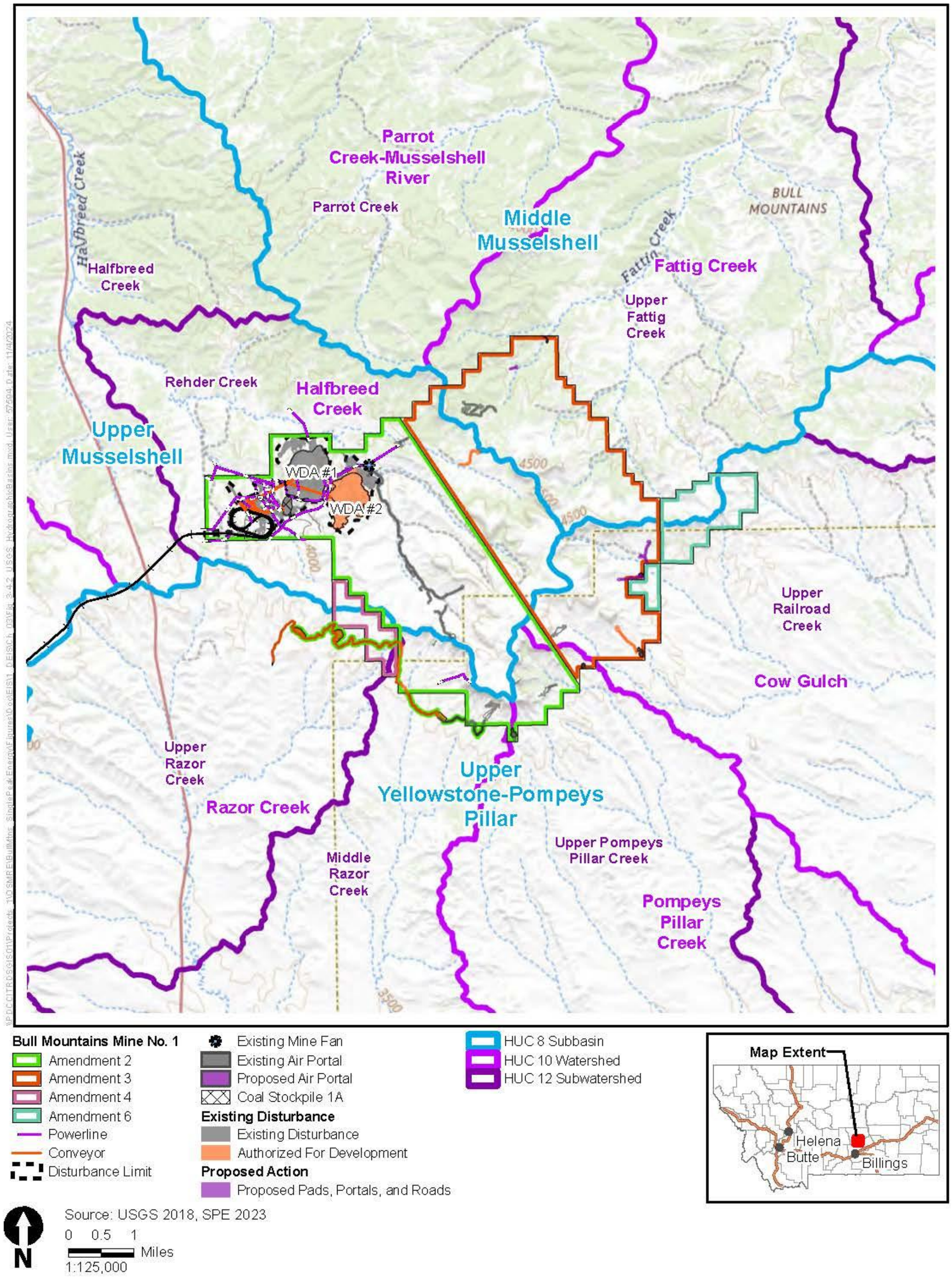


Table 3.4-3. Summary of USGS Hydrographic Units Within the Study Area for Water Resources

Sub Region (HUC 4)	Basin (HUC 6)	Subbasin (HUC 8)	Watershed (HUC 10)	Subwatershed (HUC 12)
Missouri-Musselshell (1004)	Musselshell (100402)	Upper Musselshell (10040201)	Halfbreed Creek (1004020122)	Rehder Creek (100402012201)
		Middle Musselshell (10040202)	Parrot Creek-Musselshell River (1004020204)	Parrot Creek (100402020402)
			Fattig Creek (1004020202)	Upper Fattig Creek (100402020201)
Upper Yellowstone (1007)	Upper Yellowstone (100700)	Upper Yellowstone-Pompeys Pillar (10070007)	Razor Creek (1007000703)	Upper Razor Creek (100700070302)
				Middle Razor Creek (100700070303)
			Pompeys Pillar Creek (1007000705)	Upper Pompeys Pillar Creek (100700070502)
			Cow Gulch (1007000709)	Upper Railroad Creek (100700070902)

Source: USGS 2018

3.4.4.3 Groundwater

Hydrogeologic Setting

The study area is underlain by a thick sequence of fine-grained sedimentary rocks and coal (**Figure 3.4-2**) that were deposited as part of the Powder River Basin but are now separate because of post-depositional uplift and erosion. The structure of the area includes a gently folded syncline that plunges northwest at about 1 degree (**Figure 3.4-3**), Faulting with significant offset is not observed within the study area. The study area straddles the watershed divide between Missouri-Musselshell and the Upper Yellowstone Subregions. Recharge to groundwater occurs in topographically high areas and flows away from the watershed divide toward discharge points at lower elevations. The pre-mining direction of regional groundwater flow in the study area was northwest roughly parallel to the plunge of the syncline (**Figure 3.4-4**).

Groundwater in the study area occurs in alluvium and bedrock. Alluvium is present along valley floors and is saturated in the lower reaches of the drainages for Rehder Creek and Fattig Creek (**Figure 3.4-5** and **Figure 3.4-6**). At higher elevations, alluvium is typically unsaturated except in response to seasonal snowmelt and precipitation (WET 2024a). Groundwater in alluvium flows away from the watershed divide under unconfined conditions and may either provide recharge to, or receive recharge from, underlying bedrock depending on location. The alluvial thickness generally ranges from 0 to about 37 feet and groundwater levels in the unconsolidated deposits may fluctuate by more than 20 feet seasonally or between years depending on climatic conditions (WET 2024a). The hydraulic conductivity (permeability) of alluvium is typically greater than the underlying bedrock. Baseline aquifer tests (6 slug tests and 1 pumping test) provide a median hydraulic conductivity value of 71.7 feet per day (ft/d) for alluvium with an observed range of 0.8 to 153 ft/d (WET 2024b). Site-specific data for specific yield are not available.

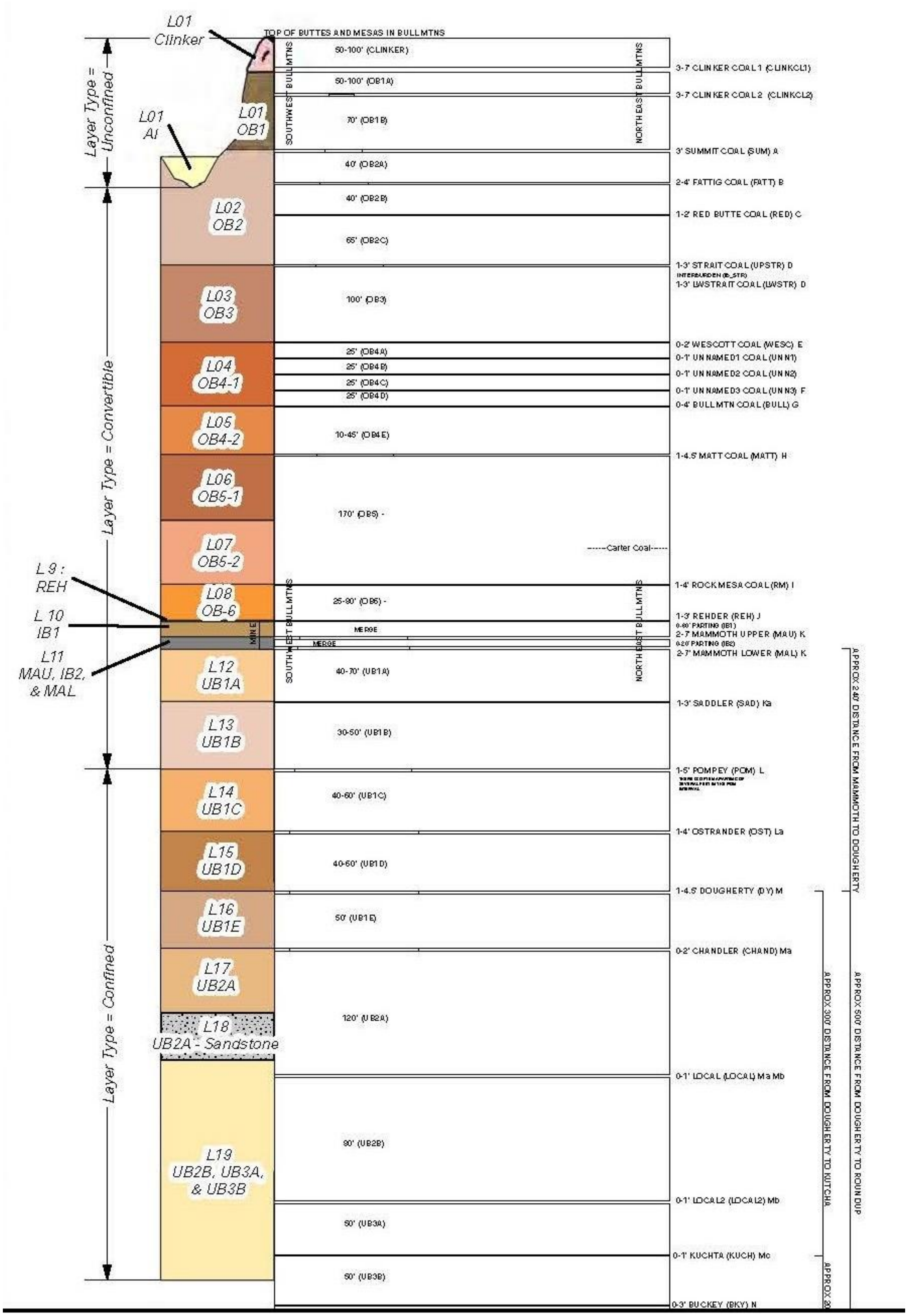
The bedrock geology of the study area includes overburden units Overburden 1 (OB1) through Overburden 7 (OB7), the Mammoth Coal, and underburden (**Figure 3.4-2**). Overburden includes all strata above the Mammoth Coal and is comprised of interbedded sandstone, siltstone, claystone and coal. A few discontinuous thin freshwater limestones also occur, but the limestone represents an insignificant fraction of the overburden (WET 2024a). Sandstones beds exhibit a range of geometries from thin and discontinuous to massive. Some sandstones, in particular the sandstone above the Rock Mesa coal, are up to 80 feet thick. Overburden thickness varies from 0 feet at the at the surface outcrop of the Mammoth Coal to more than 800 feet under the highest mesas. In areas of planned long wall mining, overburden is generally more than 150 feet thick (WET 2024b). Groundwater in overburden occurs as both localized perched systems and as part of a deeper regional groundwater flow system. Groundwater in perched systems typically flows short distances to discharge at springs in study area. Groundwater in the regional system flows northwest toward the Musselshell River and is under unconfined to semi-confined conditions near areas of surface recharge but is confined at depth near the axis of the syncline. Baseline testing data (11 slug tests and 2 pumping tests) provide a median hydraulic conductivity value of 0.018 ft/d for overburden with an observed range of 0.0006 to 0.6 ft/d (WET 2024b). Site-specific data for overburden storability and specific storage are not available.

The Mammoth Coal is continuous throughout the study area with a thickness that ranges from 8 to 12.5 feet. Where the Mammoth Coal merges with the Rehder Coal in the eastern portion of the planned mine, the coal beds have a combined thickness of 13 to 16 feet (WET 2024a). The Mammoth Coal has been dewatered by mining over a large portion of the study area but is saturated north and east of the mine where it is typically under confined conditions. The Mammoth Coal is part of the regional groundwater flow system that flows northwest toward the Musselshell River. Localized perched flow that discharges to springs also occurs where the unit crops out in the Railroad Creek drainage. Baseline testing data (13 slug tests, 1 pumping test, and 1 recovery test) provide a median hydraulic conductivity value of 0.09 ft/d for the Mammoth Coal with an observed range of 0.01 to 6.2 ft/d (WET 2024b). Site-specific data for storability and the specific storage of the Mammoth Coal are not available.

Underburden refers to sedimentary strata below the Mammoth Coal. In many respects, underburden is similar to overburden and is composed of interbedded sandstone, siltstone, claystone and shale. Underburden is recharged by infiltration where beds crop out at the surface, and by leakage from overlying units. Groundwater in underburden is typically unconfined to semi confined in outcrop areas and confined at depth (WET 2024b). Underburden is subdivided into two hydrostratigraphic units, upper underburden which is directly below the Mammoth Coal and deep underburden (UB2A), which is about 350 feet below the Mammoth Coal. Both units are part of the regional groundwater system that flows northwest. The upper underburden is composed of discontinuous lenses sandstone, siltstone, claystone and shale (WET 2024b). The deep underburden is a massive fluvial sandstone that is 40 to 80 feet thick and is used as the source of the public water supply for the mine (WET 2024a). Baseline testing data (27 slug tests and 2 pumping tests) for upper underburden provide a median hydraulic conductivity value of 0.009 ft/d with an observed range of 0.001 to 1.0 ft/d (WET 2024b). Baseline testing data (1 slug test and 3 pumping tests) for deep underburden provide a median hydraulic conductivity value of 0.25 ft/d, with an observed range of 0.003 to 0.46 ft/d (WET 2024b). Site-specific data for underburden storability and specific storage are not available.

In addition to the hydrostratigraphic units previously discussed, shallow bedrock is commonly fractured and weathered to depths between 100 to 150 feet and has higher hydraulic conductivity than the underlying competent strata (WET 2024a). Baseline testing data (3 slug tests, and 2 pumping tests) provide a median hydraulic conductivity value of 6.3 ft/d for weathered bedrock with an observed range of 2.2 to 7.8 ft/d (WET 2024b). Site specific storage data for weathered bedrock are not available.

Figure 3.4-2. Stratigraphic Column



Source. WET 2024

Figure 3.4-3. Mammoth Coal Structure Map

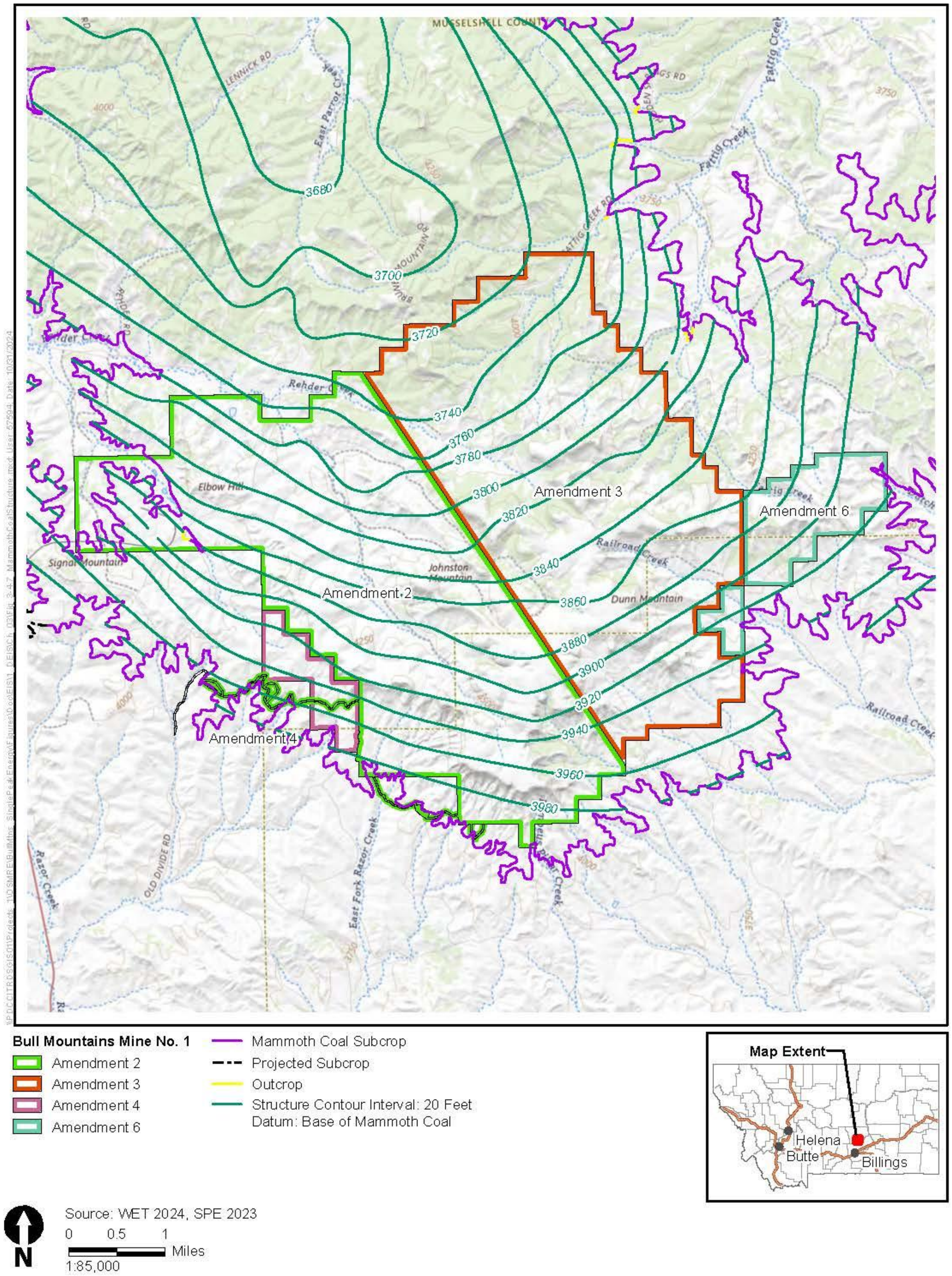


Figure 3.4-4. Pre-Mining Potentiometric Surface Map

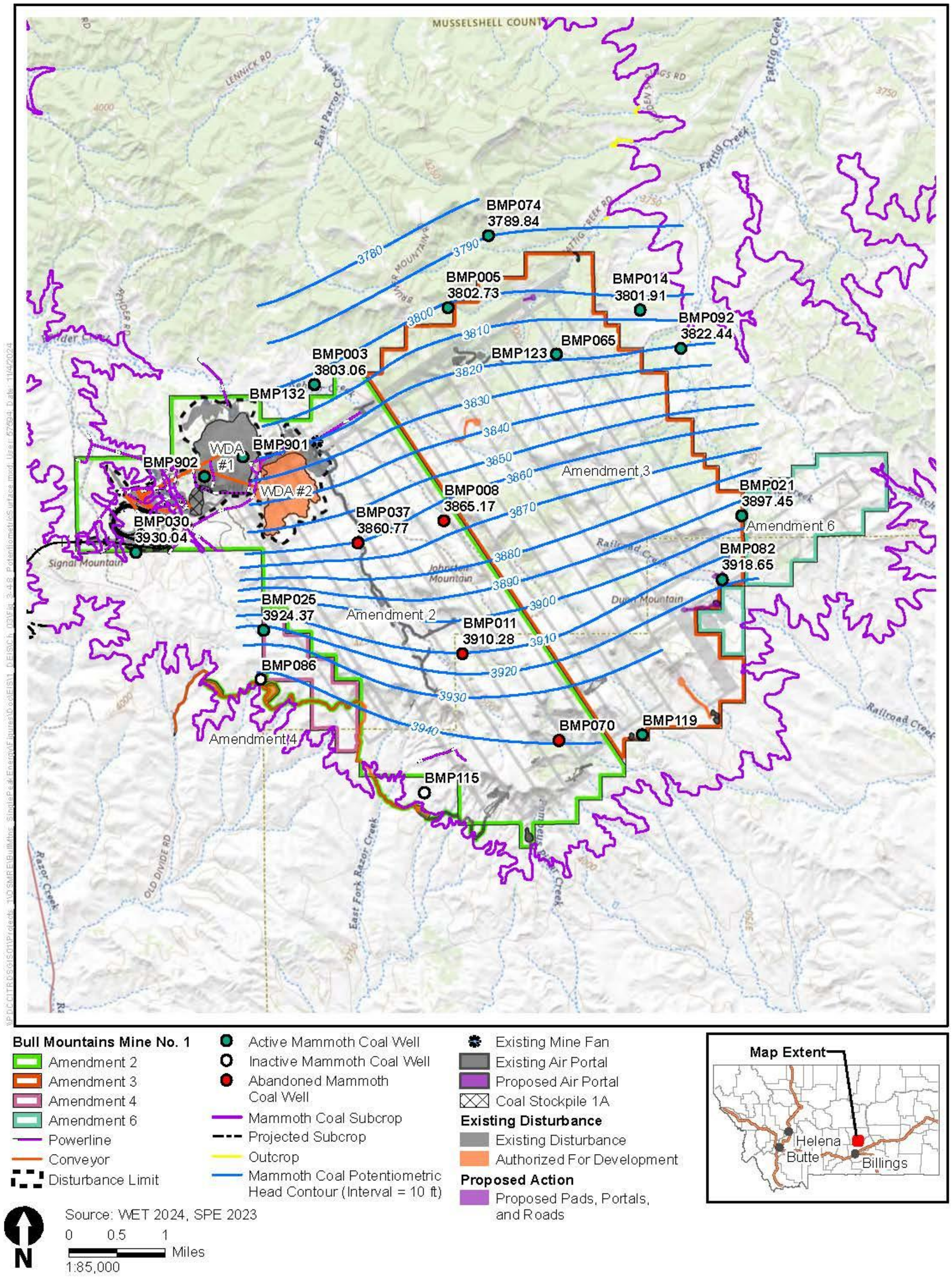


Figure 3.4-5. Water Table Rehder Creek

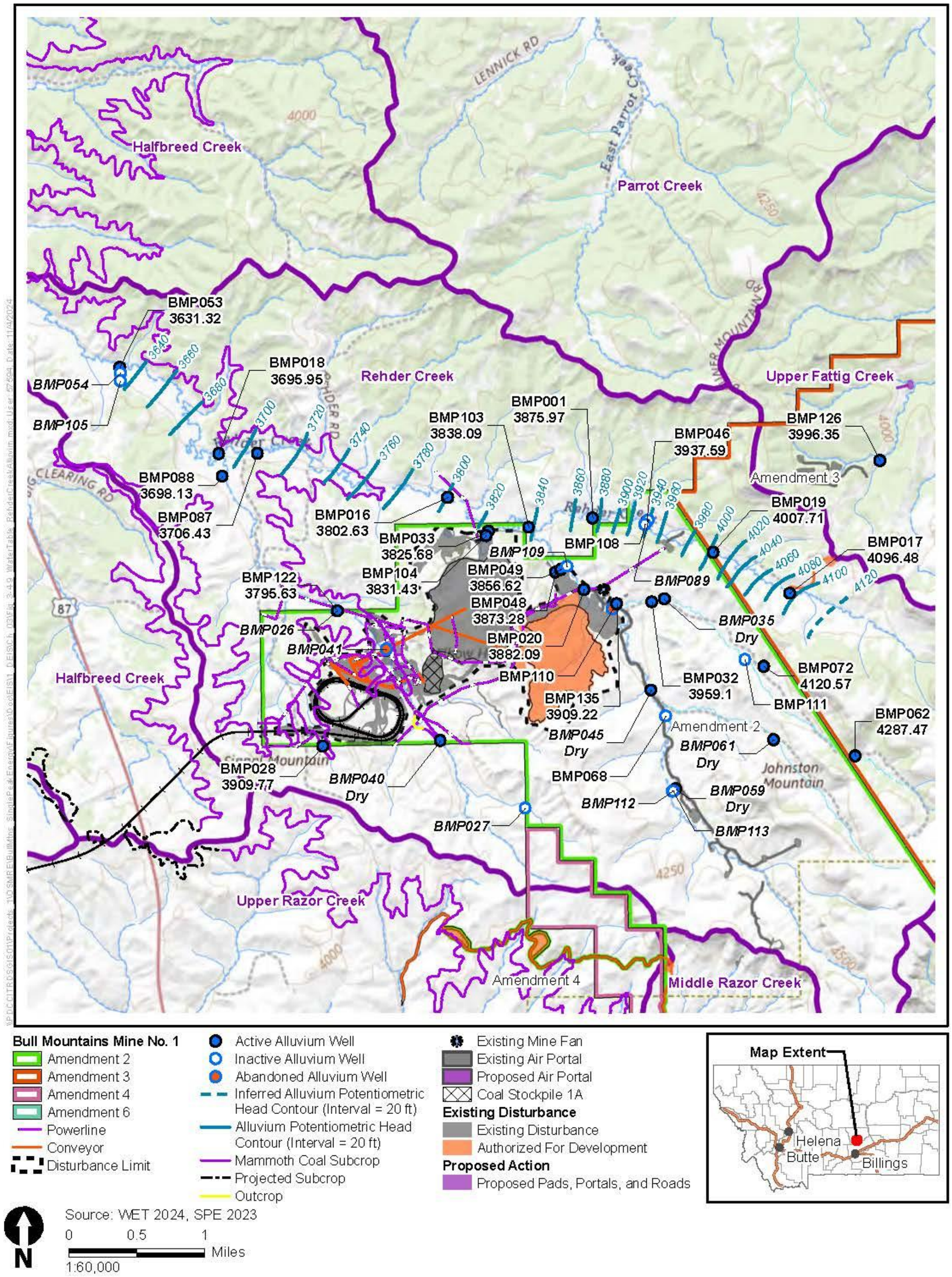
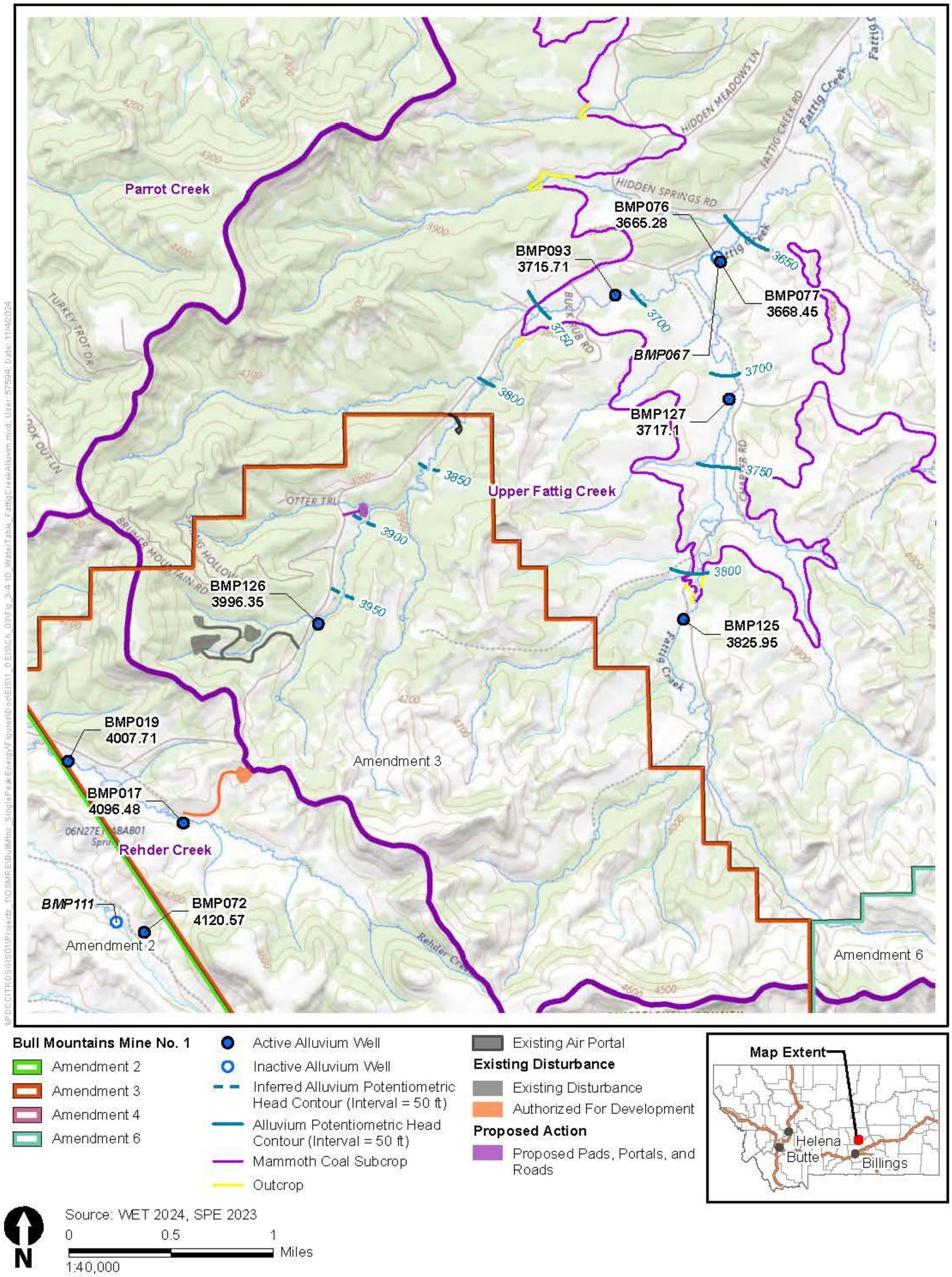


Figure 3.4-6. Water Table Fattig Creek



Groundwater Baseline

Initial baseline water level and water quality data for the study area were developed by Meridian between 1989 through 1991 (MDEQ 2024a). Monitoring continued during ownership by subsequent operators, but most of the original monitoring wells were abandoned when the Meridian mine closed in 1998. In 2002 and 2003, a new network of 121 monitoring wells was installed by BMPII (**Figure 3.4-7** and **3.4-8**). These wells have also been used to determine baseline conditions areas that have not been affected by mining disturbances.

Groundwater baseline for the study area has been determined by MDEQ (2023 and 2024a). In general groundwater monitoring data from wells are used to represent baseline conditions if mining related disturbance to the geologic unit of completion was not within 1 mile of the monitoring point as of 2016. For this analysis, surface activities were considered to disturb alluvium. Longwall mining was considered to disturb all geologic units from the upper underburden to the surface and continuous miner mining was considered to disturb geologic units from the upper underburden to overburden unit OB6.

The baseline analysis prepared by MDEQ (2023, 2024a) compared water quality in the original Meridian monitoring wells to the replacement wells to determine if the wells sampled the same water. When water quality was similar, the wells were treated as a single sampling location. In cases where the water quality was different each well was treated as a separate location.

Figure 3.4-7. Baseline Groundwater Monitoring Wells for Alluvium and Mammoth Coal

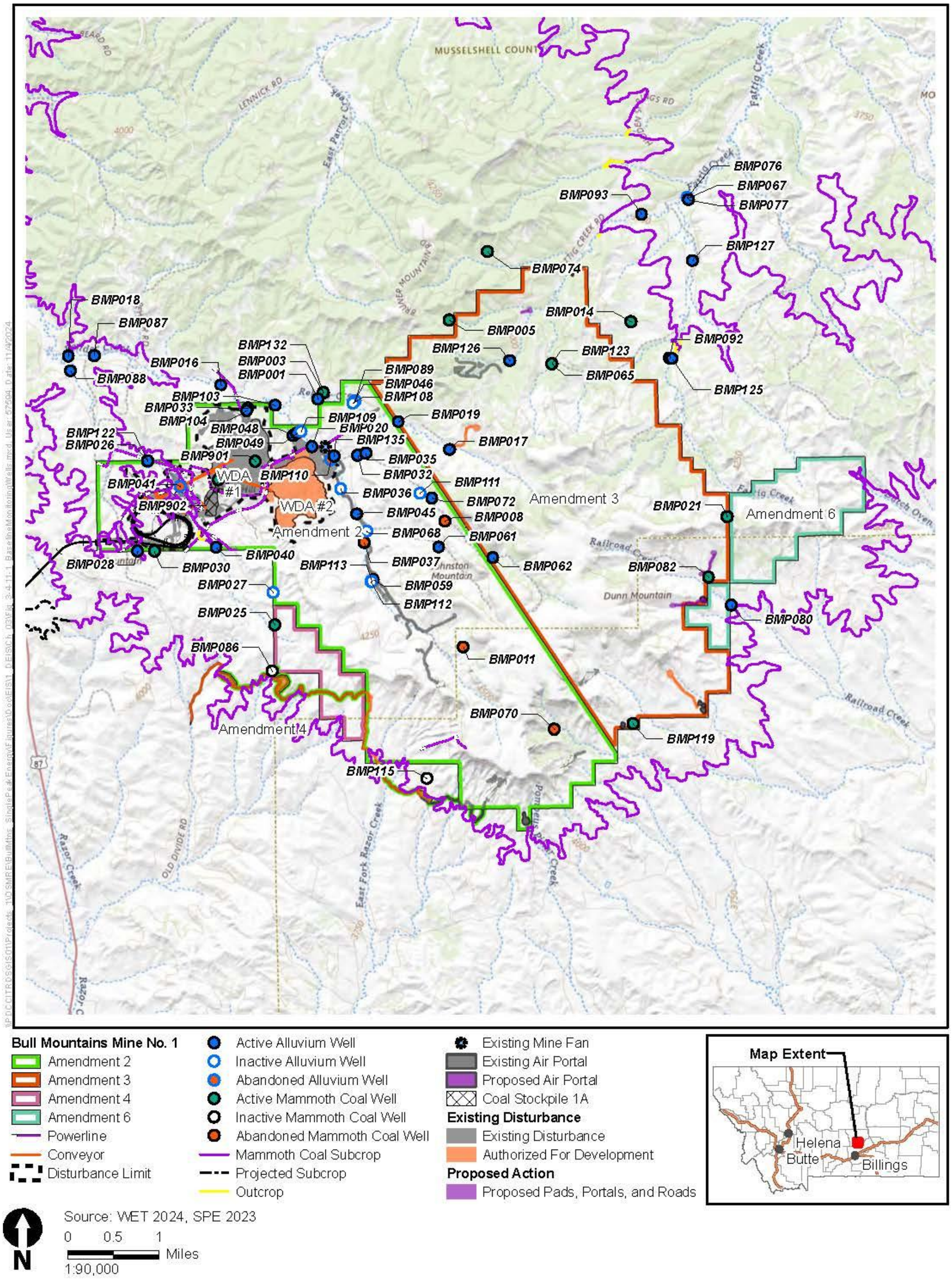
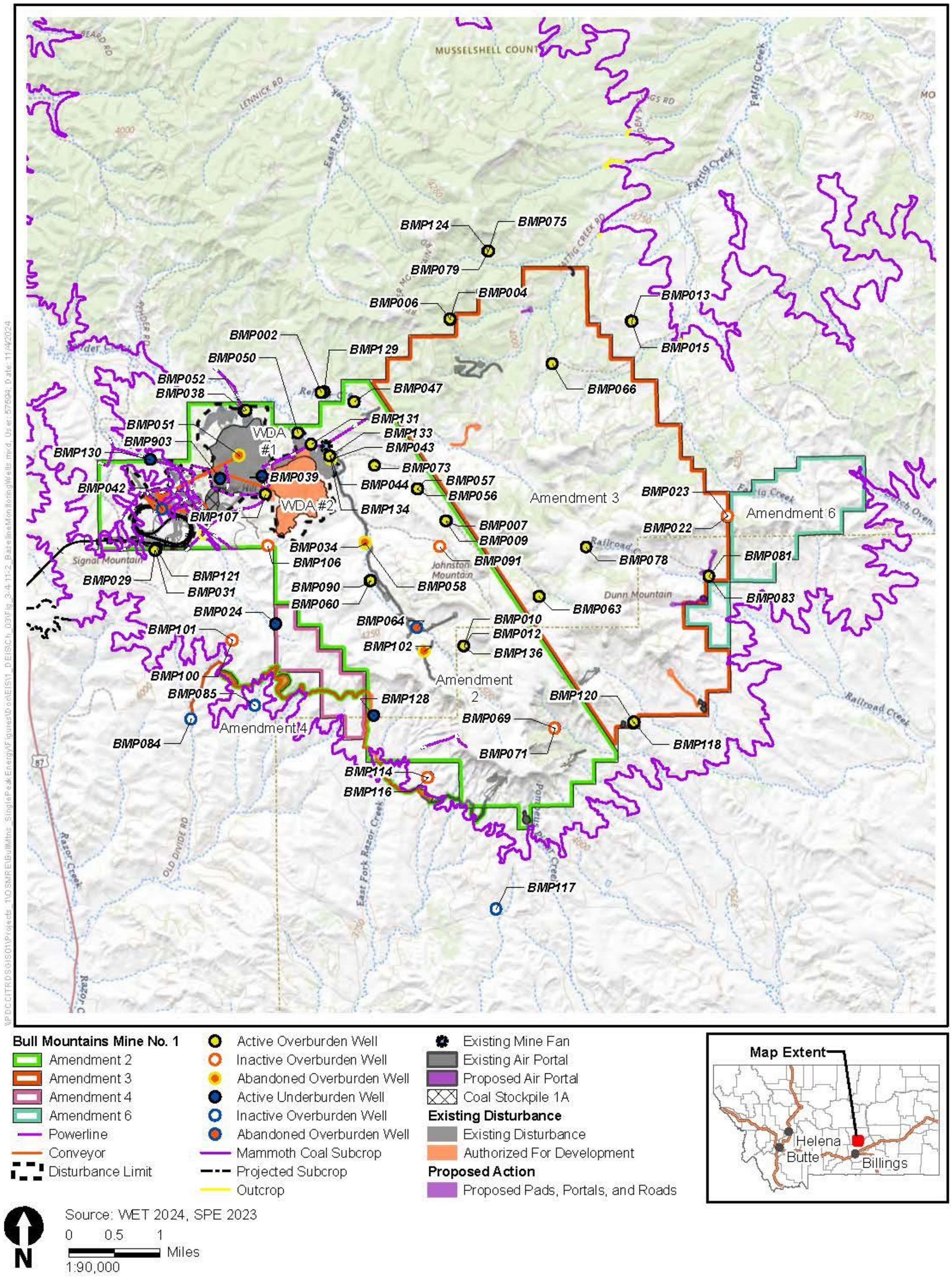


Figure 3.4-8. Baseline Groundwater Monitoring Wells for Overburden and Underburden



Alluvial Baseline

Water level data from alluvial wells indicate that alluvium is generally dry or seasonally saturated in the upper reaches of permit area drainages and saturated in the lower reaches of Rehder and Fattig Creeks. Groundwater flow in Rehder Creek alluvium is west-northwest following topography (**Figure 3.4-5**). Alluvial groundwater in the Fattig Creek drainage flows northeast also following topography (**Figure 3.4-6**).

Baseline water quality monitoring data indicate that alluvial groundwater generally has magnesium sulfate or magnesium bicarbonate composition with near circum-neutral pH (6.4 to 8.3 pH units) and total dissolved solids (TDS) between 433 and 5,260 milligrams per liter (mg/L) (MDEQ 2024a). Sulfate and TDS in alluvial groundwater often exceed Federal secondary standards for drinking water with median values of 679 and 1,470 mg/L, respectively. The secondary drinking water standard for sulfate is 250 mg/L. The secondary standard for TDS is 500 mg/L. Baseline analyses for alluvial groundwater also occasionally exceed primary or secondary drinking water standards for aluminum, iron, lead, manganese, nickel, and nitrate + nitrite (**Table 3.4-4**).

Overburden Baseline

The thickness of overburden rocks ranges from about 150 to 800 feet thick above the mining area. Groundwater in shallow overburden is typically unconfined, perched, and often moves laterally along sedimentary layers before discharging as springs, seeps, or into alluvium. Water levels in perched aquifers are influenced by seasonal and annual changes in precipitation. Deeper groundwater in the regional flow system occurs in sandstones stratigraphically above the Rock Mesa Coal (OB5) and the Mammoth Coal (OB6). The direction of pre- mining flow in the regional groundwater system was north-northwest parallel to the axis of the syncline.

Baseline water quality monitoring data indicate that overburden groundwater generally has sodium bicarbonate or sodium sulfate composition with near circum-neutral to alkaline pH (6.6 to 9.2 pH units) and TDS between 125 and 7,060 mg/L (MDEQ 2024a). Sulfate, TDS, and manganese in overburden groundwater often meet or exceed Federal secondary standards for drinking water with median values of 504, 1,250 and 0.05 mg/L, respectively. The secondary drinking water standard for sulfate is 250 mg/L. The secondary standard for TDS is 500 mg/L. The secondary standard for manganese is 500 mg/L. Baseline analyses for overburden groundwater also occasionally exceed primary or secondary drinking water standards for aluminum, arsenic, cadmium, iron, lead, and nitrate+nitrite (**Table 3.4-4**).

Mammoth Coal Baseline

The Mammoth Coal crops out at the surface or below alluvium near the mine portal, the southern face of Dunn Mountain, and in the drainages for Rehder and Fattig Creeks. The coal is unsaturated near the western and southern outcrop areas but becomes saturated and confined near the center of the syncline where it is part of the regional groundwater system that flows north–northwest. Recharge reaches the Mammoth Coal via exposed outcrops and from infiltration through the overburden. Pre-mining water level measurement for the Mammoth Coal indicate that groundwater elevations in the unit were generally stable, varying by less than two feet in monitoring wells, except for one that was located in an outcrop area and showed larger variations in response to precipitation (MDEQ 2024a).

Baseline water quality monitoring data indicate that groundwater in the Mammoth Coal generally has sodium sulfate composition with near circum-neutral to alkaline pH (6.9 to 9.8 pH units) and

TDS between 788 and 5,840 mg/L (MDEQ 2024a). Sulfate, TDS, and aluminum in Mammoth Coal groundwater often exceed Federal secondary standards for drinking water with median values of 714, 1,520 and 0.074 mg/L, respectively. The secondary drinking water standard for sulfate is 250 mg/L. The secondary standard for TDS is 500 mg/L. The secondary standard for aluminum is 0.05 mg/L. Baseline analyses for Mammoth Coal groundwater also occasionally exceed primary or secondary drinking water standards for iron, lead, and manganese (**Table 3.4-4**).

Upper Underburden Baseline

The upper underburden is located below the Mammoth Coal and is saturated in most parts of the study area. Groundwater in upper underburden is typically unconfined to semi confined in outcrop areas and confined at depth (WET 2024b). Pre-mining water level measurements indicate that water levels in the upper underburden were similar to the Mammoth Coal and that groundwater in the unit flows north-northwest parallel to the axis of the syncline.

Baseline water quality monitoring data indicates that groundwater in the upper underburden generally has sodium sulfate composition with near circum-neutral to alkaline pH (6.4 to 9.8 pH units) and TDS between 883 and 8,700 mg/L (MDEQ 2024a). Sulfate, TDS, and manganese in upper underburden groundwater often exceed Federal secondary standards for drinking water with median values of 758, 1,640 and 0.056 mg/L, respectively. The secondary drinking water standard for sulfate is 250 mg/L. The secondary standard for TDS is 500 mg/L. The secondary standard for manganese is 0.05 mg/L. Baseline analyses for upper underburden groundwater also occasionally exceed primary or secondary drinking water standards for aluminum, arsenic, cadmium, iron, and lead (**Table 3.4-4**).

Deep Underburden Baseline

The deep underburden is located about 350 feet below the Mammoth Coal and is saturated throughout the study area. Groundwater in underburden is typically confined and flow north–northwest parallel to the axis of the syncline (WET 2024b).

Baseline water quality monitoring data indicate that groundwater in the deep underburden generally has sodium sulfate composition with near circum-neutral to alkaline pH (7.2 to 12.6 pH units) and TDS between 838 and 2,550 mg/L (MDEQ 2024a). Sulfate and TDS in deep underburden groundwater often exceed Federal secondary standards for drinking water with median values of 548 and 1,160 mg/L, respectively. The secondary drinking water standard for sulfate is 250 mg/L. The secondary standard for TDS is 500 mg/L. Baseline analyses for deep underburden groundwater also occasionally exceed primary or secondary drinking water standards for arsenic, iron, lead, manganese, and zinc (**Table 3.4-4**).

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Table 3.4-4. Summary of Baseline Groundwater Water Quality Data

		Alluvium			Overburden			Mammoth Coal			Upper Underburden			Deep Underburden		
Parameter	Std.	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max
Aluminum[1] (mg/L)	0.05	0.0044	0.022	1.4	0.0046	0.0267	1.8	0.0052	0.074	1.7	0.004	0.0292	5.55	0.0054	0.0225	0.0479
Arsenic (mg/L)	0.01	0.00021	0.00055	0.0041	0.00038	0.0031	0.051	0.00054	0.0011	0.009	0.00052	0.0023	0.011	0.00053	0.005	0.0679
Cadmium (mg/L)	0.005	0.000039	0.00029	0.004	0.000043	0.000235	0.006	0.000092	0.001	0.004	0.000083	0.001	0.007	0.001	0.001	0.001
Chloride[1] (mg/L)	250	3	15	185	1.69	9.8	129	2	9	47	2	9	188	6	12.2	35.4
Copper (mg/L)	1.3	0.0005	0.0013	0.0102	0.00051	0.0012	0.0501	0.00077	0.0014	0.004	0.001	0.0018	0.0105	0.0011	0.0011	0.0011
Fluoride (mg/L)	4	0.1	0.28	1.31	0.1	0.37	2.7	0.1	0.3	1.7	0.1	0.52	3	0.1	0.464	2.2
Iron[1] (mg/L)	0.3	0.0141	0.055	0.44	0.0195	0.198	5.08	0.03	0.19	23	0.0059	0.13	6.61	0.03	0.0687	0.89
Lead[1] (mg/L)	0.015	0.00005	0.00029	0.04	0.0001	0.00027	0.04	0.00011	0.01	0.04	0.0001	0.00027	0.04	0.0001	0.00013	0.03
Manganese (mg/L)	0.05	0.00027	0.0045	1.86	0.00058	0.05	5.5	0.00095	0.04	2.63	0.0008	0.0559	1.1	0.0057	0.0304	0.473
Nickel (mg/L)[l]	0.1	0.00024	0.0039	0.107	0.00015	0.0041	0.05	0.0003	0.0012	0.0054	0.00051	0.0039	0.0643	0.00052	0.0012	0.039
pH[1] (pH units)	6.5-8.5	6.4	7.6	8.3	6.6	7.5	9.2	6.9	7.7	9.8	6.4	7.8	9.6	7.2	8.1	12.6
Selenium (mg/L)	0.05	0.0003	0.0036	0.011	0.00045	0.002	0.032	0.00053	0.00325	0.039	0.00051	0.0025	0.017	ND	ND	ND
Sulfate[1] (mg/L)	250	59	679	3550	9	504	4530	94	714.5	4200	216	758	3120	259	548	1280
Zinc (mg/L)	2	0.0024	0.02	0.21	0.0031	0.03	1.05	0.0019	0.05	1.62	0.005	0.0692	1.16	0.005	0.0658	2.84
TDS[1] (mg/L)	500	433	1470	5260	125	1250	7060	788	1520	5840	883	1640	8700	838	1160	2550
NO2-NO3 (N mg/L)	10	0.01	0.8	23.8	0.01	0.17	11	0.01	0.1175	7.3	0.0045	0.2	6.5	0.01	0.0275	0.354
SC (µS/cm)	None	759	1855	4940	438	1720	6080	1400	2140	5580	1440	2330	5090	1310	1790	7880

Source: MDEQ 2024a

Notes: Shaded values exceed Federal standards for drinking water.

[1] Secondary drinking water standard based on aesthetics

mg/L = milligrams per liter; TDS = total dissolved solids; SC = specific conductance; µS/cm = microSiemens per centimeter

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3.4.4.4 Surface Water

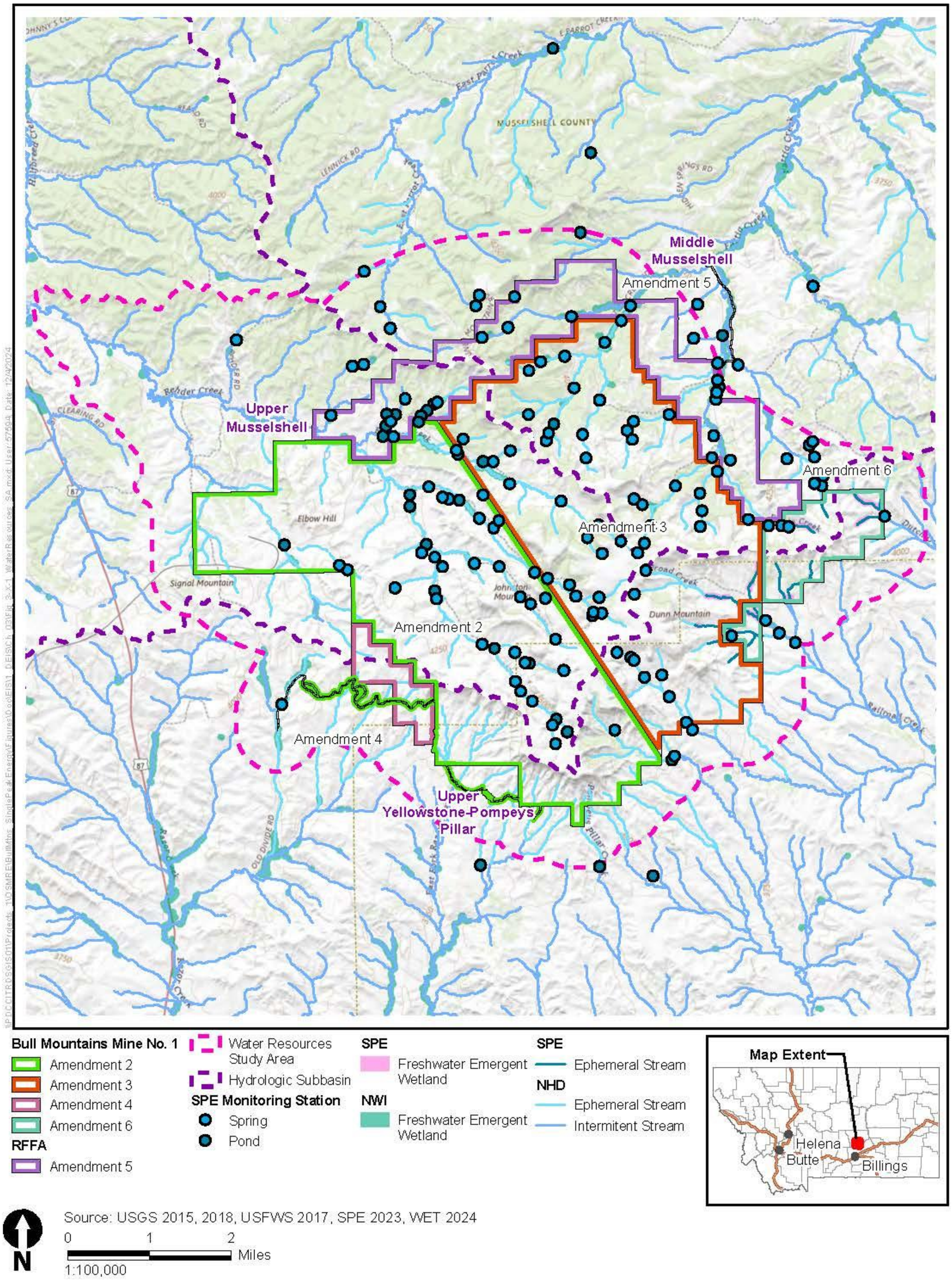
Surface waters in the Bull Mountains include springs and seeps, streams, and stock ponds. The region is drained by tributaries of the Musselshell and Yellowstone Rivers north and south of the permit area, respectively. The nearest intermittent or perennial stream to the Mine permit area is lower Halfbreed Creek which flows into the Musselshell River, approximately 18 miles north of the creek. Streams within the Mine permit area are ephemeral, flowing in response to spring snowmelt and precipitation events (MDEQ 2024a). Surface streamflow in the area is ephemeral and driven by storm events and extended periods of wet weather that recharge perched aquifers. In turn, perched aquifers supply spring flow and dry up during extended periods of below normal precipitation (MDEQ 2024a). Surface waters in the region are classified as C-3 waters by the State. The ephemeral nature of C-3 waters in the Bull Mountains limits their ability to naturally support all beneficial uses established for C-3 waters (MDEQ 2024a).

Ponds in the study area are created by landowners to water cattle, and most are instream dams fed by precipitation (MDEQ 2023 and 2024a). However, some ponds provide a more consistent supply of water because they are partially or fully sourced by springs. The variable discharge at all springs seem to be responsive to precipitation affecting the volume and unpredictable production of water by most springs limit their uses to livestock and wildlife (MDEQ 2023).

The availability of surface and subsurface water for wetlands comes from two geologic sources, localized spring and seep discharges and drainage bottoms where less permeable mudstones are at or near the surface. Mudstones slow or prevent vertical infiltration thereby retaining water for a sufficient duration to allow for wetland soils and plants to establish. The surface and subsurface water originates from either runoff and snowmelt or from springs and seeps. Measurements from groundwater wells and geologic models created from borehole lithology confirm that the local groundwater table in the AM 6 area is too deep to provide groundwater baseflow to the drainage bottom; therefore, the drainageways do not meet the criteria of intermittent streams per ARM 17.24.301(61) (MDEQ 2024a).

There are seven named NHD drainages characterized as ephemeral drainageways in the study area: Fattig Creek, Rehder Creek, Dutch Oven Creek, East Parrot Creek, East Fork Razor Creek, Pompeys Pillar Creek, and Upper Railroad Creek (**Figure 3.4-1** and **Figure 3.4-9**). These channels are described in **Table 3.4-12** (SPE 2023). Most channels in the study area are vegetated thalwegs with occasional bare sediment or exposed bedrock occurrences. Bare thalweg sediment occurrences suggest more recent flow and sediment deposition or erosion within the thalweg, or low soil moisture content within the channel. Bare sediment in channel thalwegs is not a feature unique to perennial or intermittent channels and can be encountered frequently in ephemeral drainages following a flow event (SPE 2023).

Figure 3.4-9. Surface Water Ponds and Drainages



Streams

The study area is drained by ephemeral tributaries of the Musselshell and Yellowstone Rivers. Tributaries that drain north to the Musselshell River include Fattig Creek, Rehder Creek, and East Parrot Creek. Tributaries that drain south to the Yellowstone River include Pompey's Pillar Creek, Railroad Creek, and Razor Creek. No streams with intermittent or perennial flow occur in the study area or the past, present, and RFFA study area. Typically, ephemeral channels flow only in direct response to seasonal snowmelt or precipitation. Short segments of some channels within the study area also flow below springs that issue from perched groundwater sources. The spring flows occur during typical water years and generally persist for short distances before infiltrating into alluvium. An assessment by MDEQ (2024a) indicates that the springs do not supply enough water to sustain contiguous flow in the channels below the issue points.

The ephemeral channel for Rehder Creek is tributary to Halfbreed Creek, the closest stream to the study area with perennial flow (**Figure 3.4-1**). Rehder Creek joins Halfbreed Creek about 4 miles northwest the Mine portal and surface facilities. The reported median flow in Halfbreed Creek at the USGS monitoring station near Klein, MT (06126470) for the period of record between 1977 and 1991 was 0.75 cubic feet per second (cfs) (MDEQ 2024a).

Ephemeral streams in the study area are classified as C-3 waters that are to be maintained suitable for bathing, swimming, and recreation, and growth and propagation of non-salmonid fishes and associated aquatic life, waterfowl, and furbearers (MDEQ 2024a). The quality of C-3 waters is naturally marginal for drinking water, culinary and food processing purposes, agriculture, and industrial water supply. In addition, ARM 17.30.637(4) states that that ephemeral streams are subject to ARM 17.30.635 through 17.30.637, 17.30.640, 17.30.641, 17.30.645, and 17.30.646 but not to the specific water quality standards of ARM 17.30.620 through 17.30.629. This means that applicable water quality standards for study area streams are primarily narrative and include general treatment standards (ARM 17.30.635), general operational standards (ARM 17.30.636), general prohibitions (ARM 17.30.637), and other descriptive portions of the surface water quality standards. Ephemeral streams in the study area are not subject to other standards in ARM 17.30.629, including numeric water quality standards in MDEQ-7 (MDEQ 2024a).

Baseline flow and water quality data for ephemeral streams are available from 16 stations that were monitored between 1989 and 2023 (**Figure 3.4-10**). Eleven of the stations are currently monitored. Five stations have been discontinued and are no longer monitored (WET 2024a). The baseline analysis for the Mine was prepared by MDEQ (2023 and 2024a) and considers streamflow and water quality monitoring data collected prior to mining or mining-related disturbances upstream of the monitored locations.

Although ephemeral channels in the study area typically flow only in direct response to seasonal snowmelt and precipitation, flows with a duration of several days were recorded below springs in Fattig Creek and tributaries to Rehder Creek in response to a period of above average precipitation in 2011. As described by MDEQ (2024a), the streams initially displayed ephemeral responses to prolonged precipitation followed by sustained flows from perched groundwater that had been temporarily recharged by the precipitation event. The flows ceased after depletion of the perched groundwater and the channels returned to ephemeral conditions with occasional flows during storm events or in response to snowmelt.

Baseline water quality data for streams in the study area reflect ephemeral conditions dominated by flashy flow in response to runoff from precipitation and snowmelt. These conditions result in variable water quality with analyses for some constituents varying by two to three orders of magnitude between sampling events and monitored locations. Baseline surface water quality data are also affected by other factors such as livestock use. Most water sources in the study area are used by livestock and water quality is compromised by habitat destruction, animal waste, and trampling of stream channels, pond banks, and spring areas (MDEQ 2024a).

A summary of baseline water quality data for ephemeral streams is presented in **Table 3.4-5**. The summarized data primarily reflects two conditions: flow from snowmelt that has low concentrations of most constituents and runoff from large precipitation events that has higher concentrations of most constituents. The limited number of streamflow events available for baseline monitoring and variable nature of water quality data which are dependent on flow conditions precludes detailed analysis and establishment of typical numeric baseline streamflow conditions (MDEQ 2024a).

Figure 3.4-10. Stream Monitoring Locations

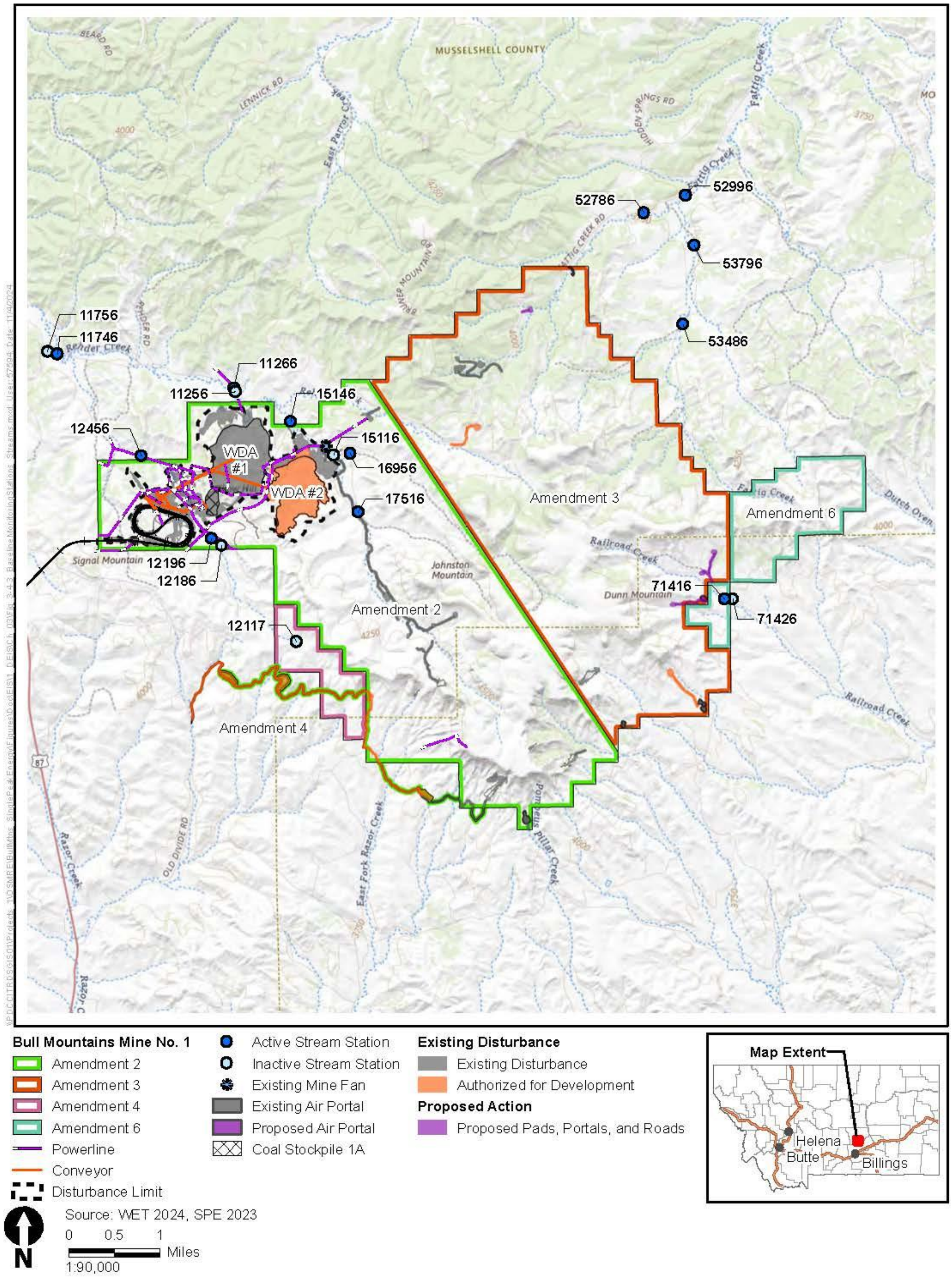


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Table 3.4-5. Summary of Baseline Water Quality Data for Ephemeral Streams

		Rehder Creek			Fattig Creek			Railroad Creek		
Parameter	Unit	Samples / Non-Detect Analyses	Range of Detected Values	Median Detected Value	Samples / Non-Detect Analyses	Range of Detected Values	Median Detected Value	Samples / Non-Detect Analyses	Range of Detected Values	Median Detected Value
Major Ions and Solution Parameters										
pH	pH units	27 / 0	6.6 - 8.4	8.1	92 / 0	8 - 8.9	8.4	19 / 0	6.2 - 8.5	8.2
Acidity	mg/L as $CaCO_3$	27 / 10	0 - 0	0	92 / 86	0 - 0	0	19 / 18	0 - 0	0
Total Alkalinity	mg/L as $CaCO_3$	27 / 0	31 - 553	468	92 / 0	139 - 749	527.5	19 / 0	57 - 468	416
Bicarbonate Alkalinity	mg/L as $CaCO_3$	27 / 0	38 - 675	463	92 / 0	169 - 765	486.5	19 / 0	70 - 468	413
Carbonate Alkalinity	mg/L as $CaCO_3$	27 / 6	0 - 29.2	0	92 / 26	0 - 130	46.25	19 / 14	10 - 48.6	33.2
Calcium	mg/L	27 / 0	8 - 136	81.7	92 / 0	18 - 352	97.1	19 / 0	19 - 111	83.2
Magnesium	mg/L	27 / 1	2 - 227	128	92 / 0	17.1 - 284	209.5	19 / 0	9 - 162	115
Sodium	mg/L	27 / 3	1.05 - 108	66	92 / 0	19.2 - 347	247	19 / 0	2 - 75.3	54.9
Potassium	mg/L	27 / 0	6.48 - 32	9.9	92 / 0	2.61 - 72	11.15	19 / 0	5.55 - 8.04	7.02
Chloride	mg/L	27 / 2	1 - 21.8	10	92 / 0	3 - 52.4	20.75	19 / 1	6 - 11	8.565
Fluoride	mg/L	27 / 7	0.1 - 0.844	0.4135	92 / 25	0.12 - 0.75	0.28	19 / 0	0.1 - 0.69	0.58
Sulfate	mg/L	27 / 1	4.2 - 905	367	92 / 0	91.6 - 1980	1045	19 / 0	11 - 485	353
TDS	mg/L	27 / 0	59 - 1890	961	92 / 0	323 - 2770	1965	19 / 0	217 - 1070	890
TSS	mg/L	28 / 2	0 - 2420	19	93 / 3	1 - 17500	9.25	19 / 1	1.1 - 389	16.4
Specific Conductance	(µS/cm)	27 / 0	99 - 2310	1440	92 / 0	330 - 3510	2640	19 / 0	126 - 1630	1350
Hardness	mg/L as $CaCO_3$	8 / 0	64.3 - 828	691	72 / 0	115 - 1350	1140	17 / 0	543 - 942	687
SAR	unitless	27 / 2	0.01 - 1.4	1.04	89 / 0	0.78 - 4.4	3.2	18 / 0	0.74 - 1.1	0.935
Nutrients										
Phosphorus	mg/L	8 / 0	0.0065 - 0.34	0.02085	75 / 1	0.0051 - 1.16	0.029	17 / 1	0.0061 - 0.0847	0.03425
Orthophosphate	mg/L	19 / 0	0 - 0.73	0.04	17 / 1	0.01 - 0.68	0.03	2 / 0	0.02 - 0.31	0.165
Nitrate/nitrite	mg/L as N	27 / 7	0 - 0.44	0.015	64 / 18	0.01 - 2.81	0.23	11 / 2	0.012 - 1.05	0.028
Nutrient-nitrogen	mg/L as N	1 / 0	3.3 - 3.3	3.3	53 / 0	0.32 - 1.8	0.63	11 / 0	0.25 - 0.57	0.33
Ammonia	mg/L as N	8 / 7	0.0654 - 0.0654	0.0654	75 / 66	0.05 - 0.18	0.077	17 / 13	0.053 - 0.212	0.0793
Metals										
Aluminum, dissolved	mg/L	15 / 5	0.0177 - 9.8	1.25	80 / 63	0.0054 - 0.101	0.0226	18 / 12	0.0218 - 0.1	0.0271
Aluminum, total	mg/L	8 / 0	0.0179 - 1.08	0.1113	82 / 9	0.0104 - 267	0.122	18 / 1	0.0133 - 8.7	0.166
Arsenic, dissolved	mg/L	15 / 3	0.00055 - 0.009	0.0011	80 / 18	0.00053 - 0.0029	0.000995	18 / 3	0.0005 - 0.0012	0.00073
Arsenic, total	mg/L	8 / 0	0.00054 - 0.0019	0.000985	82 / 14	0.00057 - 0.142	0.0011	18 / 1	0.00054 - 0.007	0.00089
Boron, dissolved	mg/L	27 / 7	0.0208 - 0.2	0.1	85 / 2	0.0242 - 0.288	0.162	18 / 1	0.0891 - 0.178	0.126
Boron, total	mg/L	8 / 0	0.0216 - 0.166	0.0871	82 / 2	0.0331 - 0.3	0.1595	18 / 1	0.0896 - 0.17	0.12
Cadmium, dissolved	mg/L	15 / 12	0.002 - 0.01	0.003	80 / 76	0.000091 - 0.003	0.000625	18 / 16	0.00014 - 0.00015	0.000145
Cadmium, total	mg/L	8 / 8	--	--	82 / 76	0.000081 - 0.005	0.000365	18 / 16	0.000082 - 0.000086	0.000084
Chromium, dissolved	mg/L	7 / 7	--	--	5 / 5	--	--	1 / 1	--	--
Chromium, total	mg/L	0 / 0	--	--	7 / 5	0.24 - 0.34	0.29	1 / 1	--	--
Copper, dissolved	mg/L	8 / 3	0.0011 - 0.0225	0.0037	75 / 37	0.00073 - 0.0054	0.0015	17 / 8	0.0011 - 0.0026	0.0013
Copper, total	mg/L	8 / 4	0.0011 - 0.0052	0.00255	75 / 37	0.001 - 0.0087	0.00155	17 / 3	0.001 - 0.005	0.00145
Iron, dissolved	mg/L	27 / 4	0.05 - 12.3	0.1	85 / 75	0.04 - 0.4	0.08465	18 / 17	0.11 - 0.11	0.11

		Rehder Creek			Fattig Creek			Railroad Creek		
Parameter	Unit	Samples / Non-Detect Analyses	Range of Detected Values	Median Detected Value	Samples / Non-Detect Analyses	Range of Detected Values	Median Detected Value	Samples / Non-Detect Analyses	Range of Detected Values	Median Detected Value
Iron, total	mg/L	8 / 4	0.165 - 0.978	0.541	82 / 21	0.0522 - 420	0.238	18 / 2	0.0601 - 10.2	0.3445
Lead, dissolved	mg/L	27 / 12	0 - 0.06	0	85 / 77	0.00011 - 0.02	0.00021	18 / 16	0.0001 - 0.00035	0.000225
Lead, total	mg/L	8 / 4	0.00026 - 0.0014	0.000685	82 / 38	0.0001 - 0.34	0.000305	17 / 4	0.00015 - 0.0037	0.00033
Manganese, dissolved	mg/L	27 / 5	0 - 4.39	0.0037	85 / 10	0.0005 - 0.14	0.0043	17 / 0	0.0053 - 0.0939	0.018
Manganese, total	mg/L	8 / 0	0.0011 - 0.047	0.00355	82 / 4	0.00098 - 7.7	0.0144	18 / 0	0.0051 - 0.25	0.0414
Mercury, dissolved	mg/L	19 / 10	0 - 0	0	10 / 10	--	--	1 / 1	--	--
Mercury, total	mg/L	0 / 0	--	--	7 / 7	--	--	1 / 1	--	--
Molybdenum, dissolved	mg/L	19 / 10	0 - 0	0	10 / 9	0.005 - 0.005	0.005	1 / 1	--	--
Molybdenum, total	mg/L	0 / 0	--	--	7 / 5	0.005 - 0.007	0.006	1 / 1	--	--
Nickel, dissolved	mg/L	15 / 7	0.0005 - 0.03	0.000945	80 / 35	0.00051 - 0.0037	0.0009	18 / 5	0.00051 - 0.0076	0.0009
Nickel, total	mg/L	8 / 4	0.00062 - 0.0018	0.00087	82 / 28	0.00053 - 0.36	0.00105	18 / 5	0.00053 - 0.0095	0.0013
Selenium, dissolved	mg/L	27 / 12	0 - 0.0021	0	85 / 15	0.00058 - 0.005	0.00215	18 / 4	0.00061 - 0.0029	0.00165
Selenium, total	mg/L	8 / 2	0.00083 - 0.0021	0.0012	82 / 8	0.0005 - 0.007	0.0022	18 / 4	0.00052 - 0.0031	0.0016
Vanadium, dissolved	mg/L	15 / 13	0.00062 - 0.00075	0.000685	80 / 67	0.00029 - 0.0015	0.0011	18 / 17	0.001 - 0.001	0.001
Vanadium, total	mg/L	8 / 4	0.0011 - 0.0022	0.0015	82 / 57	0.00076 - 0.4	0.0014	18 / 10	0.001 - 0.0041	0.00125
Zinc, dissolved	mg/L	15 / 7	0.0062 - 0.14	0.025	80 / 57	0.005 - 0.04	0.0073	18 / 11	0.0051 - 0.0091	0.0063
Zinc, total	mg/L	8 / 5	0.0067 - 0.0087	0.0069	82 / 43	0.0051 - 1.42	0.009	18 / 7	0.0051 - 0.03	0.0066

Source: MDEQ 2024a
mg/L = milligrams per liter

MDEQ's assessment is that the marginal quality of water and ephemeral nature of streamflow in the study area limits the ability of the ephemeral streams to support all beneficial uses established for C-3 waters. Where springs discharge sufficient water to develop flow and ponding below issue points, some beneficial uses such as livestock watering, wildlife, and aquatic life may be supported, but limited water volumes generally preclude support of bathing, swimming and recreation, support of non-salmonid fishes, irrigated agriculture, and industrial beneficial uses (MDEQ2023, 2024a).

Ponds

A total of 30 ponds occur in the study area, excluding those that were constructed as surface infrastructure for the Mine (**Figure 3.4-9**). All 30 ponds are human-made and are used to store water for livestock. In general, pond locations are limited to areas where springs provide the source of water, or to drainages where impoundments constructed across the channel can capture and store runoff (MDEQ 2023, 2024a). In ponds located below springs, the presence of water is related to spring discharge and the ponds may dry up seasonally as spring flows diminish or cease in the summer or fall. Ponds that capture runoff are typically less reliable and may only hold water for short periods after snowmelt and precipitation events. At these locations, the pond embankments control downstream flows and in some cases are large enough to eliminate flow completely (MDEQ 2023, 2024a).

In the study area, pond 52227 in the Fattig Creek drainage, Busse Water Pond associated with spring 14325, Cold Water Spring Pond associated with spring 16655, and Big Dam on Top Pond associated with spring 17165 have been observed to retain water throughout the year (MDEQ 2023,2024a). Other ponds in the study area are dry during portions of most years, or dry during most years (MDEQ 2023, 2024a). Stock ponds that maintain water for several months a year are considered waters of the State and are subject to water quality standards for C-3 waters (MDEQ 2023, 2024a). Numeric surface water standards applicable to stock ponds are shown in **Table 3.4-1**. Beneficial use guideline values are shown in **Table 3.4-2**.

Baseline data for ponds are available from 30 stations that were monitored between 1989 and 2023 (**Figure 3.4-11**). Eighteen of the ponds are currently monitored as part of the operational monitoring program for the Mine. Monitoring at the other ponds has been discontinued (WET 2024a). The baseline analysis for ponds was prepared by MDEQ (2023, 2024a) and considers data collected prior to mining or mining-related disturbances in the drainages of the monitored locations.

Baseline data for stock ponds (**Table 3.4-6**) indicate that the water quality of the ponds is variable, which is expected because the samples represent a variety of conditions ranging from recent runoff to stagnant summer pools (MDEQ 2024a). The observed pH of pond water ranges from near neutral to alkaline (7.4 to 9.4 pH units) and TDS range from near the detection limit to about 2,000 mg/L. Metals concentrations have similar variability with aluminum, total arsenic, and total iron exceeding DEQ-7 multiple times in samples of pond water from the Rehder, Fatting, and Razor Creeks drainages (MDEQ 2023 and 2024a). Other metals that are reported to occasionally exceed DEQ-7 standards include total lead, total copper, and total nickel (MDEQ 2024a). Baseline data also indicate that pH, TDS, sulfate, and manganese analyses exceed Federal secondary drinking water standards for some samples.

Stock ponds in the study area are developed for livestock watering and observed water quality is marginal for this beneficial use (MDEQ 2023, 2024a). Naturally occurring levels of sulfate, magnesium, and some metals mostly associated with suspended sediment often exceed guidelines for livestock drinking water (**Table 3.4-2)**. However, in the absence of better alternatives, livestock use the ponds as water supplies. Stock ponds are not used for private or public drinking water supplies, and marginal water quality and limited water availability during portions of the year generally preclude their development for this beneficial use (MDEQ 2023, 2024a). Similarly, while water quality in ponds may meet agricultural requirements for crop use, available water volumes are insufficient to support irrigation or other consumptive agricultural uses other than livestock watering (MDEQ 2023, 2024a).

Figure 3.4-11. Pond Monitoring Locations

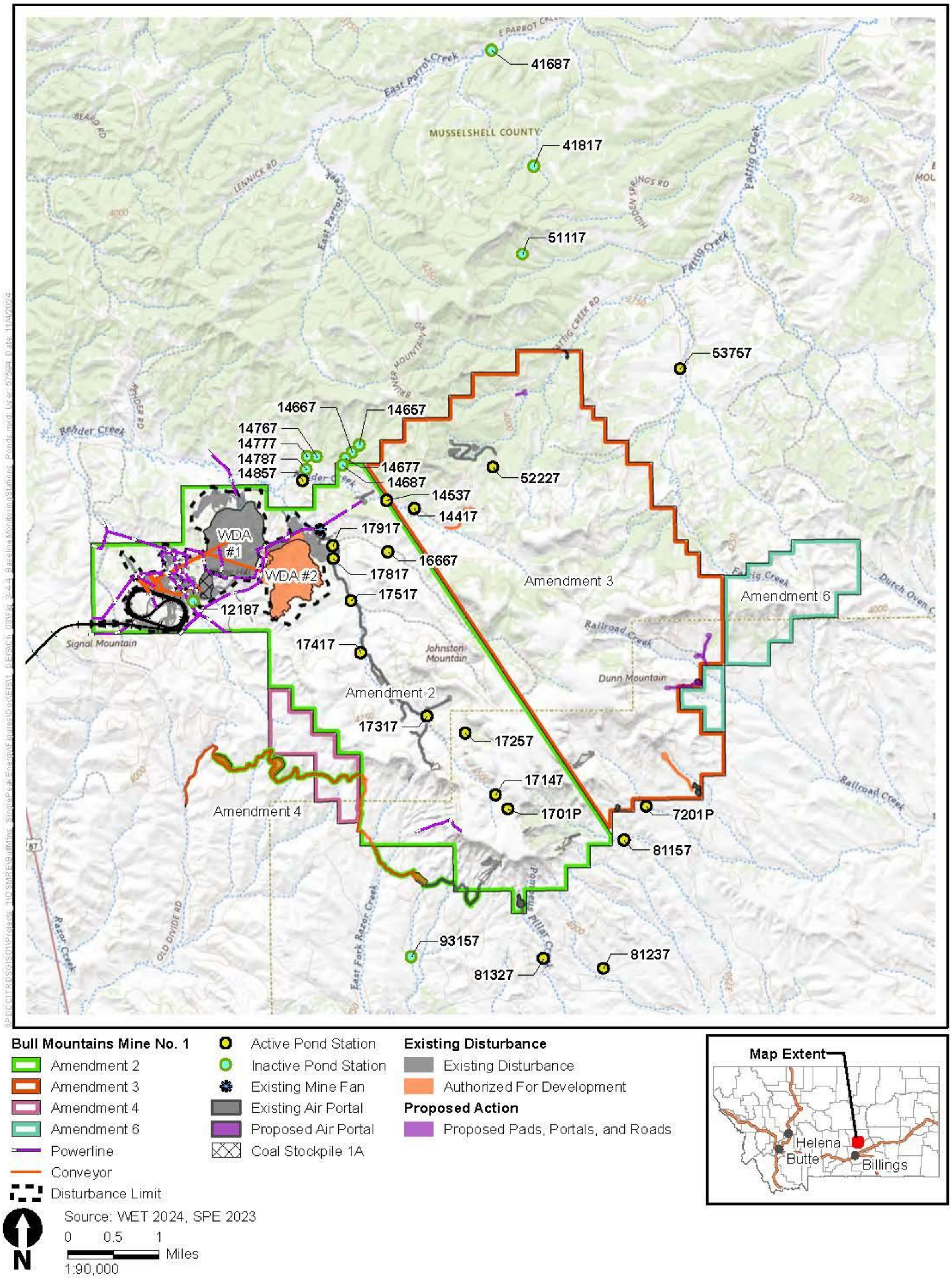

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Table 3.4-6. Summary of Baseline Water Quality Data for Ponds

		Rehder Creek Ponds			Fattig Creek Ponds			Razor Creek Ponds		
Parameter	Unit	Samples / Non-Detect Analyses	Range of Detected Values	Median Detected Value	Samples / Non-Detect Analyses	Range of Detected Values	Median Detected Value	Samples / Non-Detect Analyses	Range of Detected Values	Median Detected Value
Major Ions and Solution Parameters										
pH	pH units	49 / 0	7.5 - 9.4	8.2	45 / 0	7.6 - 8.8	8.2	9 / 0	7.4 - 8.9	8
Acidity	mg/L as $CaCO_3$	49 / 12	0 - 0	0	45 / 28	0 - 25	0	9 / 6	5 - 6	6
Total Alkalinity	mg/L as $CaCO_3$	49 / 0	74 - 821	238	45 / 0	250 - 775	605	9 / 0	73.1 - 309	126
Bicarbonate Alkalinity	mg/L as $CaCO_3$	49 / 0	90 - 1000	287	45 / 0	271 - 912	646	9 / 0	73.1 - 377	154
Carbonate Alkalinity	mg/L as $CaCO_3$	49 / 3	0 - 39.4	0	40 / 20	0 - 61.7	8.51	9 / 8	9 - 9	9
Calcium	mg/L	49 / 0	16.2 - 114	66	45 / 0	34 - 88	63.2	9 / 0	32 - 175	49
Magnesium	mg/L	49 / 0	8 - 227	105	45 / 0	37 - 179	115	9 / 0	4 - 187	9
Sodium	mg/L	49 / 2	2 - 162	38	45 / 0	85.6 - 301	157	9 / 3	2 - 72	4.45
Potassium	mg/L	49 / 0	2.36 - 55	10	45 / 0	5 - 42	8	9 / 0	6 - 20	13
Chloride	mg/L	49 / 1	1 - 30	8	45 / 0	4 - 72	9.8	9 / 1	2 - 35	4.05
Fluoride	mg/L	49 / 2	0.15 - 1	0.23	45 / 2	0.19 - 0.44	0.3	9 / 2	0.1 - 0.1	0.1
Sulfate	mg/L	49 / 0	2 - 908	280	45 / 0	189 - 922	365	9 / 0	4 - 1040	16
TDS	mg/L	0 / 0	1 - 1640	825	45 / 0	790 - 1950	1100	9 / 0	125 - 1770	312
TSS	mg/L	38 / 1	2 - 1060	30	44 / 11	3.4 - 281	19	9 / 2	13 - 341	27
Specific Conductance	(µS/cm)	48 / 0	202 - 2220	1180	45 / 0	1240 - 2420	1630	9 / 0	197 - 2000	314
Hardness	mg/L as $CaCO_3$	49 / 0	120 - 230	175	45 / 0	385 - 395	391	9 / 0	--	--
SAR	unitless	49 / 3	0.05 - 2.1	0.65	38 / 0	1.37 - 6.63	2.775	5 / 0	0.1 - 0.91	0.16
Nutrients										
Phosphorus	mg/L	0 / 0	--	--	19 / 0	0.015 - 0.44	0.064	0 / 0	--	--
Orthophosphate	mg/L	38 / 2	0.01 - 0.13	0.03	26 / 7	0.005 - 0.1	0.02	9 / 0	0.007 - 0.4	0.048
Nitrate/nitrite	mg/L as N	43 / 29	0.012 - 1.24	0.17	41 / 19	0 - 0.373	0.057	9 / 0	0.01 - 1.2	0.04
Nutrient-nitrogen	mg/L as N	0 / 0	--	--	15 / 0	0.48 - 5.6	0.79	0 / 0	--	--
Ammonia	mg/L as N	11 / 10	0.18 - 0.18	0.18	19 / 13	0.0681 - 0.24	0.093	0 / 0	--	--
Metals										
Aluminum, dissolved	mg/L	48 / 17	0.0183 - 4.5	0.4	28 / 15	0.0204 - 0.7	0.1	0 / 0	--	--
Aluminum, total	mg/L	0 / 0	--	--	32 / 10	0.0486 - 2.86	0.241	8 / 0	0.1 - 9.1	1.85
Arsenic, dissolved	mg/L	48 / 30	0.00052 - 0.02	0.00097	28 / 7	0.00092 - 0.0121	0.0014	0 / 0	--	--
Arsenic, total	mg/L	0 / 0	--	--	32 / 13	0.0011 - 0.0139	0.0021	8 / 4	0.007 - 0.02	0.0095
Boron, dissolved	mg/L	49 / 16	0.028 - 0.3	0.1	32 / 5	0.0631 - 0.204	0.13	0 / 0	--	--
Boron, total	mg/L	0 / 0	--	--	32 / 4	0.083 - 0.2	0.1305	9 / 8	0.037 - 0.037	0.037
Cadmium, dissolved	mg/L	48 / 40	0.001 - 0.003	0.002	28 / 25	0.001 - 0.002	0.001	0 / 0	--	--
Cadmium, total	mg/L	0 / 0	--	--	32 / 32	--	--	8 / 8	--	--
Chromium, dissolved	mg/L	37 / 37	--	--	9 / 9	--	--	0 / 0	--	--
Chromium, total	mg/L	0 / 0	--	--	13 / 13	--	--	8 / 8	--	--
Copper, dissolved	mg/L	11 / 7	0.0013 - 0.0487	0.00915	19 / 10	0.00068 - 0.0017	0.0013	0 / 0	--	--
Copper, total	mg/L	0 / 0	--	--	19 / 4	0.0011 - 0.007	0.0021	0 / 0	--	--
Iron, dissolved	mg/L	49 / 14	0.04 - 5.96	0.44	32 / 11	0.037 - 2.46	0.28	0 / 0	--	--
Iron, total	mg/L	0 / 0	--	--	32 / 0	0.11 - 5.32	0.459	9 / 0	0.2 - 13.2	2.67

		Rehder Creek Ponds			Fattig Creek Ponds			Razor Creek Ponds		
Parameter	Unit	Samples / Non-Detect Analyses	Range of Detected Values	Median Detected Value	Samples / Non-Detect Analyses	Range of Detected Values	Median Detected Value	Samples / Non-Detect Analyses	Range of Detected Values	Median Detected Value
Lead, dissolved	mg/L	49 / 45	0.00011 - 0.02	0.02	32 / 28	0.00011 - 0.02	0.00512	0 / 0	--	--
Lead, total	mg/L	0 / 0	--	--	32 / 16	0.00012 - 0.0034	0.0006	9 / 7	0.01 - 0.011	0.0105
Manganese, dissolved	mg/L	47 / 12	0 - 1.2	0.05	32 / 1	0.0079 - 0.36	0.051	0 / 0	--	--
Manganese, total	mg/L	0 / 0	--	--	32 / 1	0.0117 - 0.255	0.07	9 / 1	0.04 - 0.59	0.25
Mercury, dissolved	mg/L	38 / 38	--	--	13 / 13	--	--	0 / 0	--	--
Mercury, total	mg/L	0 / 0	--	--	13 / 13	--	--	8 / 8	--	--
Molybdenum, dissolved	mg/L	38 / 36	0.005 - 0.006	0.0055	13 / 12	0.008 - 0.008	0.008	0 / 0	--	--
Molybdenum, total	mg/L	0 / 0	--	--	13 / 13	--	--	9 / 8	0.0013 - 0.0013	0.0013
Nickel, dissolved	mg/L	48 / 40	0.00038 - 0.001	0.0007	28 / 12	0.00051 - 0.0029	0.001	0 / 0	--	--
Nickel, total	mg/L	0 / 0	--	--	32 / 15	0.00054 - 0.005	0.0015	8 / 8	--	--
Selenium, dissolved	mg/L	49 / 49	--	--	32 / 24	0.00057 - 0.0044	0.0011	0 / 0	--	--
Selenium, total	mg/L	0 / 0	--	--	32 / 25	0.00062 - 0.0046	0.0012	9 / 8	0.0011 - 0.0011	0.0011
Vanadium, dissolved	mg/L	0 / 47	0.00038 - 0.00038	0.00038	28 / 24	0.0006 - 0.0034	0.00115	8 / 8	--	--
Vanadium, total	mg/L	0 / 0	--	--	32 / 23	0.0011 - 0.0038	0.0016	0 / 0	--	--
Zinc, dissolved	mg/L	48 / 19	0.005 - 0.06	0.02	28 / 22	0.0081 - 0.03	0.02	0 / 0	--	--
Zinc, total	mg/L	0 / 0	--	--	32 / 20	0.0054 - 0.03	0.01	7 / 3	0.01 - 0.03	0.02

Source: MDEQ 2024a
mg/L = milligrams per liter

Springs

A total of 133 springs and seeps have been identified in the study area (**Figure 3.4-12**). Springs in the Bull Mountains typically occur where perched groundwater flows laterally along low-permeability shale or claystone beds to discharge at topographically lower points. Springs discharge occurs from all geologic units that crop out in the study area, including alluvium, overburden beds OB1, OB2, OB3, OB4, OB5, OB6, the Mammoth Coal, and underburden (UB) (**Figure 3.4-2**). Most monitored springs exhibit a history of wet, dry, and low-flow conditions that respond to local and regional precipitation trends (MDEQ 2023, 2024a). The majority of springs do not produce water in reliable quantities and may go dry during normal or low-precipitation years. Of the 133 documented springs, 33 have median measured flow rates (all monitoring events) that are greater than or equal to 0.5 gallons per minute (gpm) (WET 2024 and MDEQ 2024b). These springs are reliable sources of water for wildlife and livestock and in a few cases maintain flows that are sufficient to support aquatic life (MDEQ 2023, 2024a). Although some springs support beneficial uses for wildlife, livestock, and aquatic life, the flows are insufficient to support recreational use, irrigated agriculture or industrial use (MDEQ 2023, 2024a). While springs in the study area have not historically been used as drinking water, it is possible that where flows and water quality are adequate, some springs could support small-scale private drinking water supplies (MDEQ 2023, 2024a).

Baseline data for springs are available from initial studies performed by Meridian between 1989 through 1994 (MDEQ 2024a), and monitoring between 2004 and 2023. In addition, an updated spring survey for the study area was completed in 2023, which is included as Appendix B of the *Comprehensive Evaluation of Probable Hydrologic Consequences* (PHC) report (WET 2024a). A summary of baseline flow data for springs is presented in **Table 3.4-7**. Baseline water quality data are summarized **Tables 3.4-8** through **3.4-11.**

Spring water in the study area generally has moderate to elevated TDS with low concentrations of most metals. Median TDS concentrations broken out by geologic unit range from 352 to 1,790 mg/L increasing downward from overburden unit OB1 (353 mg/L) to the Mammoth Coal (1,790 mg/L). Springs issuing from underburden are an exception to this order with a median TDS value of 1,525 mg/L. Major ions that contribute to TDS in spring water include sulfate, magnesium, calcium, and sodium. Concentrations of calcium, magnesium, and sodium frequently exceed recommended guidelines for livestock drinking water. Sulfate alkalinity and TDS also exceed guidelines for livestock drinking water but less commonly. Metals concentrations are typically below analytical detection limits with infrequent analyses for arsenic, iron, lead, nickel, selenium, and zinc that exceed MDEQ-7 water quality standards (**Table 3.4-11**).

Figure 3.4-12. Spring Monitoring Locations

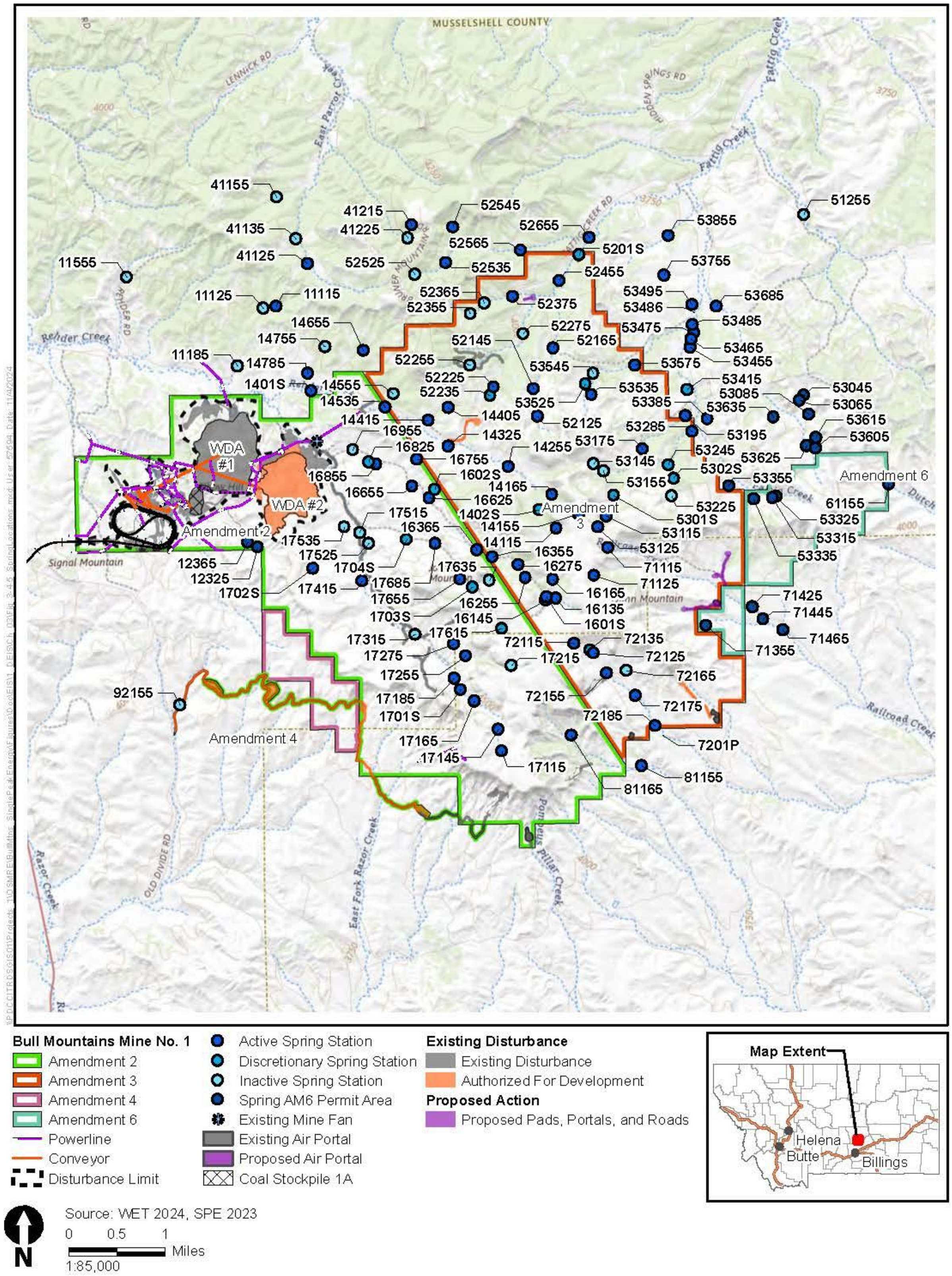

Table 3.4-7. Summary of Baseline Water Flow Measurements for Springs

				WET 2024				MDEQ 2024	
Spring Site	Name	Drainage	Geologic Unit	No. Obs. / No. Dry Obs.	Range (gpm)	Median All Obs. (gpm)	Median Obs. with Flow (gpm)	Median Obs. with Flow (gpm)	Comment
1601S	--	Rehder	OB1- OB2 Contact	--	0 – 15	1	2.25	NR	Undeveloped recently emergent spring
1602S	--	Rehder	OB4	--	4.5 – 8.95	8.95	--	NR	Undeveloped spring recently emergent in response to longwall mining, no ponding
1701S	--	Rehder	OB3	--	Wet no flow	--	--	NR	Seep that likely formed in response to longwall mining. Ponded area typically < 50 gallons
1702S	--	Rehder	OB4	--	0 – 6	0.3	0.5	NR	Undeveloped spring recently emergent in response to longwall mining, ponding often present
1704S	--	Rehder	OB3	--	0 – 8	0	0.95	NR	Recently emergent spring formed in response to longwall mining, stock tank development
14115	Red Fork Spring	Rehder	OB1-OB2 Contact	--	0 – 24.2	2.5	2.8	2.75	Undeveloped spring, ponding present, flow continues below spring for approximately 0.5 miles
14165	Fence Spring	Rehder	OB2	--	0 – 6	0	1.5	1.5	Undeveloped spring, ponding present
14255	--	Rehder	OB3/Alluvium	--	0 – 102	3	7.5	7.2	Upper and lower ponds reliably contain water
14325	Busse Water	Rehder	OB4/Alluvium	--	0-120	5	12	12	Upper and lower ponds reliably contain water
14785	--	Rehder	OB	--	--	--	--	0.5	Not surveyed by WET 2024
16135	Dunn Corner Spring	Rehder	OB1-OB2 Contact	--	0 – 25.9	1.1	3	3	Undeveloped, hoof print area low ponding
16145	--	Rheder	OB1-OB2 Contact	--	0 – 35.1	1	1.5	1.75	V-notch weir, hoof print area low ponding
16165	--	Rehder	OB1-OB2 Contact	--	0 – 5	0	1.25	NR	Hoof print area low ponding, defunct stock tank
16255	--	Rehder	OB2/Alluvium	--	0 – 83.6	1.4	4.3	4	Undeveloped spring with pond
16275	--	Rehder	OB2	--	0 – 6.9	0.25	0.9	0.63	Undeveloped spring, no significant ponding
16355	--	Rehder	OB3/Alluvium	--	0 – 144	6	9.6	8.89	Weir present, flow in channel with little ponding
16365	--	Rehder	OB3/Alluvium	--	0 – 219	3.6	5.6	7.9	Ponding below flume and in hoof prints during no flow observations
16625	--	Rehder	OB4	--	0 – 22	0.25	0.75	0.5	Hoof print area with low ponding
16655	Cold Water Spring	Rehder	OB4/Alluvium	--	0 – 105	5	9	11.49	2 main issue points 15 yards apart, large pond
16755	--	Rehder	OB3-OB4 Contact	--	0 – 2.5	0.25	0.5	NR	Culvert development with stock tank
16825	--	Rehder	OB4-OB5 Contact	--	0 – 1.6	0	NR	NR	Diverse seeps generally dry or flowing immeasurably
16855	--	Rehder	OB4-OB5 Contact	--	0 – 3.8	0	NR	NR	Hoof print area with low ponding
16955	--	Rehder	OB5	--	0 – 48	0	NR	2.25	Usually dry or seeps at low rates with occasional runoff events causing higher flows and ponding
17115	--	Rehder	OB1-OB2 Contact	--	0 – 1.5	0	NR	NR	Undeveloped spring with pond area
17145	Bull Spring	Rehder	OB2	--	0 – 15	0.5	NR	1.5	Culvert spring development with pipeline to stock tank
17165	Turtle Pond	Rehder	OB2-OB3 Contact	--	NR	NR	NR	2.25	Upper and lower ponds that typically do not discharge
17185	--	Rehder	OB3-OB4 contact/Alluvium	--	0-21	2	2.75	2.5	Culvert spring development with pipeline, stock tank, and overflow dam catchment
17275	--	Rehder	OB3-OB4 Contact	--	0 – 14	0.5	1.25	1.5	Culvert spring development with pipeline and stock tank
17315	--	Rehder	OB4	--	NR	NR	NR	3.5	Ponded area that is typically dry
17415	Litsky Spring	Rehder	OB5/Alluvium	--	NR	NR	NR	10.39	Ponded area that is dry at times, typically not flowing
17515	--	Rehder	OB5	--	NR	NR	NR	1.75	Ponded area present at times, typically not flowing
17655	--	Rehder	OB3/Alluvium	--	0 – 27.5	0	2.6	3.1	Small pond, flows short distance in channel
17685	--	Rehder	OB4/Alluvium	--	0 – 57	0	4.5	4.5	Spring with pond

				WET 2024				MDEQ 2024	
Spring Site	Name	Drainage	Geologic Unit	No. Obs. / No. Dry Obs.	Range (gpm)	Median All Obs. (gpm)	Median Obs. with Flow (gpm)	Median Obs. with Flow (gpm)	Comment
51255	--	Fattig	UB	--	NR	NR	NR	3	Not surveyed by WET 2024
52125	Upper 2 Dam Spring	Fattig	OB3	--	0 – 21	0.25	1.5	1.75	Hoof print-low area without significant ponding
52145	Lower 2 Dam Spring	Fattig	OB4	--	0 – 10.5	NR	1.5	NR	Pond with channel dam
52165	--	Fattig	OB	--	NR	NR	NR	1.5	Not surveyed by WET 2024
52455	Dugout Spring	Fattig	OB5/Alluvium	--	0 – 80	5.5	6.75	6.75	Small ponded area with flow in channel below
52535	--	Fattig	OB	--	NR	NR	NR	2	Not surveyed by WET 2024
52545	--	Fattig	OB3-OB4 Contact	--	0 – 4.5	0.5	0.8	NR	Channel spring, no significant pond
52655	Wedding Cliff Spring	Fattig	OB6/Alluvium	--	NR	NR	NR	2.88	WET 2024 reports the median state of the spring is ponded without measurable flow
53045	--	Fattig	OB5-OB6 Contact	--	0 – 0.3	--	--	NR	Usually dry or ponded, only one measurable flow of 0.3 gpm is reported
53065	--	Fattig	OB5-OB6 Contact	--	0 – ?	--	--	NR	Usually dry or frozen, only one observed flow event that could not be measured due to flow over the issue point
53085	--	Fattig	OB5-OB6 Contact	--	NR	NR	NR	NR	Reported as predominantly dry with minimal ponding during precipitation events
53115	Spring Below Cliff	Fattig	OB	--	0 – 7.75	0.5	0.75	0.75	Hoof print low area ponding
53125	--	Fattig	OB1-OB2 Contact	--	0 – 2	0.25	0.6	NR	Hoof print low area ponding
53155	--	Fattig	OB	--	NR	NR	NR	0.5	Not surveyed by WET 2024
53175	Black Canyon Spring	Fattig	OB5/Alluvium	--	0 – 22	NR	4.9	5	Water issues into bottom of developed pond below head cut in alluvium.
53195	--	Fattig	OB/Alluvium	--	NR	NR	NR	2.5	Not surveyed by WET 2024
53285	--	Fattig	OB5/Alluvium	--	0 – 7.7	0	1.4	2.1	Frequent ponding with flow in channel
53315	--	Fattig	OB4	--	0	0	--	NR	No measured flow
53325	--	Fattig	OB5	--	0 – 3.25	NR	NR	NR	Only three flow events have been observed since the start of monitoring in 1991
53335	--	Fattig	OB4-OB5 Contact	--	0 - 0.5	0	0.19	NR	Spring has been dry since 2003
53355	--	Fattig	OB5	--	0 – 0.25	0	0	NR	Spring is mostly dry with one flow event in 2023
53415	--	Fattig	OB	--	NR	NR	NR	1.3	Not surveyed by WET 2024
53455	--	Fattig	Mammoth	--	NR	NR	NR	1.31	Not surveyed by WET 2024
53475	--	Fattig	UB/Alluvium	--	0 – 40	0.45	2	1.5	Landowner periodically excavates and dams the spring
53485	"40" Spring	Fattig	Mammoth	--	NR	NR	NR	3	Not surveyed by WET 2024
53495	--	Fattig	Underburden	--	0 – 35	0	1.5	NR	Spring with pond
53605	--	Fattig	OB5	--	Dry to wet	--	--	NR	Generally dry with one observation of immeasurable flow
53615	--	Fattig	OB5	--	0 – 3.25	0	0.88	NR	Old sediment filled culvert development present
53625	--	Fattig	OB5	--	Dry to wet	--	--	NR	Often dry or wet without ponding, median state is wet without ponding or measurable flow
53635	--	Fattig	OB5	--	0 – 2.75	0	1	NR	Old culvert development is present
53755	Lake Louise Spring	Fattig	Mammoth	--	NR	NR	NR	1.5	Observed declines of pond stage and flow likely in response to mining activity
61155	--	Railroad	Mammoth	--	Dry to wet	NR	NR	NR	Often dry or ponded with some frozen and wet observations
71115	Big Spring	Railroad	OB	--	NR	NR	NR	4.25	Not surveyed by WET 2024

				WET 2024				MDEQ 2024	
Spring Site	Name	Drainage	Geologic Unit	No. Obs. / No. Dry Obs.	Range (gpm)	Median All Obs. (gpm)	Median Obs. with Flow (gpm)	Median Obs. with Flow (gpm)	Comment
71125	Wild Raspberry Spring	Railroad	OB1-OB2 Contact	--	0 – 7.6	0.5	1.25	NR	Ponding has been observed
71355	--	Railroad	OB5	--	NR	NR	NR	NR	Frequent ponding
71425	--	Railroad	UB	--	0 – 2	0	0.75	NR	Ponding has been observed
71445	--	Railroad	UB	--	0 – 2.25	0	1.25	NR	Ponding has been observed
71465	Lower Railroad Creek Spring	Railroad	UB	--	0 – 28.5	4	4	4	Culvert development with piping to stock tank
72115	Tractor Wheel Spring	Railroad	OB1-OB2 Contact	--	0 – 1.5	0.25	0.25	NR	Old stock tank is present
72125	Mountain Spring	Railroad	OB3	--	0 – 9	1.5	1.63	1.88	Old stock tank with ponding
72135	--	Railroad	OB2-OB-3 Contact	--	0 – 2	0.1	0.5	NR	Culvert development with stock tank
72155	--	Railroad	OB	--	0 – 16.7	1.25	2	2	Spring flow in channel with minimal ponding
72175	--	Railroad	OB5/Alluvium	--	0 – 30	0	4	4	Spring flow in channel with minimal ponding
72185	Deputy Dam Spring	Railroad	OB5/Alluvium	--	0 – 13.5	0	1.5	1.5	Spring flow in channel with minimal ponding

Source: WET 2024a and MDEQ 2024a

gpm = gallons per minute; NR = not recorded; Obs. = observation OB = overburden; UB = underburden

Table 3.4-8. Summary of Baseline Water Quality Data for Mammoth Coal, Overburden1 (OB1), and Overburden2 (OB2) Springs

		Mammoth Coal Springs			OB1 Springs			OB2 Springs		
Parameter	Unit	Samples / Non-Detect Analyses	Range of Detected Values	Median Detected Value	Samples / Non-Detect Analyses	Range of Detected Values	Median Detected Value	Samples / Non-Detect Analyses	Range of Detected Values	Median Detected Value
Major Ions and Solution Parameters										
pH	pH units	14 / 0	7.5 - 8.3	7.95	135 / 0	7.3 - 8.6	7.9	62 / 0	7.1 - 8.2	7.6
Acidity	mg/L as $CaCO_3$	14 / 14	--	--	134 / 105	1 - 44	8	62 / 45	2 - 39	8
Total Alkalinity	mg/L as $CaCO_3$	14 / 0	461 - 701	573.5	135 / 0	218 - 666.5	309	62 / 0	298 - 528	445
Bicarbonate Alkalinity	mg/L as $CaCO_3$	14 / 0	520 - 855	700	135 / 0	205 - 806	376	62 / 0	298 - 644	540
Carbonate Alkalinity	mg/L as $CaCO_3$	14 / 13	33.5 - 33.5	33.5	135 / 127	4 - 30	8	62 / 61	4 - 4	4
Calcium	mg/L	14 / 0	85.2 - 110	102	135 / 0	42 - 129	56	62 / 0	53.05 - 97	84
Magnesium	mg/L	14 / 0	80.7 - 204	177	135 / 0	19.7 - 231.5	49	62 / 0	44.35 - 134	70.5
Sodium	mg/L	14 / 0	189 - 570	268	135 / 0	6 - 326	19	62 / 0	11 - 47	15.9
Potassium	mg/L	14 / 0	7.07 - 16	10	135 / 1	3 - 24	5	62 / 0	3.87 - 9	5
Chloride	mg/L	14 / 0	14 - 18	16	135 / 0	2 - 30	8	61 / 0	4 - 10	5
Fluoride	mg/L	14 / 0	0.26 - 0.424	0.35	135 / 3	0.2 - 1.6	0.7	61 / 0	0.3 - 1.1	0.64
Sulfate	mg/L	14 / 0	739 - 1150	933	135 / 0	4 - 1180	26	61 / 0	30 - 444	71
TDS	mg/L	13 / 0	1620 - 2040	1790	135 / 0	184 - 2340	352	62 / 0	394.5 - 1040	527
TSS	mg/L	9 / 2	2 - 64	6	104 / 47	1 - 552	9	47 / 25	1 - 190	15.5
Specific Conductance	(µS/cm)	13 / 0	2140 - 2910	2400	135 / 0	378 - 3020	623	62 / 0	683.5 - 1520	897.5
Hardness	mg/L as $CaCO_3$	14 / 0	545 - 1115	974	135 / 0	192 - 1247	322	62 / 0	315 - 772	487
SAR	unitless	14 / 0	2.64 - 10.6	3.695	113 / 12	0.16 - 4.21	0.45	49 / 0	0.21 - 0.74	0.33
Nutrients										
Phosphorus	mg/L	0 / 0	--	--	0 / 0	--	--	0 / 0	--	--
Orthophosphate	mg/L	13 / 6	0.01 - 0.07	0.02	120 / 43	0.0032 - 0.15	0.024	58 / 22	0.0032 - 0.14	0.03
Nitrate/nitrite	mg/L as N	14 / 8	0.05 - 0.73	0.115	135 / 21	0.02 - 1.73	0.4645	62 / 11	0.03 - 0.76	0.1
Nutrient-nitrogen	mg/L as N	0 / 0	--	--	0 / 0	--	--	0 / 0	--	--
Ammonia	mg/L as N	1 / 0	0.0755 - 0.0755	0.0755	15 / 13	0.267 - 0.315	0.291	4 / 4	--	--
Metals										
Aluminum, dissolved	mg/L	1 / 0	0.0162 - 0.0162	0.0162	15 / 9	0.0109 - 0.0461	0.0228	4 / 3	0.0212 - 0.0212	0.0212
Aluminum, total	mg/L	9 / 9	--	--	100 / 73	0.1 - 2	0.2	48 / 40	0.1 - 0.7	0.35
Arsenic, dissolved	mg/L	1 / 0	0.00087 - 0.00087	0.00087	15 / 12	0.00058 - 0.0062	0.0008	4 / 3	0.0005 - 0.0005	0.0005
Arsenic, total	mg/L	9 / 9	--	--	100 / 99	0.005 - 0.005	0.005	48 / 48	--	--
Boron, dissolved	mg/L	1 / 0	0.216 - 0.216	0.216	15 / 0	0.0244 - 0.1775	0.0595	4 / 0	0.05825 - 0.118	0.079225
Boron, total	mg/L	13 / 2	0.1 - 0.2	0.2	119 / 72	0.036 - 0.4	0.1	58 / 54	0.1 - 0.1	0.1
Cadmium, dissolved	mg/L	1 / 1	--	--	15 / 14	0.00017 - 0.00017	0.00017	4 / 4	--	--
Cadmium, total	mg/L	9 / 9	--	--	100 / 95	0.001 - 0.002	0.002	48 / 43	0.001 - 0.002	0.002
Chromium, dissolved	mg/L	0 / 0	--	--	0 / 0	--	--	0 / 0	--	--
Chromium, total	mg/L	9 / 9	--	--	100 / 100	--	--	48 / 48	--	--
Copper, dissolved	mg/L	1 / 1	--	--	15 / 11	0.00075 - 0.0012	0.00094	4 / 4	--	--
Copper, total	mg/L	0 / 0	--	--	0 / 0	-	0	0 / 0	--	--
Iron, dissolved	mg/L	1 / 1	--	--	15 / 12	0.0767 - 0.217	0.134	4 / 4	--	--
Iron, total	mg/L	13 / 4	0.06 - 1.55	0.16	120 / 37	0.03 - 5.79	0.18	58 / 23	0.03 - 1.41	0.06

		Mammoth Coal Springs			OB1 Springs			OB2 Springs		
Parameter	Unit	Samples / Non-Detect Analyses	Range of Detected Values	Median Detected Value	Samples / Non-Detect Analyses	Range of Detected Values	Median Detected Value	Samples / Non-Detect Analyses	Range of Detected Values	Median Detected Value
Lead, dissolved	mg/L	1 / 1	--	--	15 / 15	--	0	4 / 4	--	--
Lead, total	mg/L	13 / 12	0.01 - 0.01	0.01	120 / 106	0.0001 - 0.02	0.01	58 / 54	0.00035 - 0.02	0.01
Manganese, dissolved	mg/L	1 / 0	0.0084 - 0.0084	0.0084	15 / 3	0.00051 - 0.207	0.00815	4 / 0	0.00445 - 0.01545	0.00685
Manganese, total	mg/L	13 / 4	0.02 - 0.38	0.11	120 / 63	0.0047 - 1.47	0.03	58 / 52	0.01 - 0.06	0.035
Mercury, dissolved	mg/L	0 / 0	--	--	0 / 0	--	--	0 / 0	--	--
Mercury, total	mg/L	13 / 12	0.02 - 0.02	0.02	112 / 111	0.001 - 0.001	0.001	57 / 57	--	--
Molybdenum, dissolved	mg/L	0 / 0	--	--	0 / 0	--	--	0 / 0	--	--
Molybdenum, total	mg/L	13 / 12	0.006 - 0.006	0.006	116 / 108	0.0011 - 0.006	0.00135	58 / 57	0.0017 - 0.0017	0.0017
Nickel, dissolved	mg/L	1 / 0	0.0016 - 0.0016	0.0016	15 / 11	0.000655 - 0.00115	0.000888	4 / 4	--	--
Nickel, total	mg/L	9 / 9	--	--	100 / 100	--	--	48 / 48	--	--
Selenium, dissolved	mg/L	1 / 1	--	--	15 / 0	0.00071 - 0.0036	0.0011	4 / 0	0.000755 - 0.00215	0.001265
Selenium, total	mg/L	13 / 13	--	--	119 / 110	0.00054 - 0.08	0.0012	58 / 52	0.00078 - 0.008	0.007
Vanadium, dissolved	mg/L	1 / 1	--	--	15 / 10	0.00014 - 0.00245	0.00066	4 / 3	0.00086 - 0.00086	0.00086
Vanadium, total	mg/L	9 / 9	--	--	100 / 100	--	--	48 / 48	--	--
Zinc, dissolved	mg/L	1 / 1	--	--	15 / 11	0.0052 - 0.01595	0.0077	4 / 4	--	--
Zinc, total	mg/L	9 / 4	0.01 - 0.04	0.02	100 / 43	0.01 - 0.7	0.02	48 / 17	0.01 - 8.96	0.07

Source: MDEQ 2024a

Notes: CaCO3 = calcium carbonate; µS /cm = microSiemens per centimeter; mg/L = milligrams per liter; N = nitrogen; NR = not recorded; Obs. = observation OB = overburden; pH = potential of hydrogen; UB = underburden

Table 3.4-9. Summary of Baseline Water Quality Data for Overburden3 (OB3), Overburden4 (OB4), and Overburden5 (OB5) Springs

		OB3 Springs			OB4 Springs			OB5 Springs		
Parameter	Unit	Samples / Non-Detect Analyses	Range of Detected Values	Median Detected Value	Samples / Non-Detect Analyses	Range of Detected Values	Median Detected Value	Samples / Non-Detect Analyses	Range of Detected Values	Median Detected Value
Major Ions and Solution Parameters										
pH	pH units	119 / 0	7.2 - 10	8	433 / 0	6.9 - 9.7	7.8	162 / 0	6.6 - 9.2	7.7
Acidity	mg/L as $CaCO_3$	117 / 95	1 - 23	10.5	424 / 346	1 - 67	13	160 / 123	1 - 43	14
Total Alkalinity	mg/L as $CaCO_3$	119 / 0	186 - 757	454	433 / 0	153 - 1870	616	163 / 0	208 - 982	528
Bicarbonate Alkalinity	mg/L as $CaCO_3$	119 / 0	200 - 924	528	433 / 0	187 - 1710	724	163 / 0	189 - 1160	642
Carbonate Alkalinity	mg/L as $CaCO_3$	119 / 98	3 - 212	19	433 / 367	2 - 243	32	163 / 146	2 - 127	19
Calcium	mg/L	119 / 0	34 - 202	77	433 / 0	12 - 702	85	163 / 0	27.1 - 1196	88
Magnesium	mg/L	119 / 0	41.4 - 638	80	432 / 0	17 - 543	134	163 / 0	39 - 235	165
Sodium	mg/L	119 / 0	8.47 - 299	19	433 / 0	9 - 555	67	163 / 0	17 - 858	90
Potassium	mg/L	119 / 0	3.28 - 62	7	433 / 0	4 - 76	8	163 / 0	5.93 - 48	9
Chloride	mg/L	119 / 0	3.03 - 95	6	433 / 0	2 - 31	10	163 / 0	6 - 21.7	11.7
Fluoride	mg/L	119 / 1	0.13 - 0.93	0.58	433 / 28	0.1 - 0.9	0.32	163 / 2	0.14 - 0.87	0.27
Sulfate	mg/L	119 / 0	41 - 3380	105	433 / 0	18 - 1390	323	163 / 0	141 - 1810	617
TDS	mg/L	119 / 0	250 - 5340	572	433 / 0	228 - 2760	1020	163 / 0	404 - 3340	1360
TSS	mg/L	92 / 45	1 - 446	12	354 / 132	1 - 25300	10	142 / 65	1 - 1640	8
Specific Conductance	(µS/cm)	116 / 0	528 - 5330	964.5	433 / 0	356 - 3520	1580	163 / 0	655 - 4440	1830
Hardness	mg/L as $CaCO_3$	119 / 0	281 - 3132	539	433 / 0	157 - 3989	746	163 / 0	305 - 3794	882
SAR	unitless	95 / 1	0.26 - 2.5	0.36	368 / 0	0.26 - 9.2	0.93	136 / 0	0.41 - 16.7	1.29
Nutrients										
Phosphorus	mg/L	0 / 0	--	--	0 / 0	--	--	0 / 0	--	--
Orthophosphate	mg/L	109 / 34	0.0014 - 0.4	0.02	403 / 110	0.0012 - 0.43	0.03	159 / 63	0.0023 - 0.34	0.02
Nitrate/nitrite	mg/L as N	119 / 34	0.02 - 0.72	0.14	433 / 117	0.01 - 6.2	0.27	163 / 35	0.014 - 1.73	0.415
Nutrient-nitrogen	mg/L as N	0 / 0	--	--	0 / 0	--	--	0 / 0	--	--
Ammonia	mg/L as N	10 / 9	0.0567 - 0.0567	0.0567	30 / 26	0.0851 - 0.389	0.1605	4 / 3	0.119 - 0.119	0.119
Metals										
Aluminum, dissolved	mg/L	10 / 7	0.0115 - 0.0261	0.0235	30 / 21	0.0128 - 0.0623	0.0219	4 / 4	--	--
Aluminum, total	mg/L	82 / 57	0.1 - 3.7	0.2	291 / 208	0.0621 - 3.5	0.2	110 / 92	0.1 - 2.7	0.25
Arsenic, dissolved	mg/L	10 / 4	0.00053 - 0.0014	0.000655	30 / 18	0.00054 - 0.0021	0.000875	4 / 2	0.00063 - 0.0015	0.001065
Arsenic, total	mg/L	82 / 74	0.006 - 0.033	0.0085	291 / 275	0.005 - 0.023	0.007	110 / 109	0.007 - 0.007	0.007
Boron, dissolved	mg/L	10 / 0	0.0356 - 0.213	0.0902	30 / 0	0.0736 - 0.357	0.1555	4 / 0	0.0733 - 0.172	0.139
Boron, total	mg/L	109 / 57	0.091 - 0.3	0.1	400 / 57	0.1 - 0.76	0.1	158 / 34	0.093 - 0.3	0.1
Cadmium, dissolved	mg/L	10 / 10	--	--	30 / 29	0.000089 - 0.000089	0.000089	4 / 4	--	0
Cadmium, total	mg/L	82 / 79	0.001 - 0.002	0.002	291 / 274	0.001 - 0.004	0.002	110 / 104	0.001 - 0.002	0.002
Chromium, dissolved	mg/L	0 / 0	--	--	0 / 0	--	--	0 / 0	--	--
Chromium, total	mg/L	82 / 82	--	--	287 / 287	--	--	110 / 110	--	--
Copper, dissolved	mg/L	10 / 6	0.00056 - 0.0013	0.00089	30 / 21	0.00058 - 0.0052	0.0011	4 / 1	0.00064 - 0.0014	0.0012
Copper, total	mg/L	0 / 0	--	--	0 / 0	--	--	0 / 0	--	--
Iron, dissolved	mg/L	10 / 8	0.0986 - 0.169	0.1338	30 / 28	0.0629 - 0.0693	0.0661	4 / 4	--	--
Iron, total	mg/L	109 / 40	0.03 - 11.6	0.14	401 / 106	0.03 - 292	0.16	159 / 70	0.029 - 5.5	0.12

		OB3 Springs			OB4 Springs			OB5 Springs		
Parameter	Unit	Samples / Non-Detect Analyses	Range of Detected Values	Median Detected Value	Samples / Non-Detect Analyses	Range of Detected Values	Median Detected Value	Samples / Non-Detect Analyses	Range of Detected Values	Median Detected Value
Lead, dissolved	mg/L	10 / 9	0.00024 - 0.00024	0.00024	30 / 27	0.00011 - 0.00029	0.00028	4 / 4	-	-
Lead, total	mg/L	109 / 101	0.000135 - 0.03	0.005185	399 / 360	0.00017 - 0.23	0.01	158 / 145	0.000215 - 0.04	0.01
Manganese, dissolved	mg/L	10 / 0	0.0012 - 0.435	0.0087	30 / 1	0.00074 - 0.241	0.005	4 / 0	0.0012 - 0.0098	0.00175
Manganese, total	mg/L	109 / 64	0.0053 - 1.19	0.04	396 / 193	0.0022 - 9.8	0.07	155 / 113	0.001475 - 0.47	0.04
Mercury, dissolved	mg/L	0 / 0	--	--	0 / 0	--	--	0 / 0	--	--
Mercury, total	mg/L	104 / 104	--	--	383 / 380	0.001 - 0.001	0.001	153 / 152	0.001 - 0.001	0.001
Molybdenum, dissolved	mg/L	0 / 0	--	--	0 / 0	--	--	0 / 0	--	--
Molybdenum, total	mg/L	109 / 98	0.0014 - 0.012	0.006	400 / 373	0.0013 - 0.009	0.0027	159 / 150	0.00082 - 0.013	0.0023
Nickel, dissolved	mg/L	10 / 4	0.00061 - 0.0026	0.000645	30 / 12	0.00051 - 0.00335	0.000853	4 / 1	0.00091 - 0.0015	0.0011
Nickel, total	mg/L	82 / 82	--	--	288 / 288	--	--	110 / 109	0.03 - 0.03	0.03
Selenium, dissolved	mg/L	10 / 0	0.00081 - 0.0039	0.00185	30 / 4	0.00063 - 0.0055	0.0014	4 / 0	0.00076 - 0.0036	0.00165
Selenium, total	mg/L	109 / 98	0.00093 - 0.024	0.007	401 / 372	0.00082 - 0.015	0.005	159 / 144	0.00078 - 0.014	0.005
Vanadium, dissolved	mg/L	10 / 7	0.00072 - 0.0013	0.00091	30 / 24	0.0005 - 0.0021	0.00095	4 / 3	0.00066 - 0.00066	0.00066
Vanadium, total	mg/L	82 / 82	--	--	288 / 288	--	--	110 / 110	--	--
Zinc, dissolved	mg/L	10 / 7	0.0051 - 0.0658	0.0055	30 / 20	0.0076 - 0.674	0.0109	4 / 2	0.0095 - 0.0098	0.00965
Zinc, total	mg/L	82 / 56	0.01 - 0.47	0.02	288 / 131	0.01 - 1.07	0.03	110 / 48	0.01 - 35.4	0.03

Source: MDEQ 2024a
Mg/L = milligrams per liter

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Table 3.4-10. Summary of Baseline Water Quality Data for Overburden6 (OB6) and Underburden Springs

		OB6 Springs			UB Springs		
Parameter	Unit	Samples / Non-Detect Analyses	Range of Detected Values	Median Detected Value	Samples / Non-Detect Analyses	Range of Detected Values	Median Detected Value
Major Ions and Solution Parameters							
pH	pH units	40 / 0	7.2 - 10.2	8.4	118 / 0	7 - 9.9	7.8
Acidity	mg/L as $CaCO_3$	40 / 35	1 - 83	8	118 / 78	2 - 89	13.5
Total Alkalinity	mg/L as $CaCO_3$	40 / 0	212 - 1750	478.5	118 / 0	135 - 863	464.5
Bicarbonate Alkalinity	mg/L as $CaCO_3$	40 / 0	109 - 2140	499.75	118 / 0	149 - 980	561
Carbonate Alkalinity	mg/L as $CaCO_3$	40 / 16	6 - 223	21	118 / 103	7.46 - 164	32.8
Calcium	mg/L	40 / 0	11 - 299	71.5	118 / 0	10 - 242	97.5
Magnesium	mg/L	40 / 0	67 - 706	173	118 / 0	15 - 261	148.5
Sodium	mg/L	40 / 0	22 - 888	224	118 / 0	4 - 334	152
Potassium	mg/L	40 / 0	4 - 96	13	118 / 0	3.955 - 89	10
Chloride	mg/L	40 / 0	3 - 86	17	118 / 0	5 - 58.4	18
Fluoride	mg/L	40 / 3	0.1 - 0.4	0.2	117 / 18	0.1 - 0.63	0.22
Sulfate	mg/L	40 / 0	200 - 3020	870	118 / 0	20 - 1630	718
TDS	mg/L	40 / 0	640 - 6030	1660	118 / 0	202 - 2730	1525
TSS	mg/L	35 / 12	2 - 90	21	93 / 53	1 - 183	10
Specific Conductance	(µS/cm)	40 / 0	965 - 6240	2225	118 / 0	277 - 2990	1995
Hardness	mg/L as $CaCO_3$	40 / 0	413 - 3132	930	118 / 0	144 - 1679	865
SAR	unitless	34 / 0	0.43 - 6.91	3.225	93 / 0	0.385 - 5.42	2.41
Nutrients							
Phosphorus	mg/L	0 / 0	--	--	0 / 0	--	--
Orthophosphate	mg/L	40 / 11	0.005 - 0.9	0.02	103 / 37	0.0039 - 0.27	0.0225
Nitrate/nitrite	mg/L as N	40 / 27	0.01 - 1.11	0.05	118 / 16	0.01 - 6.37	0.34
Nutrient-nitrogen	mg/L as N	0 / 0	--	--	0 / 0	-	-
Ammonia	mg/L as N	0 / 0	--	--	15 / 13	0.0589 - 1.36	0.70945

Parameter	Unit	OB6 Springs			UB Springs		
		Samples / Non-Detect Analyses	Range of Detected Values	Median Detected Value	Samples / Non-Detect Analyses	Range of Detected Values	Median Detected Value
Metals							
Aluminum, dissolved	mg/L	0 / 0	--	--	15 / 7	0.0041 - 0.0593	0.01995
Aluminum, total	mg/L	31 / 18	0.1 - 0.9	0.2	87 / 71	0.1 - 1.1	0.2
Arsenic, dissolved	mg/L	0 / 0	--	--	15 / 7	0.00051 - 0.0063	0.0011
Arsenic, total	mg/L	31 / 26	0.006 - 0.012	0.006	87 / 83	0.005 - 0.015	0.0075
Boron, dissolved	mg/L	0 / 0	--	--	15 / 0	0.0144 - 0.166	0.076
Boron, total	mg/L	40 / 24	0.0885 - 0.3	0.105	103 / 29	0.1 - 1.2	0.1
Cadmium, dissolved	mg/L	0 / 0	--	--	15 / 15	--	--
Cadmium, total	mg/L	31 / 31	--	--	87 / 84	0.001 - 0.005	0.001
Chromium, dissolved	mg/L	0 / 0	--	--	0 / 0	--	--
Chromium, total	mg/L	31 / 30	0.04 - 0.04	0.04	87 / 87	--	--
Copper, dissolved	mg/L	0 / 0	--	--	15 / 5	0.00068 - 0.0033	0.001275
Copper, total	mg/L	0 / 0	--	--	0 / 0	--	--
Iron, dissolved	mg/L	0 / 0	--	--	15 / 15	--	--
Iron, total	mg/L	40 / 1	0.03 - 2.5	0.28	103 / 33	0.03 - 2.67	0.165
Lead, dissolved	mg/L	0 / 0	-	-	15 / 11	0.0001 - 0.00013	0.000105
Lead, total	mg/L	40 / 34	0.00018 - 0.01	0.005565	103 / 94	0.00035 - 0.03	0.0009
Manganese, dissolved	mg/L	0 / 0	--	--	15 / 3	0.00085 - 0.169	0.00935
Manganese, total	mg/L	40 / 9	0.02 - 0.8	0.11	103 / 60	0.001 - 0.39	0.05
Mercury, dissolved	mg/L	0 / 0	--	--	0 / 0	--	--
Mercury, total	mg/L	37 / 36	0.001 - 0.001	0.001	97 / 97	--	--
Molybdenum, dissolved	mg/L	0 / 0	-	-	0 / 0	--	--
Molybdenum, total	mg/L	40 / 30	0.0012 - 0.013	0.0075	101 / 91	0.0021 - 0.008	0.0052

Parameter	Unit	OB6 Springs Samples / Non-Detect Analyses	OB6 Springs Range of Detected Values	OB6 Springs Median Detected Value	UB Springs Samples / Non-Detect Analyses	UB Springs Range of Detected Values	UB Springs Median Detected Value
Nickel, dissolved	mg/L	0 / 0	--	--	15 / 4	0.00057 - 0.0036	0.00073
Nickel, total	mg/L	31 / 31	--	--	87 / 87	--	--
Selenium, dissolved	mg/L	0 / 0	--	--	15 / 0	0.00086 - 0.0049	0.0017
Selenium, total	mg/L	40 / 35	0.00094 - 0.009	0.0013	103 / 95	0.00079 - 0.01	0.006
Vanadium, dissolved	mg/L	0 / 0	--	--	15 / 10	0.00016 - 0.00052	0.000235
Vanadium, total	mg/L	31 / 31	--	--	87 / 87	--	--
Zinc, dissolved	mg/L	0 / 0	--	--	15 / 11	0.0063 - 0.0107	0.006975
Zinc, total	mg/L	31 / 18	0.01 - 0.05	0.02	87 / 48	0.01 - 17.6	0.02

Source: MDEQ 2024a
Mg/L = milligrams per liter

Table 3.4-11. Summary of Baseline Spring Water Quality that Exceed MDEQ-7 Standards

Analyte	MDEQ-7 Limit	Mammoth Coal	OB1	OB2	OB3	OB4	OB5	OB6	UB
Total As (Arsenic)	Acute > 0.340	0/9	0/100	0/48	0/82	0/291	0/110	0/31	0/87
	Chronic > 0.150	0/9	0/100	0/48	0/82	0/291	0/110	0/31	0/87
	HHS > 0.010	0/9	0/100	0/48	3/82	2/291	1/110	1/31	1/87
Total Fe (Iron)	Chronic > 1	1/13	6/120	1/58	5/109	34/401	6/159	6/40	5/103
Total Pb (Lead)	Acute > 0.48	0/13	0/120	0/58	0/109	0/399	0/158	0/40	0/103
	Chronic > 0.02	0/13	0/120	0/58	0/109	0/399	0/158	0/40	0/103
	HHS > 0.015	0/13	3/120	0/58	2/109	2/399	0/158	0/40	0/103
Total Ni (Nickel)	Acute > 1.52	0/9	0/100	0/48	0/82	0/288	0/110	0/31	0/87
	Chronic > 0.17	0/9	0/100	0/48	0/82	0/288	0/110	0/31	0/87
	HHS > 0.1	0/9	0/100	0/48	0/82	0/288	1/110	0/31	0/87

Analyte	MDEQ-7 Limit	Mammoth Coal	OB1	OB2	OB3	OB4	OB5	OB6	UB
Total Se (Selenium)	Acute > 0.020	0/13	1/119	0/58	1/109	0/401	0/159	0/40	0/103
	Chronic > 0.005	0/13	1/119	5/58	6/109	12/401	6/159	1/40	5/103
	HHS > 0.05	0/13	1/119	0/58	0/109	0/401	0/159	0/40	0/103
Total Zn (Zinc)	Acute > 0.39	2/9	15/100	20/48	3/82	75/288	29/110	1/31	10/87
	Chronic > 0.39	2/9	15/100	20/48	3/82	75/288	29/110	1/31	10/87
	HHS > 7.4	0/9	0/100	1/48	0/82	0/288	1/110	0/31	1/87

Source: MDEQ 2024a
Notes: Exceedances/number of samples
Shaded cells indicate analyses that exceed MDEQ-7 water quality standards.

3.4.4.5 Alluvial Valley Floors

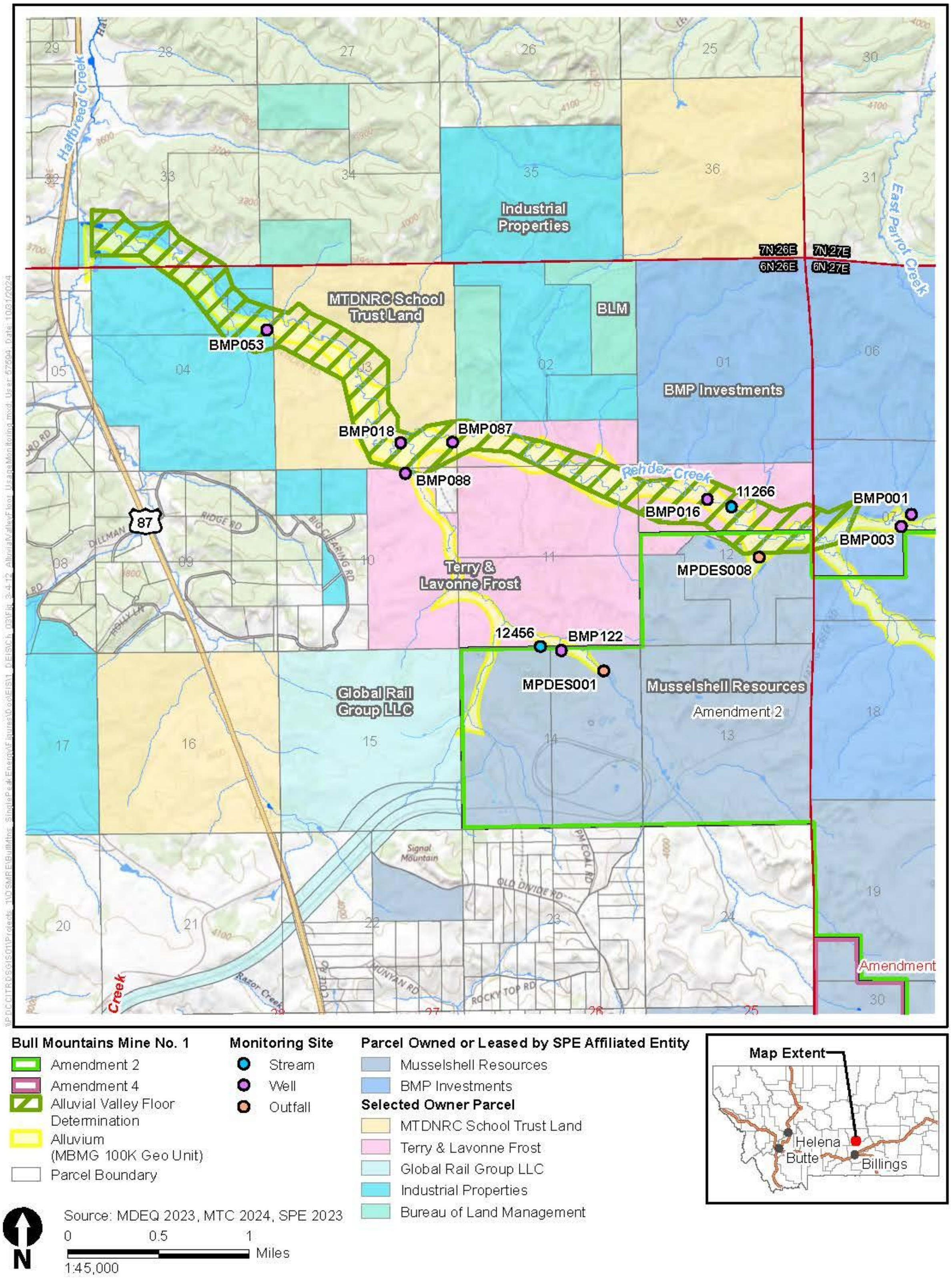
The presence of an alluvial valley floor (AVF) is determined by the presence of geologic, hydrologic, and biologic properties necessary to support agriculture, meeting the definition of Section 82-4-203(3)(a) and (b), MCA. An AVF determination was made for Rehder Creek in 1992. This determination found that Rehder Creek north of the WDA down to the confluence with Halfbreed Creek, (**Figure 3.4-13**), met the criteria for a significant alluvial valley floor (Montana Department of State Lands 1992). MDEQ has not made a formal AVF determination for other drainages in the study area.

The AFV in Rehder Creek is ephemeral. Spreader dikes have been built in the drainage for flood irrigation west of well BMP001, and this field is the farthest east extent of the AVF. The alluvial valley floor determination also identified areas of potential subirrigation starting from Township 6N Range 26E Section 2 to the confluence with Halfbreed Creek (Montana Department of State Lands, 1992). This section includes active alluvial monitoring wells BMP018, BMP053, and BMP087 (**Figure 3.4-13**).

U.S. Department of Agriculture (USDA) crop coverage maps indicate that the fields in the AVF are generally planted with alfalfa or left as rangeland grass hay. At least one large field at the downstream end of the AVF is shown as rotating between wheat, barley, and alfalfa. The 1992 AVF definition identified subirrigation benefits to alfalfa at a capillary fringe depth of less than or equal to 14 feet (Montana Department of State Lands 1992). However, current guidelines from Montana State University (MSU) indicate that alfalfa extracts most of the water necessary for growth from the first 6 feet of the ground (Bauder 2023). MDEQ in its SC and sodium absorption rate (SAR) standards rationale identified the critical zone for alfalfa's root zone from 4 to 5 feet (MDEQ 2011). Using the conservative assumption of a 3-foot capillary fringe established in the 1992 AVF determination in conjunction with the MDEQ's and MSU's ranges for subirrigation of alfalfa, water within 8 to 9 feet of the ground surface could potentially contribute significant water to subirrigation of alfalfa.

Additional years of data, however, have indicated that alluvial water levels at BMP087 are too deep for subirrigation: before 2011, water levels were consistently over 35 feet below the ground, and, after 2011, water levels range from 20 to 30 feet below the ground. Water levels at BMP018, 1,500 feet down valley from BMP087, vary from dry to less than 5 feet below ground surface and indicate that in some years subirrigation may be possible at this location. BMP053 also has water in some years between 5 and 9 feet below ground surface, indicating that some years may have subirrigation. Therefore, a revised estimate of the area of viable subirrigation would start around BMP018—Township 6N Range 26E Section 3 down to the confluence with Halfbreed Creek. PM Draw was excluded from being an alluvial valley floor in 1992 even though spreader dikes, hay fields, and alluvium are found in the tributary because the alluvium was determined to be too narrow to provide large enough alluvial terraces to support the critical AVF functions (Montana Department of State Lands 1992).

Figure 3.4-13. Alluvial Valley Floor Determination



3.4.4.6 Wetlands

Waters of the United States, as defined by USACE, includes lakes, ponds, and streams (perennial, intermittent, and ephemeral) that are relatively permanent (33 CFR § 328.3a). USACE defines wetlands as 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 (33 CFR § 328.3c). Wetlands connected to or adjacent to these defined waters are included in the Waters of the United States and include swamps, marshes, bogs, and similar areas.

Surface and subsurface water availability for wetlands results from two geologic sources: localized spring and seep discharges, and drainage bottoms where less permeable mudstones are at or near the surface. Mudstones impede vertical infiltration, retaining water long enough for wetland soils and plants to develop. This water comes from runoff, snow melt, or springs and seeps (MDEQ 2024b).

Numerous springs and seeps are located throughout the study area. The volume and unpredictable production of water by most of the springs limits their uses to livestock and wildlife. The variable discharge at all springs appears responsive to precipitation (MDEQ 2024b). See **Section 3.4.4.4** for more information on surface water.

Measurements from groundwater wells and geologic models created from boreholes confirm that the local groundwater table is too deep to provide groundwater baseflow to the drainage bottom; therefore, the drainageways do not meet the criteria of intermittent streams per ARM 17.24.301(61) (MDEQ 2024b). See **Section 3.4.4.3** for more information on groundwater.

Wetlands and Riparian Areas

No formal wetland delineations have occurred in the AM 2 or AM 3 permit boundary. Formal wetland delineations were conducted in and around the facilities disturbance boundary in AM 2 (**Figure 3.4-14**). National Wetlands Inventory mapping identified 151.0 acres of palustrine emergent (PEM) and riverine wetlands in these portion of the permit area (**Table 3.4-1; Figure 3.4-14**) (USFWS 2017). One pond was recorded in the AM 4 permit boundary and was not identified as a wetland (SPE 2023; MDEQ 2023).

A wetland survey in the AM 6 mine expansion area was conducted in the summer of 2023. Several springs/seeps are present in the AM 6 area, but they lack a persistent water discharge. The survey mapped 2.7 acres of PEM and riverine wetlands inside the AM 6 area. Of those 2.7 acres, 1.1 acres of wetlands are over longwall or continuous mining areas, and 50 percent of those 1.1 acres are over areas previously approved for mining by AM 3. The wetlands in the AM 6 area are narrow and constrained by valley bottoms and are seasonally flooded or saturated. Due to their location in ephemeral drainageways, these wetlands are unlikely to be classified as jurisdictional by USACE (SPE 2023; MDEQ 2024b).

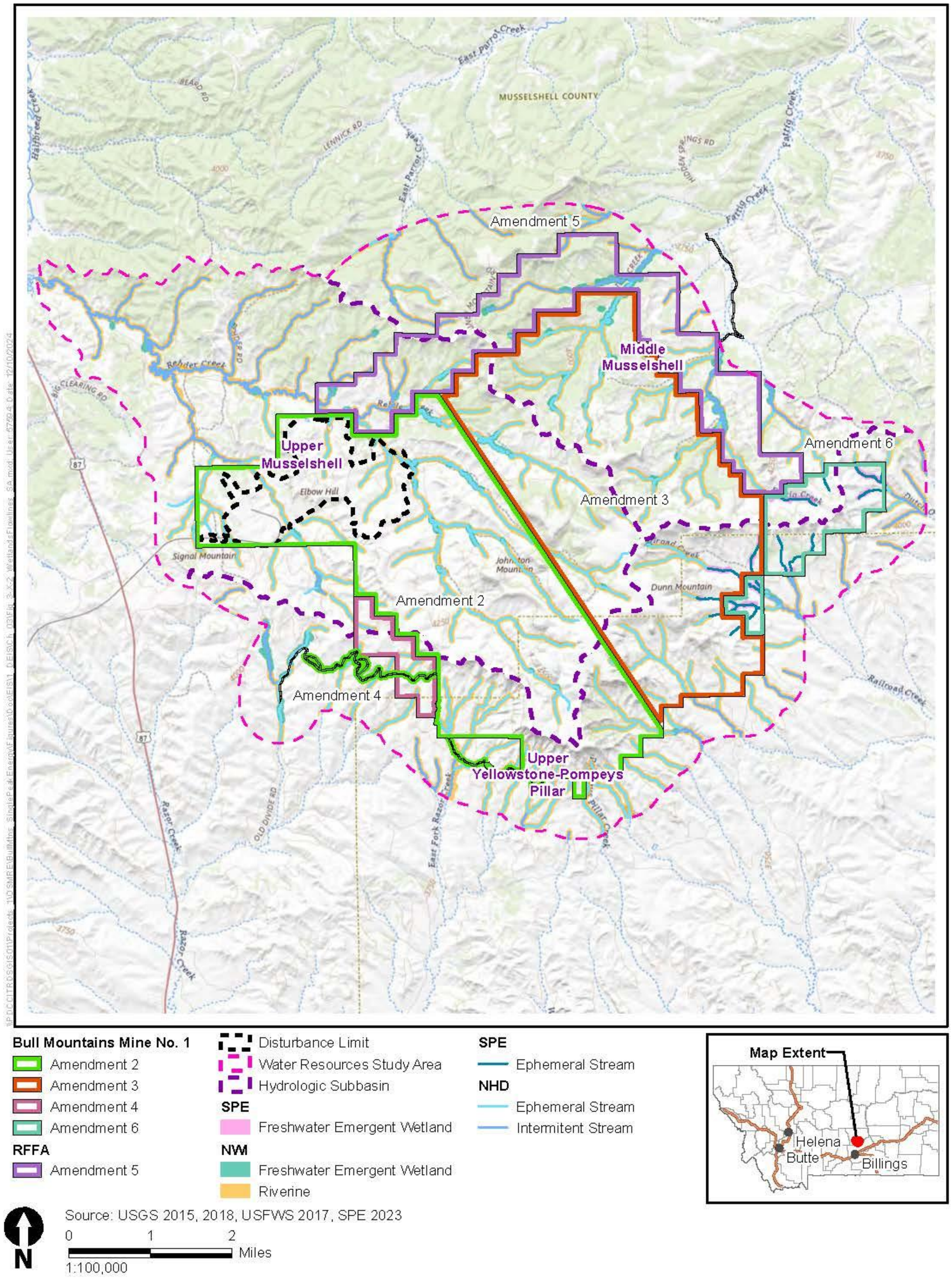
See **Table 3.4-12** for a summary of wetland acres and stream lengths in the study area and water resources study area and **Figure 3.4-14** for an illustration of these features.

Table 3.4-12. Wetland Acres and Stream Lengths by Amendment Area and Water Resources Study Area

Wetland and Stream Features (Desktop and Field Mapped)	Acres in Amendment Area	Miles in Amendment Area
Amendment 2		
Freshwater emergent wetland (NWI)	6.5	N/A
Riverine (NWI)	76.1	N/A
Stream/River: Ephemeral (NHD)	N/A	31.4
Total	*82.5*	*31.4*
Amendment 3		
Freshwater emergent wetland (NWI)	7.7	N/A
Freshwater emergent wetland (SPE)	0.6	N/A
Riverine (NWI)	60.1	N/A
Riverine (SPE)	0.1	N/A
Stream/River: Ephemeral (NHD)	N/A	27.2
Total	*68.4*	*27.2*
Amendment 4		
Riverine (NWI)	3.3	N/A
Stream/River: Ephemeral (NHD)	N/A	1.4
Total	*3.3*	*1.4*
Amendment 6		
Freshwater emergent wetland (SPE)	1.6	N/A
Riverine (SPE)	0.4	N/A
Stream/River: Ephemeral (NHD)	N/A	4.9
Total	*2.0*	*4.9*
Water Resources Study Area	Acres in Study Area	Miles in Study Area
Freshwater emergent wetland (NWI)	42.8	N/A
Freshwater emergent wetland (SPE)	2.2	N/A
Riverine (NWI)	307.2	N/A
Riverine (SPE)	0.5	N/A
Stream/River: Ephemeral (NHD)	N/A	94.3
Stream/River: Intermittent (NHD)	N/A	42.0
Total	***354.7***	***136.2***

Source: USFWS 2017; USGS 2018; SPE 2023
NWI = National Wetland Inventory; NHD = U.S. Geological Survey National Hydrography Dataset; SPE = Signal Peak Energy, LLC

Figure 3.4-14. Wetlands and Surface Water Drainages in the Water Resources Study Area



No wetlands are located in WDA 2; however, two ephemeral drainages, both lacking an ordinary high-water mark (OHWM), are located in WDA 2 (WESTECH 2015). In 2015, USACE made a jurisdictional determination that wetlands present in the WDA 2 area were deemed non-jurisdictional. This determination was based on the absence of bed or bank in the drainages located in WDA 2, as well as the absence of wetland hydrology, hydric soils, or hydrophytic vegetation (USACE 2015).

No riparian areas are identified in the AM 4 and AM 6 areas, as defined by *A System for Mapping Riparian Areas in the Western United States* (SPE 2023; USFWS 2019).

There are 198.4 acres of NWI mapped PEM and riverine wetlands that are outside the Mine permit area but within the water resources study area (USFWS 2017). There are 42.0 miles of intermittent channel in the water resources study area and 94.3 miles of ephemeral channels of which 64.9 miles occur in the Mine permit area (SPE 2023). Named ephemeral and intermittent channels in the water resource study area include Dutch Oven Creek, East Fork Razor Creek, East parrot Creek, Fattig Creek, Railroad Creek, Rehder Creek, Pompeys Pillar Creek, and West Fork Pompeys Pillar Creek (USGS 2018).

3.4.4.7 Water Resource Usage

Historic and current surface and groundwater uses in and adjacent to the mine area include public water supply, private water supply, livestock, wildlife, irrigation, and industrial uses.

Private wells in the study area were identified from the Montana Bureau of Mines and Geology, Groundwater Information Center (GWIC) database (MBMG 2023). Registered surface water and groundwater rights were identified from records at the Montana Department of Natural Resources and Conservation (DNRC) (DNRC 2023). Groundwater rights and groundwater users within the study area are listed in Table 8-1 and 8-2 of the AM 4 CHIA (MDEQ 2024a). Surface water rights and users are listed in in Table 8-3 of the AM 4 CHIA.

As described in the AM 4 CHIA, most wells and springs in the study area are used for stockwater. Domestic wells are primarily completed in underburden, while springs are primarily sourced from the overburden. SPE owns many of the wells and the rights to springs in the study area. Other major holders of wells and springs include AAM III Enterprises, LLC; Charter Ranch, Inc.; My Green Earth, LP; and Parrot Creek, LLC (1, 3, 4, CW, or MW). SPE owns all but two of the surface water rights within the permit area. My Green Earth, LP and BLM hold the remaining surface water rights. Outside the permit area, surface water rights are held by My Green Earth, LP; BLM; MT State Board of Land Commissioners; Connie & Greg Mattfield; and Lavonne & Terry Frost.

Public Water Supply

The only current public water supply in the study area is for the Mine and is permitted as water system MT0004676 by MDEQ's Public Water Supply and Subdivisions Bureau. Non-potable water supply wells are produced from Madison Wells 1A, 2, and 3 in the Surface Facility Area (**Figure 2.2-1**). They are used for toilets, showers, and sinks. Bottled water is supplied by the mine for employee consumption.

Private Water Supply

Records from the GWIC and DNRC databases indicate that 111 wells are used for domestic water supply in the study area. Domestic wells generally produce water from deep underburden sandstones that are hydrologically separate from the upper underburden and Mammoth Coal (MDEQ 2024a). A few domestic wells in the study area are also completed in the upper underburden or overburden, and one is completed in alluvium in the East Parrot Creek drainage. Ten wells have unknown completions due to incomplete or missing well logs. Two domestic wells are completed across multiple units extending from overburden to the upper underburden, including the Mammoth Coal (MDEQ 2024a).

Industrial Water Supply

Three industrial water supply wells were developed for the Mine but are not currently used. The wells are completed in carbonate rocks of the Madison Group at depths greater than 8,600 feet. Wells in the Madison Formation produce mineralized hot water (165˚F) that is isolated from the shallower groundwater of the Fort Union Formation by thousands of feet of confining strata. The water contains concentrations of fluoride and radionuclides in excess of drinking water standards for groundwater that make the deep Madison well water unsuitable as potable water. Groundwater from the Madison Formation has not been used in the facilities since 2020.

Livestock Water Supply

Livestock watering is the dominant surface water and groundwater use in the study area. Records from the GWIC and DNRC databases indicate that 107 wells are used for stockwater in the study area (MDEQ 2024a). The wells are listed as being completed in alluvium, overburden, Mammoth Coal, and underburden. There are also 68 water rights listed for stockwater use at springs in the groundwater study area. The springs are primarily sourced from alluvium or overburden aquifers with a few sourced from the Mammoth Coal or underburden. About half of the surface water rights in the surface water study area are owned by SPE (MDEQ 2024a).

Irrigation

Irrigation use is listed in the GWIC and DNRC databases for five surface water rights, one groundwater spring and two groundwater wells in the study area. An additional 15 wells list lawn and garden as one of their uses. Three of the surface water rights which list irrigation as a use are owned by SPE. Wells listing lawn and garden as a use are primarily completed in the deep underburden, with one well completed in the overburden of the East Parrot Creek drainage, and four wells undetermined due to missing well logs.

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3.5 Land Use

3.5.1 Introduction

Land use is defined in MSUMRA (82-4-203, MCA) as specific uses or management-related activities, rather than the vegetative cover of the land. Land uses may be identified in combination when joint or seasonal uses occur and may include land used for support facilities that are an integral part of the land use. Land use categories defined under MSUMRA include cropland, developed water resources, fish and wildlife habitat, forestry, grazing land, industrial or commercial, pastureland, land occasionally cut for hay, recreation, or residential. Land in the study area is dominated by forest and rangeland with limited areas of dispersed residential development. Musselshell and Yellowstone Counties are predominantly agricultural, including rangeland, commercial forests, cropland, and pasture.

3.5.2 Study Area

The study area for land use includes both a direct effects study area and an indirect effects study area. Both the direct and indirect effects study areas are the permit area (**Table 3.0-1, Figure 3.0-1**). The past, present, and RFFA effects study area for land use is the same as the study area. Direct, indirect, and past, present, and RFFA impacts are discussed in detail in **Chapter 4**.

3.5.3 Regulatory Framework

3.5.3.1 Federal Requirements

OSMRE is charged with the administration of SMCRA and has granted primacy to MDEQ as the regulatory agency for mining in Montana. SMCRA establishes a program of cooperative federalism that allows the states to receive approval from the Secretary to administer their own regulatory programs on non-Federal and non-Indian lands in accordance with SMCRA and consistent with the Federal regulations with OSMRE retaining oversight and enforcement authority (30 U.S.C. 1253, 1271, 1273). As discussed in **Section 1.2**, MDEQ administers the Montana State program approved by the Secretary, under the authority of MSUMRA, Section 82-4-221, MCA.

3.5.3.2 State Requirements

MDEQ is the primary regulatory authority for coal mining operations in the State of Montana and implements MSUMRA and the administrative rules pursuant to the Act. Pursuant to a State-Federal Cooperative Agreement (30 CFR § 926.30), MDEQ also primarily regulates permitting and operation of mines on Federal lands within Montana under the authority of MSUMRA (Section 82-4-221 et seq., MCA) and its implementing rules (ARM 17.24.301-1309).

ARM 17.24.762 includes regulations on post-mining land use, which state:

> The postmining land use must satisfy 82-4-203(28) and 82-4-232(7), MCA. In applying 82-4-232(7), MCA, the following principles apply:
>
> (a) The pre-mining uses of the land to which the postmining land use is compared are those that the land previously supported or could have supported if the land had not been mined and had been properly managed.
>
> (b) The postmining land use for that has been previously mined and not reclaimed must be judged on the basis of the land use that existed prior to any mining. If the land cannot be reclaimed to the use that existed prior to any mining because of the previously mined condition, the postmining land use must be judged on the basis of the highest and best use that can be achieved and is compatible with surrounding areas.
>
> (c) The postmining land use for land that has received improper management must be judged on the basis of the pre-mining use of surrounding lands that have received proper management.
>
> (d) If the pre-mining use of the land was changed within 5 years of the beginning of mining, the comparison of postmining use to pre-mining use must include a comparison with the use of the land prior to the change as well as its uses immediately preceding mining.

ARM 17.24.762(2) also states: "Alternative postmining land uses may be proposed and must be determined in accordance with 82-4-232(7) and (8), MCA, and ARM 17.24.821 and ARM 17.24.823. Certain pre-mining facilities may be replaced pursuant to 82-4-232(10), MCA."

3.5.3.3 Local Requirements

There are no applicable local regulations for land use within or near the analysis area.

3.5.4 Existing Conditions

3.5.4.1 Land Ownership

The Project area encompasses 16,519.3 acres of surface ownership held by BLM, the State of Montana, and private landowners (**Table 3.5-1, Figure 1.1-2**). SPE holds leases for BLM (MTM-97988), State of Montana (C-117-12), and private coal (Bull Mountain Coal Properties Inc., Yellowstone Mineral Holdings LLC, and Great Northern Properties) within the area (**Figure 3.5-1**).

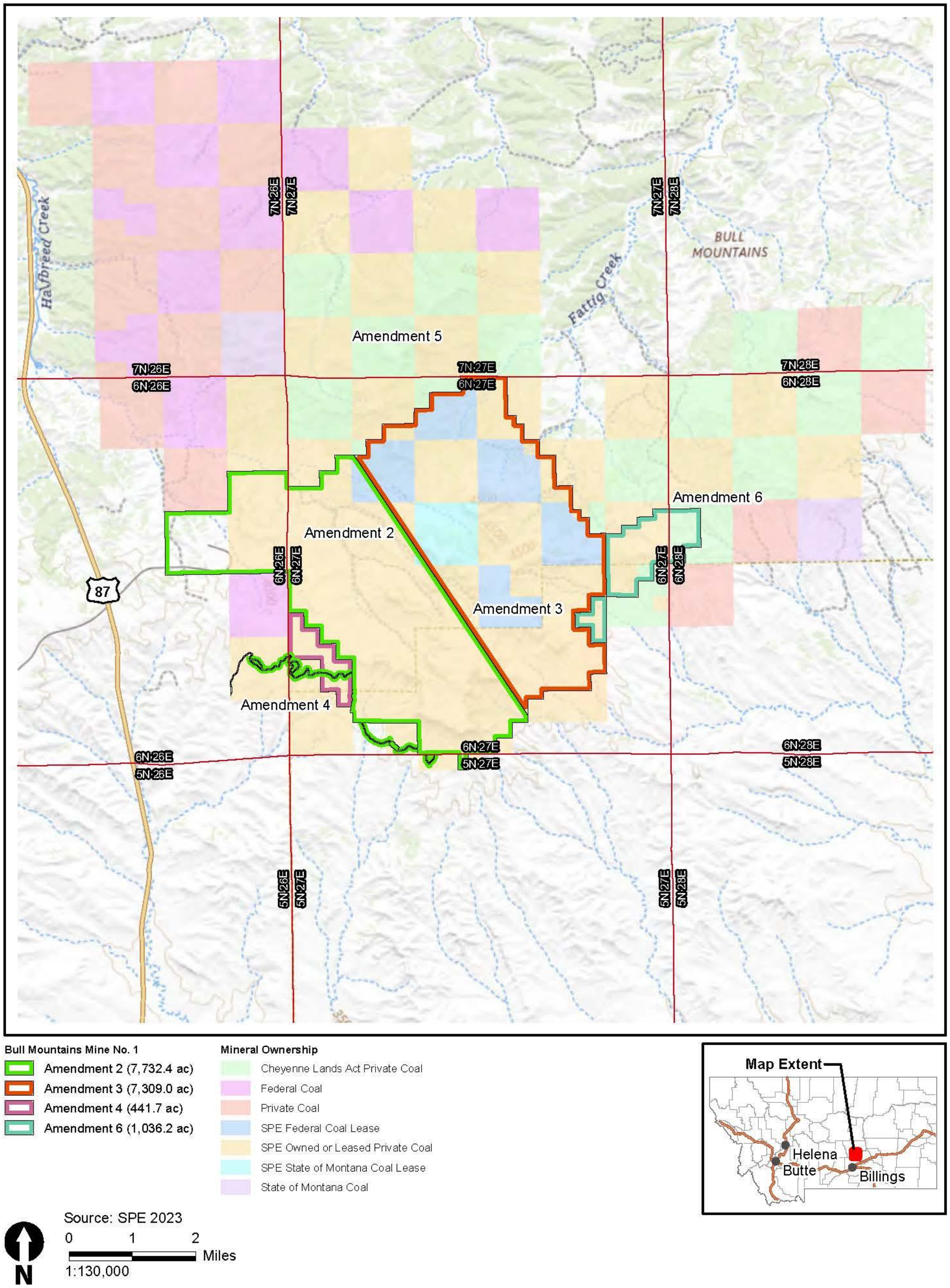
Table 3.5-1. Study Area Surface and Subsurface (Coal) Ownership.

	Acres Permitted	
Ownership	Surface	Subsurface (Coal)
Federal (BLM) Land	**945.2**	**2,661.1**
Amendment 2	*377.1*	*145.4*
Amendment 3	*568.1*	*2,515.4*
Amendment 4	*0.0*	*0.2*
Amendment 6	*0.0*	*0.0*
State of Montana	**637.1**	**638.6**
Amendment 2	*11.7*	*21.3*
Amendment 3	*625.4*	*617.3*

Ownership	Acres Permitted	
	Surface	Subsurface (Coal)
Amendment 4	*0.0*	*0.0*
Amendment 6	*0.0*	*0.0*
Private	**14,937.0**	**13,219.7**
Amendment 2	*7,343.6*	*7,565.7*
Amendment 3	*6,115.5*	*4,176.3*
Amendment 4	*441.7*	*441.5*
Amendment 6	*1036.2*	*1,036.2*
Total	**16,519.3**	**16,519.3**

Source: SPE 2023a

Figure 3.5-1. Mineral Ownership



3.5.4.2 Pre-Mining Land Uses

Musselshell County and nearby Yellowstone County are predominantly agricultural, including rangeland, forest areas including commercial forest, cropland, and pasture. Land in the study area is dominated by forest and rangeland with limited areas of dispersed residential development. Primary pre-mining land uses within the study area have been classified into eight land use classifications as outlined in **Table 3.5-2** and **Figure 3.5-2**.

Table 3.5-2. Study Area Land Use Categories

Land Use Type	Acres
Grazing Land/Fish and Wildlife Habitat/Recreation	15,579.8
Residential/Fish and Wildlife Habitat/Recreation	458.8
Special-Use Pasture/Fish and Wildlife Habitat/Recreation	264.8
Industrial/Commercial	113.1
Grazing Land/Fish and Wildlife Habitat/Industrial/Commercial	49.8
Special-Use Pasture/Fish and Wildlife Habitat/Industrial/Commercial	16.3
Cropland/Grazing Land	15.8
Developed Water Resources	13.0

Source: SPE 2023b

Grazing Land, Fish and Wildlife Habitat, and Recreation Land Use Type

The grazing land, fish and wildlife habitat, and recreation land use type can be considered the most important type within the study area. Comparatively, it occupies more of the study area than all the other types combined (15,579.8 acres).

Livestock grazing is the primary use of land classified under this type. Within the study area, livestock grazing principally involves cattle. A few horses are raised by some landowners; however, sheep are not currently present. The study area includes three livestock grazing allotments: Dunn Mountain, Coal Mine, and Johnson Mountain allotments. The location, size, and distribution of each gazing allotment are discussed in detail in **Section 3.11**.

Although land placed in this category provides fish and wildlife habitat, none is specifically managed as fish and wildlife habitat. Wildlife species are allowed to exist throughout this type as long as they do not interfere with livestock operations. Therefore, this type functions secondarily as fish and wildlife habitat. Fish and wildlife habitat is discussed in detail in **Section 3.12**.

Like the fish and wildlife habitat use, areas identified as grazing land, fish and wildlife habitat, and recreation provide some dispersed and undeveloped human recreation. Hunting is essentially the only recreational activity occurring in areas designated with this land use type. No developed recreational facilities exist. Additionally, none of the landowners manage their property for recreation.

Residential, Fish and Wildlife Habitat, and Recreation Land Use Type

The residential, fish and wildlife habitat, and recreation land use types occur only in the north-central portion of the study area and makes up approximately 458.8 acres. None of the acreage occupied by this type is located near the mine surface facilities. The residential, fish and wildlife habitat, and recreation acreage consists of a residential subdivision located north of Rehder Creek and is accessed from Fattig Creek Road. Because the residential development of the subdivision is relatively dispersed, the land still serves as fish and wildlife habitat; however, none of the acreage is directly managed for fish and wildlife.

The subdivided parcels are also presently used for recreational activities. As with the grazing land, fish and wildlife habitat, and recreation type, hunting is essentially the only recreation activity. However, as more residences are developed, hunting would likely cease to be a recreational activity. Development of the subdivision's parcels is likely to bring forth another form of leisure-time recreation. Based on an examination of Musselshell County records, many of the new landowners are from outside of Montana. For these people, the land may serve as a summer or vacation site; thus, these residences would still function as private recreation.

Special-Use Pasture, Fish and Wildlife Habitat, and Recreation Land Use Type

This land use type occurs over a relatively small portion of the study area, approximately 264.8 acres. Special-use pasture is the primary land use. However, the acreage also functions as fish and wildlife habitat and provides ample recreational opportunities.

Within the study area, portions of special-use pasture have been tilled and seeded to improve vegetative production. This increased production is used directly and indirectly for livestock. Indirectly, portions are harvested as hay and put up for winter livestock feed. The rest is left uncut and directly grazed by cattle. Intermediate and crested wheatgrass are the primary introduced species in the special-use pastures.

This land use type also functions as the secondary uses of fish and wildlife habitat and recreation. Wildlife species, such as elk and deer, often use the special-use pastures for grazing. Due to the presence of these species, recreational hunting activities also occur in these areas.

Industrial or Commercial Land Use Type

Within the study area, there is one general area, totaling 113.1 acres, that is used for industrial or commercial purposes. This area includes the Meridian test pit and the Bull Mountains Mine No.1 surface facilities. The primary use of land in this land use type is for extraction of coal.

Grazing Land, Fish and Wildlife Habitat, Industrial or Commercial Land Use Type

This land use type occupies all areas within the Meridian test pit permit boundaries and the Bull Mountains Mine No.1 surface facilities not defined as either of the two land uses described above and comprises 49.8 acres. These areas have not been disturbed by mining activities and have not been tilled or seeded to improve vegetative production.

Special-Use Pasture, Fish and Wildlife Habitat, and Industrial or Commercial Land Use Type

This land use type occurs solely within the area of the Bull Mountains Mine No.1 surface facilities and only occupies 16.3 acres. This acreage has only experienced limited direct Mine-related disturbance.

As is the case with the special-use pasture, fish and wildlife habitat, and recreation land use type, this type is accessible to and used by wildlife. Therefore, fish and wildlife habitat is considered to be a secondary use.

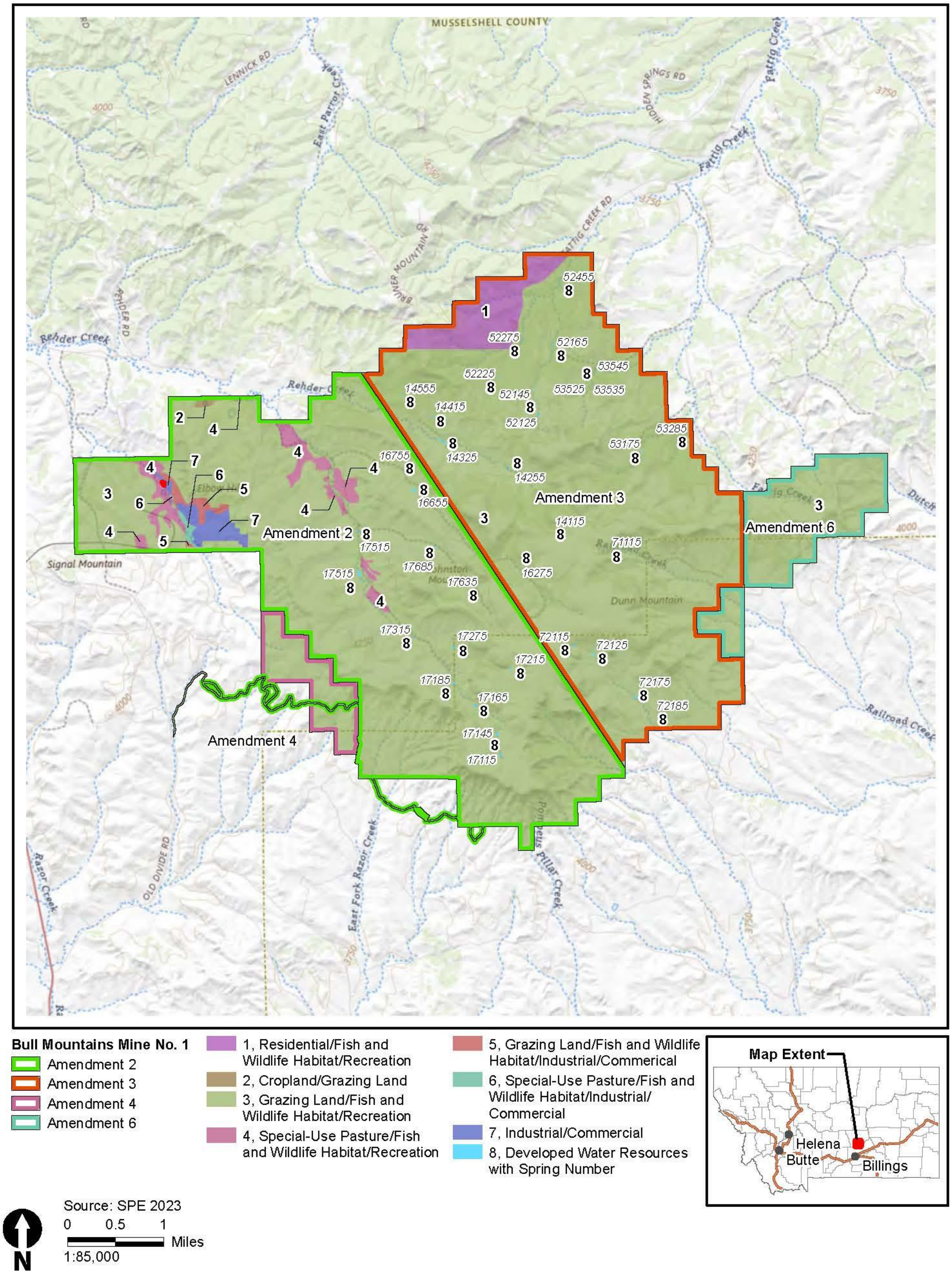
Cropland and Grazing Land - Land Use Type

This land use type occupies a relatively small portion of the study area (15.8 acres). Primary crops include wheat, alfalfa, and hay (grass). Areas under cultivation vary from year to year, and crops are sometimes rotated. Between the season's final cutting and the following spring's seeding, the landowners allow cattle on the fields to graze the un-harvested vegetation. Thus, the fields function secondarily as grazing land.

Developed Water Resources Land Use Type

Many of the landowners within the study area have created ponds to catch and store water. Because these ponds serve a beneficial use for livestock, they are considered developed water resources. However, these resources are relatively small and widely scattered. In addition, they collectively occupy the smallest portion of the study area (13.0 acres).

Figure 3.5-2. Pre-Mining Land Uses



3.6 Topography and Physiography

3.6.1 Introduction

The Mine is located in the Bull Mountains, which is part of the Northern Great Plains physiographic province in the watersheds of the Musselshell and Yellowstone Rivers. The topography of the study area is generally characterized by gently sloping valleys bound by moderately steep to steep ridges capped by isolated sandstone and clinker mesas. Some areas of the study area that contain lands previously disturbed by mining activities may experience altered site topography.

3.6.2 Study Area

The study area for physiography and topography includes both a direct effects study area and an indirect effects study area. Both the direct and indirect effects study areas are the permit area (**Table 3.0-1**, **Figure 3.0-1**). The past, present, and RFFA effects study area for physiography and topography is the same as the study area. Direct, indirect, and past, present, and RFFA impacts are discussed in detail in **Chapter 4**.

3.6.3 Regulatory Framework

3.6.3.1 Federal Requirements

SMCRA outlines the minimum requirements to restore land affected by surface coal mining operations to a condition capable of supporting pre-existing uses or to higher or better uses. Under section 523(c) of SMCRA (30 U.S.C. 1273(c)), a state with an approved State program, such as Montana, can elect to enter into a State-Federal Cooperative Agreement, which generally allows the State the authority to regulate surface coal mining and reclamation operations on Federal lands within the state. OSMRE granted MDEQ this authority (30 CFR § 926.30), and MDEQ is the primary regulatory authority in charge of permitting and regulating the operation of surface coal mines on all non-Indian lands within Montana under the authority of MSUMRA, Section 82-4-221, MCA.

3.6.3.2 State Requirements

MDEQ is the regulatory authority for coal mining operations in the State of Montana and implements MSUMRA and the administrative rules pursuant to the Act. Pursuant to a State-Federal Cooperative Agreement (30 CFR § 926.30), MDEQ also primarily regulates permitting and operation of mines on Federal lands within Montana under the authority of MSUMRA (Section 82-4-221 *et seq*., MCA) and its implementing rules (ARM 17.24.301-1309).

MSUMRA (ARM 17.24.313) outlines the requirements for post-mining reclamation of topography. These requirements include, but are not limited to, the creation of a post-mining land use plan including a timeline and cost estimate for reclamation activities; a plan for backfilling, stabilization, compacting, and grading of the proposed permit area; a plan for post-mining drainage basin reclamation that ensures protection of the hydrologic balance; and plans for removal, storage, and redistribution of soil.

3.6.3.3 Local Requirements

There are no local requirements related to topography within or near the analysis area.

3.6.4 Existing Conditions

The Project is located in the unglaciated portion of the Missouri Plateau physiographic section of the Northern Great Plains physiographic province (Fenneman 1928). The unglaciated Missouri Plateau lies generally south of the Missouri River, although the boundary with the glaciated section of the plateau is indefinite. The section is characterized by erosion features, such as mesas, terraces, and badlands.

The general climate in south-central Montana is Middle Latitude Steppe. This is a semi-arid region characterized by low rainfall, low humidity, clear skies, and wide ranges in annual and diurnal temperatures. Average annual precipitation is about 14 inches with about one third of that falling in May and June. The driest period is from November to February. Heavy snows are not unusual during the winter. Strong downslope winds known as Chinooks have a thawing and drying effect, and snow seldom accumulates to great depths.

The Project lies in the Bull Mountains Basin, which is a topographically low mountain range northwest of the Powder River Basin. Topography in the study area is characterized by gently sloping valleys bounded by ridges and mesas capped by sandstone and clinker. Differential erosion of rocks of varying hardness and resistance is the main process active in forming the present landscape. The underlying rocks are composed of interbedded shale, claystones, siltstones, coals, and sandstones. However, the high mesas and ridges are capped by "clinker", which is a term used to describe the baked sedimentary rocks resulting from burning of underlying coal beds. The shale and claystones tend to be easily eroded, while the sandstone and clinker are more resistant to erosion. Sheet and rill erosion are active geomorphic processes in the upper drainage basins, and mass-wasting occurs locally along the steep-walled ridges.

Elevations range from 3,700 to 4,700 feet above mean sea level (amsl) and the surface varies from flat to steep slopes that occur in incised drainages. Average elevations in the area of the existing surface facilities complex are about 3,900 feet. Surface slopes vary from flat lying near the surface facilities with slopes up to 15 percent around the surface facilities, and as great as 45 percent around mesas and ridges, including Dunn Mountain.

3.7 Geology, Minerals, and Paleontology

3.7.1 Introduction

In the Bull Mountains Basin, commercial coal is largely located in the Fort Union Formation. The Tongue River Member is the dominant coal-bearing unit of the Fort Union Formation. The thick sandstones were deposited by fluvial processes as point bars and channel deposits, while the siltstones, shales, and claystones were deposited by floodplain, overbank, and lacustrine processes. The coal was deposited in peat swamps and the limestones were deposited in shallow lakes.

The Fort Union Formation is also known to contain paleontological resources, such as invertebrate, plant, and vertebrate fossils.

3.7.2 Study Area

The study area for geology, minerals, and paleontology includes both a direct effects study area and an indirect effects study area. Both the direct and indirect effects study areas are the permit area (**Table 3.0-1, Figure 3.0-1**). The past, present, and RFFA effects study area for geology, minerals, and paleontology includes the study area plus the area classified as AM 5. Direct, indirect, and past, present, and RFFA impacts are discussed in detail in **Chapter 4**.

3.7.3 Regulatory Framework

3.7.3.1 Geology and Minerals

Federal Requirements

OSMRE is charged with the administration of SMCRA and has granted primacy to MDEQ as the primary regulatory agency for mining in Montana. SMCRA establishes a program of cooperative federalism that allows the states to receive approval from the Secretary to administer their own regulatory programs on non-Federal and non-Indian lands in accordance with SMCRA and consistent with the Federal regulations with OSMRE retaining oversight and enforcement authority (30 U.S.C. 1253, 1271, 1273). As discussed in **Section 1.2**, MDEQ administers the Montana State program approved by the Secretary, under the authority of MSUMRA, Section 82-4-221, MCA.

Additionally, SMCRA outlines the minimum Federal coal-mining requirements to restore land to a condition capable of supporting preexisting uses or to higher or better uses. Under 30 CFR § 784.22, an applicant for a surface coal mining operations permit must provide specific information needed to assist in determining the probable hydrologic consequences of the operation on surface water and groundwater, all potential acid- and toxic-forming strata, whether the reclamation can be accomplished, and whether the proposed operation has been designed to prevent material damage to the hydrologic balance outside the permit area.

State Requirements

MDEQ is the regulatory authority for coal mining operations in the State of Montana and implements MSUMRA and the administrative rules pursuant to the Act. Pursuant to a State-Federal Cooperative Agreement (30 CFR § 926.30), MDEQ also primarily regulates permitting and operation of mines on

Federal lands within Montana under the authority of MSUMRA (Section 82-4-221 *et seq*., MCA) and its implementing rules (ARM 17.24.301-1309).

Under ARM 17.24.322, *Geologic Information and Coal Conservation Plan*, detail must be provided by the applicant on the specific geologic information needed in a surface and underground mine permit application as well as the requirement that the application include a coal conservation plan.

Local Requirements

There are no applicable local regulations for geologic resources within or near the study area.

3.7.3.2 Paleontological Resources

Federal Requirements

The Paleontological Resources Preservation Act of 2009 (PRPA) and the paleontology regulations at 43 CFR Part 49 provide for guidance in paleontological resources management on Federal lands (BLM 2023a). However, the rules and the Potential Fossil Yield Classification (PFYC) System (discussed below) can provide guidance for the classification and preservation of fossils regardless of where fossils are found.

The PFYC system is a way of classifying geologic units based on the relative abundance of vertebrate fossils or scientifically significant fossils (plants, vertebrates, and invertebrates) and their sensitivity to adverse impacts. A higher-class number indicates higher potential for the presence of valuable fossils. The PFYC system is not intended to be applied to specific paleontological localities or small areas within units. Although significant localities may occasionally occur in a geologic unit, a few widely scattered important fossils or localities do not necessarily indicate a higher class. Instead, the relative abundance of significant localities is intended to be the major determinant for the class assignment (BLM 2016).

The PFYC system is meant to provide baseline guidance for predicting, assessing, and mitigating paleontological resources. The classification should be considered at an intermediate point in the analysis and should be used to assist in determining the need for further mitigation assessment or actions. The PFYC system is intended to be used as a guideline as opposed to rigorous definitions. Descriptions of the potential fossil yield classes are summarized in **Table 3.7-1**.

Table 3.7-1. Potential Fossil Yield Classification

Class	Description	Basis
1	Igneous and metamorphic (tuffs are excluded from this category) geologic units or units representing heavily disturbed preservation environments that are not likely to contain recognizable fossil remains.	• Fossils of any kind known not to occur except in the rarest of circumstances. • Igneous or metamorphic origin. • Landslides and glacial deposits.
2	Sedimentary geologic units not likely to contain vertebrate fossils or scientifically significant invertebrate fossils.	• Vertebrate fossils known to occur very rarely or not at all. • Age greater than Devonian. • Age younger than 10,000 years before present. • Deep marine origin. • Aeolian origin.

Class	Description	Basis
		• Diagenetic alteration.
3	Fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence.	• Units with sporadic known occurrences of vertebrate fossils. • Vertebrate fossils and significant invertebrate fossils known to occur inconsistently; predictability known to be low. • Poorly studied and/or poorly documented. Potential yield cannot be assigned without ground reconnaissance.
4	Class 4 geologic units are Class 5 units (see below) that have lowered risks of human-caused adverse impacts and/or lowered risk of natural degradation.	• Significant soil/vegetative cover; outcrop is not likely to be impacted. • Area of any exposed outcrop is smaller than 2 contiguous acres. • Outcrop forms cliffs of sufficient height and slope that most is out of reach by normal means. • Other characteristics that lower the vulnerability of both known and unidentified fossil localities.
5	Highly fossiliferous geologic units that regularly and predictably produce invertebrate fossils and/or scientifically significant invertebrate fossils, and that are at risk of natural degradation and/or human-caused adverse impacts.	• Vertebrate fossils and/or scientifically significant invertebrate fossils are known and documented to occur consistently, predictably, and/or abundantly. • Unit is exposed; little or no soil/vegetative cover. • Outcrop areas are extensive; discontinuous areas are larger than 2 contiguous acres. • Outcrop erodes readily; may form badlands. • Easy access to extensive outcrop in remote areas. • Other characteristics that increase the sensitivity of both known and unidentified fossil localities.
U	Unknown	• Little or no information is available concerning the presence of fossils.
W	Water	• Environments associated with water (shorelines, caves, sinkholes) that may provide for the preservation of fossils.
I	Ice	• Environments associated with ice (glaciers) have the potential to yield fossils as ice melts.

Source: BLM 2016

State Requirements

The Montana State Antiquities Act and the Montana State Historic Preservation Office's (SHPO) Administrative Rules (ARM 10.121.901 through 10.121.916) provide protections for paleontological resources and address the responsibilities of SHPO and other State agencies on state-owned lands.

Local Requirements

There are no applicable local regulations for paleontological resources within the study area.

3.7.4 Existing Conditions

3.7.4.1 Geology

The geology in the Bull Mountains Basin ranges in age from Precambrian to recent alluvial deposits. Some geologic units are missing due to erosion or non-deposition. Geologic units younger than Precambrian in age may be more than 10,000 feet thick (Jensen 1972). The Paleocene Fort Union Formation comprises the bedrock of the study area and also contains the Mammoth Coal bed. The Fort Union Formation is composed of sandstone, siltstone, mudstone, claystone, and coal beds (Mapel and Swanson 1977; Roberts et al. 1999).

3.7.4.2 Stratigraphy

The stratigraphy of the Fort Union Formation of the Bull Mountains Basin is similar to that of the Powder River Basin, although structurally the Bull Mountains Basin is a separate basin. When the formation was being deposited during the Paleocene, the Powder River Basin and the Bull Mountains Basin were contiguous (Stricker 1999). The Fort Union Formation lies unconformably on the Cretaceous Lance (or Hell Creek) Formation, which marks the Cretaceous-Tertiary boundary (Connor 1988). Generally, the Fort Union Formation consists of a complex of sandstone, siltstone, shale, carbonaceous shale, and coal beds (USGS 2023a). These geologic strata were originally deposited as sediments in a floodplain-delta type environment, which resulted in geology of limited lateral and vertical extent (Flores et al. 2010).

In the Bull Mountains Basin, the lowest unit of the Fort Union Formation is the Tullock Member, which consists of "yellow sandstone interbedded with subordinate grayish brown and black shale and non-commercial thin beds of coal" and may be 500 feet thick (USGS 2023a). The Tullock contains "stacked" channel sandstone deposits, which may be massive (no bedding) or cross-bedded (Wilde and Porter 2008). The Tullock Member may not be present over the entire Bull Mountains Basin, but it is present in the subsurface in the permit area. The Tullock does not contain commercial coal seams (SPE 2010). Overlying the Tullock is the Lebo Shale Member, which consists of dark gray carbonaceous shale, bentonitic claystone, sandstone, coal and is 200 to 300 feet thick (Stricker 1999). Although the Lebo Shale is primarily composed of shale, 5- to 50-foot stacked sandstone channels are present (Wilde and Porter 2008).

The Tongue River is the uppermost member of the Fort Union Formation. It is composed of "yellowish orange sandstone, sandy and silty carbonaceous shale, coal" and minor inclusions of lacustrine limestone (USGS 2023). Published sources indicate that the Tongue River Member may range from 1,000 to 2,000 feet thick (Striker 1999; USGS 2023a).The Tongue River Member has stacked sandstone channels that range in thickness from 50 to 300 feet and form prominent cliffs (Ward and Porter 2008). The sandstone channels grade laterally to tabular sandstones, shale, and carbonaceous shale. The Tongue River Member contains numerous coal seams, including the Mammoth Coal seam, which is mined in the Bull Mountains Mine.

The other geological unit in the study area is alluvium, which consists of gravel, sand, silt, and clay deposits and is found in stream and river channels, and floodplains. The alluvium varies from 20 to 50 feet in thickness (USGS 2023a).

3.7.4.3 Structure

The Bull Mountains Basin is an asymmetric west to east trending syncline with steeper dipping beds on the north limb (Dobbin and Erdmann 1946). The axis of the basin generally parallels the Musselshell River. Wilde and Porter (2008) did not map faults in the study area, but there are northwest to southeast striking normal faults several miles west of the study area. This area of faulting, which extends north of the Musselshell River, also contains northwest to southeast trending anticlines. The study area includes a gently folded syncline that plunges northwest at about 1 degree. Faulting with significant offset is not present within the study area.

3.7.4.4 Geological Hazards

Subsidence

Subsidence occurs as a response to the creation of an underground opening. Earth material surrounding the opening deforms or collapses in order to reach equilibrium. Depending on the depth of the opening, subsidence impacts can manifest through the overburden to the surface. Subsidence can occur as a result of underground mining.

As of December 2024, SPE has completed mining in panels 1-8 of the permitted 15 longwall panels. Additionally, SPE has mined most of panel 9 and the southern portions of panels 10 and 11. Subsidence is occurring above the longwall panels as planned in the underground mining section of the approved Mine Permit. A total of 25.1 acres of subsidence reclamation has occurred across the overlying 5,794.8 acres of mined out longwall area (**Table 2.3-1**).

Seismicity

The study area has a low incidence and magnitude of earthquakes. A total of 16 events of an average 3.1 magnitude have been recorded since 1974 within a 60-mile (100 km) radius of Roundup, Montana (USGS 2023b). For this study, a search of the USGS earthquake catalog search was limited to magnitudes of 2.5 and greater to eliminate quarry and mine blasts. No Quaternary faults have been identified within or near the study area. A Quaternary fault is a fault where evidence indicates that movement has taken place within the last 2.58 million years (USGS 2023c).

Mass Wasting

Mass wasting or landslides may occur along the sides of mesas where erosion causes instability resulting in large blocks and slumps to move quickly down slopes (Wilde and Porter 2008). Landslide deposits have been identified within the vicinity of the study area, but the deposits are limited in extent.

3.7.4.5 Mineral Resources

Coal

Coal beds in the Fort Union Formation in the Roundup, Montana area were first described by L.H. Woolsey during the 1907 field season as part of an effort by the USGS to assess potential coal resources in the western United States (Campbell 1909). A subsequent report by Woolsey et al., (1917), provided a description of coal in the Bull Mountains Basin.

The Tongue River Member contains the most abundant coal seams; Woolsey, et al., (1917) reported 26 coal seams in the Tongue River Member. Most of the coal seams range five to eight feet in thickness. An exception is the Mammoth Coal seam, which is 16 feet thick (Stricker 1999). The thickest coal seam in the Bull Mountains Basin is the Big Dirty at 17 feet thick in the Lebo Shale. However, due to excess detrital material (partings) and splits, it is not suitable for mining. Partings occur when non-organic sediment is deposited with coaly material and splits occur when a coal seam separates into two or more seams due to the deposition of detrital material. Partings lower the quality of the coal and splits can cause unanticipated loss of mineable coal through reduction in coal seam thickness. Splits can make correlation of coal seams difficult, which may also affect coal recovery. Descriptions of the Bull Mountains Basin paleocene stratigraphy are summarized in **Table 3.7-2.**

Table 3.7-2. Bull Mountains Basin Paleocene Stratigraphy

System	Series	Formation	Member	Member Thickness (feet)	Coal Bed	Coal Thickness (feet)
Quaternary	Holocene	Alluvium		20-50		
Paleogene	Paleocene	Fort Union	Tongue River	2,000	Unnamed	3-7
					Summit/Fattig	3-4
					Bull Mountain	2.5-6.5
					Rock Mesa	2-7.5
					Rehder Split	0-5.5
					Mammoth	5-16
					Dougherty	1.5-5
					Buckley	0-6
					Wildhorse	0-3
					Roundup	0-6
					McCleary	0-8
					Carpenter	0-8
			Lebo Shale	200-300	Big Dirty	2-17
			Tullock	600		

Sources: Connor 1988, Stricker 1999, and Woolsey, et al; 1917

Selected samples of Bull Mountains Basin coal seams were tested for coal quality parameters and 12 metals (Stricker 1999). Testing results indicated a calorific value ranging from 5,760 to 10,990 British Thermal Units (BTUs). Coal quality from the same sample set averaged moisture content 17.21 percent, ash content averaged 8.32 percent, and total sulfur averaged 0.82 percent on an as-received basis. Coal maturity ranges from subbituminous A to high volatile bituminous C. Analyses of 12 metals indicated average concentrations within or below the range of naturally occurring concentrations for metals in soils and surface materials in the western United States (Shacklette and Boerngen 1984).

Production of Bull Mountains Basin coal began in the late 19th century consisting of a few tons per year for local use (Stricker 1999). Commercial mining began in 1907 from the Roundup coal bed and from 1926 to 1960, 23 Mt of coal was produced from underground mines in the Roundup and McCleary seams. Mammoth Coal was initially produced by surface mining in the 1970s and later by underground mining in the 1990s. The USGS estimated the resource of the Mammoth Coal to be 1,100,000 million short tons (Stricker 1999).

Petroleum and Natural Gas

Regionally, there are several oil and gas fields in Musselshell County; however, there is no established oil and gas production in the study area, although there are several abandoned exploratory wells on the south side of the area (Montana Board of Oil and Gas and Conservation 2023). There is no coal bed methane (coalbed natural gas) production in the study area in contrast with formerly abundant coal bed methane production in the Powder River Basin.

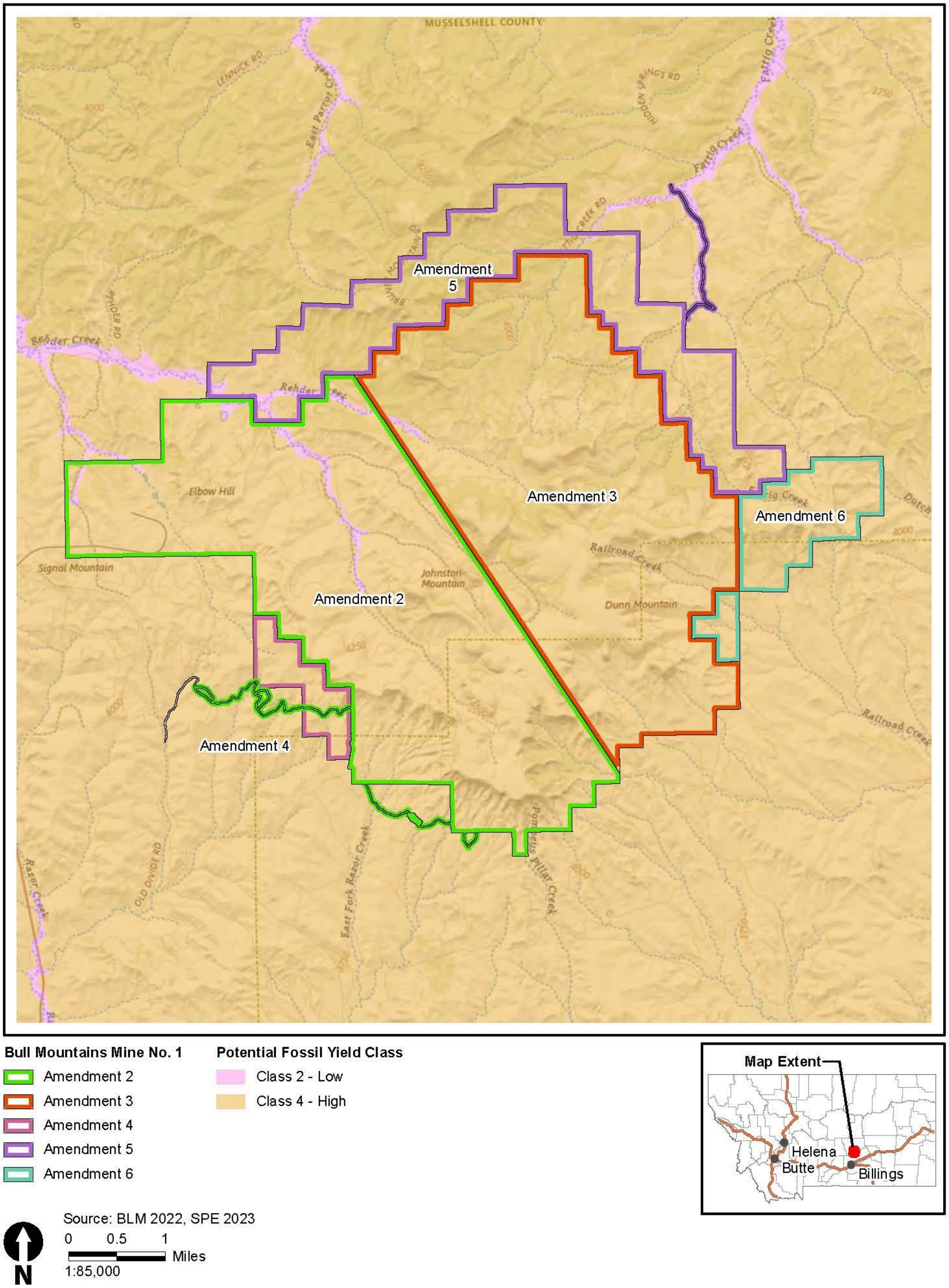
Other Mineral Resources

It is possible that alluvial deposits in the study area could have sufficient sand and gravel to be mineable, although clinker can be used as a substandard road base. No gravel quarries or other industrial mineral deposits were identified (Berg and Gammons 2023). Uranium has been an important commodity in the southern Powder River Basin and has been found in occurrences in the Fort Union and Wasatch Formations. However, these formations in the northern portion of the Powder River Basin in Montana were judged to be unfavorable for uranium resources (Bendix 1976).

3.7.4.6 Paleontological Resources

The Fort Union Formation in Wyoming and southeastern Montana is known as containing abundant vertebrates (mammals, reptiles, fish), invertebrates (pelecypods and gastropods) and plants (BLM 2015; Flores 1980; Horner and Hanson 2023). Significant accumulations of mammalian fossils (including multituberculates, marsupials cimolestans, pantolestans, primates, condylarths, and pantodonts) have been recovered within the Tongue River Member of the Fort Union Formation in eastern Montana (Robinson and Honey 1987; Lofgren et al. 2004). However, their occurrences are neither consistent nor predictable as in other Tertiary formations. Accordingly, the portion of the Fort Union Formation within the study area has been rated by BLM as PFYC Class 4, indicative of the potential for the occurrence of scientifically important fossils (**Figure 3.7-1**) (BLM 2023b). The alluvium in the study area is rated PFYC Class 2, or low potential for paleontological resources. The PFYC is based on characteristics of the entire Fort Union Formation, and is not based on a specific bed, lithologic layer, or paleontological locality.

Figure 3.7-1. PFYC Classifications



3.8 Solid Waste and Hazardous Materials

3.8.1 Introduction

Hazardous materials and solid waste, which are defined in various ways under a number of regulatory programs, can represent potential risks to both human health and to the environment when not managed properly. Issues related to hazardous materials and solid waste are the potential impacts to the environment from an accidental release of hazardous materials and improper disposal of solid waste. In addition to hazardous materials, this section summarizes the solid wastes that are generated during mining operations. Other issues relate to the potential presence of uncontrolled hazardous materials sites where releases have potentially impacted the environment.

3.8.2 Study Area

The study area for solid waste and hazardous materials includes both a direct effects study area and an indirect effects study area. Both the direct and indirect effects study areas are the permit area (**Table 3.0-1**, **Figure 3.0-1**). The past, present, and RFFA effects study area for solid waste and hazardous materials is the same as the area of analysis. Direct, indirect, and past, present, and RFFA impacts are discussed in detail in **Chapter 4**.

3.8.3 Regulatory Framework

3.8.3.1 Federal Requirements

Solid and Hazardous Waste

Solid waste consists of a broad range of materials that include garbage, refuse, wastewater treatment plant sludge, non-hazardous industrial waste, and other materials (i.e., solid, liquid, or contained gaseous substances) resulting from industrial, commercial, mining, agricultural, and community activities (EPA 2014). Solid waste is regulated under two subtitles of RCRA that define hazardous waste and non-hazardous waste.

A suite of Federal laws governs the management and disposal of solid and hazardous waste. The Solid Waste Disposal Act of 1965 addresses the safe disposal of large volumes of municipal and industrial solid wastes and was the first Federal effort covering solid-waste management. The Resource Conservation and Recovery Act (RCRA) of 1976 gives the EPA authority to manage to control both solid waste and hazardous waste from "cradle to grave," including the generation, transportation, treatment, storage, and disposal of hazardous and waste. The Hazardous and Solid Waste Amendment of 1984 requires phasing out land disposal of hazardous waste and provides increased enforcement authority for EPA, more stringent hazardous-waste management standards, and a comprehensive underground-storage-tank program.

Regulation of solid and hazardous waste management is established under RCRA (40 CFR Parts 239–282). RCRA sets national goals for the protection of human health and the environment from the potential hazards of waste disposal, conserving energy and natural resources, reducing the amount of waste generated, and ensuring that wastes are managed in an environmentally-sound manner. 40 CFR Parts 239–259 contain the regulations for solid waste and 40 CFR Parts 260–273 contain the regulations for hazardous waste. Disposal of mine waste on SMCRA mine sites is also regulated under provisions of the SMCRA and Solid Waste Disposal Act (SWDA). Section 702 of the SMCRA indicates that the provisions of the SMCRA do not supersede the SWDA. Mine wastes would be disposed of in surface waste disposal areas WDA 1 and WDA 2 as described in **Chapter 2**.

Hazardous waste as defined in RCRA procedures in 40 CFR Part 262 are used to determine whether a waste is hazardous. The types of materials used in mining activities and that would be subject to these requirements could include liquid waste materials with a flash point of less than 140°F, spent solvent-containing wastes, and corrosive liquids. Hazardous waste is also regulated by the Division of Waste Management & Remediation of Montana DEQ under delegated Federal authority.

Certain types of materials, while they may contain potentially hazardous constituents, are specifically exempt from regulation as hazardous waste. Used oil, for example, may contain toxic metals, but would not be considered a hazardous waste unless it exceeds certain criteria (Characteristics of Hazardous Waste 40 CFR 261) Exemptions from solid and hazardous waste regulations are listed in (EPA 2024).

Hazardous Material

The term hazardous materials include the following materials that may be used or disposed of in conjunction with the proposed coal mining operations:

- Substances covered under the Occupational Safety and Health Administration Hazard Communication Standard (29 CFR 1910.1200) and MSHA Communication Standards (30 CFR Part 47) – the types of materials that may be used in mining activities and that would be subject to these regulations would include almost all of the materials covered by the regulations identified below.
- Hazardous materials as defined under the U.S. Department of Transportation (USDOT) regulations in 29 CFR Parts 170-177 – the types of materials that may be used in mining activities and that would be subject to these regulations would include fuels, some paints and coatings, and other chemical products.
- Hazardous substances as defined by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and listed in 40 CFR Table 302.4 – the types of materials that may contain hazardous substances that are used in mining activities and that would be subject to these requirements include solvents, solvent-containing materials (e.g., paints, coatings, degreasers), acids, and other chemical products.
- Any hazardous substances and extremely hazardous substances as well as petroleum products such as gasoline, diesel, or propane, which are subject to reporting requirements (Threshold Planning Quantities) under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act (SARA). The types of materials that may be used in mining activities and that would be subject to these requirements include fuels, coolants, acids, and solvent-containing products, such as paints and coatings.
- Petroleum products defined as "oil" in the Oil Pollution Act of 1990 and under 40 CFR Part 112 – the types of materials used in mining activities and that would be subject to these requirements include fuels, lubricants, hydraulic oil, and transmission fluids.

In conjunction with the definitions noted above, the following lists provide information regarding management requirements during transportation, storage, and use of particular hazardous chemicals, substances, or materials:

- SARA Title III List of Lists or the Consolidated List of Chemicals Subject to the Emergency Planning and Community Right-to-Know Act and Section 112(r) of the Clean Air Act (CAA).
- U.S. Department of Transportation (DOT) listing of hazardous materials in 49 CFR 172.101.

3.8.3.2 State Requirements

The Montana Hazardous Waste Act (75-10-401, MCA) and the Solid Waste Management Act (75-10-201–250, MCA) regulate the storage and disposal of solid and hazardous wastes. MDEQ is responsible for implementing the Solid Waste Management Act under ARM 17.50.101 to 17.50.1405 and for implementing the Hazardous Waste Act under ARM 17.53.101 to 17.53.1502. Coal mines in MT must also comply with MSUMRA (82-4-201 et seq., MCA). MDEQ is responsible for MSUMRA under ARM 17.24.301. The storage and final disposal of solid waste is administered under ARM 17.24.507. The burial and treatment of waste materials generated is administered under ARM 17.24.505 and the use of bottom ash is administered under ARM 17.24.510.

3.8.3.3 Local Requirements

There are no applicable local solid and hazardous waste regulations or hazardous materials regulations within or near the analysis area.

3.8.4 Existing Conditions

3.8.4.1 Hazardous Materials On-Site

Diesel fuel, gasoline, and other materials are stored in aboveground tanks or other appropriate containers. Secondary containment is provided and materials are stored in a containment structure that complies with regulatory volumetric requirements. Hazardous materials classified as "oil" products under 40 CFR Part 112 are subject to regulatory requirements for oil storage, including requirements for a site-specific Spill Prevention, Control, and Countermeasures (SPCC) Plan describing on-site oil storage equipment and management, control, and monitoring systems. Other materials are stored in accordance with applicable regulatory requirements and established Best Management Practices. Fuels, oils, and lubricants are the hazardous materials that would be used in the largest quantities. The estimated annual use of these materials is listed in **Table 3.8-1**.

Table 3.8-1. Estimated Annual Major Hazardous Material Use

Material	Estimated Annual Use[1] (gallons)
#2 Diesel Fuel	650,000
Unleaded gasoline	15,000
Lubrication oil	3,500
Transformer oil	1,000

Source: Weber 2023

3.8.4.2 Solid Waste On-Site

Typical non-hazardous solid wastes that may be generated include floor sweepings, empty containers, scrap metal, tires, filters, office trash, and food waste. Some of these items may be disposed of offsite at permitted disposal facilities (e.g., municipal waste landfills). In addition to the wastes listed above, other typical special wastes that may be generated include used oil, batteries, and fluorescent lights. Batteries and bulbs are categorized as universal waste under Montana regulations and Federal universal waste regulations under 40 CFR Part 273.

Usually, coal mines do not generate large amounts of RCRA hazardous waste and are generally classified as Small Quantity Generators or Conditionally Exempt Small Quantity Generators (EPA 2014). The Bull Mountains No. 1 Mine does not generate hazardous waste under routine operations. The mine generates 3,500 gallons of used oil, which is not considered hazardous waste. Used oil is regulated separately under Montana regulations and Federal used oil regulations under 40 CFR 279 (Weber 2023).

Non-hazardous solid waste that is disposed at a municipal landfill is generated at a volume of about 400 tons per year (tpy). The used oil is hauled by a contracted third-party waste hauler to a licensed used oil management facility. Universal waste (e.g., bulbs, batteries) is hauled by a contracted third-party to a licensed universal waste management facility.

Approximately 2.2 Mt of Coal Processing Waste (CPW) is disposed annually on site in the existing approved WDA 1 (Weber 2023). The CPW is placed in a maximum of 2-foot lifts and compacted to the 90 percent dry density requirement in the approved existing WDA 1 per the approved Mine Permit. The WDA is inspected by a third-party engineer and quarterly reports are certified and submitted to the MDEQ. After final construction, the WDA 1 will be covered with a minimum of 4 feet of soil (Weber 2023).

3.8.4.3 Hazardous Material Spill and Unauthorized Disposal

There has been one recorded hazardous material spill incident and one incident of unauthorized waste disposal at the Mine. The spill occurred on May 25, 2009, when approximately 20 gallons of hydraulic oil leaked onto soil during drilling activities for the Madison Well 2 (water well). Remediation was completed and a final cleanup report was submitted to the MDEQ on August 3, 2010. The agency determined no further action was required on August 25, 2010 (Weber 2023).

On December 7, 2021, SPE was issued a Notice of Noncompliance (NON) and Order of Abatement to remediate actions not in compliance related to unapproved dumping of coal processing wastewater slurry from a thickener tank to old mine workings (PM Mine) that occurred in 2013 and 2015. SPE completed the remediation actions and Montana DEQ terminated and vacated the NON on July 8, 2022 (Weber 2023).

3.9 Human Health and Safety

3.9.1 Introduction

Public health pertains to the well-being of entire populations, encompassing the discrepancies in healthcare quality and accessibility. It encompasses various aspects, such as the occurrence of infectious and chronic diseases, mental health concerns, and disparities in healthcare access. Public health can be influenced by environmental factors, demographics (such as poverty and minority status), infrastructure and services availability, as well as behavioral and social issues (see **Section 3.16**).

3.9.2 Study Area

The study area for human health and safety includes both a direct effects study area and an indirect effects study area. The direct effects study area is the permit area, and the indirect effects study area encompasses Yellowstone and Musselshell Counties, including the cities of Billings and Roundup, and the Crow Reservation (**Table 3.0-1, Figure 3.0-1**). The past, present, and RFFA effects study area for human health and safety is the same as the study area. Direct, indirect, and past, present, and RFFA impacts are discussed in detail in **Chapter 4**.

3.9.3 Regulatory Framework

3.9.3.1 Federal Requirements

Federal Mine Safety Act and Health Act of 1977

According to the Federal Mine Safety and Health Act, it is mandatory for the U.S. Department of Labor's MSHA to ensure the well-being and safety of miners while they work. MSHA conducts multiple inspections throughout the year to ensure compliance with their safety and health regulations. In addition to establishing standards to prevent hazardous and unhealthy conditions, MSHA's regulations impose certain obligations on mine operators. These include:

- Prompt reporting of accidents, injuries, and illnesses at the mine by the operator.
- Implementation of training programs that meet the requirements set forth in the Mine Act.
- Obtaining approval for the use of specific equipment in gassy underground mines.
- Enforcing the usage of personal protective equipment (PPE) to ensure safety.

Occupational Safety and Health Act (29 U.S.C. 651 et seq.)

Under the Occupational Safety and Health Act, the Occupational Safety and Health Administration (OSHA) is responsible for the formulation and enforcement of workplace health and safety regulations. These regulations encompass various aspects, such as setting limits on chemical exposure, granting employee access to necessary information, imposing requirements for the usage of personal protective equipment (PPE), and establishing safety procedures.

At the Mine, the employees are covered under OSHA regulations, which ensure their safety and well-being. Conversely, Mine workers fall under the coverage of the MSHA, which operates in accordance with the Federal Mine Safety and Health Act to guarantee safe and healthy work environments for miners.

EPA Noise Control Act of 1972

As per the EPA Noise Control Act of 1972, it is recommended to maintain a 24-hour equivalent noise level below 70 decibels on the A-weighted scale (dBA) to prevent hearing loss. Moreover, a noise level lower than 55 dBA is generally considered to have minimal impact.

Regarding blasting activity, 30 CFR § 816.67 (Use of explosives: Control of adverse effects) is enforced by MDEQ and overseen by OSMRE. This regulation addresses noise and vibration resources related to blasting (as detailed in **Section 3.15**) in order to control and manage the potential impact of blasting activities on the surrounding environment and community.

Hazardous and Solid Waste

All activities conducted at the Mine and power plants must adhere to the regulations established by various acts and agencies. These include RCRA, CERCLA, the Safe Drinking Water Act (SDWA), the Toxic Substances Control Act (TSCA), SMCRA, Solid Waste Disposal Act (SWDA) and the CAA. Compliance with these statutes and their associated regulations ensures the proper handling and management of solid and hazardous waste, aiming to safeguard the environment and public health. **Section 3.8** provides an in-depth discussion of issues related to hazardous and solid waste.

Air Quality

The CAA, along with its relevant amendments and standards concerning public health, is addressed in **Section 3.2**. The regulations that pertain to safeguarding public health include the National Ambient Air Quality Standards (NAAQS), which establish limits for Criteria Air Pollutants (CAPs). Additionally, the Maximum Achievable Control Technology Standards (MATS), also known as National Emission Standards for Hazardous Air Pollutants (NESHAP), set limits for Hazardous Air Pollutants (HAPs), mercury, and acid gases.

Water Quality

The study area is subject to Federal regulations pertaining to surface water quantity and quality, which primarily include the Clean Water Act of 1972 and its subsequent amendments in 1977. These regulations mandate Federal agencies to take measures to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters."

Furthermore, the SMCRA sets forth requirements for surface coal mining and reclamation operations to safeguard surface water and groundwater quality and quantity. These operations must adhere to all relevant State and Federal water quality laws and regulations, along with the specified effluent limitations for coal mining activities.

For a comprehensive understanding of water quality standards, please refer to **Section 3.4**.

Surface Transportation Board (STB)

STB is an independent adjudicatory and economic-regulatory agency charged by Congress with resolving railroad rate and service disputes and reviewing proposed railroad mergers. STB has jurisdiction over railroad rate and service issues and rail restructuring transactions (e.g., mergers, line sales, line construction, and line abandonments) and has authority to investigate rail service matters of regional and national significance. STB regulations preempt State and local laws (e.g., noise ordinances) that would otherwise manage or govern rail transportation.

Federal Railroad Administration (FRA)

As part of the USDOT, FRA formulates and enforces rail safety regulations, administers rail funding, and researches rail improvement strategies and technologies. FRA also facilitates national and regional rail planning to maintain current services and infrastructure and also expand and improve the rail network. For example, the Passenger Rail Investment and Improvement Act of 2008 requires states to develop FRA-accepted State rail plans and encourages State involvement in rail policy, planning, and development. For the most part, all railroad operational procedures are subject to FRA regulations, including highway-railroad crossing signals, train speeds, train horn use, and track condition.

3.9.3.2 State Requirements

Public Safety

MSUMRA regulates the use of explosives, which includes notifying the public ahead of blasting including nearby residences where noise and vibrations may be experienced.

Air Quality

Under the CAA, individual states have the authority to adopt more stringent standards for CAPs and can also establish air quality standards for other chemicals of potential concern (COPCs) that go beyond the Federal standards. The Maximum Allowable Ambient Air Quality Standards (MAAQS) are presented in **Appendix B**. A comprehensive discussion of these standards can be found in **Section 3.2**.

Montana has its own Settleable PM standard, distinct from the Federal NAAQS for PM_{10} and $PM_{2.5}$. This Montana standard is designed to regulate much larger particles. To mitigate the generation of excess PM, Montana employs various measures through permitting and enforcement to ensure reasonable precautions are taken. A detailed explanation of this standard is provided in **Section 3.2**.

Water Quality

Under the Clean Water Act, individual states have the authority to establish water quality standards that are more stringent than the Federal standards. In Montana, the MDEQ is responsible for administering the Montana Water Quality Act. This State law is designed to prevent the degradation of surface water and groundwater caused by discharges of mine wastewater and stormwater.

For a comprehensive understanding of water resources, including surface water and groundwater, please refer to **Section 3.4**. This section delves into the rules and regulations aimed at protecting water quality and quantity, including water quality performance standards and the use of the best technology currently available to safeguard water resources in accordance with the rules implementing MSUMRA.

3.9.3.3 Local Requirements

There are no local requirements related to human health and safety within or near the study area.

3.9.4 Existing Conditions

In 2022, the University of Wisconsin Population Health Institute compiled a Health Factors model to assess the well-being of counties in Montana. According to the rankings, Yellowstone County emerged as a top-ranked county for health factors. This can be attributed to various indicators, including access to high quality care, clean air & water, sufficient housing & transit options, robust educational opportunities, favorable employment & income prospects, strong family & social support networks, a safe community environment, and relatively lower rates of tobacco use. It is worth noting that Yellowstone County's prominence in the rankings is likely influenced by the presence of Billings, one of the largest cities in Montana, which likely provides better access to healthcare, education, employment opportunities, and housing. Conversely, Musselshell County appeared as a bottom-ranked county for health factors in the same model. Because of these factors, the population of Musselshell County may be more vulnerable to health impacts.

3.9.4.1 Primary Contaminants and Exposure Pathways

Environmental media that have the potential to be contaminated as a result of Mine operations include air, soil, surface water, and groundwater. Public health concerns are evaluated by considering if there would potentially be public exposure through these media that could result in health concerns. Possible exposure pathways to environmental contaminants include inhalation of PM, volatile organic compounds (VOCs), and fugitive dust; incidental ingestion of soil and dermal exposure from contact with soil; drinking water; recreation; and consuming fish, home-grown produce, and livestock. The primary relevant public health risk concern in the study area would be health effects related to:

- PM_{10} and $PM_{2.5}$ emissions from the Mine that can result in long- and short-term health implications due to human exposures.
- Diesel exhaust emissions including Hazardous Air Pollutants (HAPs), Chemicals of Potential Concern (COPCs), and Diesel Particulate Matter (DPM), which consists of PM less than 2.5 micrograms per meter (μm) in diameter and found in diesel exhaust at the Mine. Inhalation of these emissions can cause both carcinogenic and noncarcinogenic adverse health effects.
- Metals found in coal dust (e.g., arsenic, cadmium, chromium, copper, lead, mercury, and selenium). Metals in coal particulate dust may contribute to both cancer risk and non-cancer acute or chronic hazard through both inhalation of PM and non-inhalation pathways (i.e., exposure to metals deposited on the surface of soil and waterbodies).
- Contamination of surface water and groundwater used for recreation and drinking water from Mine operations, including hazardous materials.
- Noise and vibration from heavy equipment and blasting events.
- Other primary contaminants and exposure pathways will be discussed qualitatively and within the limits of existing data. Deposition of COPCs and HAPs from air emissions on surface water and soil are assumed to be secondary results of air quality and are therefore not treated as separate topics.

3.9.4.2 Particulate Matter

Air quality has been monitored at the Mine since 2010 (**Appendix B**). Existing sources of air pollution in the study area include the existing permitted areas of the Mine, vehicle exhaust, fugitive dust from vehicle traffic, wind erosion of exposed surfaces, residential activities such as wood-burning fireplaces, and a few industrial sources nearby. With respect to the existing emissions from the Mine, emphasis will be on health impacts from PM. Historic and recent PM air concentrations detected at the Mine and the study area have been within the NAAQS standards (MDEQ 2017).

PM emissions may be composed of a number of substances, including acids, organic chemicals, metals, and soil or dust particles (EPA 2023). Sources may include construction sites, unpaved roads, power plants, motor vehicles, mining operations, biomass combustion (e.g., forest fires and burning of wood), power plants, mines, and vehicle emissions (Stanek et al. 2011; EPA 2023). Following inhalation, deposition and retention of particles in the respiratory tract is dependent upon the size of the particles. Larger particles are deposited higher in the respiratory tract (nose, throat), while smaller particles are deposited lower (lungs). The EPA regulates PM_{10} and $PM_{2.5}$, which have aerodynamic diameters <10 µm and <2.5 µm respectively and are considered the most likely to cause adverse health effects. Both have the potential to penetrate to the terminal bronchioles and the alveoli within the lungs, and $PM_{2.5}$ is considered especially harmful to respiratory health (Hinds 1999; EPA 2023). Exposure to $PM_{2.5}$ and PM_{10} has been linked with worsening adverse effects in populations with asthma. There is a potential link between exposure and worsening existing cardiopulmonary problems for those with diabetes (EPA 2023). Recent studies indicate there may be a causal link between particulate inhalation and an increased incidence of asthma (American Academy of Pediatrics 2004; Guarnieri and Balmes 2014; Keet et al. 2018).

There is evidence indicating that populations with asthma and compromised respiratory systems may have increased susceptibility to viral and bacterial respiratory infections during and after episodes of heightened air pollution (Kelly and Fussell 2011; Keet et al. 2018). While it is possible that $PM_{2.5}$ might be linked to certain health problems like cardiovascular issues, respiratory problems, lung cancer, and diabetes, the majority of these health conditions are influenced and compounded by various other factors, including lifestyle variables like diet, physical inactivity, and smoking rates among adults.

Based on information included in MDEQ's Emission Inventory Detail document for MAQP #3179-12 (MDEQ 2023), the Mine's annual PM_{10} emission rate is estimated to be approximately four times greater than the rate for any other criteria pollutant. **Section 3.2** provides a detailed discussion of the current air quality conditions within the affected environment, including summaries of the existing emissions from the Mine and other regional air pollutant sources.

Diesel Exhaust Emissions

Diesel engine exhaust primarily consists of CO2 and water vapor, with smaller amounts of DPM and various gaseous substances (International Agency for Research on Cancer 2014; EPA 2002). DPM is primarily composed of fine particles known as $PM_{2.5}$. Elevated exposures to DPM have been associated with various health effects, including acute irritant effects such as eye, throat, or bronchial irritation, respiratory symptoms like cough, phlegm, and wheezing, immunologic effects that exacerbate asthma and trigger allergenic responses, lung inflammatory effects, cardiovascular health responses such as blood clotting or restricted blood flow, and cancer, particularly lung cancer (Hesterberg et al. 2010; Ghio et al. 2012).

Most of the research on health effects from DPM has focused on exposure to exhaust from older diesel engines. However, advances in diesel engine technology have led to the development of modern diesel engines that emit less DPM and have lower concentrations of HAPs and COPCs compared to older engines. These modern engines also comply with more stringent national and State emissions standards. As a result, the applicability of analyses based on available data and assumptions may be limited to situations where older diesel engine technology is still in use.

Although research on the health effects of exposure to exhaust from modern diesel engines is limited, some studies suggest that adverse effects may be reduced compared to older engines (Hesterberg et al. 2010; Mills et al. 2011). Nonetheless, it is essential to continue monitoring and studying the health impacts of diesel engine exhaust to ensure the safety and well-being of individuals exposed to these emissions.

Coal Dust

Coal dust is generated during the handling and transportation of coal, and its toxicity is influenced by the chemical composition and size of the dust particles. The health risks associated with coal dust exposure depend on factors such as particle size, the location of deposition or transportation, the extent of absorption, and the specific composition of the coal dust. In general, approximately half of the emitted coal dust particles fall within the PM_{10} size range, while only about 15 percent are in the $PM_{2.5}$ size range (EPA 1995). Particle size and shape also affect how far coal dust travels, how long it remains suspended in the air, and where it settles on soils and surface water.

Coal dust contains chemical components that may be toxic to humans, including silica, polycyclic aromatic hydrocarbon compounds, and trace metals such as arsenic, lead, copper, iron, mercury, and selenium. However, metal concentrations in coal dust are typically low. Recent analyses of coal samples from the Otter Creek coal bed in Montana reported metal concentrations mostly in the range of a thousandth of a percentage or less by mass (USDOT 2015).

The majority of research on the potential health effects of coal dust exposure has been conducted in occupational settings, particularly among coal miners exposed to dust in above-surface or underground coal mines, where concentrations of exposure are typically much higher than what would be expected in non-occupational settings (National Institute for Occupational Safety and Health (NIOSH) 2011). Studies suggest that individuals and communities located near coal mines do not exhibit an increased incidence of asthma (Fitzpatrick 2018; Pless-Mulloli et al. 2001). However, they may face an elevated risk of cancer and other chronic illnesses (Jenkins et al. 2013; Hendryx and Ahern 2008).

3.9.4.3 Surface Water and Groundwater Quality

Section 3.4 provides a comprehensive discussion of the current water quality conditions in the study area, and **Section 3.8** provides a comprehensive overview of hazardous materials onsite and previous incidents related to contamination. Hazardous materials are stored onsite and have the potential to impact water quality, and therefore human health through drinking water and recreation. Fuels, oils, and lubricants are the greatest quantity of hazardous materials stored onsite. Monitoring wells downgradient of the Project area have exhibited elevated levels of radium and fluoride, but the levels of concentrations of these materials would not cause impacts to downstream surface water or groundwater resources as no human health standards have been exceeded (see **Section 3.4**).

3.9.4.4 Noise and Vibration

Section 3.15 provides a comprehensive discussion of the current noise levels in the study area.

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3.10 Soils

3.10.1 Introduction

Soil resources, for purposes of this analysis, include topsoil and subsoil to the overlying bedrock or parent material, which can range in depth dependent on the soil series or soil map units. Soils in the planning area are predominantly loams, silty loams, or sandy loams, with an occasional increase in fines to silty clay.

3.10.2 Study Area

The study area for soil resources includes both a direct effects study area and an indirect effects study area. Both the direct and indirect effects study areas are the permit area. The past, present, and RFFA effects study area for soils includes the HUC 12 subwatersheds for Rehder Creek, Halfbreed Creek, Parrot Creek, Upper Fattig Creek, Upper Railroad Creek, Upper Pompeys Pillar Creek, Upper Razor Creek, and Middle Razor Creek (**Table 3.0-1**, **Figure 3.0-1**). Direct, indirect, and past, present, and RFFA impacts are discussed in detail in **Chapter 4**.

3.10.3 Regulatory Framework

3.10.3.1 Federal Requirements

SMCRA outlines the minimum requirements to restore land affected by surface coal mining operations to a condition capable of supporting pre-existing uses or to higher or better uses. Under section 523(c) of SMCRA (30 U.S.C. § 1273(c)), a state with an approved State program, such as Montana, can elect to enter into a State-Federal Cooperative Agreement, which generally allows the State the primary authority to regulate surface coal mining and reclamation operations on Federal lands within the state. OSMRE granted MDEQ this authority (30 CFR § 926.30), and MDEQ regulates permitting and operation of surface coal mines on all non-Indian lands within Montana under the authority of MSUMRA, Section 82-4-221, MCA.

3.10.3.2 State Requirements

MDEQ is the primary regulatory authority for coal mining operations in the State of Montana and implements MSUMRA and the administrative rules pursuant to the Act. Pursuant to a State-Federal Cooperative Agreement (30 CFR § 926.30), MDEQ also primarily regulates permitting and operation of mines on Federal lands within Montana under the authority of MSUMRA (Section 82-4-221 et seq., MCA) and its implementing rules (ARM 17.24.301-1309).

Surface coal mining operations are required by MSUMRA (82-4-2.231 and 232, MCA) and its implementing rules (ARM 17.24.701 through 703) to remove all topsoil and subsoil suitable for reclamation, to immediately replace or temporarily store and protect the soil resource during mining, and to replace soil following mining to support revegetation. **Table 3.10-1** summarizes the applicable rules and regulations.

Table 3.10-1. Applicable Soil Rules and Regulations

ARM 17.24 Subchapter	Summary of Requirement
Applicable Rules and Regulations under the Administrative Rules of Montana	
3	Contains requirements of the surface mine permit application, including gathering soil baseline information (ARM 17.24.304 and 306), requirements of the reclamation plan (ARM 17.24.313)
5	Contains backfilling and grading requirements
6	Lists performance standards for drainage reclamation (ARM 17.24.634) and sediment-control measures (ARM 17.24.638)
7	Includes the requirements of soil removal (ARM 17.24.701); soil stockpiling and redistribution (ARM 17.24.702); soil-stabilizing practices (ARM 17.24.714); use of soil amendments, management techniques, and land use practices (ARM 17.24.718); establishment of vegetation (ARM 17.24.711); soil/spoil monitoring plan (ARM 17.24.723); postmining land use (ARM 17.24.762); and cropland reclamation (ARM 17.24.764)
Applicable Rules and Regulations under Montana Strip and Underground Mine Reclamation Act	
MCA 82-4-2 Subpart	Summary of Requirement
222	Contains requirements of a mine permit application, which include a plan for the mining, reclamation, revegetation, and rehabilitation of land and water to be affected by the operation.
231	Requires submission of and action on reclamation plan and to include a plan of grading, backfilling, highwall reduction, topsoiling and reclamation for the area of land affected by the operation.
232	Contains specifications for soil removal, storage, replacement, and reconstruction on prime farmlands and non-prime farmlands.
233	Contains requirements for planting of vegetation following grading of disturbed area.

MDEQ has outlined its procedures and methods to protect soil resources that would be disturbed by coal mining operations and to enhance the potential of achieving successful reclamation in its Soil, Overburden, and Re-graded Spoil Guidelines (MDEQ 1998). These guidelines are based on the requirements and objectives of MSUMRA and its implementing ARMs (**Table 3.10-1**) and include soil-suitability criteria for determining salvage depths and volumes of suitable soil and soil materials for use as a plant-growth medium.

3.10.3.3 Local Requirements

There are no applicable local regulations for soil resources within or near the analysis area.

3.10.4 Existing Conditions

Description of soils in the Meridian Minerals Company EIS stated the soils in the planning area are predominantly loams, silty loams, or sandy loams, with an occasional increase in fines to silty clay. Soils are shallower along upper slopes and fans, and deeper on lower terraces and drainage bottoms. The relatively shallow, upland Cabbart soil series dominates the mine area with the Cabbart loam dominating the surface facility complex. These soils are described as well drained, have limited available water capacity and are easily eroded. Sandstone outcrops and clinker characterize plateaus and rims (Montana DSL 1992).

3.10.4.1 Original Baseline Surveys

The original soil survey was designed and conducted in accordance with the regulations and MDEQ Soil, Overburden and Regraded Spoil Guidelines December 1994, Updated August 1998 (MDEQ 1998). Soil surveys conducted in 1978 for the adjacent P.M. Coal Company (SPE 2017) property and in 1989 for the Meridian Minerals Company Test Pit permit application (Meridian Minerals Company 1989) were used as references in addition to consultation with the Roundup and Billings, Montana offices of the Soil Conservation Service (SCS) and available aerial photographs. Principal aerial photographs included color (May and July 1970); color infrared and black and white (July 1986); and black-and-white (December 1988) (SPE 2017).

Soil surveys completed by the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) in Musselshell and Yellowstone Counties (USDA 2007 and 2010) were used to characterize the soil types occurring in areas outside of the surface facilities disturbance area. A detailed field survey was conducted within the surface facilities disturbance area in order to refine the preliminary mapping unit boundaries. Phases of soil series were mapped as consociations (dominant soil in the map unit) or complexes (two or more intricately mixed soils) by field traverse and verification. The series phases were based on texture, slope, erodibility, coarse fragments, depth, or other diagnostic parameters (SPE 2017).

3.10.4.2 2014 Waste Disposal Area 2 Soil Survey and 2015 Waste Disposal Area 1 Supplemental Survey

A soil survey effort was conducted in 2014-2015 to expand the soil survey area and collect data for the proposed disturbance footprint for the WDA 2 (and associated facilities) and undisturbed areas adjacent to WDA 1. Although soil conditions were similar to the original soil surveys, it was necessary to develop new mapping units for these supplemental survey areas. Due to the proposed use for coal processing waste storage, additional suitable cover materials were required to supplement the topsoil (A horizons) and subsoil (B horizons) typically salvaged. The survey identified the thickness of unconsolidated (weathered or depositional; C or Cr horizons) material below the subsoil horizons for potential future salvage (SPE 2017).

Table 3.10-2 below shows the soil map units and acreages in the permit area by amendment area and **Table 3.10-3** shows the soil map unit descriptions and percent soil series composition in the permit area. **Table 3.10-4** shows the soil series and taxonomic description for the dominant soil series in the permit area. **Figure 3.10-1** illustrates the soil map units in the study area that includes the permit area and the indirect effects study area. **Figure 3.10-2** shows the soils mapped within the limit of surface disturbance area around the facilities at the Mine.

Table 3.10-2. Soil Map Unit Acres in the Permit Area by Amendment Area

Map Unit #	Soil Map Unit Name	AM 2 (acres)	AM 3 (acres)	AM 4 (acres)	AM 6 (acres)	Grand Total (acres)
283D	Barvon-Cabba loams, 2 to 8 percent slopes	4.0	0.0	0.0	0.0	4.0
255D	Barvon-Cabba-Shambo loams, 4 to 15 percent slopes	71.1	279.7	0.0	0.0	350.8
289F	Cabba-Barvon loams, 15 to 65 percent slopes	1,736.2	2,162.8	35.8	497.0	4,431.7
284D	Cabba-Barvon loams, 4 to 15 percent slopes	439.6	429.6	78.8	0.0	948.1
285D	Cabba-Doney loams, 4 to 15 percent slopes	261.5	189.1	151.2	70.6	672.4
282F	Cabba-Doney loams, 8 to 45 percent slopes	871.2	863.2	142.2	71.9	1,948.5
282E	Cabba-Ridge complex, 8 to 25 percent slopes	521.6	60.6	15.7	48.0	646.0
283F	Cabba-Rock outcrop complex, 8 to 45 percent slopes	913.7	682.1	7.0	292.8	1,895.5
287D	Delpoint, dry-Cabbart, moist loams, 2 to 8 percent slopes	33.7	0.0	0.0	0.0	33.7
285C	Doney-Cabba loams, 2 to 8 percent slopes	230.8	380.8	0.0	0.0	611.6
281D	Doney-Cabba-Macar loams, 4 to 15 percent slopes	801.2	142.1	8.0	0.0	951.4
284F	Doney-Wayden complex, 15 to 60 percent slopes	16.9	0.0	0.0	0.0	16.9
El	Elso (Cabbart) clay loam, 7 to 15 percent slopes	11.5	0.0	2.9	0.0	14.4
245C	Lamedeer-Ringling channery loams, 2 to 8 percent slopes	69.2	170.6	0.0	17.0	256.7
245F	Lamedeer-Ringling channery loams, 4 to 45 percent slopes	249.6	462.4	0.0	37.8	749.8
246F	Lamedeer-Ringling channery loams, moist, 4 to 45 percent slopes	361.5	1,180.7	0.2	0.0	1,542.3
Lt	Lohmiller-Elso (Cabbart) complex, 4 to 15 percent slopes	9.2	64.5	0.0	0.0	73.7
Ms	McRae-Bainville loams, 7 to 15 percent slopes	0.0	60.3	0.0	1.2	61.5
My	Midway-Shale outcrop complex, 4 to 35 percent slopes	0.0	34.7	0.0	0.0	34.7
SI	Shale outcrop	527.5	94.1	0.0	0.0	621.6
294C	Shambo loam, 2 to 8 percent slopes	158.0	0.0	0.0	0.0	158.0
255C	Shambo-Korchea-Barvon loams, 2 to 8 percent slopes	223.9	51.6	0.0	0.0	275.4
292A	Straw-Korchea loams, 0 to 2 percent slopes	220.6	0.0	0.0	0.0	220.6
	Grand Total	7,732.4	7,309.0	441.7	1,036.2	16,519.3

Sources: SPE 2017, USDA 2007 and 2010

Table 3.10-3. Soil Map Unit Descriptions and Percent Soil Series Composition in the Permit Area

Map Unit Symbol	Soil Map Unit Name	Composition[1]
283D	Barvon-Cabba loams, 2 to 8 percent slopes	Barvon 45% / Cabba 40%
255D	Barvon-Cabba-Shambo loams, 4 to 15 percent slopes	Barvon 35% / Cabba 30% / Shambo 30%
289F	Cabba-Barvon loams, 15 to 65 percent slopes	Cabba 45% / Barvon 40%
284D	Cabba-Barvon loams, 4 to 15 percent slopes	Cabba 45% / Barvon 40%
285D	Cabba-Doney loams, 4 to 15 percent slopes	Cabba 45% / Doney 40%
282F	Cabba-Doney loams, 8 to 45 percent slopes	Cabba 45% / Doney 40%
282E	Cabba-Ridge complex, 8 to 25 percent slopes	Cabba 45% / Ridge 35%
283F	Cabba-Rock outcrop complex, 8 to 45 percent slopes	Cabba 60% / Rock outcrop 25%
287D	Delpoint, dry-Cabbart, moist loams, 2 to 8 percent slopes	Delpoint, dry 45% / Cabbart, moist 40%
285C	Doney-Cabba loams, 2 to 8 percent slopes	Doney 55% / Doney 55% / Cabba 35%
281D	Doney-Cabba-Macar loams, 4 to 15 percent slopes	Doney 35% / Macar 30% / Cabba 30%
284F	Doney-Wayden complex, 15 to 60 percent slopes	Doney 40% / Wayden 25%
El	Elso (Cabbart) clay loam, 7 to 15 percent slopes	Elso (Cabbart) 80%
245C	Lamedeer-Ringling channery loams, 2 to 8 percent slopes	Lamedeer 65% / Ringling 25%
245F	Lamedeer-Ringling channery loams, 4 to 45 percent slopes	Lamedeer 50% / Lamedeer 50% / Ringling 40%
246F	Lamedeer-Ringling channery loams, moist, 4 to 45 percent slopes	Lamedeer 50% / Lamedeer 50% / Ringling 40%
Lt	Lohmiller-Elso (Cabbart) complex, 4 to 15 percent slopes	Lohmiller 45% / Elso (Cabbart) 35%
Ms	McRae-Bainville loams, 7 to 15 percent slopes	McRae 45% / Bainville 35%
My	Midway-Shale outcrop complex, 4 to 35 percent slopes	Midway 50% / Rock outcrop, shale 25%
SI	Shale outcrop	Rock outcrop, shale 90%
294C	Shambo loam, 2 to 8 percent slopes	Shambo 90%
255C	Shambo-Korchea-Barvon loams, 2 to 8 percent slopes	Shambo 35% / Korchea 30% / Barvon 30%
292A	Straw-Korchea loams, 0 to 2 percent slopes	Straw 45% / Korchea 40%

Sources: SPE 2023; USDA 2007 and 2010
[1]Soils that do not equal 100% have other minor inclusions present.

Table 3.10-4. Soil Series and Taxonomic Description of Soil in the Permit Area

Series	Taxonomic Description
Bainville	Fine silty, mixed, superactive, calcareous, mesic Aridic Ustorthents
Barvon	Fine-loamy, mixed, superactive, frigid Entic Haplustolls
Cabba	Loamy, mixed, superactive, calcareous, frigid, shallow Typic Ustorthents
Elso (Cabbart)	Loamy, mixed, superactive, calcareous, frigid, shallow Aridic Ustorthents
Delpoint	Fine-loamy, mixed, superactive, frigid Aridic Haplustepts
Doney	Fine loamy, mixed, superactive, frigid Typic Haplustepts
Havre	Fine loam, mixed, superactive, calcareous, frigid Aridic Ustifluvents
Korchea	Fine loamy, mixed, superactive, calcareous, frigid Mollic Ustifluvents
Lamedeer	Loamy skeletal, mixed, superactive, frigid Calcic Haplustepts
Lohmiller	Fine, smectitic, calcareous, mesic Torrertic Ustifluvents
Macar	Fine-loamy, mixed, superactive, frigid Typic Haplustepts
McRae	Fine loamy, mixed, superactive, mesic Aridic Haplustepts
Midway	Clayey, smectitic, calcareous, mesic, shallow Ustic Torriorthents
Ridge	Loamy, mixed, superactive, frigid, shallow Typic Haplustepts
Ringling	Loamy skeletal over fragmental, mixed, superactive, frigid Typic Haplustolls
Shambo	Fine loamy, mixed, superactive, frigid Typic Haplustolls
Straw	Fine-loamy, mixed, superactive, frigid Cumulic Haplustolls
Wayden	Clayey, smectitic, calcareous, frigid, shallow Typic Ustorthents

Sources: SPE 2017 and 2020

Figure 3.10-1. Soil Map Units in the Study Area

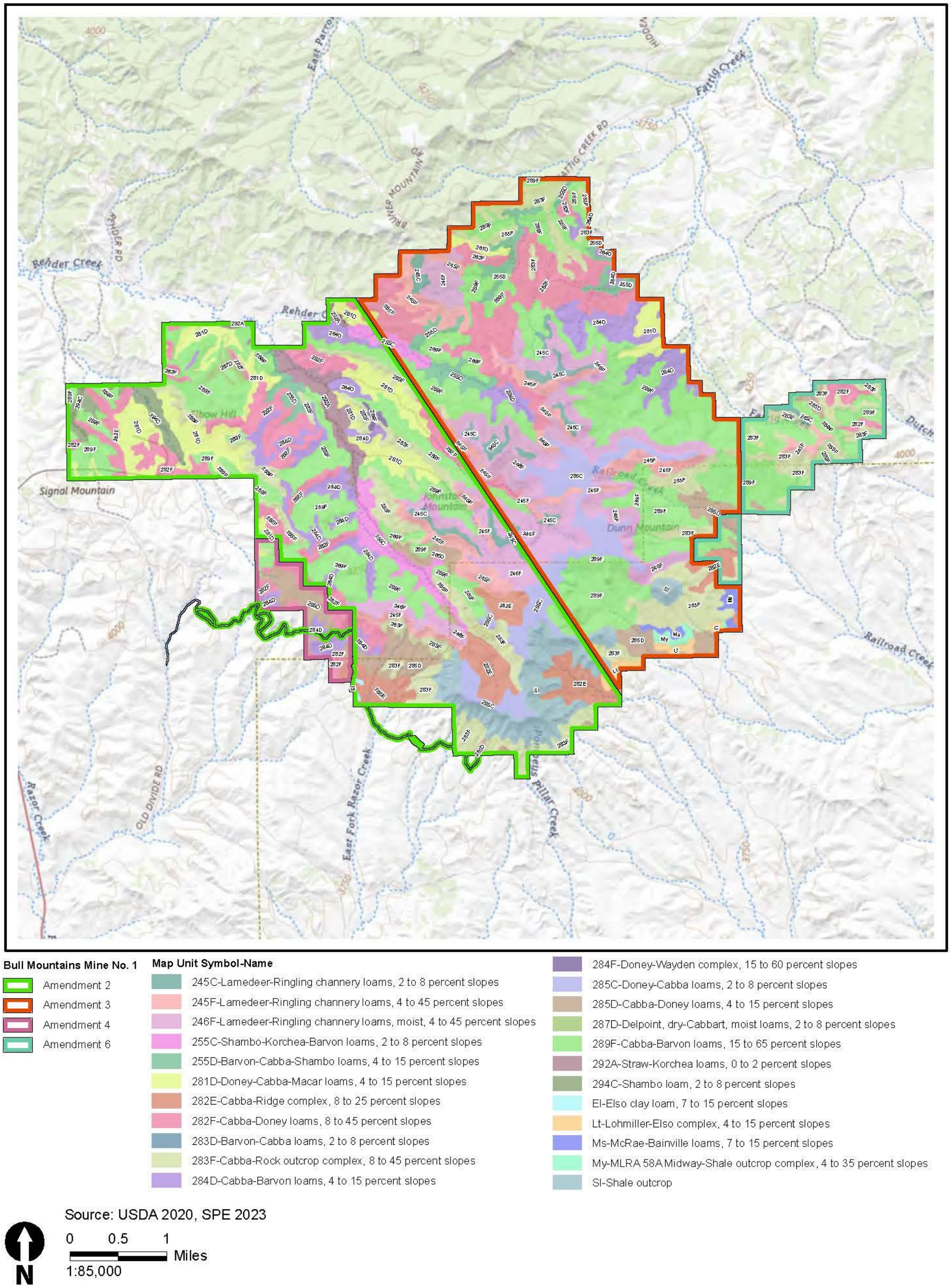
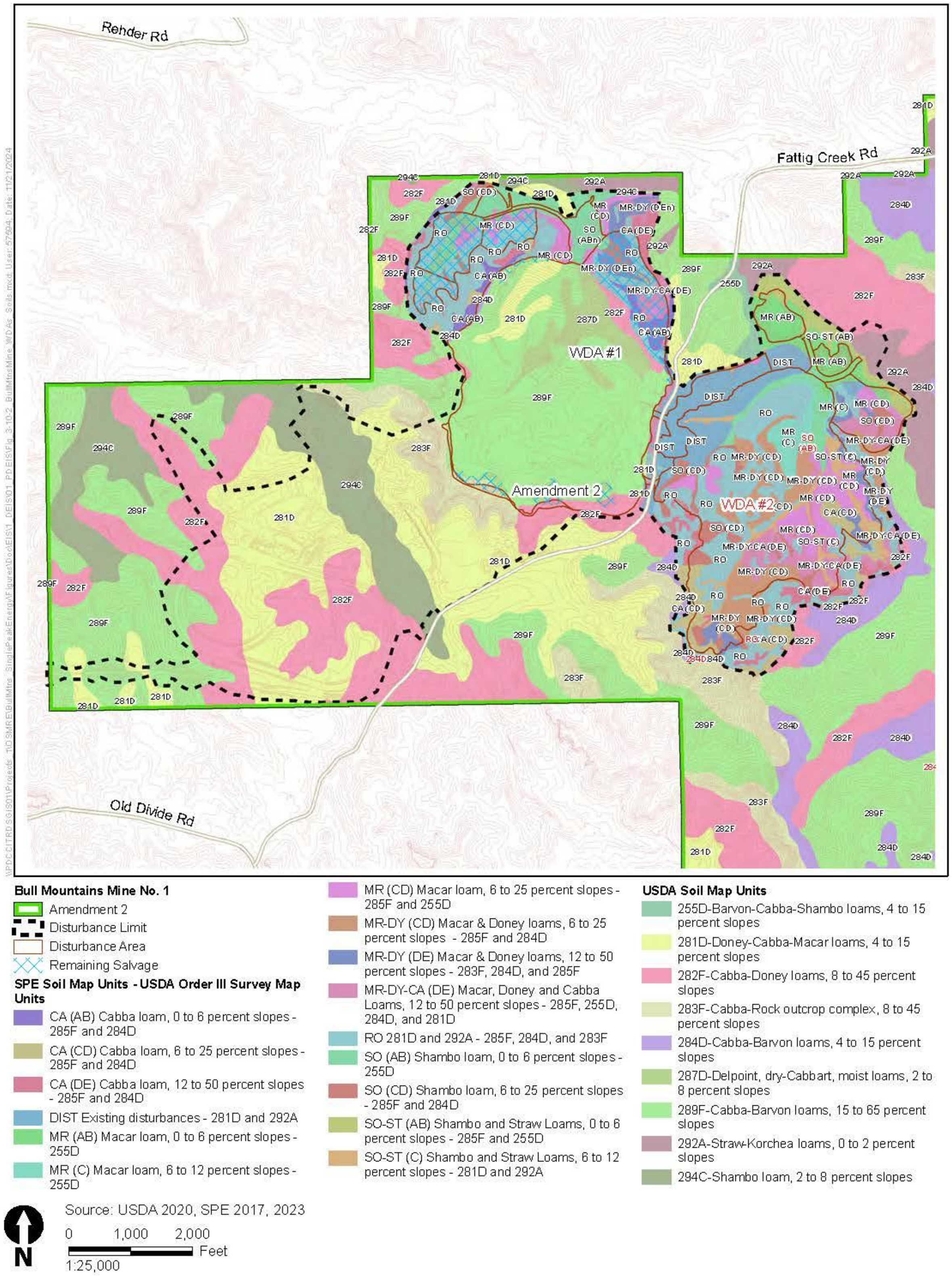


Figure 3.10-2. Soil Map Units in the Facilities Disturbance Area



Natural Resources Conservation Service Order 3 Surveys

Mapping units differ along the county boundary in the southeast corner of the permit area due to differences in nomenclature used by Musselshell versus Yellowstone Counties in their mapping of area Bull Mountains Mine No. 1. Soils found in the mine plan of permit area have somewhat more of an upland character than those of the permit area, based on the percent composition of upland versus lowland soils (SPE 2017 and USDA 2007 and 2010).

Original Surface Disturbance Area Survey

The original surface disturbance area soil survey was a refinement of mapping units within the original surface disturbance area around the mining facilities, rail loop, and WDA 1 based upon the more detailed soil survey conducted in 2014 and 2015 (SPE 2017).

2014 Waste Disposal Area 2 and 2015 Waste Disposal Area 1 Supplemental Soil Survey

The soil types mapped were generally similar to those previously mapped. The classification of soils was completed assuming an ustic moisture regime to maintain consistency with the Order 3 NRCS mapping. Map units were dominated by the Cabba, Macar, Doney, Shambo, and Straw soil series. Salvage depths in this area transition from rock outcrops (no salvage) and shallow soils (<20 inches) on ridges, hilltops, and convex slopes to moderately deep (20-40 inches) and deep (40-60+inches) soils on lower hillslopes, swales, concave slopes, and valley bottoms (SPE 2016 and 2017).

3.10.4.3 Existing Disturbance

Chapter 2 outlines and describes existing disturbance acres from facilities and other surface facilities in the Mine permit area. **Table 3.10-5** below lists the existing, authorized for development, and proposed soil disturbances overlaid with the mapped soil map units for these disturbance features in the permit area.

Table 3.10-5. Existing, Authorized for Development and Proposed Soil Disturbance

Map Unit No.	Soil Map Unit Name	Acres
Existing Disturbance		
255D	Barvon-Cabba-Shambo loams, 4 to 15 percent slopes	6.0
289F	Cabba-Barvon loams, 15 to 65 percent slopes	262.3
284D	Cabba-Barvon loams, 4 to 15 percent slopes	3.0
285D	Cabba-Doney loams, 4 to 15 percent slopes	10.9
282F	Cabba-Doney loams, 8 to 45 percent slopes	93.0
282E	Cabba-Ridge complex, 8 to 25 percent slopes	4.0
283F	Cabba-Rock outcrop complex, 8 to 45 percent slopes	18.1
287D	Delpoint, dry-Cabbart, moist loams, 2 to 8 percent slopes	33.7
281D	Doney-Cabba-Macar loams, 4 to 15 percent slopes	192.0
245F	Lamedeer-Ringling channery loams, 4 to 45 percent slopes	0.5
246F	Lamedeer-Ringling channery loams, moist, 4 to 45 percent slopes	10.0
Lt	Lohmiller-Elso complex, 4 to 15 percent slopes	1.3

Map Unit No.	Soil Map Unit Name	Acres
Sl	Shale outcrop	15.2
294C	Shambo loam, 2 to 8 percent slopes	39.5
255C	Shambo-Korchea-Barvon loams, 2 to 8 percent slopes	13.3
292A	Straw-Korchea loams, 0 to 2 percent slopes	37.5
Existing Disturbance Total		**740.2**
Authorized Disturbance for Development		
283D	Barvon-Cabba loams, 2 to 8 percent slopes	1.4
255D	Barvon-Cabba-Shambo loams, 4 to 15 percent slopes	56.6
289F	Cabba-Barvon loams, 15 to 65 percent slopes	0.1
284D	Cabba-Barvon loams, 4 to 15 percent slopes	49.2
285D	Cabba-Doney loams, 4 to 15 percent slopes	12.7
282F	Cabba-Doney loams, 8 to 45 percent slopes	147.5
282E	Cabba-Ridge complex, 8 to 25 percent slopes	9.3
283F	Cabba-Rock outcrop complex, 8 to 45 percent slopes	9.3
281D	Doney-Cabba-Macar loams, 4 to 15 percent slopes	7.7
El	Elso clay loam, 7 to 15 percent slopes	1.1
My	Midway-Shale outcrop complex, 4 to 35 percent slopes	0.1
292A	Straw-Korchea loams, 0 to 2 percent slopes	2.0
Authorized Disturbance for Development Total		**297.0**
Proposed Disturbance		
255D	Barvon-Cabba-Shambo loams, 4 to 15 percent slopes	0.1
289F	Cabba-Barvon loams, 15 to 65 percent slopes	5.2
285D	Cabba-Doney loams, 4 to 15 percent slopes	2.3
283F	Cabba-Rock outcrop complex, 8 to 45 percent slopes	3.6
Proposed Disturbance Total		**11.1**
Grand Total		**1,048.3**

Sources: SPE 2007a and 2023; USDA 2007 and 2010

3.10.4.4 Soil Stockpiles and Salvage Volumes

The salvageable soil depths and estimated volumes for each mapping unit within the surface disturbance area and WDA 2 (including WDA 1 Expansion Area) Area, are listed in **Table 3.10-6** below.

Table 3.10-6. Soil Series and Topsoil/Subsoil Salvage Depths in the Limit of Disturbance Area (Sections 12, 13, and 14, T6N, 26E)

Soil Series No.[1]	Soil Series	Salvageable Soil Depth (inches) Topsoil/Subsoil
1	Cabbart Loam, 15 to 30 percent slopes	12/18
1A	Cabbart Loam, 0 to 8 percent slopes	4/8
1B	Cabbart Loam, 2 to 10 percent slopes	6/62
2	Delpoint Loam, 10 to 20 percent slopes	12/72
3	Havre Loam, 0 to 8 percent slopes	12/72
4	Rock Outcrop	0/0
5	Disturbed Area	0/0
5A	Reclaimed Area	6/12
81D	Cabbart Loam, 0 to 8 percent slopes	4/8
82B	Cabbart-Delpoint Loams, 4 to 15 percent slopes	12/18
82E	Cabbart-Delpoint-Rock Outcrop Complex, 15 to 45 percent slopes	12/18
131C	Delpoint-Yamac Loams, 2 to 8 percent slopes	12/18

[1] SPE soil series designed number
Source: SPE 2007b and 2007c

Soil volumes per soil type (topsoil, subsoil, and suitable) are updated annually, if needed, and submitted to MDEQ in the Mine’s annual report. All topsoil and subsoil piles are stabilized to prevent erosion by either wind or water. The piles are graded and the side slopes tracked with a dozer to create small impressions to hold moisture and to prevent rills on the slopes (SPE 2024).

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3.11 Vegetation

3.11.1 Introduction

The vegetation types assessed in this section range from ponderosa pine and Rocky Mountain juniper forests on uplands, rock outcrops, and ravines at higher elevations; to sagebrush and mixed prairie grassland communities on benches, slopes, and drainages where soils are deeper. Within the study area, these vegetation types provide wildlife habitat, stabilize and protect soils; support agricultural and grazing operations, and provide other valuable ecosystem functions.

3.11.2 Study Area

The study area for vegetation includes both a direct effects study area and an indirect effects study area. Both the direct and indirect effects study areas are the permit area. The past, present, and RFFA effects study area for vegetation includes the HUC 12 subwatersheds for Rehder, Halfbreed, Parrot, Upper Fattig, Upper Railroad, Upper Pompeys Pillar, Upper Razor, and Middle Razor creeks (**Table 3.0-1**, **Figure 3.0-1**). Direct, indirect, and past, present, and RFFA impacts are discussed in detail in **Chapter 4**.

3.11.3 Regulatory Framework

3.11.3.1 Federal Requirements

SMCRA established a nationwide program to protect society and the environment from the adverse effects of surface coal mining and reclamation operations. SMCRA authorizes OSMRE oversight of State regulatory programs with primacy, which includes oversight of State program compliance with requirements related to the protection and enhancement of proposed or listed species, including plant species, protection and enhancement of important habitats, and achieving minimum vegetative standards in reclamation. OSMRE administers and enforces SMCRA on behalf of the Secretary of the Interior. SMCRA sets forth minimum performance standards for environmental protection and public health and safety which apply to, surface effects of underground coal mining operations and reclamation.

Additionally, the ESA requires OSMRE, in coordination with the USFWS, to ensure that any action they authorize, fund, or carry out would not adversely affect a federally listed threatened or endangered species, which can include plant species (16 U.S.C. §§ 1531-1544). The ESA also requires OSMRE to confer with the USFWS on any agency action that is likely to jeopardize the continued existence of proposed species or result in the destruction or adverse modification of proposed critical habitat.

OSMRE is also required to prevent the spread of, and manage for, invasive species and noxious weeds. EO 13112 – Invasive Species, defines invasive species as an alien species whose introduction causes, or is likely to cause, economic or environmental harm or harm to human health. Federal agencies whose actions may affect the status of invasive species should prevent the introduction and spread of invasive species, detect, and respond rapidly to control populations of invasive species in a cost-effective and environmentally sound manner, monitor invasive species populations accurately and reliably, and provide for restoration of native species and habitat conditions in ecosystems that have been invaded.

Lastly, the Federal Noxious Weed Act of 1974, as amended (7 U.S.C. §§ 2801 *et seq*.) requires cooperation with state, local, and other Federal agencies in the application and enforcement of all laws and regulations related to the management and control of noxious weeds. In recognition of these regulations, NEPA documents consider and analyze the potential for the spread of noxious weed species and provide preventative or rehabilitation measures for management actions involving surface disturbance as noxious and invasive species spread aggressively with few, if any, natural limiting factors, and can result in substantial changes to vegetation composition, structure, and ecosystem function.

3.11.3.2 State Requirements

The Montana Natural Heritage Program (MTNHP) maintains a list of plant species, classified as species of concern (SOC) that are native plant and animal species considered to be rare, or at risk of becoming endangered or extirpated in Montana. The SOC list includes many of the BLM Special Status Plant Species and ESA-listed species managed at the Federal level. However, the SOC list is not a statutory or regulatory classification; instead, it provides a basis for resource management, conservation, and data collection priorities throughout the state.

MSUMRA (82-4-233 and 82-4-235, MCA) and its implementing rules (Subchapters 3, 5, 6, 7, 8, and 11 of the ARM) include regulations requiring collection of baseline vegetation information, enforcement of reclamation and revegetation activities, protection of federally listed T&E species, and vegetation-specific conditions for bond releases.

Noxious weeds are managed under the ARM Chapter 4.5: Noxious Weed Management, and the Montana County Weed Control Act (7-22-2102 through 7-22-2153, MCA, as amended). The State of Montana defines noxious weeds as “any exotic plant species established or that may be introduced into the state that may render land unfit for agriculture, forestry, livestock, wildlife, or other beneficial uses or that may harm native plant communities.” Furthermore, a noxious weed is defined as such when designated as a statewide noxious weed by rule of the Montana Department of Agriculture (MDA) or as a district noxious weed by a board, following public notice of intent and a public hearing. Additionally, MSUMRA (17.24.308, MCA) requires mine operators to submit a plan to prevent the establishment of, or to control, noxious weeds on lands within the permit area to comply with the Montana County Weed Control Act. MDA maintains and updates a prioritized list of State-listed noxious weeds for reference (MDA 2019).

3.11.3.3 Local Requirements

The Musselshell/Golden Valley Weed District helps with noxious weed identification and control of noxious weeds in Musselshell County. The Yellowstone County Noxious Weed Division assists the public, private, and other government agencies to manage and control existing noxious weed infestations and prevent new invasive species from infesting the county. Yellowstone County maintains the Yellowstone County Noxious Weed Management Plan as a mechanism to ensure effective management of State and County declared noxious weeds (Yellowstone County 2018).

There are no other applicable local regulations for vegetation resources within or near the study area.

3.11.4 Existing Conditions

Vegetation of the study area is characteristic of the Eastern Sedimentary Plains of Montana in the 10-to-14-inch precipitation zone (Scow 2009). Vegetation cover varies from ponderosa pine and Rocky Mountain juniper forests on uplands, rock outcrops, and ravines at higher elevations, to sagebrush and mixed prairie grassland communities on benches, slopes, and drainages where soils are deeper. Existing influences on local distribution of plant communities include soils, topography, surface disturbance, availability of water, management boundary fence lines, and soil salinity. Livestock grazing, fire suppression, and a large wildfire in 1984 have substantially affected plant succession in the study area.

3.11.4.1 Vegetation Survey History

During the spring of 1989, Meridian Minerals Company retained the services of Greystone Consultants to complete vegetation baseline studies for Bull Mountains Mine No. 1. The Montana Department of State Lands (MDSL) reviewed the vegetation field inventory work, and the subsequent Permit Application Vegetation Baseline Study and associated appendices and maps. The MDSL determined that the information submitted did not meet the requirements of the applicable vegetation rule [ARM 26.4.304(9)] in affect at the time of Permit Application submittal (January 31, 1991). Portions of the 1989 vegetation inventory narrative, data and maps were deleted from the 1991 Permit Application, as per MDSL request (SPE 2023a).

The initial baseline vegetation study was redone and conducted by WESTECH for the Mine during the summer of 1991 (Scow 1991). The revised vegetation study was reviewed in 1992 by MDSL, which was submitted as a part of the initial Mine Permit. The Mine was eventually sold to Bull Mountain Coal Mining, Inc. (BMCM), which added approximately 2,172 acres to its Mine permit area via Permit Amendment Application 00178 ("the South Amendment Area") in 2006 and 2007. This amendment required two additional vegetation baseline studies for the South Amendment area, and one Vegetation Baseline Study for the Life-of-Mine (LOM) extension area (Scow 2008 and 2009). The South Amendment Area encompasses the south and southeastern portions of AM 2 and AM 3.

The 1991 vegetation inventory addressed both the surface disturbance area (intensive study area) and the permit area excluding the surface disturbance area as well as the extended mine plan area (extensive study area). The survey identified and mapped vegetation community types and complied a comprehensive species list (including potential rare plant species) for both study areas (SPE 2023a).

Beginning in 2007, baseline hydrophytic vegetation inventories of spring/seep sites in the South Amendment Area were designed to locate and sample vegetation at all known spring/seep sites in this survey area. Sampling protocols for this study are consistent with those currently employed for the hydrophytic vegetation monitoring program that is carried out at the Mine (Scow 2008).

The 2008 baseline upland vegetation inventory of pre-mining vegetation within the proposed 5-year permit area and LOM area for the South Amendment Area were conducted to provide a baseline assessment of impacts and reference for reclamation. The baseline upland vegetation study emphasized accurate mapping of vegetation types and collection of detailed vegetation composition data. The compositional data and available soil mapping were then used to establish a baseline for the range condition of vegetation types in the South Amendment, including potential sensitive plant populations and noxious weeds (Scow 2009).

In summary, the following baseline vegetation surveys have been completed in the study area:

- 1991 baseline vegetation survey of the Surface Facilities area, the Mine permit area and the original LOM area (Scow 1991). This section was originally titled Appendix 304(9)-26 in Volumes 6A and 6B of the original permit application.
- 2007 Hydrophytic Vegetation Survey of the South Amendment Area (both the permit area and the LOM area) (Scow, 2008).
- 2008 Baseline Upland Vegetation Survey of the South Amendment Area (both the permit area and the LOM area) (Scow, 2009).

No other vegetation inventories have been completed at the Mine since the BLM Coal Lease EA was prepared.

A composite map was generated of the vegetation community types occurring across the original Mine permit survey area, the South Amendment Area, AM 2, and the LOM extension area, which includes the area classified under the No Action Alternative. The vegetation types were generally classified into their primary growth types (e.g., grasslands, shrub-grasslands, etc.) for summary presentation. Some areas were added to the composite map that were not included in the original surveys. These areas include the pumpable cribbing (gob seals) access road and portion of the permit in T5N, R27E, NE ¼ Section 4 (Intake Air Portal Revision Area), Portal 2, Portal 4, and AM 4. These added areas were interpolated from recent aerial photography to complete the vegetation mapping of the study area (SPE 2023a).

3.11.4.2 Vegetation Communities

The vegetation in the study area is characteristic of the Eastern Sedimentary Plains of Montana in the 10-to-14-inch precipitation zone. The analysis area ranges in elevation from 3,825 feet above sea level (asl) to more than 4,745 feet. The analysis area has limited human impact beyond the existing mine operations, but some vegetation communities have been impacted by livestock grazing, agricultural operations, roads, utility corridors, and wildlife.

Vegetation types in the study area were determined during the 2008 Baseline Upland Vegetation Survey discussed above. Five primary vegetation communities were identified: burned ponderosa pine stands, grassland, pine forest & pine savannah, shrub grassland, and tame pastureland (**Figure 3.11-1**). The plant communities were segregated by dominant plant species, influence of soil type/texture, topography, elevation, and other related factors. Less prevalent vegetation communities include areas of disturbance, cropland, thin breaks and rock outcrop, and water/miscellaneous areas.

The burned ponderosa pine stands, grassland, and pine forest & pine savannah plant communities dominate the land-surface cover, comprising more than 80 percent of the total study area (**Table 3.11-1**). Shrub grassland comprises approximately 11 percent of the study area while pastureland and cropland occupy approximately 2 percent, and all other community and land-use types occupy approximately 6 percent of the study area. **Table 3.11-2** shows the vegetation community acres by amendment area.

Table 3.11-1. Vegetation Community Type Acreage Summary in the Permit Area

Vegetation Community and Land Types Supporting Vegetation	Acres	Percent of Total
Burned Ponderosa Pine Stands	6,169.9	37.4
Grassland	4,030.0	24.4
Pine Forest and Pine Savannah	3,152.3	19.1
Shrub Grassland	1,827.1	11.1
Tame Pastureland	259.9	1.6
Cropland	31.3	0.2
Thin Breaks and Rock Outcrop	902.8	5.5
Disturbed Areas	117.3	0.7
Water & Miscellaneous Areas	16.6	0.1
Total	**16,507.2**	**100.0**

Source: SPE 2023a

Table 3.11-2. Vegetation Community Acreage Summary by Amendment Area

Vegetation Community and Land Types Supporting Vegetation	Acres in Amendment Area	Percent of Total Amendment Area
Amendment 2		
Burned Ponderosa Pine Stands	3,428.8	44.4
Cropland	31.3	0.4
Disturbed Areas	117.3	1.5
Grassland	1,847.6	23.9
Pine Forest and Pine Savannah	955.5	12.4
Shrub Grassland	542.2	7.0
Tame Pastureland	258.3	3.3
Thin Breaks and Rock Outcrop	529.5	6.9
Water and Miscellaneous Areas	14.3	0.2
Total	**7,724.8**	**100.0**
Amendment 3		
Burned Ponderosa Pine Stands	2,737.0	37.5
Grassland	1,772.9	24.3
Pine Forest and Pine Savannah	2,043.4	27.9
Shrub Grassland	632.8	8.7
Thin Breaks and Rock Outcrop	117.9	1.6
Water & Miscellaneous Areas	2.3	0.1
Total	**7,306.3**	**100.0**
Amendment 4		
Burned Ponderosa Pine Stands	3.8	0.9
Grassland	165.9	37.6
Shrub Grassland	215.4	48.8
Thin Breaks and Rock Outcrop	56.7	12.8
Total	**441.8**	**100.0**

Vegetation Community and Land Types Supporting Vegetation	Acres in Amendment Area	Percent of Total Amendment Area
Amendment 6		
Burned Ponderosa Pine Stands	0.4	0.1
Grassland	243.6	23.6
Pine Forest and Pine Savannah	153.4	14.8
Shrub Grassland	436.7	42.2
Tame Pastureland	1.6	0.2
Thin Breaks and Rock Outcrop	198.8	19.2
Total	**1,034.5**	**100.0**

Source: SPE 2023a

Burned Ponderosa Pine Stands

The burned ponderosa pine (*Pinus ponderosa*) stands community is the dominant vegetation type in the study area. It is a transitional community resulting from a wildfire in 1984 that removed virtually all live pine canopy from a large percentage of pine stands in the study area. Damage ranges from a few sites of partial burns, which affected the understory of herbaceous vegetation, shrubs and tree seedlings/saplings and scattered mature tree crowns, to the preponderance of sites in severely burned stands where the understory was substantially altered, and the pine crown canopy was entirely removed. Grasses and forbs have proliferated in the post-fire community, while ponderosa pine reproduction is not evident.

Grassland

Upland herbaceous communities in the study area were identified as "grasslands" according to physiognomic stature. Grasslands occur on deep soil of flat valley bottoms to gently sloping hillsides and occasionally on hilltops surrounded by conifers. Species composition varies considerably in grassland communities, depending on size of stand, topographic position and aspect, soil texture, adjacent community types, burn intensity and grazing history. However, these grassland communities are comprised of two series dominated by western wheatgrass (*Agropyron smithii*) and bluebunch wheatgrass (*Agropyron spicatum*).

Pine Forest and Pine Savannah

The pine forest and pine savannah vegetation type is comprised of ponderosa pine breaks with a mix of shrubs and grasses characterizing the understory. Three pine/grass communities dominate this vegetation community including ponderosa pine/ bluebunch wheatgrass, ponderosa pine/western wheatgrass and ponderosa pine/Idaho fescue (*Festuca idahoensis*). The remaining composition of this vegetation community is comprised of two pine/shrub types, including ponderosa pine/chokecherry (*Prunus virginiana*) and ponderosa pine/western snowberry (*Symphoricarpos occidentalis*).

Shrub Grassland

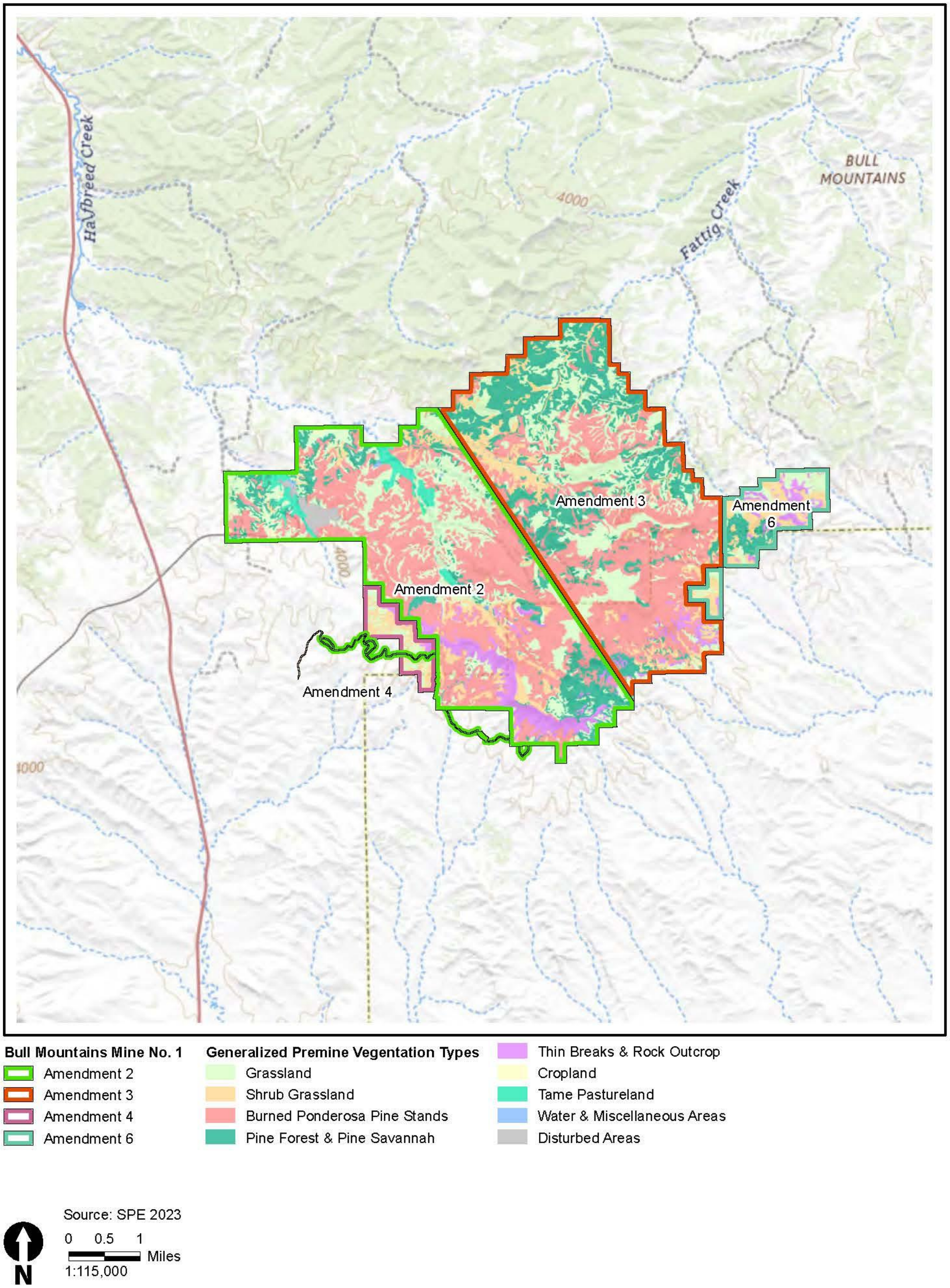
The shrub grassland vegetation community consists of both shrub and grassland species, generally occurring on gentle to moderately sloping bottoms, benches and lower slopes of variable aspects.

Within the study area, the shrub grassland community is dominated by multiple sagebrush (*Artemisia cana*) species.

Tame Pastureland

The tame pastureland and hay meadow vegetation community consists of several cultivated areas planted to introduce grasses (crested and intermediate wheatgrass) or alfalfa. They are often grazed or harvested and are limited to very small portions of the study area.

Figure 3.11-1. Pre-Mining Vegetation Communities Composite



3.11.4.3 Special Status Plant Species

Information from the Montana Natural Heritage Program website (MTNHP 2024) indicates that there are no known occurrences of Federal sensitive plant species in or near the study area, nor are there any known occurrences within Musselshell or Yellowstone Counties themselves. BLM confirmed that there are no known BLM specific sensitive species in the study area (Taylor 2009). USFWS (2024) sensitive species lists also do not indicate any known occurrences in the study area. Further, no USFWS threatened or endangered plant species are known to occur in Musselshell or Yellowstone Counties (USFWS 2024).

The Montana Natural Heritage Program (MTNHP 2024) also indicates that there are no known occurrences of State sensitive plant species (vascular and non-vascular) within Musselshell or Yellowstone Counties.

3.11.4.4 Noxious Weeds and Non-Native Invasive Species

Competition from noxious weeds and invasive, non-native plants constitutes a potential threat to native plant species and wildlife habitat within the study area. SPE controls noxious weeds on company-owned private surface. SPE also controls noxious weeds on other surface in the permit area where noxious weeds can reasonably be attributed to activities of SPE. However, other surface owners are responsible for noxious weed control elsewhere in the Mine permit area. SPE controls noxious weeds with herbicide in accordance with Weed Management Plans approved by the Yellowstone County Weed District and Musselshell County Weed District (SPE 2023c, 2023d).

Eight noxious weeds have been identified in the permit area, including four State-listed species, (MDA 2019) and three County-listed species (Musselshell County 2024, Yellowstone County 2024). **Table 3.11-3** lists the noxious weeds and non-native invasive species identified in the permit area (SPE 2023b).

Table 3.11-3. Noxious Weeds and Non-Native Invasive Species

Species	Classification
Saltcedar (*Tamarix spp*)	State Listed Noxious Weed – Priority 2B
Canada Thistle (*Cirsium arvense*)	State Listed Noxious Weed – Priority 2B
Spotted Knapweed (*Centaurea stoebe, C. maculosa*)	State Listed Noxious Weed – Priority 2B
Houndstongue (*Cynoglossum officinale*)	State Listed Noxious Weed – Priority 2B
Russian Olive (*Elaeagnus angustifolia*)	Regulated Weeds – Priority 3
Common Mullein *(Verbascum thapsus L.)*	Yellowstone County Noxious Weed
Scotch Thistle *(Onopordum acanthium)*	Yellowstone County Noxious Weed
Black Henbane (*Hyoscyamus niger)*	Musselshell County Noxious Weed
Bull Thistle *(Cirsium vulgare)*	Non-Native Invasive Species

Source: SPE 2023b
Priority 2B - These weeds are abundant in Montana and widespread in many counties. Management criteria will require eradication or containment where less abundant. Management shall be prioritized by local weed districts (MDA 2019).
Priority 3 - These regulated plants have the potential to have significant negative impacts. The plant may not be intentionally spread or sold other than as a contaminant in agricultural products. The State recommends research, education and prevention to minimize the spread of the regulated plant. These are not Montana listed noxious weeds (MDA 2019).

County Noxious Weeds - Noxious weeds as identified by individual counties.
Non-Native Invasive Species – Species that are exotic, or non-native, but are not listed as noxious weeds.

3.11.4.5 Livestock Grazing

Livestock currently graze all vegetation types within the study area; however, gazing primarily occurs in the grassland, shrub grassland, and tame pastureland vegetation types. Livestock grazing in the region is largely limited to the vegetative growing season because of the winter snow cover and cold temperatures. Grazing management in the study area generally follows a deferred rotation system. This system is the recommended long term grazing management system because deferred rotation grazing provides benefits to livestock gains, pasture improvement (both vegetation and soils), and net returns.

The savory, or intensive, grazing management system is also used in the study area by a few ranchers. As mentioned above, this system involves intensive management and grazing of the available forage. This method promotes better use of the forage and, when managed correctly, would benefit the range condition by the removal of the standing crop that promotes root and plant development during the non-grazing periods. The disadvantage of this system is the high level of management by the operator, increased fencing costs, and the added stress to the animals during pasture rotation.

Grazing management in the study area is mainly influenced by the weather. Snow cover and cold spring temperatures would sometimes delay the use of the spring pastures. However, precipitation is the primary factor for determining pasture use. During moist years, pastures would sustain longer and heavier use. During dry years, livestock would be moved more frequently or be grazed at a lesser stocking rate.

The areas of Federal surface are managed by BLM under the Standards for Rangeland Health and Guidelines for Livestock Grazing Management (BLM 2009). These areas are shown on **Figure 3.11-2,** and the associated acreage is shown on **Table 3.11-4**. These standards apply primarily to rangeland health and only indirectly address by-products of healthy rangeland such as higher livestock productivity and healthy wildlife. The standards must meet the Fundamental of Rangeland Health listed at 43 CFR Part 4180 and conform to other applicable Federal regulations and guidelines. The fundamentals of rangeland health include:

- Maintain or promote adequate amounts of vegetative ground cover;
- Maintain or promote subsurface soil conditions;
- Maintain, improve or restore riparian-wetland functions;
- Maintain or promote stream channel morphology;
- Maintain or promote appropriate kinds and amounts of soil organisms, plants and animals;
- Promote the opportunity for seedling establishment;
- Maintain, restore, enhance water quality;
- Restore, maintain or enhance T&E habitat;
- Restore, maintain, enhance T&E candidate and special status species habitat;
- Maintain or promote native populations and their communities;

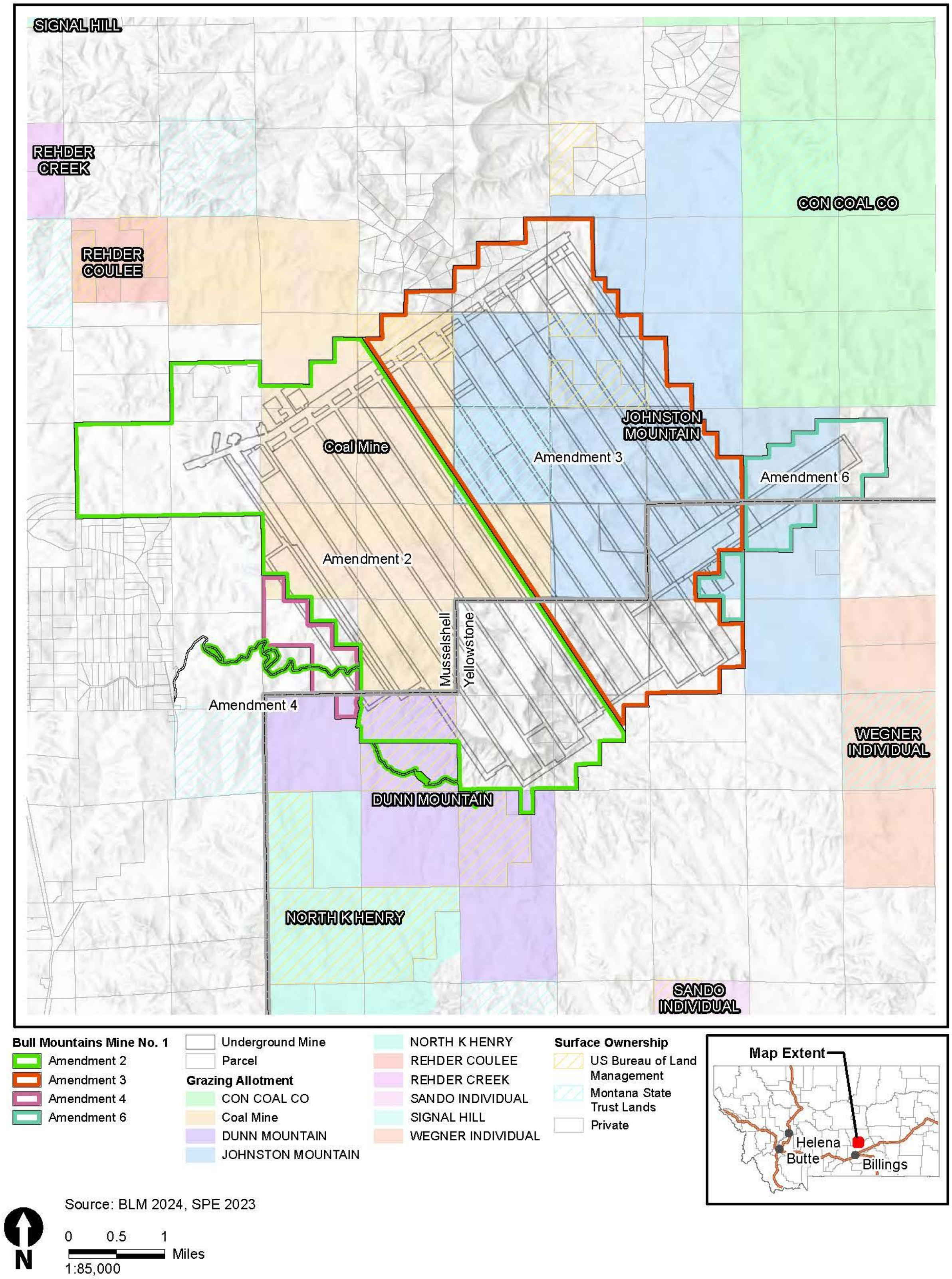
- Emphasize native species in the support of ecological function; and
- Only incorporate the use non-native plant species when native species are not available or are incapable of achieving proper functioning condition.

The study area includes three livestock grazing allotments, as shown in **Figure 3.11-2. Table 3.11-4** outlines the location, size and distribution of each gazing allotment within each Mine Permit Amendment Area.

Table 3.11-4. Livestock Grazing Allotments by Amendment

Allotment No.	Allotment Name	Acres
05337	Dunn Mountain	415.6
	Amendment 2	*375.9*
	Amendment 3	*0.0*
	Amendment 4	*39.8*
	Amendment 6	*0.0*
03195	Coal Mine	4,714.9
	Amendment 2	*3,822.5*
	Amendment 3	*853.6*
	Amendment 4	*38.9*
	Amendment 6	*0.0*
09680	Johnson Mountain	5,222.9
	Amendment 2	*21.0*
	Amendment 3	*4,440.4*
	Amendment 4	*0.0*
	Amendment 6	*761.5*

Figure 3.11-2. Grazing Allotments



3.12 Wildlife

3.12.1 Introduction

Wildlife resources, for this purpose of this analysis, include big game, terrestrial and aquatic wildlife, and migratory birds. Affected environment for special status species, including species listed as endangered or threatened under the Federal ESA and those proposed or candidates for listing, and BLM Sensitive Species, are discussed in **Section 3.13**.

3.12.2 Study Area

The study area for wildlife includes both a direct effects study area and an indirect effects study area; and includes private, state, and federally owned (BLM) surface and mineral interests (**Figure 1.1-1**). Both the direct and indirect effects study areas encompass the permit area plus a one-mile buffer, and a 600-meter buffer around the rail transportation route to Laurel. The past, present, and RFFA effects study area for wildlife includes the HUC 12 subwatersheds for Rehder Creek, Halfbreed Creek, Parrot Creek, Upper Fattig Creek, Upper Railroad Creek, Upper Pompeys Pillar Creek, Upper Razor Creek, and Middle Razor Creek; plus, a 600-meter buffer around the rail transportation route to Laurel (**Table 3.0-1**, **Figure 3.0-2**). Direct, indirect and past, present, and RFFA impacts are discussed in **Chapter 4**.

3.12.3 Regulatory Framework

3.12.3.1 Federal Requirements

Congress enacted SMCRA to establish a nationwide program to protect society and the environment from the adverse effects of surface coal mining and reclamation operations. Permit applications must provide information sufficient to ensure that surface coal mining operations are designed and conducted in accordance with SMCRA and its implementing regulations. OSMRE administers and enforces SMCRA on behalf of the Secretary of the Interior. SMCRA contains a directive to minimize disturbances and adverse impacts of the operation on fish, wildlife, and related environmental values, and achieve enhancement of such resources where practicable.

BLM manages habitat for wildlife on BLM-administered lands in accordance with existing land use plans. BLM maintains agency policies that drive management of wildlife habitats, including instruction memoranda (IM). The Billings Field Office (FO) Approved Resource Management Plan (RMP) (BLM 2015) defines the management goals and objectives for wildlife habitat within BLM's jurisdiction. BLM released a habitat connectivity policy IM in 2022 to protect connections between habitats for fish, wildlife, and native plants to ensure self-sustaining populations and to preserve the ability of wildlife to migrate between and across seasonal habitat (BLM 2022).

Under the Migratory Bird Treaty Act (MBTA) of 1918 (16 U.S.C. 703-712; Ch 128 as amended), agencies are required to consider management impacts to migratory birds (including raptors). Under the MBTA, it is illegal to "take" any migratory bird, its eggs, its parts, or any bird nest except as permitted (such as waterfowl hunting licenses, falconry licenses, or bird banding permits) by USFWS. The definition of "take" under the MBTA includes any attempts or acts of pursuing, hunting, shooting, wounding, killing, trapping, capturing, possessing, or collecting. Removal of active nests resulting in the loss of eggs or young is also prohibited (16 U.S.C. §§ 703–712). In addition, EO

13186, *Migratory Bird Conservation*, directs Federal agencies to develop a Memorandum of Understanding with USFWS to further implement the MBTA and promote the conservation of migratory bird populations. A Memorandum of Understanding between OSMRE and the USFWS (2016) “strengthen (s) migratory bird conservation through enhanced collaboration between OSMRE and the USFWS” and “focuses on identifying areas of cooperation and avoiding or minimizing avian stressors on migratory birds with an emphasis on species of concern and their habitats”.

While all migratory birds are protected under the MBTA, some species have been identified as being of particular conservation concern by the USFWS, which are classified as Birds of Conservation Concern (BCC) (USFWS 2021). The BCC list identifies bird species that “without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act of 1973.” Species on this list have been assessed based on population trends, threats, distribution, abundance, and relative density (USFWS 2021). Inclusion in the BCC list does not constitute a finding that listing under the ESA is warranted, or that substantial information exists to indicate that listing under the ESA may be warranted (USFWS 2021); This designation is a watch list and does not constitute an additional regulatory protection.

Any activity proposed on lands managed by the USFWS National Wildlife Refuge system must undergo a Compatibility Determination conducted by the Refuge.

The Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. § 668) is administered by the USFWS and protects bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*). BGEPA prohibits the “take” of bald or golden eagles, which applies to individual eagles, eggs, nests, and feathers. Take is defined as pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb. Recent clarification (72 FR 31132) explicitly defines disturbance and protects eagles from impacts of human-initiated activities primarily around active, alternate, and historic nest sites. The definition of “disturb” includes any activity that will cause, or is likely to cause, based on the best scientific information available (1) injury to an eagle; (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior; or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior. Montana mining regulations require SPE to report bald or golden eagle roost sites, seasonal concentration area, or breeding territory to MDEQ and USFWS to ensure mining activities do not result in take (State of Montana Administrative Rules Governing Mining, Rule 17.24.751).

3.12.3.2 State Requirements

In general, most terrestrial and aquatic wildlife in the study area are managed by Montana Fish, Wildlife and Parks. The State of Montana regulates wildlife resources under MCA Title 87 Fish and Wildlife, Chapter 5, Wildlife Protection. The Montana Department of Fish, Wildlife & Parks (MFWP) is responsible for the conservation and management of birds, mammals, reptiles, and amphibians and their habitats.

The Montana Natural Heritage Program (MTNHP) maintains a list of species classified as species of concern (SOC) that are native plant and animal species considered to be rare, or at risk of becoming endangered or extirpated in Montana. The SOC list includes many of the BLM- and ESA-listed species. However, the SOC list is not a statutory or regulatory classification, rather it provides a basis for resource management, conservation, and data collection priorities throughout the state.

MSUMRA (82-4-233 and 82-4-235, MCA) contains implementing rules under the ARM (Subchapters 3, 5, 6, 7, 8, and 11 of the ARM). One of the primary objectives of MSUMRA is wildlife protection [82-4-202(2)(a), MCA]. ARM 17.24.751(1) prohibits mining operations that may jeopardize continued existence of federally listed threatened or endangered species, result in adverse modification of critical habitat, or result in unlawful take of bald or golden eagles including active nests or eggs. ARM 17.24.751(2)(a–g) requires avoidance and minimization measures as well as BMPs for siting and construction of electric power lines, roads, and fencing that minimize adverse impacts on wildlife habitat. MSUMRA and the associated administrative rules require submittal of pre-mining wildlife surveys, preparation of a fish and wildlife plan, periodic monitoring and reporting during operations, and reclamation of wildlife habitats. These requirements are summarized in MDEQ's 2001 *Fish and Wildlife Guidelines for the Montana Strip and Underground Mine Reclamation Act* document (MDEQ 2001).

3.12.3.3 Local Requirements

There are no applicable local regulations for fish and wildlife resources within or near the analysis area.

3.12.4 Existing Conditions

As described in **Section 3.11**, habitat for wildlife is largely comprised of burned ponderosa pine stands, grassland, and pine forest & pine savannah plant communities that dominate the land-surface cover. Smaller areas of additional vegetation communities including shrub grassland, pastureland and cropland provide wildlife habitat. **Appendix D** presents a comprehensive list of wildlife species and the year or survey period during which they were recorded in the Mine vicinity. The list also includes species that are expected to occur in the area but have not yet been recorded. Many species occurring at the Mine are migratory birds protected under the MBTA, including bald and golden eagles, which are also protected under the BGEPA.

Mining-related wildlife studies began in the Bull Mountains in the early 1970s (SPE 2023) and annual wildlife monitoring was conducted in 1991 – 1996 and resumed in 2003. Catena Consulting, LLC (Catena) assumed responsibility for wildlife monitoring in the permit area in early 2010. Baseline wildlife surveys for AM 6 occurred in 2022 and 2023 (Catena 2024). Surveys and monitoring have not occurred around the existing rail transportation route to Laurel.

3.12.4.1 Big Game and Predators

Catena Consulting, LLC (Catena) has conducted annual wildlife surveys and presented findings in wildlife survey reports from 2011-2024 (Catena 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023).

MFWP conducts monitoring of big game species in the study area to assess population levels and population trends to inform management decisions. Recent data for species monitored by MFWP is included in Catena 2024, as well as in information provided in previous years.

Four species of big game have been recorded in the study area, including mule deer, elk, pronghorn, and white-tailed deer. Mule deer have been the most abundant game species in the permit area during surveys (Catena 2023). Pronghorn and white-tailed deer are relatively less abundant in the area (Catena 2023). In 2022, observations of elk and mule deer were fewer than previous years; pronghorn observations in 2022 were within range of historical records. White-tailed deer were not observed in 2021 and 2022. MFWP has expressed concern for mule deer populations and declines in population estimates across MFWP Region 5 and no specific concerns about elk, pronghorn, and whitetail deer populations (Catena 2024).

Monitoring has not occurred around the rail transportation route to Laurel. The study area is outside of priority migration areas for big game species (MFWP 2022).

Mule Deer

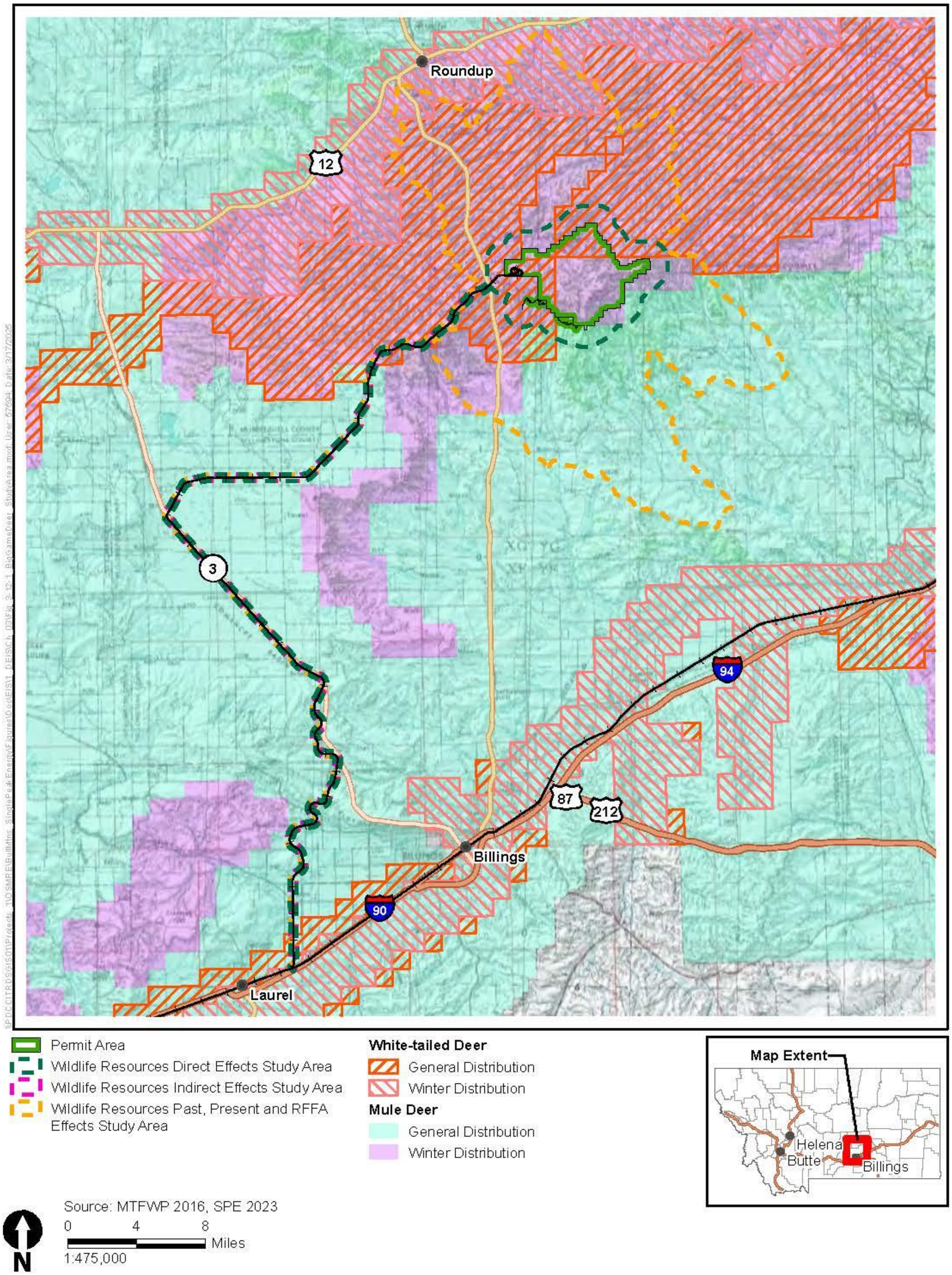
Mule deer are the most abundantly observed game species in the study area (Butts 1997 as cited by Catena 2023) and are non-migratory; they make modest seasonal movements in response to changes in forage conditions and weather (Jay Newell, wildlife biologist, Montana Department of Fish, Wildlife and Parks (MFWP), personal communication, January 29, 2002; Butts 1997 as cited by Catena 2023). They are typically widespread during mild winter conditions; however, during inclement winter, populations concentrate in the Rehder Creek, Elbow Hill, and Fattig Creek areas. The Project is in deer Hunting District (HD) 590; there are no population estimates for mule deer in HD590 by MFWP (Catena 2024).

In general, mule deer in the permit area follow an aggregate group pattern, using all vegetation communities during all seasons in the area (Catena 2022). In lower elevations, mule deer use agricultural lands, particularly crop fields where cover is tall and dense. In higher elevations, mule deer use the ponderosa pine-mixed grassland community (Catena 2022). Mule deer are less common in the western portion of the permit area, due to the paucity of forested cover resulting from a 1984 fire, less topographic relief than central and eastern portions of the area, and a relatively greater concentration of homes and associated human activities (Catena 2022). In 2022 and 2023 surveys in the permit area observed 15 groups of mule deer in eight habitat types (rock, riparian, ponderosa pine/juniper scrub, ponderosa pine/grass, burned ponderosa forest, skunkbrush sumac, and silver sage/grassland) (Catena 2023 and 2024). The permit area and the eastern portion of the existing rail transportation route to Laurel are within mule deer winter distribution habitat, and the southern portion of the rail transportation route is adjacent to winter distribution habitat. The remainder of the rail transportation route is within general distribution habitat (**Figure 3.12-1**). Mule deer are expected to seasonally occur in the study area and in vicinity of the existing rail transportation route to Laurel in areas that support the preferred habitat described above.

White-tailed Deer

White-tailed deer have been observed in low numbers and recorded infrequently in the permit area, in the vicinity of Fattig Creek in the ponderosa pine-mixed grassland and grassland communities (, and most recently in 2013, 2018, and 2020 (Catena 2023). The Project is in deer Hunting District (HD) 590; current MFWP data indicates the whitetail population in HD 590 is below the long-term average (Catena 2024). The western and northern portions of the permit area and the eastern portion of the existing rail transportation route to Laurel are within white-tailed general distribution habitat, and the southern-most portion of the rail transportation route near Laurel is within general distribution habitat and winter distribution habitat (**Figure 3.12-1**). White-tailed deer may occur in moderate numbers in the study area and in the vicinity of the existing rail transportation route to Laurel in areas that support preferred habitat described above.

Figure 3.12-1. Mule Deer and White-Tailed Deer General Distribution



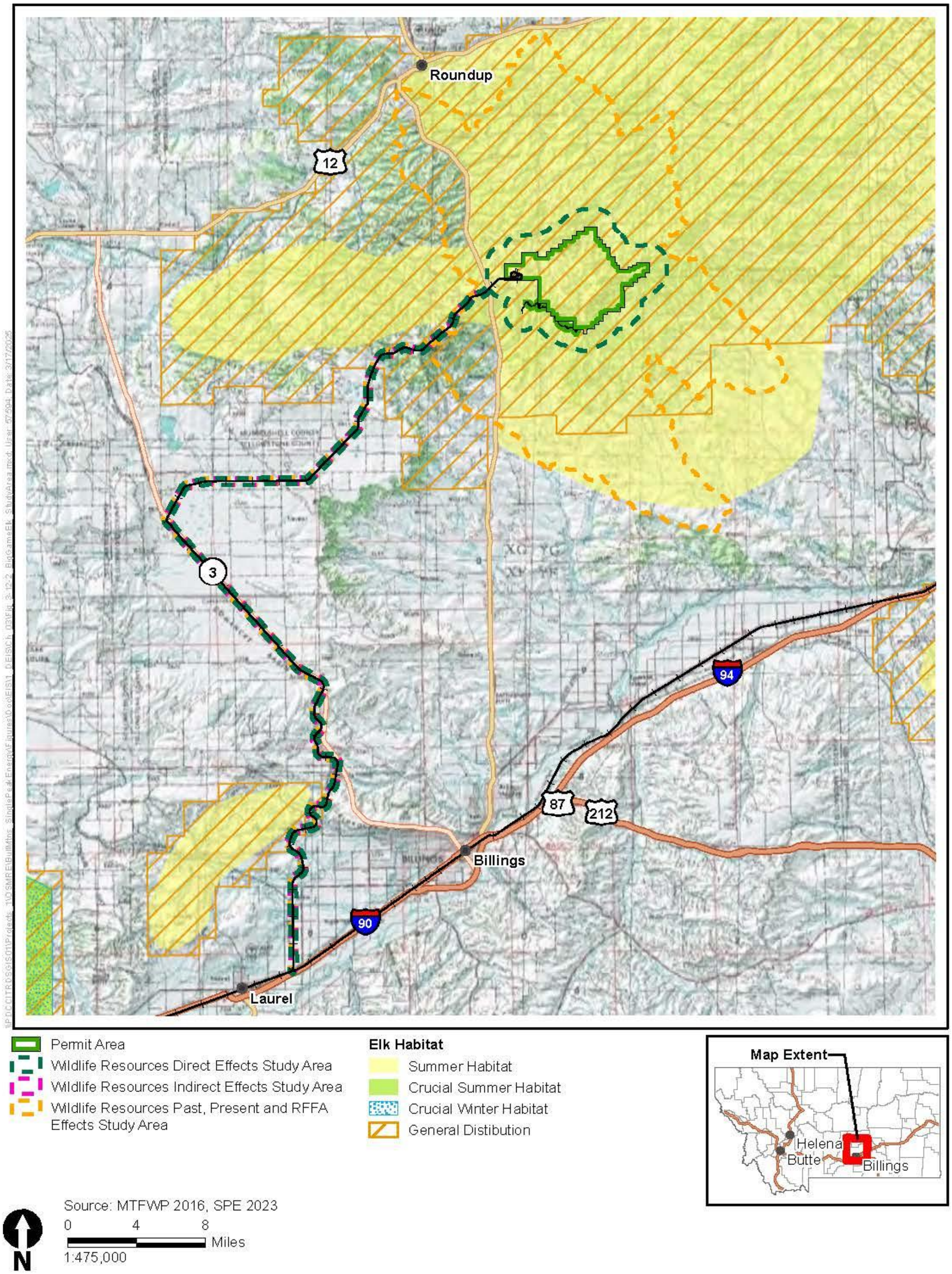
Elk

A migratory herd of 92-100 elk use the Bull Mountains (SPE 2023); elk are generally the second most numerous game animal observed during annual surveys and are distributed throughout the higher elevations, generally in areas away from human activity (Catena 2023). Elk are migratory within the area, and, though populations have increased considerably in recent years, their migratory distribution has not changed dramatically (SPE 2023; Catena 2023). Elk are most commonly observed from spring through autumn at higher elevations that are removed from human activity and livestock, using habitats that provide abundant forage and security cover (Catena 2023). The Project is in elk Hunting District (HD) 590. The 2023 Montana Statewide Management Plan (MFWP 2023) provides historic elk trend data and the most recent available elk data indicates that the elk population in HD 590 is increasing (Catena 2024).

Portions of the Rehder and Fattig Creek drainages as well as ponderosa pine and grass/burned pine habitats are used as summer range. Elk observations in the WMA by habitat have shown a general association with ponderosa pine dominated areas interspersed with native grasslands and shrublands (Catena 2011-2023; SPE 2023). Elk sign was observed throughout the eastern half of the permit area and near Ped Loop 1. Tracks and trails were abundant in the eastern permit area and near Ped Loop 1, particularly in the vicinity of East Loop 3, and shed antlers were found, which suggests that sustained use corresponds with the late spring when male elk drop their antlers. Railroad and Pompeys Pillar Creek drainages and portions of Dunn Mountain serve as occasional winter range, where elk concentrate on south-facing slopes or other slopes blown free of snow (Catena 2023). While the coal lease area should be considered elk winter range BLM (Parks 2009) is not aware of any elk migration corridors.

In 2022 and 2023, surveys observed 4 elk individuals and elk signs in ponderosa pine/grassland or riparian habitats (Catena 2024) in the northeastern portion of the permit area, along East Loops 2 & 3. The permit area and the eastern portion of the existing rail transportation route to Laurel are within elk summer habitat, and the southern portion of the rail transportation route is adjacent to elk summer habitat (**Figure 3.12-2**). Elk are expected to occur in the study area and in the vicinity of the existing rail transportation route to Laurel in areas that support preferred habitat.

Figure 3.12-2. Elk General Distribution

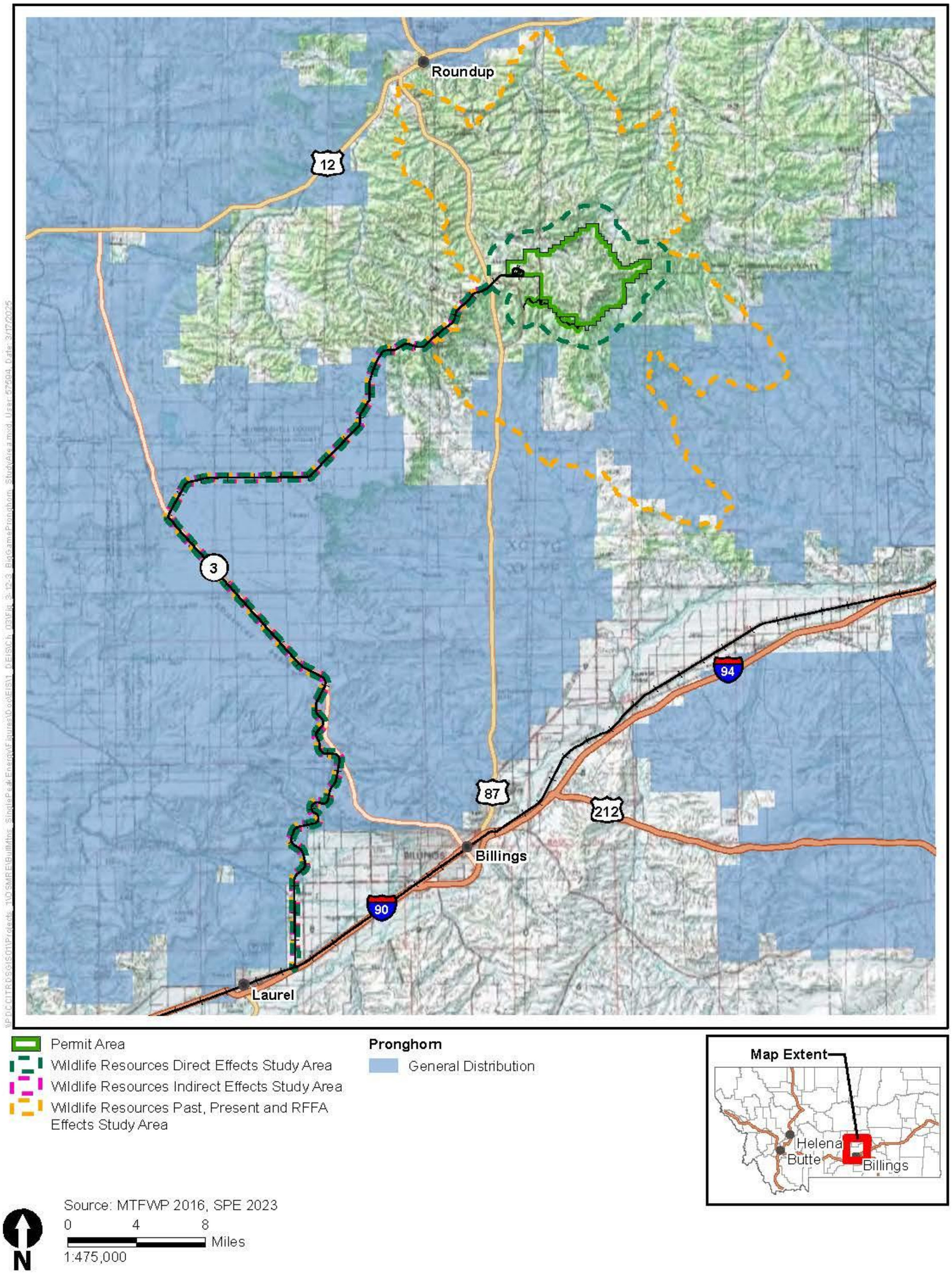


Pronghorn Antelope

The central Bull Mountains are marginal pronghorn habitat; pronghorn are migratory in the area, using open habitat including silver sagebrush-mixed grassland, mixed grassland, and agriculture vegetation communities that are fragmented and interspersed with the ponderosa pine-mixed grassland communities. The Project is in antelope HD 596 (previously HD 540); MFWP estimates the pronghorn population in HD 596 is between 895-1076 animals, which is above the population objective (Catena 2024).

Pronghorn distribution in the permit area is both seasonal and relatively dispersed, occurring in the spring, summer, and early fall (Catena 2023). No critical pronghorn habitat types have been identified; however, they use most major drainages in the area. Higher elevations in the area generally lack suitable habitat and cover for antelope. The western portion of the area has regular pronghorn use of agricultural and crop fields. In summer and particularly winter, pronghorn tend to be concentrated in large herds in the more open areas of the Hay and Comanche basins about 10 miles southwest of the mine surface facilities. In 2022, pronghorn habitat distribution followed a similar pattern to that observed in previous years (Catena 2011-2023, SPE 2023) with approximately half of animals observed in grassland, and the remaining animals observed in ponderosa forest, and silver sage habitats (Catena 2023). In 2022 and 2023, pronghorn habitat distribution followed a similar pattern to that observed in previous years (Catena 2011-2023; SPE 2023) with approximately half of the animals observed in grassland, and the remaining animals observed in ponderosa forest, and silver sage habitats (Catena 2023). The permit area and the eastern portion of the existing rail transportation route to Laurel are not within pronghorn general distribution habitat; however, the remainder of the rail transportation route is within pronghorn general distribution habitat (**Figure 3.12-3**). Pronghorn may occur in low numbers in the study area and in the vicinity of the existing rail transportation route to Laurel in areas that support the preferred habitat described above.

Figure 3.12-3. Pronghorn Antelope General Distribution



Predators

Nine species of predators have been observed in the permit area: black bear (also a big game species), coyote, red fox, mountain lion (also a big game species), badger, bobcat, long-tailed weasel, striped skunk, and raccoon. Coyotes are the most common predator in this area and have been recorded in almost all habitats. Coyotes are relatively more tolerant of human activity than other described predators (Catena 2023). Red fox and mountain lion activity have been confirmed in the permit area; mountain lion has been recorded in the permit area and vicinity but were not observed during any survey component in the AM 6 area (Catena 2024). Mountain lions are a secretive species, which is likely a causing factor to this infrequency (. In 2007, a mountain lion was observed in Section 4 of the lease area (Catena 2023). This area likely constitutes the predator's territory. Bobcats have been observed in low numbers throughout the history of wildlife monitoring in the permit area. Badgers, on the other hand, are more frequently observed and reported in the permit area. This species is widespread and uses a variety of habitats (Catena 2023). Black bear has been recorded once (2016) in the permit area since surveys began in 1989. Predators are expected to occur throughout the study area and the vicinity of the existing rail transportation route to Laurel in areas that support each species preferred habitat.

3.12.4.2 Birds

The study area is within the U.S North American Bird Conservation Initiative Bird Conservation Region 17 – Badlands and Prairies (BCR) (NABCI 2021). BCRs are ecologically distinct regions in North America that support similar bird communities, habitats, and resource management issues. The Badlands and Prairies habitat is characterized as semi-arid rolling plains dominated by a mixed-grass prairie that lies west and south of the glaciated Prairie Pothole region, east of the Rocky Mountains, and north of the true shortgrass prairie (NABCI 2021). Many contiguous grassland tracts of significant size are situated within this area, primarily because of the dominance of ranching; consequently, the area is habitat for populations of high priority dry-grassland bird species, including Mountain plover, McCown's longspur, and long-billed curlew (NABCI 2021). These habitats support some of the healthiest populations of high priority dry-grassland birds on the continent and intensive use by upland nesting waterfowl and broods (NABCI 2021). It is within the Central Flyway migration route for migratory neotropical migrant avian species. The study area is not within an Audubon Important Bird Area, that is (Montana Audubon 2024). The study area overlaps a National Wildlife Refuge, the Musselshell County Waterfowl Production Area (WPA), that is situated approximately 10 miles southwest of the permit area and is adjacent to the existing rail transportation route to Laurel west of Goulding Creek Road (USFWS 2024). WPAs are areas owned by the USFWS and are small natural wetlands and grasslands that provide breeding, resting and nesting habitat for waterfowl, shorebirds, grassland birds, insects, and other wildlife. Catena Consulting, LLC. has conducted surveys for the following categories of birds: waterfowl, waterbird, and shorebirds; landbirds; raptors; and raptor nests. Some species of birds are considered resident, while others are considered migratory. Migratory bird species include nongame raptor and passerine species, most of which are protected under the under the Migratory Bird Treaty Act (MBTA), including bald and golden eagles, which are also protected under the Bald and Golden Eagle Protection Act (BGEPA).

One hundred sixty-nine bird species, including waterfowl, shorebirds, and land birds, and including migratory birds, are known to inhabit or seasonally use the permit area, including all vegetation communities (Catena 2011-2023). The burned ponderosa pine-mixed grassland community provides an abundance of snags as nesting habitat for cavity-nesting small birds such as woodpeckers, swallows, bluebirds, and wrens. Habitat for shorebirds, waterfowl, and other wetland species is relatively limited and confined to small wetlands in the permit area. Land bird species diversity is comparatively higher in respect to these monitoring surveys; species of the Passeriformes family were the most documented (Catena 2011-2023).

Within the permit area, 19 SOC birds have been documented during mine-related wildlife surveys (Catena 2011-2023). In 2022 and 2023, five SOC bird species were recorded in the permit area: golden eagle, Clark's nutcracker, Lewis's woodpecker, red-headed woodpecker, and great blue heron (Catena 2023). Birds may occur in all habitats appropriate to each individual species within the study area and throughout the vicinity of the existing rail transportation route to Laurel.

Raptors

Nesting and foraging habitats exist within the permit area; nesting and foraging habitats occurring in the permit area include forested habitats, burned habitats, rock outcrops and cliffs, ridges and other ground nesting habitats, and grasslands and shrub grasslands (Catena 2024). Eighteen species of raptors have been observed as residents and migrants including 14 diurnal species and three species of owls (Catena 2023 and 2024). Most of these species are migratory and are protected under the Migratory Bird Treaty Act (MBTA). One SOC raptor species, golden eagle, has been recorded permit area and in the AM 6 area and surrounding areas. Golden eagles and bald eagles are discussed in **Section 3.13**. Raptors may occur in all habitats in the vicinity of the existing rail transportation route to Laurel in areas.

Multiple raptor nests have been observed during surveys; nests known to be present as of 2023 include the following: eleven red-tailed hawk nest sites are known from historical records, of which eight are extant, and 4 additional nests were found in 2022 and 2023; there are seven known great horned owl nests in the WMA, of which 5 are extant; two kestrel nest has been identified; four prairie falcon aeries have been identified, of which one nest has been used by both turkey vultures and common ravens; one Cooper's hawk nest was found in 2022; several other nests found were intact with undetermined species associations and additional undiscovered nests are likely present (Catena 2023 and 2024). Golden eagle nests have been documented in the study area and are discussed in **Section 3.13**.

Raptor nests may occur in trees throughout the study area and in the vicinity of the existing rail transportation route to Laurel in areas with appropriate habitat.

Upland Game Birds

The two primary species of upland game birds in the permit area are wild turkey and sharp-tailed grouse. Other species such as ring-necked pheasant, gray partridge, and greater sage-grouse may be present in low numbers (Catena 2023). In 2022 two species of upland game birds, sharp-tailed grouse and wild turkey, were observed in the permit area during 2022 surveys (Catena 2023). Three sharp-tailed grouse leks were active in 2022, including one near the rail loop, one on Dunn Mountain, and one new lek southeast of the permit area (Catena 2023). Wild turkeys were observed on many occasions in or near forested habitats in the eastern and southern portions of the permit area.

Sharp-tailed grouse are uncommon year-round residents of the permit area though leks are present (Catena 2023 and 2024); they are found in silver sagebrush-mixed grassland and mixed grassland communities for courtship, nesting, and brood rearing in the spring and summer, and use the other communities for foraging and cover during the fall and winter. Since 2001, activity has been observed at 15 leks. One new sharp-tailed grouse lek was discovered in the north-central portion of the AM 6 area during surveys in 2023 (Catena 2024). Lack of shrub habitat may continue to act as a limiting factor for sharp-tailed grouse in the study area, however, shifting lek locations may be in response to varying conditions of vegetative cover, and improving habitat conditions may be contributing to the reported high bird counts at Lek 9 (Catena 2018, 2019, 2020) and the formation of leks 10 through 15, discovered between 2019 and 2023.

Wild turkeys are year-round residents of the permit area; they were introduced by MFWP in 1958 and have spread throughout the area. Their preferred habitat is ponderosa pine-mixed grassland, and also utilize the agricultural lands, burned forest, riparian areas and barren habitats (Catena 2023). The ponderosa pine-mixed grassland community provides roosting trees year-round, thermal cover during cold weather and food during all seasons. Turkeys have been observed during every year of monitoring since 2001, and the majority of the observations have occurred in the northern portions of the permit area (Catena 2023). Wild turkey tracks are wide-spread and common in the northern and eastern portions of the permit area (Catena 2023).

Sharp-tailed grouse and wild turkey may occur in the study area and in the vicinity of the existing rail transportation route to Laurel in areas that support the preferred habitat including silver sagebrush-mixed grassland, mixed grassland communities, ponderosa pine-mixed grassland, and agricultural lands.

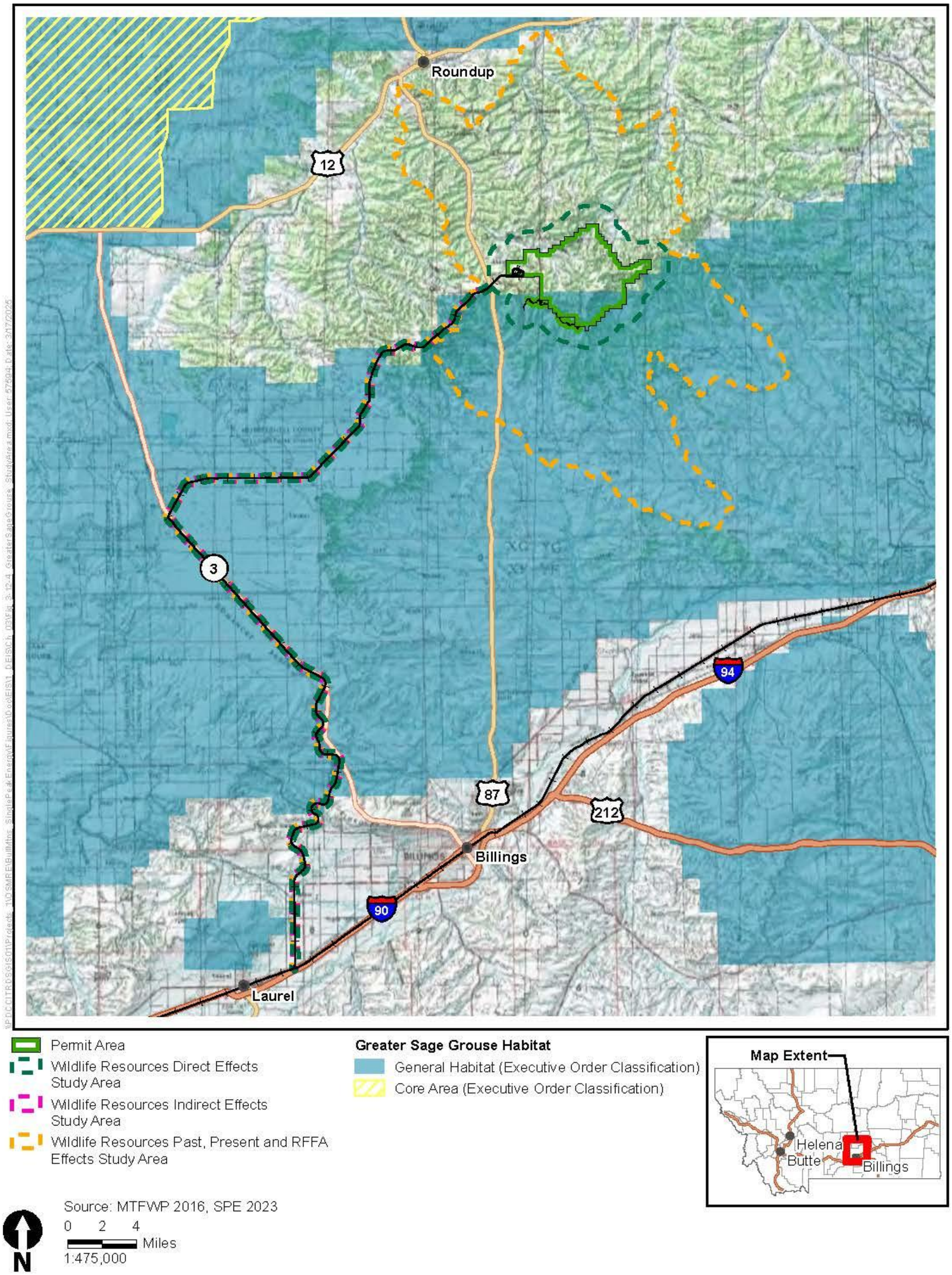
Non-native gray partridges and ring-necked pheasants are not observed frequently in the area but have been recorded in the western agricultural community. Gray partridge has not been recorded since 2012 (Catena 2023). With about 50 percent of agricultural land converted to Conservation Reserve Program (CRP), both species should benefit from increased, undisturbed permanent cover and respond with an increase in numbers and area occupied (Catena 2023).

Gray partridges and ring-necked pheasants may occur in the study area and in the vicinity of the existing rail transportation route to Laurel in areas that support the preferred habitat including agricultural lands.

Greater sage grouse may occur in the permit area or vicinity but has not been observed during surveys, which have included spring lek surveys (Catena 2024). Montana's Governor issued two EOs (EO 10-2014 and 12-2015) concerning conservation of sage-grouse habitat (Montana Office of the Governor 2014, 2015) that define suitable habitat as being "within the mapped occupied range of sage-grouse." Southern portions of the permit area are within the "general habitat' designation of the Sage Grouse Executive Order Habitat Classification for greater sage-grouse, and the nearest core area is approximately 15 miles north of the Mine permit area boundary. Habitat mapping of the permit area in 2007 showed the vicinity of Dunn Mountain, including the general habitat in the permit area as being dominated by ponderosa pine forest and savanna, interspersed with small patches of grassland (Catena 2017, Section 304(1)I, Vegetation Surveys). There were no mapped patches of shrublands, including sagebrush, in those sections. Silver sagebrush skunkbrush sumac, and western snowberry occur in the understory of ponderosa pine, savanna, grasslands, and areas where the forest canopy has been opened by fire.

Approximately 4,513 acres of the permit area is situated within greater sage-grouse general habitat. Approximately 17 miles (10,864 acres) of the rail transportation route to Laurel traverses general habitat for greater sage-grouse (**Figure 3.12-4**). No wildlife monitoring was conducted along the rail line. For the area within 5 miles of the rail spur, MFWP (2017) reports two historical lek locations last surveyed in 2001. At that time, one lek (1.7 miles from the spur) was confirmed inactive and the status of the other lek (1.2 miles from the spur) was unconfirmed. However, greater sage-grouse is considered to have low potential to be present in habitats in the study area and near the rail transportation route.

Figure 3.12-4. Greater Sage Grouse General Distribution and Core Area



3.12.4.3 Bats

Bats roost in a variety of habitats, including trees and tree snags, rocky outcrops and rock crevices, caves, historical mining structures, buildings and bridges. Roosting habitat in the Project area includes rock outcrops and burned ponderosa pine. Foraging habitat includes grassland, pastureland, shrub grasslands, wooded habitats, and open water bodies. Acoustic and capture sampling for bats has been conducted in the permit area. Butts (2006) as cited in Catena 2023 documented considerable diversity, patchy distribution and variable abundance of bats in the area. Thirteen bat species have been recorded: Big brown bat, pallid bat, western long-eared myotis silver-haired bat, hoary bat, spotted bat, small-footed myotis, long-legged myotis, eastern red bat, fringed myotis, northern long-eared bat, and little brown bat and Townsend's big-eared bat. Most of these species are common year-round residents of Montana (MTNHP 2022). In 2022, calls from seven bat species were potentially identified from recordings in the permit area, including little brown myotis, long-eared myotis, long-legged myotis, western small-footed bat, big brown bat, hoary bat, and silver-haired bat. Eight SOC bat species (fringed myotis, little brown myotis, long-eared myotis, long-legged myotis, hoary bat, pallid bat, spotted bat and Townsend's big-eared bat) were detected in the permit area. Bats may occur in the study area and in the vicinity of the existing rail transportation route to Laurel in areas that support appropriate foraging and roosting habitat.

3.12.4.4 Amphibians, Reptiles, and Aquatic Species

Reptiles and amphibians observed during surveys over the last 5 years include four reptile species (painted turtle, gopher snake, prairie rattlesnake, and common garter snake) and three amphibian species (boreal chorus frog, Woodhouse's toad, plains spadefoot, and tiger salamander) (Catena 2018 – Catena 2023). Boreal chorus frogs and painted turtles were observed in association with springs and ponds and likely occur throughout the permit area in and near such habitats; chorus frogs are likely to occur in uplands as they travel between water sources. The tiger salamander was observed only in Busse Spring, possibly because of the (typically) perennial nature of that water body. Surveys for herpetofauna at rock outcrops in 2022 and 2023 yielded no detections in the AM 6 study area; with the exception of painted turtle, reptiles are uncommonly observed in the AM 6 study area and surrounding areas and have rarely been recorded.

Aquatic habitat in the permit area includes streams, ponds, springs, seeps, and areas associated with the wetland community and is described in **Section 3.4**, *Water Resources*. While a number of wet sites remain relatively undisturbed by current land use practices, many aquatic sites have been modified by livestock grazing, development of livestock watering facilities, or other disturbance including fire such as the 1984 fire that resulted in loss of insulating cover and increases in siltation from runoff and cattle disturbance. All animals found in the area use streams, ponds, springs, and related habitat to a greater or lesser degree (Catena 2011).

The aquatic invertebrate community is not monitored or surveyed and is described as species predominantly those that typically use standing water; with some species represented that are found only in lotic (flowing water) habitats. No fish species are known to exist in the permit area (BLM 2011). There are no fish hatcheries at this location (USFWS 2024).

Amphibians, reptiles, and aquatic species are expected to occur in areas that support the preferred habitat for an individual species within the study area and along the entire length of the existing rail transportation route to Laurel.

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3.13 Threatened, Endangered, and Special Status Species

3.13.1 Introduction

This section discusses special status species including USFWS-listed, proposed, or candidate species, BLM sensitive species, and Montana Species of Concern. BLM sensitive species are those species identified by BLM that occur on BLM-administered lands and for which BLM has the capability to affect the conservation status of the species through management actions. Other criteria for consideration include species that have experienced, are experiencing, or are expected to have downward trends in the viability of the species across portions or all of their range; and species that depend on refugia or specialized habitats on BLM-administered lands that are threatened with alteration that may affect the continued viability of the species.

For the purposes of this analysis, special status species considered in this section include:

- USFWS-listed, proposed, and candidate species for the study area (USFWS 2025)
- Montana BLM Billings Field Office Sensitive Species List (BLM 2024)
- Montana Species of Concern (MTNHP 2024)

3.13.2 Study Area

The study area for threatened and endangered species includes both a direct effects study area and an indirect effects study area; and includes private, state, and federally owned (BLM) surface and mineral interests (**Figure 1.1-1**). Both the direct and indirect effects study areas encompass the permit area plus a one-mile buffer, and a 600-meter buffer around the rail transportation route to Laurel. The past, present, and RFFA effects study area for threatened and endangered species includes the HUC 12 sub-watersheds for Rehder Creek, Halfbreed Creek, Parrot Creek, Upper Fattig Creek, Upper Railroad Creek, Upper Pompeys Pillar Creek, Upper Razor Creek, and Middle Razor Creek; plus, a 600-meter buffer around the rail transportation route to Laurel (**Table 3.0-1, Figure 3.0-2**). Direct, indirect and past, present, and RFFA impacts are discussed in **Chapter 4**.

3.13.3 Regulatory Framework

Special status species are those species for which State or Federal agencies afford an additional level of protection by law, regulation, or policy. Included in this category are species listed as endangered or threatened under the Endangered Species Act (ESA) and those proposed for listing and candidates for listing, and species designated as sensitive by BLM. Montana Species of Concern are native animals breeding in the state that are considered to be "at risk" due to declining population trends, threats to their habitats, and/or restricted distribution.

3.13.3.1 Federal Requirements

The ESA requires that Federal agencies including OSMRE consult with the USFWS to ensure that any action authorized, funded, or implemented by the agency is not likely to jeopardize the continued existence of federally listed species or result in destruction or adverse modification of critical habitats as designated by the USFWS.

For Federal program mining activities in which OSMRE is the authority issuing permits, any incidental take anticipated to occur from these activities will be analyzed and quantified through project-specific, step-down ESA section 7(a)(2) consultations between the USFWS and OSMRE (USFWS 2020a). OSMRE, State regulatory authorities, and mine operators will be afforded an exemption from the prohibition against take resulting from surface mining activities subject to regulation under SMCRA when those surface mining activities are carried out in accordance with the implementing regulations as described in OSMRE's 2020 biological assessment, provided that they comply with the Reasonable and Prudent Measures and associated Terms and Conditions of the Incidental Take Statement (USFWS 2020a) and any anticipated take is quantified by USFWS at the project level. The USFWS formally submitted a Final Programmatic Biological Opinion (FPBO) to OSMRE in 2020. Appendix E of the FPBO provides an overview of considerations pertaining to exposure and response analyses for each species guild addressed in the FPBO for surface coal mining under the SMCRA.

The BLM manages special status species in accordance with the objectives outlined in the BLM Special Status Species Policy (Manual 6840 – *Special Status Species Management*). These objectives include:

- Conserving and/or recovering ESA-listed species and the ecosystems on which they depend so that ESA protections are no longer needed for these species.
- Initiating proactive conservation measures that reduce or eliminate threats to BLM Sensitive species to minimize the likelihood of and need for listing of these species under the ESA.

The goal of special status species management is to improve or maintain habitats for special status species that occur on lands managed by BLM to maintain viable populations of these species. As part of BLM's management responsibility, BLM identifies areas where other resource actions may conflict with special status species habitat and life history needs in order to develop conservation strategies and meet agency obligations for other resource uses. BLM not only implements conservation actions for special status species but also must consider the potential impacts of other management actions on special status species when authorizing agency actions.

3.13.3.2 State Requirements

The State of Montana regulates wildlife resources under Montana Code Annotated (2023) Title 87 *Fish and Wildlife*, Chapter 5. The Montana Department of Fish, Wildlife & Parks is responsible for the conservation and management of birds, mammals, reptiles, and amphibians and their habitats.

State of Montana Administrative Rules Governing Mining Rule 17.24.751, *Protection and Enhancement of Fish, Wildlife, and Related Environmental Values,* describes states that no surface or underground mining operation may be conducted which is likely to jeopardize the continued existence of endangered or threatened species listed or which is likely to result in the destruction or adverse modification of designated critical habitat of such species in violation of the FESA.

State of Montana Species of Concern (SOC) are plants and animals that are rare, threatened, and/or have declining populations and as a result are at risk or potentially at risk of extirpation in Montana, maintained by the Montana Natural Heritage Program. It is not a statutory or regulatory classification; the designations provide a basis for resource managers and decision-makers to make proactive decisions regarding species conservation and data collection priorities in order to maintain viable populations and avoid extirpation of species from the state.

3.13.3.3 Local Requirements

There are no applicable local regulations for threatened, endangered or special status species within or near the study area.

3.13.4 Existing Conditions

3.13.4.1 Plants

Information from the Montana Natural Heritage Program website (MTNHP 2024) indicates that there are no known occurrences of Federal sensitive plant species in or near the study area nor are there any known occurrences within Musselshell or Yellowstone Counties themselves. BLM confirmed that there are no known BLM specific sensitive species in the study area (Taylor 2009). USFWS (2024) sensitive species lists also do not indicate any known occurrences in the study area. Further, no USFWS threatened or endangered plant species are known to occur in Musselshell or Yellowstone Counties (USFWS 2025).

MTNHP (2024) also indicates that there are no known occurrences of State sensitive plant species (vascular and non-vascular) within Musselshell or Yellowstone Counties.

3.13.4.2 Wildlife

Endangered Species Act Listed Species

The USFWS Information for Planning and Consultation query results for the study area states that three species are potentially affected by activities in the study area: Rufa red knot, monarch butterfly, and Suckley's cuckoo bumble bee. There is no critical habitat for any ESA-listed species situated within the study area (USFWS 2025).

Rufa Red Knot

The rufa red knot (*Calidris contutus*) is listed as federally threatened and may occur in or near the study area (USFWS 2025). The rufa red knot has not been observed during wildlife surveys for the Project (Catena 2023). The rufa red knot nests in the Canadian arctic tundra and is considered migratory through Montana. While the study area is outside the known wintering and breeding range for this species, it occurs within the migration range (USFWS 2020b). In Montana, the rufa red knot is a very rare migrant that uses both alkaline/saline and freshwater lakes during their northerly migration towards their breeding grounds (USFWS 2014). Verified observations for the rufa red knot are documented in the following counties in Montana: Cascade, Chouteau, Deer Lodge, Lewis and Clark, Madison, Petroleum, Phillips, Teton, Valley, and Yellowstone. Proposed critical habitat is located outside of the study area along the east and south coastline of the United States (USFWS 2023 50 CFR Part 17).

The rufa red knot occurs in the Central Flyway during migration and it is possible they may stop on surface mines along this flyway during their migration (USFWS 2020b). OSMRE - Regions 5, 7-11 determined that there appears to be limited suitable habitat for rufa red knot within the permit area and made a finding that "may effect, not likely to adversely affect" rufa red knot because there is potential for the red knot to occur within the area migration. Mining and/or rail transport may displace the rufa red knot in search of other suitable habitat (i.e., resource selection). Historically, there appears to have been verified observations within or in the vicinity of the study area. The rufa red knot has been observed in Montana approximately 50 times since 1915 with the most recent in 2022 (MTNHP 2023), with sixty percent of the verified observations occurring in May during northward migration. The study area appears to contain limited suitable migratory habitat for the rufa red knot.

Monarch Butterfly

The USFWS listed the monarch butterfly (*Danaus plexippus*) as a proposed threatened species in addition to proposed critical habitat and a species-specific 4(d) rule on December 12, 2024 (89 FR 100662-100716). The monarch butterfly is rare across most of Montana and has undergone severe declines in the past decades (MTNHP 2024). Montana is situated in the contact zone between eastern and western populations of monarch butterflies. The entire state is within the monarch summer breeding range (USFWS 2024a); however, based on the Montana Natural Heritage Program's latest predicted habitat suitability model, less than half (44 percent) of Montana is predicted to have some level of suitable monarch butterfly habitat (2023). Within the study area, Monarch butterflies use a wide variety of wildflowers for nectaring; however females require milkweeds as larval host plants (87 FR 26152). Having both host and nectar plants available is critical for monarch survival, and the availability of milkweed is a main driver for monarch butterfly reproduction. Milkweeds occur in a broad variety of habitat types including mesic riparian areas, grasslands, meadows, prairie to desert habitats.

The primary threats to the monarch butterfly include loss and degradation of habitat from conversion of grasslands to agriculture, widespread use of herbicides, logging/thinning at overwintering sites in Mexico, senescence and incompatible management of overwintering sites in California, urban development, drought, exposure to insecticides, and effects of climate change (87 FR 26152).

While monarch butterfly has not been a focus species during the wildlife surveys conducted for the Project, due to the designation of the monarch butterfly as a candidate species by the USFWS in 2020 and the importance of host plants to monarch butterflies, beginning in 2022 the wildlife monitoring consultant began to record observations of milkweed plants observed during wildlife surveys (Catena 2023). Three species of milkweed are expected to occur in the Bull Mountains areas; all three were observed in or near the Mine permit area in 2022. The habitat for showy milkweed (*Asclepias speciosa*) is described as “grasslands, meadows, fields, roadsides, and marshes in plains and valleys” (MTNHP & MFWP 2022); showy milkweed has been observed in relatively large patches in the bottom or on the banks of seasonally moist drainages and along roadsides in the vicinity of the permit area (Catena 2023).

The habitat of whorled milkweed (*Asclepias verticillata*) is described as “sandy, clayey, or stony soil of grasslands, badlands, floodplains, and woodlands” (MTNHP & MFWP 2022); whorled milkweed was observed on the floodplain of Fattig Creek in the vicinity of the permit area, and it is likely present elsewhere (Catena 2023).

The habitat for green milkweed (*Asclepias viridiflora*) is described as “sandy soils of grasslands and plains” (MTNHP & MFWP 2022); green milkweed was observed in riparian bottoms, including a drainage in the central portion of the permit area (Catena 2023).

Suckley's Cuckoo Bumble Bee

The USFWS listed the Suckley's cuckoo bumble bee (*Bombus suckleyi*) as a proposed endangered species on December 17, 2024 (89 FR 102074-102091); no critical habitat has been designated. The Suckley's cuckoo bumble bee is rare across most of Montana and appears to be declining (MTNHP 2024). The Mine permit area supports habitat primarily rated as unsuitable or low suitability (MTNHP 2022). Suckley's cuckoo bumble bees are obligate social parasites and are entirely dependent on host colonies for their survival. They have been found in various habitat types including prairies, grasslands, meadows, and woodlands in addition to urban and agricultural areas (USFWS 2024b); host bumble bee colonies are often found in rodent burrows. Females overwinter, likely within mulch or other decomposing vegetation (USFWS 2024b). Abundant spring and fall floral resources are important to Suckley's cuckoo bumble bees (USFWS 2024b).

The primary threats to the Suckley's cuckoo bumble bee includes population declines of their host species; susceptibility to a variety of pathogens and parasites by Suckley's cuckoo bumble bee and/or their host bumble bees, particularly fungal microsporidians, protozoan parasites, tracheal mites, viruses including deformed wing virus, black queen cell virus and other viruses, and nematodes; pesticides; habitat conversion and fragmentation; increasing environmental temperatures; drought frequency and intensity; wildfire frequency and intensity; livestock grazing; and early spring frosts (USFWS 2024b).

Insects have not been focus species during the wildlife surveys conducted for the Project.

Black-Footed Ferret

The black-footed ferret was designated as an endangered species by USFWS in 1967. The Project is situated within the historical and potential current range of the black-footed ferret (*Mustela nigripes*); however, from the late 1800s to approximately the 1960s, the population precipitously declined throughout its range; in Montana, the decline coincided with the decline of prairie dogs due to the conversion of native grasslands to cropland, poisoning, and disease (MFWP 2021). In Montana, re-introductions began in 1994 after a 17-year absence. While the black-footed ferret was previously considered to have potential to occur in the study area, it is not currently expected to occur in the study area and is not included on the IPaC report as a species potentially affected by Project activities (USFWS 2025). No observations of black-footed ferret have been recorded in the permit area during Project wildlife surveys (Catena 2023).

Bats

No federally listed bat species are expected to occur in the study area per the USFWS IPaC report (USFWS 2025). The study area is well outside of the known and predicted range of northern long-eared bat (USFWS 2022). Montana Natural Heritage Program's Field Guide habitat assessment for the northern long-eared bat states that all active season captures within the state have been within or near riparian forest dominated by cottonwood and green ash. This portion of the Bull Mountains area does not support cottonwood and green ash riparian forests.

Identification of northern long-eared bats is challenging, with considerable potential for misidentification of both acoustic recordings and in-hand animals (Bachen 2023). The list of Project species observed during annual Project wildlife monitoring (**Appendix D**) includes a 2006 acoustic signal of northern long-eared bat. Because the study area is considered to be well outside of the known and predicted range of northern long-eared bat and due to the known difficulties with identification, the record was determined to be a misidentification. Consequently, the occurrence of the northern long-eared bat in Montana is considered accidental as this species occupies habitat within a limited range along the Missouri and Yellowstone River drainages near the North Dakota border. One researcher has noted that extensive acoustic and mist net surveys have been conducted by regional bat experts familiar with northern long-eared bat and western Myotis bat species and that no evidence has emerged that the species occurs within this area, that previous records that locate the species within this area appear to be spurious based on review of identification methods used during these surveys and data quality, and that the weight of evidence is that the species is not present in this area (Bachen 2023). Consequently, OSMRE previously made a finding of "no effect" for this species as a result of no species present and lack of suitable habitat. In 2024, Environmental Solutions & Innovations, Inc. (ESI) provided an assessment of acoustic call files recorded during 2013 through 2017 during Project surveys to determine the likelihood of the presence of the northern long-eared bat; they determined that 30 call files had characteristics consistent with northern long-eared bat (ESI 2024). The USFWS reviewed the 2024 ESI report and submitted the report and data files to Montana northern long-eared bat experts at Montana Fish, Wildlife and Parks (FWP) and at the Montana Natural Heritage Program (MTNHP) for independent review. Montana FWP found no evidence of northern long-eared bat presence based on the acoustic data and report. MTNHP found that the acoustic data and report provided no convincing evidence to support a reasonable conclusion that the northern long-eared bat was present at detector sites and that the report did not sufficiently account for the presence of similar species that have consistently been confirmed by multiple observers in the area using a diversity of methods and the report did not account for confounding factors that impede the ability to discriminate between the northern long-eared bat and acoustically similar species in Montana. Based on their detailed call file reviews, additional extensive review of northern long-eared bat summer and hibernacula habitat, connectivity considerations, known location data, and other bat survey results in the general mine vicinity (including mist netting), MTNHP concluded that the northern long-eared bat is unlikely to occupy the local Bull Mountains area. USFWS agreed with the conclusions reached independently by FWP and MTNHP; specifically, that: 1) the acoustic data provided do not reasonably support the ESI report's conclusion of northern long-eared bat presence; and 2) the northern long-eared bat is unlikely to occupy the local Bull Mountains area (USFWS 2025).

Whooping Crane

The whooping crane (*Grus americana*) is listed as federally threatened in the southwest region of the United States (AZ, NM, TX, OK). The natural population of whooping cranes nests in Wood Buffalo National Park and nearby areas in Canada and winters in coastal marshes in Texas at Aransas National Wildlife Refuge (ANWR) and vicinity. Spring and fall migration primarily occurs in the central Great Plains of the U.S.; the species is known to fly through Montana during both spring and fall migration. The whooping crane has been observed in the marsh habitat in Montana, including at Medicine Lake National Wildlife Refuge and Red Rock Lakes National Wildlife Refuge (Montana Bird Distribution Committee 2012 as cited in MTNHP/Montana FWP 2024). No observations of whooping crane have been recorded in the permit area and vicinity during Project wildlife surveys (Catena 2023).

Grizzly Bear

Grizzly bear (*Ursus arctos horribilis*) is listed as federally threatened and may occur in or near the study area. The study area is outside of the areas where grizzly bear "may be present" as identified by the USFWS Grizzly Bear Recovery Program (2020). Nearest "may be present" areas occur approximately 50 miles northwest and west of the rail spur, and immediately south of the rails spur at Laurel, and the occupied range of the grizzly bear population in the Greater Yellowstone Ecosystem is situated south of the rail spur at Laurel and I94 (Costello 2023). OSMRE verified with the U. S. Geological Survey grizzly bear research team and the USFWS grizzly bear recovery team there are no other records of occurrences within Yellowstone and Musselshell Counties, including the study area, within the last 10 years (USFWS 2021). The grizzly bear was not listed as a species potentially occurring within the study area in the USFWS IPaC report (USFWS 2025). No critical habitat has been designated for the grizzly bear.

Special-Status Species

This section discusses special status wildlife species that are not federally-listed under the ESA. This includes BLM sensitive and Montana Species of Concern. Federally Listed species are described in the preceding section.

Eagles

Golden eagles have been observed at all times of the year; five golden eagle observations occurred in the permit area, and four golden eagle observations were recorded in 2022 in the northeast portion of the AM 6 area in ponderosa pine/grassland, burned forest, skunkbrush sumac, breaks (highly eroded areas), silver sagebrush, and rock outcrop/cliff habitats.

Golden Eagles

Two golden eagle nests are present in the permit area; one that was confirmed active in both 2022 and 2023, and one inactive probable golden eagle nest (Catena 2023 and Catena 2024); no additional golden eagle nests were discovered during wildlife surveys in 2022-2023, although suitable nesting habitats, including large trees and cliff/rock outcrop, are present.

Rehder Road Nest (Golden Eagle)

This nest is outside the study area, approximately 1.6 miles northwest of the surface facilities area. The nest was used by golden eagles in 2017, 2019, and 2021, was occupied but not active in 2020, and was inactive in 2018 and in 2022 was active with 1+ young observed (Catena 2023).

Dunn Mountain Nest (potential Golden Eagle)

This nest is on a cliff on the south side of Dunn Mountain, within the permit area, approximately 0.5 miles northeast of the existing air portal. This nest is not new but was previously unrecorded. The location, size, and materials used for construction suggest that it is a golden eagle nest. While the nest was not used in 2017 to 2022, golden eagles were observed in the immediate nest vicinity in 2017-2019 and in 2022.

Bald Eagles

Bald eagles are occasionally observed during winter and seasonal migrations (Catena 2023). Bald eagles typically nest adjacent to large bodies of water, which do not occur in the immediate vicinity of the Mine. Although bald eagles have been observed in the Project monitoring area during annual wildlife monitoring, no nesting behavior or nests have been observed by Catena biologists in the monitoring area (Catena 2023). USFWS has no records of bald eagle in the study area (USFWS 2025).

Other Special Status Species

Table 3.13-1 provides a list of special status wildlife species that are known or have the potential to occur in the study area, including Federal ESA-Listed species, BLM sensitive and Montana Species of Concern. There are two species of amphibians, four reptiles, 22 species of birds, and eight mammals detailed on **Table 3.13-1**. The table includes the likelihood of species occurrence within the study area.

Table 3.13-1. Special-Status Species Documented or with Potential to Occur

Species	Conservation Status Federal/State	Habitat Association	Likelihood of Occurrence
Birds			
Baird's Sparrow (*Centronyx bairdii*)	MBTA; BLM/SOC	Tall grass prairies	Low – observed one time (2020). Habitat exists in the study area
Bald Eagle (*Haliaeetus leucocephalus*)	BGEPA, MBTA; BLM/SOC	Along waterbodies with tall trees	High – observed frequently. Habitat present in the study area
Black-billed Cuckoo (*Coccyzus erythropthalmus*)	MBTA; BLM/SOC	Edges of mature forest	Low – not observed. Little habitat present in the study area
Brewer's Sparrow (*Spizella breweri*)	MBTA; BLM/SOC	Sagebrush	High - observed frequently. Habitat present in the study area
Burrowing Owl (*Athene cunicularia*)	MBTA; BLM/SOC	Prairie dog colonies	Low - Not observed. Little habitat present in the study area
Chestnut-collared Longspur (*Calcarius ornatus*)	MBTA; BLM/SOC	Open prairies	Low – Observed in 2012 and prior to 1996. Habitat is present in the study area
Ferruginous Hawk (*Buteo regalis*)	MBTA; SOC	Semiarid grassland	Moderate - Observed infrequently. Habitat is present in the study area
Golden Eagle (*Aquila chrysaetos*)	BGEPA, MBTA; BLM/SOC	Widespread	High – Observed frequently. Habitat is present in the study area
Grasshopper Sparrow (*Ammodramus savannarum*)	MBTA; SOC	Grassland	High – Observed frequently. Habitat is present in the study area
Gray-crowned Rosy Finch (*Leucosticte tephrocotis*)	MBTA; SOC	High elevation prairie	Low – Observed infrequently. Little habitat is present in the study area
Greater Sage-Grouse (*Centrocercus urophasianus*)	BLM/SOC	Sagebrush	Low – Not observed. Habitat is present in the study area
Lewis's Woodpecker (*Melanerpes lewis*)	MBTA; BLM/SOC	Open forest	High – Observed frequently. Habitat is present in the study area
Loggerhead Shrike (*Lanius ludovicianus*)	MBTA; BLM/SOC	Grassland with fencerows	Low – Observed infrequently. Little habitat is present in the study area
Long-billed Curlew (*Numenius americanus*)	MBTA; BLM/SOC	Grassland	Low – Observed infrequently. Little habitat is present in the study area

Species	Conservation Status Federal/State	Habitat Association	Likelihood of Occurrence
Thick-billed (McCown's) Longspur (*Rhynchophanes mccownii*)	MBTA; SOC	Short-grass prairie	Low – Not observed. Habitat is present in the study area
Peregrine Falcon (*Falco peregrinus*)	MBTA; BLM/SOC	Cliffs	Low – Not observed. No habitat is present in the study area
Red-headed Woodpecker (*Melanerpes erythrocephalus*)	MBTA; BLM/SOC	Forest with tree snags	High – Observed frequently. Habitat is present in the study area
Rufa red Knot (*Calidris canutus rufa*)	FT; MBTA	Large wetlands during migration	Low – very rare migrant. No habitat is present in the study area
Sage Thrasher (*Oreoscoptes montanus*)	MBTA; BLM/SOC	Sagebrush	Low – Observed infrequently. Little habitat is present in the study area
Sprague's Pipit (*Anthus spragueii*)	MBTA; BLM/SOC	Grassland	Low – Not observed. Habitat is present in the study area
Veery (*Catharus fuscescens*)	MBTA; BLM/SOC	Denser forest	Low – Not observed. No habitat is present in the study area
Whooping crane (*Grus americana*)	FE; MBTA; SOC	Large wetlands and river bottoms	Low – Not observed. Habitat is present in the study area
Mammals			
Black-tailed Prairie Dog (*Cynomys ludovicianus*)	BLM/SOC	Grassland	High – observed in 2022. Habitat is present in the study area
Eastern Red Bat (*Lasiurus borealis*)	BLM/SOC	Wooded riparian areas	Moderate – probable acoustic detection. Habitat is present in the study area
Fringed Myotis (*Myotis thysanodes*)	BLM/SOC	Forest and grassland	Moderate – probable acoustic detection. Habitat is present in the study area
Hoary Bat (*Lasiurus cinereus*)	BLM/SOC	Forested riparian corridors	High – probable acoustic detection. Habitat is present in the study area
Northern Long-eared Bat (*Myotis septentrionalis*)	FE; SOC	Caves and cottonwood snags	Study area is outside of the known range of the species.
Pallid Bat (*Antrozous pallidus*)	BLM/SOC	Ponderosa forest and sagebrush	Moderate – probable acoustic detection. Habitat is present in the study area
Spotted Bat (*Euderma maculatum*)	BLM/SOC	Open habitats	Moderate – probable acoustic detection. Habitat is present in the study area

Species	Conservation Status Federal/State	Habitat Association	Likelihood of Occurrence
Townsend's Big-eared Bat (*Corynorhinus townsendii*)	BLM/SOC	Caves and mines	Moderate – observed infrequently. Habitat is present in the study area
Amphibians			
Great Plains Toad (*Pseudacris maculata*)	SOC	Upland grassland	Not observed in the study area
Northern Leopard Frog (*Rana pipiens*)	BLM/SOC	Edges of waterbodies and wetlands	Not observed in the study area
Reptiles			
Greater Short-horned Lizard (*Phrynosoma hernandesi*)	BLM/SOC	Sagebrush, grassland	Moderate – Not observed. Habitat is present in the study area
Plains Hog-nosed Snake (*Heterodon nasicus*)	BLM/SOC	Sandy alluvial beds	Low – Not observed. Habitat is present in the study area
Spiny Softshell (*Apalone spinifera*)	BLM/SOC	Rivers	Low – Not observed. No habitat is present in the study area
Western Milksnake (*Lampropeltis gentilis*)	BLM/SOC	Sagebrush, grassland	Low – Not observed. Habitat is present in the study area
Invertebrates			
Monarch butterfly (*Danaus plexippus*)	FPT; SOC	Milkweed	Moderate – Not observed. Habitat is present in the study area
Suckley's cuckoo bumble bee (*Bombus suckleyi*)	FPE; SOC	Milkweed	Moderate – Not observed. Habitat is present in the study area

FE=Federally Endangered; BGEPA=Bald and Golden Eagle Protection Act; FPT=Federally Proposed Threatened Species; MBTA=Migratory Bird Treaty Act; BLM = BLM Billings Field Office Sensitive; SOC = Montana species of concern (MTNHP& MFWP 2022); FPE=Federally Proposed Endangered Species

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3.14 Cultural Resources

3.14.1 Introduction

Cultural resources are past and present expressions of human culture and history in the physical environment. They represent physical locations of human activity, occupation, or use and can refer to historical or architectural objects, sites, structures, or places with potential public and scientific value, including locations of traditional cultural, ethnic, or religious significance to a specific social or cultural group. Fragile and irreplaceable, cultural resources represent an integral part of American heritage that is identified through field inventories, historical documentation, or oral evidence. Cultural resources are located, classified, ranked, and managed in order to identify, protect, and use them for public benefit.

3.14.2 Study Area

The study area for cultural resources includes both a direct effects study area and an indirect effects study area. Both the direct and indirect effects study areas are the areas subject to this Federal undertaking (Proposed Action and Alternative areas), which includes AM 3, WDA 2, and MR 279, as described in detail in **Chapter 2** (**Table 3.0-1**, **Figure 3.0-1**). The past, present, and RFFA effects study area for cultural resources is the permit area, plus a 0.25-mile buffer. Potential direct, indirect, and past, present, and RFFA impacts to cultural resources from each alternative are discussed in detail in **Chapter 4**.

3.14.3 Regulatory Framework

3.14.3.1 Federal Requirements

The National Historic Preservation Act of 1966 (NHPA), as amended, established the Advisory Council on Historic Preservation (ACHP), State Historic Preservation Offices (SHPOs), and the National Register of Historic Places (NRHP) and mandates that Federal agencies consider an undertaking's effects on cultural resources that are listed or eligible for listing on the NRHP (see 36 CFR Part 800). Historic properties are a set of cultural resources that meet specific eligibility criteria for listing in the NRHP. Used in this context, the words "historic properties" have no connotation of age or cultural affiliation and refer only to cultural resources that are listed on, determined eligible for listing on, or may be eligible for listing in the NRHP. Historic properties are managed as directed by 36 CFR Part 800, Protection of Historic and Cultural Properties. The historic preservation laws mandating the cultural resource study specifically identify eligibility for inclusion in the NRHP as the key factor in determining preservation needs.

The ACHP is authorized by Section 211 of the NHPA to issue regulations to govern the implementation of Section 106 of the NHPA. These regulations, "Protection of Historic Properties" (36 CFR Part 800), establish the process that Federal agencies must follow in order to consider the effects of their undertakings on historic properties and provide the ACHP its required opportunity to comment. Section 106 establishes a review process by which historic properties are given consideration during the conduct of Federal undertakings and requires that agencies consult with the SHPO and/or Tribal Historic Preservation Office (THPO) to determine if the agency's undertaking could affect historic properties. Both listed and potentially eligible properties are considered during Section 106 review, as are cultural resources that have not yet been evaluated for the NRHP. OSMRE is the lead Federal agency responsible for compliance and consultation under the NHPA.

In addition to the NHPA, other relevant Federal historic preservation laws include, but are not limited to, the Antiquities Act of 1906 (16 U.S.C. 431-433), the Archaeological Resources Protection Act of 1979 (16 U.S.C. 470aa-mm), and National Trails System Act of 1968 (P.L. 90-543 as amended through P.L. 111-11, March 30, 2009), American Indian Religious Freedom Act of 1978, the Native American Graves Protection and Repatriation Act, EO 13007, and EO 13175. The SMCRA also requires that permit applications identify cultural resources in the proposed mining area.

3.14.3.2 State Requirements

The MDEQ is the State permitting and regulating agency for the Proposed Action, which includes both private and Federal coal leases. MSUMRA and its implementing rules require identification of cultural resources including those listed on or eligible for the NRHP (ARM 17.24.304(1)(b). Rules applicable to cultural resources are summarized in **Table 3.14-1**.

Additionally, under MSUMRA, MDEQ may not approve an application for mining when the area of land described in the application includes land that has special, exceptional, critical or unique characteristics (including archaeologic or cultural significance) or where mining on such land would adversely affect the use, enjoyment or fundamental character of neighboring land with special, exceptional, critical or unique archaeological or cultural significance, with particular attention being paid to the preservation of Plains Indian history and culture (82-4-227(2) MCA). An application for a mine permit must include a listing, location and description of the archaeological, cultural and other values of the area of land to be affected by the proposed mining operation (ARM 17.24.1807(8)).

Table 3.14-1. Administrative Rules of Montana Applicable to Cultural Resources under MSUMRA and other State Regulations

Administrative Rules of Montana	Summary of Requirement
17.24.304(1)(b)	Includes the requirements for baseline information in the permit application; specifically, it must include a listing, location, and description of all archeological, historical, ethnological, and cultural resources and values of the proposed mine plan and adjacent area. Sites listed on, eligible for, or potentially eligible for the NRHP must be so identified.
17.24.305(1)(h)	Contains mapping requirements for the permit application; the application must contain locations of any cultural or historical resources listed or eligible for listing in the NRHP.
17.24.318	Contains requirements for the permit application; specifically, the application must contain information on the protection of public parks and historic places and the inclusion of plans to minimize or prevent impacts on these resources.
17.24.1131	Contains requirements that prohibit from use for surface or underground mining parks, historic sites, and places listed on the national register of historic places unless approved jointly by the department and the Federal, state, or local agency with jurisdiction over the park or historic site.
17.24.1132(1)	Prohibits coal mining from impacting a “community or institutional building…that functions as an educational, cultural, historic, religious, scientific…facility.”

Administrative Rules of Montana	Summary of Requirement
2.65.101-401	Establishes a burial preservation board that ensures that burials discovered on State and private lands are accorded equal treatment, establishes procedures for the protection of burial discoveries, and establishes repatriation procedures.

3.14.3.3 Local Requirements

There are no applicable local regulations for cultural resources within the study area.

3.14.4 Existing Conditions

Human use of the area by Native American and Euro-American cultures is evident in vestigial precontact and post-contact archaeological and architectural structures, features, and objects that have been revealed in various cultural resource inventories that were completed over time as part of mine development projects. Precontact resources are artifacts, features, and sites resulting from human activity predating written records and prior to European contact in the region. Typically, precontact sites in the region consist of isolated clusters of stone tools or pottery sherds; features including hearths, stone circles, or rock art; or human-modified plant and animal remains. Precontact sites may contain information that can contribute to our understanding of past cultures and settlement patterns. Precontact site types in the Bull Mountains area include camps, log structures, limited activity loci, rock art, rock cairns, lithic quarries, and workshops (BLM 2011).

Post-contact resources are artifacts, features, buildings, and structures that were created within the period of historic written records, after European contact in the region. Post-contact resources include buildings and structures such as dams and bridges, as well as historical archaeological features such as artifact scatters, building foundations, landscape modifications, and trails. Post-contact resources may yield information in the same manner as precontact sites but are more often considered important for their association with important historical persons or events or as examples of distinctive architectural, engineering, or artistic styles.

Multiple cultural resources surveys have been conducted within the direct and indirect effects study area and past, present, and RFFA effects study area (Aaberg and Crofutt 2013a, Aaberg and Crofutt 2013b, Ferguson 2009, GCM Services Inc. 2014, and GCM Services Inc. 2017). In 2024, a Class I survey was performed within the permit boundaries plus a 0.25-mile buffer of AM 3, 4, 5, and 6 areas and within waste disposal area 2 identified in AM area 2 (Petersen and Ferguson 2024). The Class I report (Petersen and Ferguson 2024) provides a consolidated summary of the cultural resources previously identified within these areas from the Class III cultural resources surveys.

Within the direct and indirect effects study area, which are the areas subject to this Federal undertaking, a total of 22 cultural resources have been identified. Of these, 20 are precontact sites and 2 are post-contact sites. None of these sites have been determined eligible for the NRHP, one site is recommended eligible for the NRHP, 5 sites have not been evaluated for NRHP eligibility, 3 sites are recommended as not eligible for the NRHP, and 13 sites have been determined ineligible for the NRHP (Petersen and Ferguson 2024).

Within the larger past, present, and RFFA effects study area, which is the permit area plus a 0.25-mile buffer, a total of 278 cultural resources have been identified. Of these, 153 are precontact sites, 19 are post-contact sites, 3 are multicomponent sites, and no data was able to be obtained for the remaining 103 sites. For the 175 sites that have associated data, 7 sites have been determined eligible for the NRHP, 3 sites are recommended eligible for the NRHP, 25 sites have not been evaluated for NRHP eligibility, 67 sites are recommended as not eligible for the NRHP, and 73 sites have been determined ineligible for the NRHP (Petersen and Ferguson 2024). Sites within the direct effects study area are also counted within the larger indirect effects study area and the past, present, and RFFA effects study area.

Sites that are recommended or determined eligible for listing in the NRHP must be avoided by surface-disturbing activities. Sites that are recommended eligible for the NRHP or have unresolved or undetermined NRHP eligibility are treated as NRHP eligible sites and must be avoided by surface-disturbing activities until such time as additional investigation and evaluation can be performed upon these sites and NRHP eligibility can be determined by SHPO. Per Section 106 of the NHPA, if avoidance of surface-disturbing activities is not possible, minimization and mitigation measures to resolve or reduce adverse effects to these sites must be developed and agreed upon within a Memorandum of Agreement between OSMRE, SHPO, and the Project lessee as signatories. Other consulting parties may sign as concurring parties to review and agree to the terms of the agreement. Sites recommended and determined not eligible for listing in the NRHP require no further treatment or consideration, and avoidance is not necessary.

3.15 Noise and Vibration

3.15.1 Introduction

Noise and vibration levels from mining operations have the potential to result in adverse impacts to sensitive receivers within the study area. The measurements used for noise impacts in the study area is A-weighted decibels (dBA), which is measure of noise level used to compare noise from various sources. A-weighting approximates the frequency response of the human ear.

Day-night average noise level (DNL) is the energy average of dBA sound level over a 24-hour period and includes a 10-decibel adjustment factor for noise between 10 p.m. and 7 a.m. to account for the greater sensitivity of most people to noise during the night. The impact of nighttime adjustment is that one nighttime event, such as a train passing by between 10 p.m. and 7 a.m., is equivalent to 10 similar events during the daytime.

Equivalent Sound Level (Leq) represents an average of the sound energy occurring over a specified period. In effect, Leq is the steady-state sound level containing the same acoustical energy as the time-varying sound that occurred during a specified period. For example, a 1-hour A-weighted equivalent sound level (1-hour Leq) is the energy average of A-weighted sound levels occurring during a 1-hour period.

Peak particle velocity (PPV) is the amplitude of vibration velocity (the speed of the movement), measured in units of inches per second (in/sec). The amplitude of displacement describes the distance that a particle moves from its resting (or equilibrium) position as it oscillates.

Ambient noise is the sum of all noise from human and naturally occurring sources at a specific location over a specific time. Existing ambient noise conditions in the study area vary considerably depending on population density, vehicular traffic noise, and other noise sources. In general, the lower the population density, the lower the ambient noise level. Noise is audible at further distances from the source in quiet areas compared to areas with higher ambient noise.

3.15.2 Study Area

The study area for noise and vibration includes both a direct effects study area and an indirect effects study area. The direct effects study area is the permit area, and the indirect effects study area encompasses the permit area plus a 1-mile buffer and a 1-mile buffer around the rail transportation route to Laurel (**Table 3.0-1**, **Figure 3.0-3**). The past, present, and RFFA effects study area for noise and vibration is the same as the study area. Direct, indirect and past, present, and RFFA impacts are discussed in **Chapter 4.**

3.15.3 Regulatory Framework

3.15.3.1 Federal Requirements

Environmental Protection Agency

In 1974, EPA published Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, a comprehensive document that identifies noise levels consistent with the protection of public health and welfare against hearing loss, annoyance, and activity interference.

In response to the requirements of the Noise Control Act, EPA identified indoor and outdoor noise limits to protect public health and welfare. The EPA identified an outdoor day-night level (Ldn) limit of 55 decibels (dBA) and indoor Ldn limits of 45 dBA as desirable for protecting against speech interference and sleep disturbance in residential areas and at educational and health care facilities. The sound-level criterion for protecting against hearing damage in commercial and industrial areas is identified as the 24-hour equivalent sound level (Leq) value of 70 dBA (both outdoors and indoors). Based on attitudinal surveys, EPA determined that a 5 dBA increase in Ldn or Leq is the minimum required for a change in community reaction (EPA 1974).

The Noise Control Act also directed Federal agencies to comply with applicable Federal, state, interstate, and local noise control regulations. Although EPA was given a major role in disseminating information to the public and coordinating with Federal agencies, each Federal agency retained authority to adopt noise regulations pertaining to its programs. EPA can, however, require Federal agencies to justify their noise regulations in terms of Noise Control Act policy requirements.

Federal Guidelines for Construction Equipment Noise

Noise and vibration impacts from heavy equipment have been assessed using analysis methods recommended by the U.S. Department of Transportation. These standards are applicable to the analysis of noise from operation of heavy equipment on a long-term basis.

The Federal Transit Administration (FTA) has developed methods for evaluating construction noise levels, described in the Transit Noise and Vibration Impact Assessment Manual (FTA 2018). For residences, the standard noise limits recommended by FTA are 80 dBA equivalent continuous sound level (1-hour Leq) during daytime hours (7:00 a.m. to 10:00 p.m.), and 70 dBA 1-hour Leq during nighttime hours (10:00 p.m. to 7:00 a.m.) These standards are appropriate for use in an impact assessment or where no numerical noise limits have been set by the applicable local jurisdiction. These limits are guidelines for criteria and not standardized at a Federal level. In State and local jurisdictions these may be applied as noise criteria for sensitive land uses to describe levels that may potentially result in negative community reaction.

For Bull Mountains Mine, the construction equipment noise criteria are adjusted given the rural setting of the study area and the long-term operation of equipment at the mine site. A minus-10 dBA adjustment was made to FTA noise level criteria to account for the rural nature of the study area where operation of heavy equipment would be more noticeable relative to background ambient levels. Therefore, Project activities may result in a significant noise or vibration impacts if operations noise is predicted to exceed a daytime (7:00 a.m. to 7:00 p.m.) exterior noise level of 70 dBA 1-hour Leq, or an evening/nighttime (7:00 p.m. to 7:00 a.m.) exterior noise level of 60 dBA 1-hour Leq.

Surface Transportation Board Standards for Rail Noise

For an action that results in increased rail traffic, the STB has developed Federal standards for analysis of noise and vibration codified in 49 CFR § 1105.7(e)(6). These are shown in **Table 3.15-1**.

Table 3.15-1. Thresholds for Noise and Vibration Analysis

Facility	Threshold
Rail Line Segment	An increase in rail traffic of at least 100 percent (measured in GTMs annually) or an increase of at least eight trains per day on any segment of rail line affected by the Proposed Action, compared to the No-Action Alternative.
Rail Yard	An Action-related increase in rail yard activity of at least 100 percent (measured by carload activity), compared to the No-Action Alternative.
Intermodal Facility	An average increase in truck traffic of more than 10 percent of the average daily traffic or 50 vehicles a day on any road segment(s) affected by the Proposed Action compared to the No-Action Alternative.

Source: 49 CFR § 1105.7(e)(6)

A noise impact from the rail activity is considered to occur at a receptor location if the Project-related noise exposure would exceed 65 DNL or cause ambient noise levels to increase by at least 3 dBA compared to existing conditions pursuant to 49 CFR § 1105.7(e)(6). For the purposes of this analysis, the existing ambient level in the study area is assumed to be 40 dBA based on measurements reported in the BLM Coal Lease EA (BLM 2011).

Federal Guidelines for Potential Damage to Fragile Buildings from Groundborne Vibration

FTA analysis guidelines call for an investigation of the potential for vibration-induced damage to “fragile” or “extremely fragile” buildings (FTA 2018). Damage to a building is possible (but not necessarily probable) if groundborne vibration levels exceed the following criteria.

- A 0.20-inch-per-second peak particle velocity (PPV) (approximately 100 velocity in decibels [VdB]) for non-engineered timber and masonry buildings.
- A 0.12-inch-per-second PPV (approximately 95 VdB) for buildings that are extremely susceptible to vibration damage.

3.15.3.2 State Requirements

SMCRA does not include rules in regard to noise and vibration from mining activities.

MSUMRA’s implementing rules do not regulate noise per se but do include regulations related to the use of explosives. Specifically, ARM 17.24.623(1-2) states:

> “The operator shall publish a blasting schedule at least 10 days, but not more than 20 days, before beginning a blasting program in which blasts that use more than 5 pounds of explosive or blasting agent are detonated. The blasting schedule must be published once in a newspaper of general circulation in the locality of the blasting site. (2) copies of the schedule must be distributed by mail to local governments and public utilities and by mail or delivered to each residence within 1/2 mile of the permit area described in the schedule. For the purposes of this section, the permit area does not include haul or access roads, coal preparation and loading facilities, and transportation facilities between coal excavation areas and coal preparation or loading facilities, if blasting is not conducted in these areas. Copies sent to residences must be accompanied by information advising the owner or resident how to request a pre-blasting survey.”

3.15.3.3 Local Requirements

Neither Yellowstone County nor Musselshell County have specific laws related to control of noise. Both counties follow the State statutes in the Montana State Code, which regulate exhaust noise and the use of mufflers on vehicles.

3.15.4 Existing Conditions

3.15.4.1 Bull Mountains Mine

Ambient noise levels in the vicinity of Bull Mountains Mine are influenced by heavy equipment used for ongoing mining operations. As such, heavy equipment use is intermittent and is used in different areas at different times as resources are extracted, over the course of days or weeks in any given area. In general equipment noise would be most noticeable at the perimeter of mining areas. Heavy equipment used for mining would produce noise levels similar to construction equipment, producing noise levels of 74 to 90 dBA at a distance of 50 feet (FTA 2018). A mine ventilation fan operates continuously, producing a noise level of 75 dBA at 150 feet (OSMRE 2018). Ambient sound level monitoring has not been conducted in the vicinity of the Mine since the BLM Coal Lease EA was prepared. According to EPA guidance, ambient sound levels consistent with a “small town residential” setting are in the range of 50 dBA DNL or lower as shown in **Figure 3.15-1**. This is consistent with the measured ambient value of 40 dBA reported in the BLM Coal Lease EA (BLM 2011).

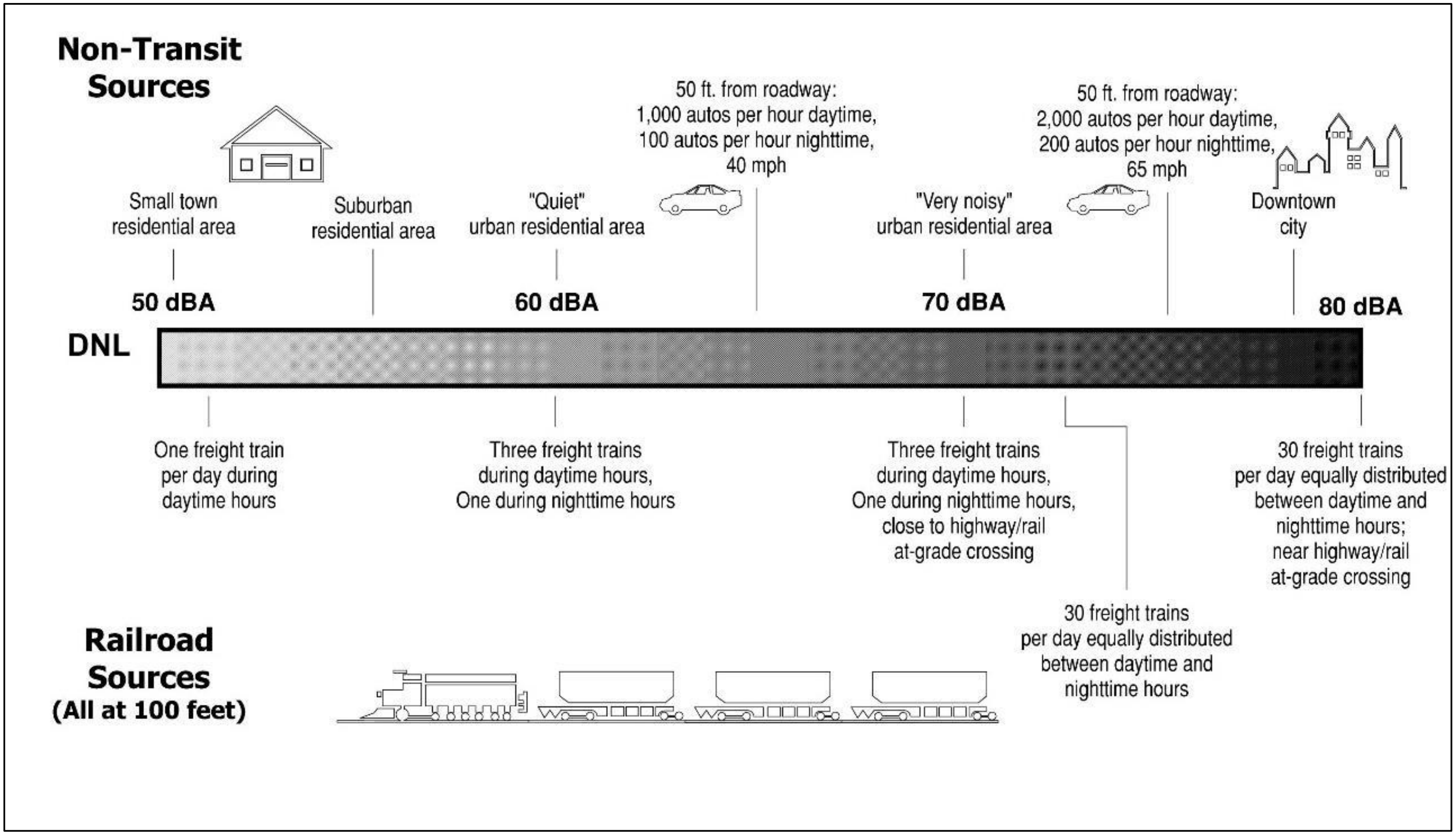
Sources of groundborne vibration include use of heavy equipment at surface facilities and use of longwall mining equipment. Generally, vibration from heavy equipment is only perceptible in a localized area around the source.

3.15.4.2 Rail Transportation Routes

The rail corridors extend from Bull Mountains Mine to the west through Montana, Idaho and Washington to Westshore Terminal in British Columbia, Canada, and to the east through Montana, North Dakota and Minnesota to Superior Midwest Energy Terminal in Superior, Minnesota. The existing noise environment varies substantially along the rail corridor, depending on the level of development and the presence of other sources of noise, such as highways and industrial sources. The rail corridor for the Proposed Action would use existing rail corridors, which pass through undeveloped areas, rural areas, and population centers. To account for the lower ambient sound levels in less populous areas, the study area is generally categorized as “small town residential,” corresponding with ambient noise levels in the 50 dBA DNL range, as shown in **Figure 3.15-1**.

Vibration sources along the rail transportation corridor consist primarily of existing freight locomotives and car events where vibration is generated at the wheel-rail interface. Trucks and other rubber-tired vehicles on local roads are not a significant source of vibration. Groundborne vibration from train passbys may intermittently cause perceptible vibration within structures directly adjacent to the rail corridor.

Figure 3.15-1. Typical Day-Night Average Noise Levels (DNL) for Residential Areas



Source: EPA 1974.

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3.16 Socioeconomics

3.16.1 Introduction

This section describes existing socioeconomic conditions in the study area using recent data about current socioeconomic conditions, including 2022 population and employment estimates and 2023 mine-related revenue data. State and Federal revenues from mining activities are also discussed.

3.16.2 Study Area

The study area for socioeconomics includes both a direct effects study area and an indirect effects study area. Both the direct and indirect effects study areas encompass the boundaries of Musselshell and Yellowstone Counties, including the cities of Billings and Roundup, and the Crow Reservation. (**Table 3.0-1**, **Figure 3.0-1**). The past, present, and RFFA effects study area for socioeconomics is the same as the study area. Direct, indirect and past, present, and RFFA impacts are discussed in **Chapter 4**.

The socioeconomic study area is based on various factors that may influence the location and magnitude of potential socioeconomic impacts. These factors include:

- The location of and access to the permit area;
- The likely residence area for people working at the mine (existing residents and/or any in-migrating Project employees);
- The rate and magnitude of population and employee turnover, if any (including student population turnover in schools, employee turnover at the mine, and employee turnover from existing jobs to employment at the mine);
- The availability and location of existing housing and potential housing, and the capacity and condition of existing local services and facilities;
- The people affected economically by the proposed mining operation (e.g., from wages and taxes); and
- The willingness and ability of community residents and local government personnel to deal with change.

3.16.3 Regulatory Framework

3.16.3.1 Federal Requirements

Mineral Leasing Act

Under the Mineral Leasing Act of 1920, as amended, the Federal government collects royalties on every ton of coal that is mined on Federal lands or to which the Federal government holds title. The Department of the Interior's Office of Natural Resources Revenue subsequently forwards approximately half of these royalty revenues to states, which in turn distribute the money toward road construction, schools, universities, communities affected by energy development, and general funds.

Coal Excise Tax

Section 4121 of the Internal Revenue Code imposes an excise tax on domestically produced coal. The taxes collected on the sales of coal are deposited to the Black Lung Disability Trust Fund to finance payments of benefits to afflicted miners.

Producers of coal in the United States are liable for the tax upon the first sale or use of the coal. The producer is the entity who has vested interest in the coal immediately after its severance from the ground without regard to the existence of any contractual arrangements for the sale or other disposition of the coal or the payment of any royalties between the producer and third parties.

The tax imposed for surface mines is the lower of 55 cents per ton or 4.4 percent of the sales price. Therefore, Project coal would be taxed at the 4.4 percent rate if the selling price is less than $12.50 per ton for surface coal.

Federal Abandoned Mine Reclamation Fund

Among other things, SMCRA requires that active coal mines contemporaneously reclaim coal mining operations, returning land to the same or better condition as before mining and not cause long-term impacts on surface or underground water resources. However, before the enactment of SMCRA, coal mining was not uniformly regulated and many pre-SMCRA coal mines were not adequately reclaimed; these mines are typically called “abandoned mine land” (AML). To address these AML sites, Title IV of SMCRA created the Abandoned Mine Reclamation Fund (AML Fund), which is funded in part by a reclamation fee assessed on each ton of coal produced in the United States, and that, among other things, provides funds to eligible States and Tribes for the reclamation of coal mining sites abandoned or left in an inadequate reclamation status as of August 3, 1977. The AML Fund has historically been the most significant source of funding to remediate AML sites. From 1977 through 2007, reclamation fees were generally set at 35 cents per ton for surface-mined coal and 15 cents per ton for deep-mined coal. When OSMRE’s fee collection authority was extended in 2006, these fees were lowered. In fiscal years (FY) 2008 through 2012, fees were 31.5 and 13.5 cents per ton, respectively. From FY 2013 through 2021, the fees decreased again to 28 and 12 cents per ton, respectively. Since FY 2022, the fee was reduced to 22.4 and 9.6 cents per ton, respectively.

In Montana, the MDEQ’s AML Section is responsible for administering AML reclamation projects that are funded by Federal grants under SMCRA. In 1989, Montana certified to OSMRE that the State had addressed all its high-priority coal-related reclamation problems that were eligible for funding under SMCRA. Montana was then approved to use SMCRA funding for reclamation of mines other than coal mines.

3.16.3.2 State Requirements

Montana relies on its natural resources as a primary source of tax revenue. Generally, natural resource taxes are categorized as either severance/license taxes or some form of ad valorem (property) taxes. Total natural resource tax collection for the State of Montana in 2022 was $314,384,399. Montana coal severance taxes accounted for approximately 21 percent of total 2020 revenues (Montana Department of Revenue 2022).

Federal Mineral Royalties

Twenty-five percent of the revenue the State receives for Federal mineral royalties is distributed to local governments based on mineral production in each county (17-3-240, MCA).

State of Montana Coal Severance Tax

Coal mines in Montana pay a severance tax based on the value of coal produced (15-35-103, MCA). The tax rate on coal varies with the heat content of the coal and the type of mine (open-pit or underground).

The value of coal represents the contract sales price, which is either the price of the severed coal or the price of coal as computed by the Montana Department of Revenue. The contract sales price includes royalties paid on the production of the coal and is reduced to 15 cents per ton only when royalties are paid to the Federal government, the state, or a federally recognized Tribe. Each producer is exempt from tax on 20,000 tons per year, and mines producing less than 50,000 tons per year are exempt from the tax.

State of Montana Coal Gross Proceeds Tax

While no actual property tax is levied on coal real property in Montana, the coal gross proceeds tax is implemented in lieu. The coal gross proceeds tax is equal to 5 percent of the coal's value, temporarily reduced to 2.5 percent for underground mines (15-23-703, MCA). The value of coal is determined by considering the contract sales price, which represents either the price of coal when extracted or a price imposed by the Montana Department of Revenue. The price may be imposed by the Montana Department of Revenue if any of the following apply:

- The extracted coal is used by the operator in a manufacturing process.
- The coal is refined to improve quality through either drying, cleaning, or additional processing.
- The coal is sold through a contract and that contract is not an arm's-length agreement.
- The gross yield statement for a mine is not filed.

The local county treasurer collects the tax. The revenue is proportionally distributed to the appropriate taxing jurisdictions in which production occurred based on the total number of mills levied in FY 1990. No tax is levied on reserve coal property in Montana.

Business Equipment Tax

Coal-related personal property (business equipment) owned by coal companies in Montana such as machinery, fixtures, and equipment is classified as Class 8 property. The first $100,000 of market value is exempt. From $100,000 to $6 million of market value, Class 8 property is taxed at 1.5 percent. Above $6 million, Class 8 property is taxed at 3 percent.

3.16.3.3 Local Requirements

The governing body of a city, town, county, or school district; any other local or State governmental unit or agency; or the governing body of a federally recognized Tribe may apply for a State of Montana Coal Board Grant to enable it to provide governmental services that are needed as a direct consequence of an increase or decrease in coal development or of an increase or decrease in the consumption of coal by a coal-using energy complex (90-6-208, MCA).

3.16.4 Existing Conditions

3.16.4.1 Local Economy

The local economy in Musselshell County and rural portions of adjacent Yellowstone County is dominated by mine and ranching-related employment. Yellowstone County is the State's major retail and wholesale trade, financial, energy, transportation, and medical center. A comparison of county business patterns, including number of business establishments, paid employees, and annual payroll is summarized in **Table 3.16-1**.

Table 3.16-1. Comparison of County Business Patterns, 2022

County and Category[1]	Number of Establishments[2]	Number of Paid Employees	Annual Payroll ($1,000)
Musselshell County			
Total for All Sectors	120	940	47,631
Mining, quarrying, and oil and gas extraction (NAICS 21)	8	339	28,797
Yellowstone County			
Total for All Sectors	5,935	73,119	3,984,524
Mining, quarrying, and oil and gas extraction (NAICS 21)	47	306	38,367

Source: U.S. Census Bureau 2024a
[1] NAICS = North American Industry Classification System
[2] An establishment is a single physical location at which business is conducted or services or industrial operations are performed.

Economies of both counties are affected by Mine payroll, local business transactions, infrastructure investments, community foundation contributions, coal board grant eligibility and awards, royalties and taxes. A summary of payrolls, expenditures, tax revenues (hereafter collectively referred to as “revenues”) for 2023 and associated rates are provided in **Table 3.16-2**. The Mine payroll totaled approximately $31 million in 2016, $28.5 million in 2022, and $38.2 million in 2023. SPE spends approximately $40 million annually on local business transactions (e.g., purchases, contracting), of which approximately 75 percent of the transactions occur in Yellowstone County (SPE 2024).

SPE (2017) estimates approximately $500 million was spent in capital infrastructure between 2007 and 2009 when the rail spur and facilities were constructed and longwall mining began. Additional infrastructure investments are made annually at a rate of approximately $18 million per year ($19 million in 2022 and $37.1 million in 2023) (SPE 2024). As a voluntary community service organization, the Signal Peak Community Foundation provides approximately $400,000 annually to fund college scholarships and projects in Musselshell County, with $500,000 contributed annually in 2022 and 2023. Projects have included updates to the hospital, swimming pool, 4-H building and 62 other grants (Olson 2017). The mine has contributed about $10,000 annually to the Yellowstone County community in 2022 and 2023.

In 2023, revenue derived directly and indirectly from taxes and royalties was paid to the Federal government ($2.6 million), State of Montana ($75.2 million), Musselshell County ($7.1 million), and Yellowstone County ($0.4 million), including local governmental entities. Revenue sources include lease bonus bids, severance taxes, gross proceeds taxes (in lieu of county property tax), Montana resource indemnity trust and groundwater assessment tax, AML fees, black lung tax, royalty payments, use taxes on coal-related equipment, rental fees, property taxes, and payroll tax.

Due to the presence of the Mine and potential growth-related issues, Musselshell County has applied for and received Coal Board grants funded by the Coal Severance Tax and administered by the Montana Department of Commerce. Grants over the past 10 years have included infrastructure projects, school improvements, and construction equipment and vehicle purchases. **Table 3.16-2** provides additional detailed revenue information.

Table 3.16-2. Estimated Revenues for 2023

Revenue Source/ Category	Rate	Musselshell County	Yellowstone County	Other Counties	State of Montana	Federal Government
Mine Expenditures, including Payroll						
Employees		82	172	11		
Wages and Benefits[1]		$9,937,500	$26,830,000	$1,432,500		
Local Business Transactions		$10,763,000	$30,464,000			
SPE Community Foundation		$500,000				
Other Community Groups[2]		$27,354	$10,315			
Taxes and Fees[3]						
Montana Severance Taxes	4% of saleable value				$30,280,000	
Resource Indemnity Trust Fund and Groundwater Assessment Tax	0.4% of gross value (i.e., saleable value)				$3,037,075	
Gross Proceeds Tax[4]	2.5% of saleable value. 50% to State, 50% to County (increases after 2020)	$5,119,836	$363,486		$5,483,322	
State Land Surface Annual Lease					$1,920	
State Mineral Royalties	10%/ton FOB				$34,339,214	
Federal Land Surface Annual Lease	$3/acre annually					$8,040
Federal Mineral Royalties[5]	8% of saleable value (50% to State, 50% to Federal Gov't.)				$132,298	$132,298
Abandoned Mine Reclamation Fees	$0.096 per saleable ton (underground rate)					$706,262
Free on Board (FOB)/Black Lung	Lesser of 4.4% or $1.10 per saleable ton (underground rate), paid on domestic sales only.					$126,722

Revenue Source/ Category	Rate	Musselshell County	Yellowstone County	Other Counties	State of Montana	Federal Government
Property Taxes[6]	on value of land and equipment	$1,975,231	$461		$1,975,692	
Payroll Tax						$2,638,432
Totals		$7,095,067	$363,947	$0	$75,249,521	$3,611,754

Source: SPE 2024. All values are approximate.

[1] County portions estimated from the portion of the Mine's 265 employees residing in Yellowstone County (65%) and Musselshell County (31%). Includes the portion that would be paid as State and Federal income tax.

[2] Average annual mine contribution 2022-2023. Over the two years, the mine contributed approximately $20,629 to the Yellowstone County community.

[3] Taxes and fees are for Fiscal Year 2023.

[4] SPE paid $10,966,644 in Gross Proceeds Taxes in FY 2023. Allocation among the State and counties is imputed based on FY 2022 allocation of $1,237,000 to the state, $1,155,000 to Musselshell, and $82,000 to Yellowstone.

[5] SPE could not mine after February 2023. In FY 2022, SPE paid $1.6 million Federal mineral royalties, split equally between Federal and state.

[6] Yellowstone County property taxes paid were lower due to longwall not being located in Yellowstone County at year end.

3.16.4.2 Population

A review of population estimates data (U.S. Census Bureau 2010, 2020, 2024b) reveals recent population changes in both Yellowstone and Musselshell Counties (**Table 3.16-3**). Musselshell County's population grew only 1.9 percent from 4,471 in 2000 to 4,555 in 2010 but grew 4.3 percent to 4,750 between 2010 and 2020, still more slowly than Montana's 10 percent population growth per decade. By contrast, Yellowstone County's population grew 14.4 percent from 129,570 in 2000 to 148,394 in 2010 and 11.3 percent to 165,218 between 2010 and 2020, faster than the statewide population grew. However, from 2020 to 2023, Musselshell's population was estimated to have surged 11.7 percent to 5,308, outpacing the estimated 3.4 percent growth in Yellowstone and 4.2 percent growth statewide. Montana's most populous county of Yellowstone, with its population concentrated in Montana's largest city of Billings, has over 32 times as many residents as Musselshell County. However, most of the area in both counties is rural.

Table 3.16-3. Study Area Population Characteristics, 2000-2023

Population Statistic	Musselshell County	City of Roundup	Yellowstone County	City of Billings	Montana
2000 Population[1]	4,471	1,928	129,570	91,950	903,773
2010 Population[2]	4,555	1,789	148,394	104,509	990,697
2020 Population[3]	4,750	1,748	165,218	117,224	1,087,211
2023 Population[3]	5,308	1,960	170,843	120,864	1,132,812
Percent Change, 2000-2010	1.9	-7.2	14.5	13.7	9.6
Percent Change, 2010-2020	4.3	-2.3	11.3	12.2	9.7
Percent Change, 2020-2023	11.7	12.1	3.4	3.1	4.2
Percent Change, 2000-2023	18.7	1.7	31.9	31.4	25.3

[1] U.S. Census Bureau, 2010
[2] U.S. Census Bureau, 2020
[3] U.S. Census Bureau, 2024b

3.16.4.3 Employment

Table 3.16-4 presents employment data from both 2010 and 2022, including the number of total residents in the civilian labor force, unemployment rates, and percent employed in agriculture, forestry, fishing and hunting, and mining sector for Musselshell County, Yellowstone County, and the State of Montana. Between 2010 and 2022, the civilian labor force increased 10.1 percent in Montana and 11.6 percent (9,027 workers) in Yellowstone County but only 1.1 percent (22 workers) in Musselshell County. The unemployment rate in Yellowstone County and the state fell between 2010 and 2022 but increased in Musselshell County (U.S. Census Bureau 2011, 2023). The unemployment rate has fluctuated from 2.8 percent of 2,055 people in the labor force in 2010 to 2.9 percent of 2,077 in 2022 for Musselshell County, from 4.3 percent of 78,117 in 2010 to 3.5 percent of 87,144 in 2022 for Yellowstone County, and from 5.7 percent of 504,878 in 2010 to 3.9 percent of 555,742 in 2022 statewide. Musselshell County has 18.6 percent of its workforce in agriculture, forestry, fishing, hunting, and mining, compared to only 6.3 percent statewide and 2.8 percent in Yellowstone County.

In 2022, 25.1 percent (316 jobs) of 1,257 total jobs in Musselshell County were in natural resources and mining. 16.9 percent (213 jobs) were in trade, transportation, and utilities. 12.3 percent (154 jobs) were in private health care and social assistance. 11.2 percent (141 jobs) were in public elementary and secondary schools. 9.5 percent (119 jobs) were in other government activities. In Yellowstone County, only 1.1 percent (944 jobs) of 85,415 total jobs were in natural resources and mining. 23.7 percent (20,208 jobs) were in trade, transportation, and utilities. 16.9 percent (14,413 jobs) were in private health care and social assistance. 14.0 percent (11,949 jobs) were in leisure and hospitality. 10.6 percent (9,088 jobs) were in professional and business services. 10.5 percent (9,005) were in government (U.S. Bureau of Labor Statistics 2023).

Table 3.16-4. Study Area Employment Characteristics, 2010 to 2022

Year and Employment Statistic	Musselshell County	Yellowstone County	Montana
2010			
Number in the Civilian Labor Force	2,055	78,117	504,878
Unemployment Rate	2.8	4.3	5.7
Percent Employed in Agriculture, Forestry, Fishing, Hunting and Mining	19.6	3.1	7.1
2022			
Number in the Civilian Labor Force	2,077	87,144	555,742
Unemployment Rate	4.9	3.5	3.9
Percent Employed in Agriculture, Forestry, Fishing, Hunting and Mining	18.6	2.8	6.3
Percent Change in Civilian Labor Force, 2010-2022	1.1	11.6	10.1

Sources: U.S. Census Bureau 2011, 2023

3.16.4.4 Housing

Table 3.16-5 presents a summary of housing characteristics in the study area for both 2010 and 2022. In 2022, 20.2 percent (540 housing units) of 2,677 total housing units in Musselshell County were vacant. Within Musselshell's County seat of Roundup, 15.2 percent (151) of 993 housing units were vacant. The relatively low percentage of housing occupied in Musselshell County and the City of Roundup indicate that surplus housing still exists in both jurisdictions, but especially in Musselshell County. By contrast, Yellowstone County and the City of Billings continue to have an active housing market. Only 6.0 percent (4,355) of 72,252 housing units in Yellowstone County were vacant. Within Yellowstone's County seat of Billings, 6.6 percent (3,481) of 52,709 housing units were vacant. Owner-occupied units comprised 80.8 percent (1,727) of the 2,137 occupied housing units in Musselshell County, well above the 69.5 percent (47,210) of 67,897 in Yellowstone County and 69.0 percent statewide.

Table 3.16-5. Study Area Housing Units and Change, 2010[1] to 2022[2]

Year and Housing Statistic	Musselshell County	City of Roundup	Yellowstone County	City of Billings	Montana
2010 Housing Units	2,539	1,078	62,450	45,021	471,723
2010 Percent Occupied	80.1	75.8	95.7	95.9	85.1
2010 Owner-Occupied as a Percent of Occupied	76.7	69.2	70.3	65.8	69.0
2022 Housing Units	2,677	993	72,252	52,709	517,430
2022 Percent Occupied	79.8	84.8	94.0	93.4	85.8
2022 Owner-Occupied as a Percent of Occupied	80.8	73.4	69.5	64.8	69.0
Percent Change in Housing Units, 2010-2022	5.4	-7.9	15.7	17.1	9.7

[1] U.S. Census Bureau 2011
[2] U.S. Census Bureau 2023

3.16.4.5 Local Government Facilities and Services

Revenues generated by mineral production continue to support Musselshell County facilities and services, allowing facilities to keep pace with growth (Musselshell County Commissioners 2017). Improvements in Musselshell County and the City of Roundup since 2011 include a new elementary school, improvements to the facility and equipment at Roundup Memorial Healthcare, a new senior center and other improvements funded in part by the Signal Peak Community Foundation and grants from the Montana Coal Board as discussed earlier in this section.

Based on the scope of improvements made in recent years, existing facilities and services are likely meeting current population needs, accommodating the moderate population growth experienced in Musselshell County. Improvements in government facilities and services in Yellowstone County are paid for by increased property values and tax rates, including a number of special tax districts (Yellowstone County 2023).

3.17 Visual Resources

3.17.1 Introduction

Visual resources consist of all natural and human-made elements within a given landscape that include but are not limited to landform (topography and soils), vegetation, bodies of water (lakes, streams, and rivers), and human-made structures (roads, buildings, and modifications of the land, vegetation, and water) that make up the overall visual landscape. The characteristic landscapes found within the study area generally correspond to rolling hills and mesas, low mountains, and areas of open grasslands and farmlands on a mix of private, BLM, and Montana State Land Trust lands. Existing mining operations within the Mining Plan Area have created visual contrast within the surface disturbance areas (**Figure 2.1-1**), largely centralized in the Surface Facility Area (**Figure 2.2-1)**; however, the underground disturbance areas are not visible to the public and the terrain and land cover associated with the natural visual setting predominates.

The BLM Visual Resource Management (VRM) system provides a recognized method of analyzing visual impacts associated with the No Action Alternative, Proposed Action, and the Partial Mining Alternative. (BLM 1986) BLM manages visual resources in order to preserve the quality of natural landscapes and unique geologic features, while providing for different levels of landscape modifications in order to meet the multiple resource objectives inherent to the BLM mission. BLM lands within the study area consists only of VRM Class III lands (BLM 2017).

3.17.2 Study Area

The study area for visual resources includes both a direct effects study area and an indirect effects study area. The direct effects study area is the permit area, and the indirect effects study area encompasses the permit area plus a 1-mile buffer and a 1-mile buffer around the rail transportation route to Laurel (**Table 3.0-1**, **Figure 3.0-3**). The past, present, and RFFA effects study area for visual resources is the same as the study area. Direct, indirect and past, present, and RFFA impacts are discussed in **Chapter 4**.

3.17.3 Regulatory Framework

3.17.3.1 Federal Requirements

Federal regulations (the Federal Land Policy and Management Act of 1976, SMCRA, and NEPA) require that BLM manages visual resources equally with other resources. In response to that congressional mandate, BLM conducts a Visual Resource Management (VRM) inventory that identifies, sets and meets objectives for the maintenance of scenic values and visual quality of Federal lands. This inventory is based on research designed to objectively assess aesthetic qualities of the landscape (BLM 1986). The VRM classification ratings range from I to IV as follows:

- **Class I Objective - No Visible Change** - The objective of this class is to preserve the existing character of the landscape. Only Congressionally authorized areas or areas approved through the Management Framework Plan (MFP)/RMP process where the goal is to provide a landscape setting that appears unaltered by man should be placed in this class. The level of change to the characteristic landscape should be extremely low because only very limited development such as hiking trails should occur in these areas.

- **Class II Objective - Change Visible but Does Not Attract Attention -** The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
- **Class III Objective - Change Attracts Attention but Is Not Dominant -** The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
- **Class IV Objective - Change is Dominant but Mitigated -** The objective of this class is to provide for management activities that require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements. The land included in the proposed tracts is classified as visual resource management Class III.

3.17.3.2 State Requirements

There are no State regulations applicable to visual resources within or near the study area.

3.17.3.3 Local Requirements

Musselshell County

Musselshell County does not appear to have a comprehensive or general plan or growth policy document (Musselshell County 2020). Therefore, there are no policies related to visual resources that apply to the Proposed Action for Musselshell County.

Yellowstone County Growth Policy Update

The *2008 Yellowstone County – City of Billings Growth Policy Update* contains the following policies related to visual resources that apply to the Proposed Action (Yellowstone County-City of Billings Planning Division 2009).

Land Use Element

Issue 2: The current zoning ordinances and subdivision regulations do not always prevent incompatible uses in and adjacent to existing City neighborhoods and County townsites.

- **Goal:** New developments that are sensitive to and compatible with the character of adjacent City neighborhoods and County townsites. Compatibility refers to the degree of similarity between uses with respect to appearance, use, scale, and traffic volumes generated.
- Objectives:
- Maintain a high quality of life for new and existing residents.
- Reduce conflicts between neighbors.

- Improve the appearance of land uses.
- Preserve property values.

Aesthetics Element

Issue 1: There are areas in the City and County that are unattractive and present a poor image of the community.

- **Goal:** Visually appealing communities.
- Objectives:
- Improve the image of the community.
- Instill pride in the community.
- Improve the quality of life for residents.
- Preserve the community assets such as the Rimrocks, the Yellowstone River, the downtown and the major street thoroughfares.

Transportation Element

Issue 4: The design of roads, streets, and pedestrian facilities can be more attractive and functional.

- **Goal:** Visually appealing rights-of-way that serve the needs of all modes of travel.
- Objectives:
- Employ smart, cost effective designs.
- Use designs that recognize the needs of all users.
- Incorporate attractive visual elements into rights-of-way design.

3.17.4 Existing Conditions

The study area is located approximately 1 mile east of Highway 87, which is the closest major road that provides access to the site. The Mine permit area is not open to the public. Therefore, public views of the study area and surface disturbance areas, including scenic vista views, are only available from U.S. Highway 87 (Highway 87), Rehder Road, Big Clearing Road, Old Divide Road, and Fattig Creek Road, before the mine entrance, and from smaller local roadways connecting to these routes. Private views are available from residences located east of Highway 87, but Signal Mountain and a series of low ridges limits views toward the surface disturbance areas so that only a few residences have direct or partially obscured views of the surface disturbance areas. However, the focus of this analysis is on publicly affected views.

There are no protected scenic resources associated with the study area. Highway 87 is not a Federal, state, or locally designated scenic byway (Federal Highway Administration 2024; Musselshell County 2020; Scenic America 2024; Yellowstone County-City of Billings Planning Division. 2009). There are no identified areas of special, critical, or unique surface features of scenic significance and no National Landmarks Within the study area (National Park Service 2024). In addition, there are no public recreational areas in the study area, and the study area is not a common recreational destination. Therefore, views of the study area are mostly seen by viewers living or working in or passing through the area. Per **Chapter 1** and **Figure 1.1-2** there are lands managed by BLM in AM 3.

Per **Section 3.5**, AM 3 includes 1,890.4 acres of surface ownership held by BLM. Because BLM lands are present within AM 3, any impacts from light pollution in the Project area may affect resources on nearby BLM-managed lands. BLM parcels within the study area consist only of VRM Class III lands (BLM 2017).

The study area is characterized by rolling hills and mesas, low mountains, and areas of open grasslands and farmlands. The highest mountain in the vicinity of the permit area is Dunn Mountain, which has an elevation of about 4,750 feet. There are no outstanding features or unique surface expressions identified by the Montana Bureau of Mines and Geology or professional geologists working in the area. Vegetation within the study area is dominated by areas of ponderosa pine and Rocky Mountain juniper forest, portions of which have been affected by wildfire due to the presence of charred and dead trees; and grasslands that cover the rolling terrain and tops of mesas. Small ponds and drainages are common throughout the study area. Hardened and exposed soils and rock outcroppings in tans, oranges, and pinkish red are also common in the landscape, and deep cracks can be seen where the land has subsiding from existing underground mining operations. The natural landscape in the study area appears largely intact. Human-made features are concentrated east of Highway 87, are fairly common to the region, and primarily include rural residences and ancillary features (e.g., fencing, mailboxes, sheds, garages, generators, propane fuel tanks), paved and dirt roadways, and wooden utility poles and transmission lines that range from blending with to slightly detracting from the natural landscape.

As described in **Section 2.2**, several facilities and structures have been built and other surface disturbance activities have occurred throughout the life of the Mine. Public views of the surface disturbance areas are primarily available from Highway 87 and local roadways east of Highway. However, facilities located within the surface facilities area (**Figure 2.2-1**) and smaller surface disturbances located outside of the surface facilities area (**Figure 2.1-1**) are shielded from traffic on Highway 87 by natural topography, except for disturbances on the steep south slopes of Dunn Mountain are visible from Highway 87. Most surface disturbances and visible Mine infrastructure can be seen from Fattig Creek Road and Old Divide Road, including the two tall storage silos that are located near the conveyor facilities, which are the most prominent features within the surface facilities area that are visible. Outside of the surface facilities area, surface disturbances are associated with ancillary facilities (e.g., air portal, boreholes, and a ventilation fan), subsidence repair, crack sealing, and road construction. Disturbances associated with crack sealing and subsidence repair have been reseeded in accordance with the State-approved Mine Permit, mitigating visual impacts. WDA 2 could result in future disturbances, which were authorized under the 2018 mining plan modification approval, but the area has not currently been developed. Although the two silos within the surface facilities area are visible from some locations east of Highway 87, they do not greatly detract from the natural landscape. Overall, the mostly low-profile disturbances associated with the Mine, which are mostly underground, do not greatly detract from public views, and the natural landscape dominates views.

The Mine creates a source of nighttime light and glare in the study area. The surface facilities area is illuminated at night (365 days a year). Brightness at the surface facilities area is 21.45 magnitude/arc second^2 that falls within Bortle Class 4, which is the rural/suburban transition zone where distant large objects are distinct on the ground and light pollution is visible on the horizon. In comparison, brightness at Highway 87 and areas east of the surface facilities area are 21.82 magnitude/arc second^2 that fall within Bortle Class 3, which is rural sky where large distant objects are vague on the ground and there is low light pollution (Handprint.com 2024, Lightpollutionmap.info 2024, and Lorenz 2022). Lighting associated with the surface facilities area has increased the amount of nighttime illumination visible to the scattered residences in the vicinity, affecting dark skies prevalent in the area before the Mine's expanded facilities construction in 2008 and 2009. As described in **Section 3.5**, the study area is a mix of Federal, State and privately owned and managed lands. Although the State of Montana does not have any laws or regulations governing dark skies or light pollution (NCSL 2022), BLM has best management practices for artificial light at night that would apply to any night lighting associated with this Project located on lands managed by BLM. Because there are no local or State regulations governing light pollution and because of the presence of BLM-managed lands in the study area, "the relatively long distances at which some types of light pollution are noticeable is important to consider in the context of BLM-managed lands. Light pollution from sources miles away can affect resources and people on BLM lands, and in the case of skyglow, the impacts can be noticeable even when there is no direct line-of-sight from the offending light sources" (BLM 2023).

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Chapter 4
Environmental Consequences

4.0 Introduction

This chapter discloses and analyzes the potential direct and indirect impacts, as well as impacts from past, present, and RFFAs that may result from selection and implementation of the Proposed Action and the alternatives carried forward for analysis, as described in **Chapter 2**. As mentioned in **Section 1.4**, this analysis was prepared before the Supreme Court's decision in *Seven County*. Simply because a resource is analyzed in this section is not indicative as to whether an analysis is required under NEPA.

NEPA requires OSMRE, to examine and disclose to the public the potential impacts on the human environment of proposed projects or activities that require State or Federal approval. Impact analyses and conclusions are generally based on the review of existing literature and studies, information provided by resource specialists and other agencies, professional judgment, agency staff insights, and public input; resource-specific analysis methodologies are provided in the introductions to each resource section.

4.0.1 Definitions

The following terms were used in this EIS to describe the nature of impacts associated with each alternative. An impact is defined as any change from the present condition of any resource or issue that may result as a consequence of implementation an action (e.g., the Proposed Action).

Impacts can be direct or indirect in nature, or associated with past, present, and RFFAs:

- **Direct Impact:** Means changes to the human environment from the Proposed Action or alternatives that are reasonably foreseeable and have a reasonably close causal relationship to the Proposed Action or alternatives.
- **Indirect Impacts:** Those effects that occur at the same time and place as the Proposed Action or alternatives and may include effects that are later in time or farther removed in distance from the Proposed Action or alternatives.
- **Past, Present, and RFFA Impacts:** The incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions.

Impacts are also described by their level of significance (i.e., significant, moderate, minor, negligible, or no impact). For purposes of discussion and to enable use of a common scale for all resources, definitions used to describe the intensity of impacts are listed below:

- **Significant Impact**: Impacts that potentially could cause irretrievable loss of a resource; significant depletion, change, or stress to resources; or stress within the social, cultural, and economic realm.
- **Moderate Impact:** Impacts that potentially could cause some change or stress to an environmental resource, but the impact levels are not considered significant.
- **Minor Impact:** Impacts that potentially could be detectable but slight.

- **Negligible Impact:** Impacts in the lower limit of detection that potentially could cause an insignificant change or stress to an environmental resource or use.
- **No Impact:** No discernible or measurable impacts.

Impacts can also vary in their duration, ranging from temporary to permanent in nature. The scale of duration, or length of time an impact would occur, are outlined below:

- **Temporary Impacts:** Impacts that are anticipated to last no longer than 1 year.
- **Short-term Impacts:** Impacts that are anticipated to begin and end within the first 5 years after the Project is implemented.
- **Long-term Impacts:** Impacts that are anticipated to last beyond 5 years to the end of mining operations and through Project reclamation.
- **Permanent Impact:** Impacts that would remain after Project reclamation is completed.

4.0.2 Organization of This Chapter and Individual Resource Sections

The initial impact analysis for each resource is broken down by alternative and discusses the direct and indirect impacts of each. Each resource section also includes a discussion on impacts from past, present, and RFFAs within the past, present, and RFFA effects study area, as described in **Section 3.0**. Finally, each resource discussion concludes with a discussion of mitigation measures proposed to limit long-term impacts from the Proposed Action.

4.1 Transportation and Electrical Transmission

Coal is loaded on trains owned and operated by BNSF Railway (BNSF); each train typically consists of 125 cars. The average current estimate is 1.4 round trips per day. With over 97 percent of the coal shipments going to Westshore Terminal in the Port of Vancouver and to obtain a conservative estimate from the impact analysis, 100 percent of the Mine's coal transported volume was analyzed based on the route to British Columbia. Because truck transport of coal is very limited, distributed over a range of routes, and involves shorter distances, including the truck volumes in the rail calculations is conservative.

4.1.1 Direct and Indirect Impacts

4.1.1.1 No Action Alternative

Rail Transportation

Under the No Action Alternative, SPE would continue to mine for 1 year to recover approximately 10.0 Mt of saleable non-Federal coal remaining within the permit area that is economically recoverable without accessing Federal coal (**Table 2.3-1**). The transportation period would be shortened by approximately 8 years relative to the Proposed Action.

SPE expects the maximum and expected trains/day would be the same under the No Action Alternative and Partial Mining Alternative (SPE 2024); however, the lower mining rate would result in fewer trains/day for the Proposed Action. Moreover, the duration of continued train shipments would be very short term (1 year) under the No Action Alternative.

Vehicle and Electrical Transportation

Public roads, Mine roads, and ranch trails would continue to be used for 1 year under the No Action Alternative. Transportation impacts would remain consistent with existing conditions under the No Action Alternative.

At the conclusion of mining, roads and transmission lines would be decommissioned and roads would be reclaimed to the pre-Mine condition unless landowners request that these facilities remain to support post-Mine land uses. As mining ceases, traffic related to employee transport would also cease. Mine traffic would continue at a lower level during the reclamation phase and would cease entirely in the long term when the Mine is fully reclaimed and no employees or contractors remain. There would be no impact on traffic in the long term as all Mine-related traffic would cease after the Mine is fully reclaimed. Public road improvements and Mine roads and electrical transmission lines retained by landowners would have minor impacts in the long term.

4.1.1.2 Proposed Action

Rail Transportation

The Proposed Action would result in both lower annual production and fewer trains per day. The Proposed Action would, however, increase the number of years of production within the permit area up to 9 years (8 years more than the No Action Alternative). Mining rates would vary from year to year but would average approximately 7.1 Mtpy of saleable coal for the duration of the Project. SPE expects that nearly all coal would continue to be sold to customers in Japan, ROK, Chile, and Hong Kong.

Analysis Approach and Data Sources

The rail safety analysis used existing rail accident data from FRA for 2020 through 2023 as the basis. Although State agencies typically gather information on the accidents that occur in their state, neither the states nor the FRA have enough corresponding data on train-miles within each state to reliably determine accidents per million train-miles for each state. Instead, the FRA provides national accident rates, including rates for individual railroads. The accident rates provided by the FRA have been adjusted by track class to serve as the basis of the rail safety analysis. For the likelihood of an accident, the analysis included both loaded coal trains and unloaded train returns. The analysis was based on BNSF's national accident rates for rail accidents on all track classes, taking into consideration the impacts of unit trains, which are less likely to spend time in yards and thus avoiding many yard accidents. **Table 4.1-1** presents the overall national rates as well as the national rates for BNSF. The BNSF experience is slightly better than all railroads on average nationwide. Train accident rates were not available for specific cargoes, such as coal.

Table 4.1-1. Nationwide Train Accident Rates

	Accident Rate per Million Train-Miles			
	All Railroads (Passenger and Freight Trains)		BNSF (Freight Trains)	
Year	All Track Types	Mainline and Siding Tracks	All Track Types	Mainline and Siding Tracks
2020	2.92	1.03	2.11	0.64
2021	2.92	0.97	1.78	0.49
2022	3.24	0.99	2.27	0.53
2023	3.24	0.99	2.72	0.58

Source: FRA 2024

These accident rates are based on the experience for all track types—mainlines, sidings, industry tracks, and yards. Both the rates for the full set of track types and the rates combining mainline and siding tracks are included in **Table 4.1-1**. As the unit trains would not be expected to stop in any yards, rather to stay on mainlines and possibly use sidings, the combined rate for mainline and siding tracks was used in the safety analysis. Based on the average for the last 4 years of BNSF experience, the selected starting point for the accident rate in this analysis was 0.6 accidents per million train-miles. The average of 0.56 accidents per million train-miles was rounded up to 0.6 accidents per million train-miles.

The analysis estimated for each route segment the incremental addition to the base accident frequency attributable to the SPE rail traffic, based on train-miles and route length. There was obviously no way to predict exactly where an accident might occur, be it a collision or a derailment, which are the two accident types of primary concern. By predicting accidents per segment, there was some level of information on the general areas in which an accident may occur. Potential consequences (e.g., number of cars derailed and potential for a coal spill) are discussed qualitatively.

The predicted number of accidents per year was calculated by multiplying segment length by the number of trains per year by the appropriate accident rate. Accident rates have been shown to vary considerably by track class, with higher accident rates (i.e., yielding more accidents for a given number of train-miles) occurring on lower track classes. Train accidents are more likely to occur on lower track classes (which have lower maximum allowable speeds) because lower track classes are not designed and maintained to the same standards as higher track classes. FRA's track safety standards establish nine specific classes of track (1 to 9). The selected routes are likely a mix of track classes 3 and 4, with respective maximum operating speeds of 40 and 60 mph. As a conservative approach, all the route except the initial spur was assumed to be track class 3. The spur was assumed to be track class 2, with a maximum speed of 25 mph.

Derailment rates by track class were derived by Liu et al. (2011). Track class 3 was found to have derailment rates that were twice the overall average considering all track classes. Track class 2 was determined to have six times the overall average rates. Likewise, Anderson and Barkan (2004) had found the overall accident rate (i.e., collisions, derailments, and all other types of accidents) on track class 3 was approximately twice the overall average rate for all track classes. These findings continue to be applied in more recent rail safety analyses because the FRA-calculated rates by track class use the same number of train-miles as the denominator in the calculations, rather than the specific number of train-miles that were actually traveled on the different classes of track. Thus, the base rate of 0.6 accidents per million train-miles was doubled to better represent track class 3, resulting in a rate of 1.2 accidents per million train-miles for the majority of the route traveled by trains originating from the Mine. For the rail spur, the adjusted rate used in the analysis was 3.6 accidents per million train-miles.

Predicted Mine-Related Train Accidents

Table 4.1-2 provides the predicted number of train accidents on each segment for both the loaded and unloaded coal trains associated with the Project. As described earlier, the number of trains averages 1.3 per day each for loaded and unloaded trains. The analysis assumed operation would occur 365 days per year.

Table 4.1-2. Predicted Train Accidents for Loaded and Unloaded Trains

Segment	Length (miles)	Accident Rate per Million Train-Miles	Mine-Related Coal Train Accidents/Year
Loaded Trains			
Rail Spur to BNSF	30	3.6	0.05
Broadview to Laurel	33	1.2	0.02
BNSF Main Line	1,327	1.2	0.76
Empty Trains			
BNSF Main Line	1,327	1.2	0.76
Broadview to Laurel	33	1.2	0.02
Rail Spur to BNSF	30	3.6	0.05

The results in **Table 4.1-2** show that along the entire route traveled by the Mine-related trains, the analysis predicted less than one accident involving a loaded Mine train per year, using the FRA definition of an accident. For the entirety of the spur and the local line down to the BNSF Main Line, considering both loaded and unloaded trains, the estimate was 0.14 per year or approximately one accident every 7 years. These estimates are higher than the known experience to date, likely due to the BNSF Main Line track classes being a mix of class 3 and class 4, not just class 3 as was assumed in the analysis. Class 4 was determined to have an accident rate of approximately half that for all track classes combined; this would give a factor of four difference between the accident rates for track classes 3 and 4 and would reduce the predicted number of accidents per year on the Main Line for Mine-related trains.

The estimated number of accidents in **Table 4.1-2** are those associated with Mine-related trains. For the Main Line to Broadview, there would be roughly twice as many accidents if the other (existing) traffic is also considered along with both loaded and unloaded Mine-related trains. On the BNSF Main Line, the Mine-related trains (loaded and unloaded) had been estimated as approximately 4 to 15 percent of the overall traffic. Thus, the overall number of accidents expected would be much higher than the estimates associated with just the Mine-related trains.

Notably, the chance of an accident in any one location would be very low. As discussed earlier, accidents include derailments, collisions, and other types of events, some with as little as $12,000 in damage. Smaller events might not even be discernable as an accident to a passerby.

Impacts of Accidents

Not every accident of a loaded Mine-related train would result in a coal spill, and any spills that might occur would vary in size. A collision or derailment could involve only a few rail cars or lead to a greater number of rail cars being derailed in certain circumstances. Furthermore, even when rail cars are derailed, not all of the derailed cars would end up in a position where some or all of their contents could be spilled, depending on the nature, severity, and speed of the accident, as well as the levelness of the surrounding terrain.

Any spills that did occur on the initial spur would be expected to be small given the lower operating speeds, which yield less energetic derailments, which results in fewer rail cars derailing and even fewer releasing cargo. Available data from Liu et al. (2012) indicates that the average number of rail cars derailed on Main Line track (all classes and speeds) for 2001 through 2010 was 8.4 cars; the number of rail cars on yard, siding, and industry track ranged from 4.3 to 5.7 rail cars. These types of track provide a better indication of the consequences of derailments at very low speeds.

If an accident caused a significant release of coal, the actual impacts to the environment would depend on the amount of coal released, the length of time that the spilled coal remained in the area before being recovered or cleaned up, the location of the spill relative to areas of environmental concern, and whether the coal ignited, possibly due to the forces involved in the accident. As an example, a derailment of several cars might result in the need to reset the cars in the train and quickly clean up any coal that may have spilled, which would result in minimal or no damage to the environment. A large derailment would require more effort to clear the damaged cars and remove the spilled coal, possibly resulting in damage to the environment around the spill area. If a large derailment occurred and released coal into a stream or sensitive habitat (e.g., wetland) or resulted in a fire, the damage to the environment would be more extensive.

Given that derailments could occur anywhere along the route and that the number of cars involved also could range from very few to a larger fraction of the train, each accident would be unique. OSMRE finds it too speculative to attempt to specify the exact location and consequences of a derailment. The railroads have procedures and policies that cover the range of potential accident scenarios. OSMRE used the best information available to the agency to calculate the likelihood of a derailment and describe the likely number of cars involved in possible derailments (averaging less than 10, as presented above for different types of track).

Potential impacts to the human and natural environment would be mitigated by existing FRA, railroad, and state/local rail emergency response and risk management plans. BNSF has emergency responders in seven locations in Montana (Billings, Chester, Glendive, Great Falls, Havre, Helena, and Whitefish) and additional responders in other locations along their routes (BNSF 2020a). They pre-position response equipment and share emergency response plans specific to different geographic areas with appropriate State and local emergency response organizations along their routes (BNSF 2020b).

Vehicle and Electrical Transportation

The Proposed Action would continue to use existing public roads, Mine roads, and ranch trails in a manner comparable to the No Action Alternative except that mining would continue for 8 years longer than the No Action Alternative (about 9 years in total). In addition, the Proposed Action may require construction of new Mine roads and transmission lines. Construction, operation, and maintenance of the conveyor and the at-grade equipment crossing associated would periodically affect traffic in the immediate vicinity. SPE would obtain the necessary permits or permissions from Musselshell County before constructing any crossings and would comply with provisions of the agreement and State-approved Mine Permit pertaining to these facilities, ensuring that impacts would be minimized. Short term impacts to vehicle transportation would be minor. The conveyor and equipment crossings would be removed and reclaimed at the conclusion of mining, ensuring that there would be no long-term impacts. Like the No Action Alternative, new transmission lines and Mine roads would be reclaimed unless retained at the request of landowners.

Mine employment and coal production rates would be comparable to the No Action Alternative, so there would be no additional demand for transportation of employees, contractors, or supplies, and traffic would be constant in the short term, relative to the No Action Alternative. However, this level of activity and traffic would continue for an additional 8 years, relative to the No Action Alternative, declining at the time of Mine closure and eventually ceasing following reclamation, as it would under the No Action Alternative.

In the short term, Mine-related traffic would continue to have minor impacts to public roads before declining in association with Mine closure after the remaining 9 years of mining. There would be no impact on traffic in the long term as all Mine-related traffic would cease after the Mine is fully reclaimed. Public road improvements, Mine roads, and electrical transmission retained by landowners would have minor long-term impacts.

4.1.1.3 Partial Mining Alternative

Rail Transportation

The Partial Mining Alternative would maintain annual production rates consistent with the No Action Alternative and would continue within the Mine permit area for approximately 5 years from the date that the Department of the Interior's (DOI's) Assistant Secretary for Land and Minerals Management (ASLM) approves the mining plan modification. Under this alternative, mining rates would be anticipated to recover approximately 10.0 Mtpy of saleable coal over the 5-year production period. SPE expects that nearly all coal would continue to be sold to customers in Japan, ROK, Chile, and Hong Kong consistent with the No Action Alternative and Proposed Action. The total chance of a derailment over the operating period would be about the same as that for the Proposed Action, while the annual chances would be the slightly higher.

Vehicle and Electrical Transportation

Impacts from vehicle transportation and electrical transmission would be the same as described for the Proposed Action, except that the duration of the minor impacts would be reduced by less than half for the mining period; the length of the reclamation period would be similar to that for the Proposed Action.

4.1.2 Impacts from Past, Present, and Reasonably Foreseeable Future Actions

Given the uncertain nature of the number and location of accidents (including train derailments and spills) that may occur along the rail transport route, impacts from past, present, and RFFAs associated with the No Action Alternative, Proposed Action, and Partial Mining Alternative cannot be determined.

4.1.3 Mitigation Measures

No additional mitigation measures were determined necessary to avoid unacceptable impacts.

4.1.4 Irreversible and Irretrievable Commitment of Resources

All alternatives would contribute to rail and roadway traffic, operations, and reclamation, thereby increasing the amount of fuel used by vehicles to continue the life-of mine. Fuel is a non-renewable resource; thus, traffic related to the Alternatives would result in an irreversible commitment of resources.

All alternatives would contribute to consumption of electricity to power Project equipment and facilities. Electrical transmission is considered to be irreversible and irretrievable as it cannot be recycled or recovered once it is consumed.

4.2 Air Quality

4.2.1 Direct and Indirect Impacts

Impacts on air quality are directly related to air pollutant emission rates that are generally proportional to the rate of saleable coal recovery across all segments (Mine operations, rail/truck transportation, seaport handling, ocean transport, and overseas combustion) as presented in **Section 3.2**. Direct and indirect impacts are evaluated by quantifying annual emissions at the assumed rate of saleable coal recovery under each alternative. Three alternatives are evaluated as shown in **Table 4.2-1**.

Table 4.2-1. Saleable Coal Recovery by Alternative

Description	Alternative		
	No Action	Proposed Action	Partial Mining
Approximate Annual Saleable Coal Recovery (Mt)	10.0 [1]	7.1	10.0
Duration (approximate years)	1[2]	9	5

[1] Represents the total remaining amount of coal currently authorized for mining.
[2] Conservative assumption for purposes of emissions analysis that the remaining authorized coal is mined in 1 year (recovery rate of approximately 10.0 million tons per year).
Mt = million tons

Section 2.3 provides further information on each of the three alternatives. The recovery rate of approximately 10.0 Mtpy under the No Action Alternative, and the Partial Mining Alternative is described in **Section 2.1**. The average recovery rate of approximately 7.1 Mtpy under the Proposed Action represents the average of the Mine's actual saleable coal between 2018 and 2023 (**Table 2.1-1)**. As such, the average recovery rate of approximately 7.1 Mtpy under the Proposed Action results in emissions levels that are considered to be the most representative of the actual annual impacts that would occur under the Proposed Action.

Under the No Action Alternative, mining activities could continue for approximately 1 year; however, the total recovery of saleable coal would not exceed 10.0 Mt, regardless of whether mining continues for 1 year. Therefore, the analysis conservatively assumes that the recovery of approximately 10.0 Mt of saleable coal and the associated emissions would occur within 1 year. The Mine could have a maximum coal production with the annual limit of 15.0 Mtpy of raw coal allowed under the Mine's air quality permit (MDEQ 2023). The Mine is not physically capable of shipping 15.0 Mtpy but could mine at this rate for a limited time while storing the excess until it can be shipped. The maximum mining rate reflects an 80 percent recovery of the raw coal, or 12.0 Mtpy.

Estimated emissions by alternative and for maximum coal production per the air permit are presented for each segment (Mine operations, rail/truck transportation, seaport handling, ocean transport, and overseas combustion) in **Appendix B**, Tables C-12 through C-16 (respectively). Methods used to estimate emissions are described in **Appendix C**, where annual emissions are presented on a 1.0 Mt basis. Findings of the analysis of alternatives are summarized in the following sections.

4.2.1.1 No Action Alternative

Mining

Mining activities under the No Action Alternative could produce and ship up to approximately 10.0 Mt saleable non-Federal coal annually for 1 year. Mining activities would continue to be controlled by the existing air quality permit (MDEQ 2023) and the underlying regulations, which are designed to prevent major impacts (see **Section 3.2** and **Appendix B**). Ambient air monitoring has demonstrated that the Mine's historical impacts to local air quality have been minor with respect to applicable air quality standards (NAAQS and MAAQS). Although actual annual emissions from the No Action Alternative could increase relative to historical rates, they would not increase beyond levels associated with the air permit limits, which allow mining up to 15.0 Mtpy of raw coal (approximately 12.0 Mtpy saleable coal). Therefore, the direct and indirect impacts of Mine operations to air quality are expected to be minor. This conclusion is supported by MDEQ's February 2017 approval to terminate local air monitoring for PM10 (MDEQ 2017). Air quality impacts related to the No Action Alternative would be short term, lasting about 1 year, while mining continues and then declines, eventually ceasing at the end of on-site reclamation activities.

Rail Transport

Rail transport emissions are presented as pounds per mile traveled, reflecting distribution of impacts over the 2,780 miles trains travel round-trip, including rail line segments that may see both loaded and unloaded rail traffic. Separate emissions are calculated for loaded and unloaded trains and are combined to estimate total round-trip emissions (**Appendix C**). At the estimated annual criteria pollutant emission rates, impacts to air quality from rail transport under the No Action Alternative are expected to be negligible and short term, lasting 1 year. Emissions would be distributed over long distances and be transitory in nature. As described in **Appendix B**, rail routes do not encroach on any Class I areas, and they pass through one SO2 nonattainment area for about 2 miles in Laurel, Montana. In addition, coal dust-related impacts associated with rail transport of coal under the No Action Alternative would be negligible (**Appendix B**). Impacts on air quality would be short term as the duration of mining and transport would be extended by 1 year. Coal dust deposited in soil and water would remain in the long term.

Seaport Handling

At estimated annual criteria pollutant emission rates, impacts to air quality from seaport handling under the No Action Alternative are expected to be negligible and short term, lasting 1 year. As noted in **Appendix B**, measured ambient pollutant concentrations proximal to Westshore Terminal were all below the relevant air quality objectives and standards in 2020. Existing regulations will continue to ensure that individual emitting sources produce air quality impacts at levels that do not adversely affect human and environmental health.

Ocean Transport

Estimated annual criteria pollutant emissions related to transporting coal from the Westshore Terminal to Japan, ROK, Chile, and Hong Kong are presented as pounds per mile traveled round-trip because impacts of emissions from marine vessels are distributed over a large distance, similar to locomotive emissions, as discussed above. At these emission rates, impacts to air quality from ocean transport are expected to be negligible and short term, lasting 1 year. Localized impacts would be negligible as emissions would be distributed over long distances and be transitory in nature.

Overseas Combustion

Estimated annual pollutant emissions related to combusting coal for power generation in Japan, ROK, Chile, and Hong Kong would be subject to air quality control laws of each nation that would ensure emissions and resultant air quality are within acceptable (regulatory) limits considered protective of human health and the environment (see **Appendix B**). The United Nations Environment Programme reports that ambient air quality standards in Japan and ROK are within World Health Organization (WHO) targets (UNEP 2016a, 2016b). The United Nations Human Rights Office reports that ambient air quality standards in Chile are not within WHO targets (UNHRO 2023). The Hong Kong Environment Bureau reports that ambient air quality standards in Hong Kong are within WHO targets (HKEB 2021.) Given this, air quality impacts from combustion would be minor and would be short term, lasting 1 year. Impacts in Chile could be greater in a relative sense because Chilean ambient air quality standards are not within WHO targets. Reasonably foreseeable future impacts of mercury are discussed in **Section 4.2.2**.

4.2.1.2 Proposed Action

Under the Proposed Action, the Mine would continue to recover saleable coal at an average annual mining rate of approximately 7.1 Mtpy for up to 9 years. Mine production would last approximately 8 years longer than the No Action Alternative. Annual emissions and air quality impacts from the Proposed Action would be, on average, less than those resulting from the No Action Alternative because of the lower anticipated average recovery rate of approximately 7.1 Mtpy of saleable coal. Air quality impacts related to the Proposed Action would be minor for Mine operations and negligible for rail transport, seaport handling, and ocean transport. The degree of impacts from overseas combustion would depend on emission controls and local conditions within Japan, ROK, Chile, and/or Hong Kong but would be minor due to existing regulations in place that are considered protective of human health and the environment. Air quality impacts from all segments would be short term but, under the Proposed Action, would persist for 9 years compared to 1 year under the No Action Alternative. As further described in **Appendix B**, impacts would be expected to decrease over time as equipment (e.g., locomotive engines, ship engines, boilers) that emit air pollutants is improved and replaced with newer technology and as regulations become more stringent.

The Proposed Action would result in a lower rail transport rate than the No Action Alternative because of the lower saleable coal recovery rate (see **Section 2.3**). Indirect impacts associated with generation of coal dust would be negligible. While impacts would occur 9 years under the Proposed Action compared to 1 year under the No Action Alternative, the duration of air quality impacts is still considered short term as the impacts would cease after rail transport of the Mine's coal concludes. As with the No Action Alternative, coal dust deposited in soil and water would remain in the long term.

4.2.1.3 Partial Mining Alternative

This alternative would establish a limit of approximately 5-years to mine Federal coal within AM 3 from the date of ASLM mining plan modification approval until approximately 2030, at which time no additional Federal coal would be mined unless SPE received an additional mining plan modification approval. The Partial Mining Alternative assumes that the authorized 5 years would coincide with years 2025 through 2030. Under this alternative, mining in AM 3 would be sequenced over a 5-year period at a rate of approximately 10.0 Mt of saleable coal per year. Because the annual saleable coal recovery rate is the same as for the No Action Alternative, the annual air quality impacts would be expected to be the same as the No Action Alternative. However, the Partial Mining Alternative impacts would cease after 5 years rather than the 1-year period of the No Action Alternative. Compared to the Proposed Action, the Partial Mining Alternative impacts would cease after 5 years, rather than the 9-year period of the Proposed Action. However, the annual saleable coal recovery rate of the Partial Mining Alternative (approximately 10.0 Mtpy) would be greater than the Proposed Action (average recovery rate of 7.1 Mtpy) (see **Section 2.3**). After the cessation of mining, impacts from reclamation would be the same as for the Proposed Action and would persist for the same duration.

4.2.1.4 Localized Air Quality Effects from Mine Operations

To evaluate localized air quality effects due to Mine operations, SPE conducted a dispersion modeling study to estimate potential ambient concentrations of criteria pollutants in the area surrounding the Mine (**Appendix E**). The modeling accounted for all emission sources associated with Mine operations, including underground and surface operation of equipment and vehicles, worker commuting, coal handling and storage, coal processing, waste handling and disposal, coal loadout to trucks and trains, and transport of coal by trucks and trains while on-site. Concentrations of CO, NO_2, PM10, PM2.5, and SO_2 were modeled using the EPA Regulatory model AERMOD in accordance with EPA guidance.

One operations scenario was modeled that corresponds to the maximum mining rate, 15.0 Mtpy of raw coal, that is allowed by the Mine's MDEQ air quality permit. This permitted rate is based on the maximum physical capacity of Mine operations over 1 year and is higher than has ever occurred in practice. The permitted rate of 15.0 Mtpy is higher than the mining rates assumed for the No Action Alternative (approximately 10.0 Mtpy), the Proposed Action (average recovery rate of approximately 7.1 Mtpy), and the Partial Mining Alternative (approximately 10.0 Mtpy). Therefore, potential air quality impacts based on the permitted rate are conservative (high) estimates compared to the impacts anticipated with any of the NEPA alternatives. If ambient concentrations estimated for the maximum permitted mining rate do not exceed the NAAQS and MAAQS, then it may be assumed confidently that concentrations with any of the NEPA alternatives also would not exceed the NAAQS and MAAQS.

A detailed report of the modeling results is provided in **Appendix E**. The results are summarized in **Table 1-1** of **Appendix E** and show that for the modeled 15.0 Mtpy maximum mining rate, all estimated concentrations are less than the NAAQS and MAAQS for all averaging time periods. Therefore, concentrations under the No Action Alternative, the Proposed Action, and the Partial Mining Alternative, which assume lesser mining rates than the modeled maximum mining rate, also would be less than the NAAQS and MAAQS. Consequently, no local adverse air quality effects from Mine operations are anticipated under any alternative.

4.2.2 Impacts from Past, Present, and Reasonably Foreseeable Future Actions

Assessment of impacts from past, present, and RFFAs is inherent to evaluation of air quality impacts due to the combined impacts of multiple emission sources in the study area, whether it be the air quality in the vicinity of a monitoring station, an airshed, a region, or the world. Air pollutant emissions directly related to mining and indirectly resulting from rail transport, port operations, ocean transport, and combustion occur in a highly regulated context, as described in **Appendix B**.

Most emissions affect air quality in areas proximal to the emissions source and result in short-term impacts as they dissipate rather than accumulate over time. Though mercury air emissions also dissipate in the atmosphere, elemental mercury can travel long distances before depositing to soil and water where it accumulates and can be reemitted, resulting in long-term impacts (see **Appendix B** for additional detail). Total mercury emissions range from 0.025 to 0.15 tons per year under the No Action Alternative and from 0.018 to 0.11 tons per year under the Proposed Action, accounting for between 0.0007 and 0.0062 percent of global mercury emissions (2,451 tons annually (UNEP 2019). Existing regulations in Japan, ROK, Chile, and Hong Kong and increasing implementation of mercury controls similar to those implemented in the United States are expected to reduce mercury accumulation in the environment in the short term and long term.

Though the extent of air quality impacts from past, present, and RFFAs would vary by segment as discussed and their locale, the factors identified above indicate that impacts from past, present, and RFFAs on air quality resulting from criteria pollutants and arsenic emissions would be minor and short term. Mercury emissions would be minor and have long-term impacts as they are combined with global emissions and accumulate in the environment. Based on modeling studies and mercury deposition measured in the Pacific Northwest, there is evidence that mercury emitted from sources in Asia, including from coal combustion, can be transported in the atmosphere and deposited in the United States (Jaffe et al. 2005; Jaffe and Strode 2008; Seigneur et al. 2004).

Coal dust resulting from the Proposed Action and No Action Alternative would combine with dust generated from other past, present and reasonably foreseeable coal haulage. Continued implementation of BNSF's Coal Loading Rule (BNSF 2015, 2017) ensures that coal dust emissions are minimized on BNSF owned and operated rail lines, thereby minimizing the potential for coal dust emissions and subsequent deposition to soil and water. Increases to port capacity are not foreseeable, so the future rate of coal transport on the Main Line would not change significantly from recent shipping rates. Based on this and the findings of evaluations for other rail transport projects (WDOE and Cowlitz County 2017; STB 2015), Project-related coal dust emissions, dispersion and deposition would result in negligible long-term reasonably foreseeable impacts to air quality and the environment.

4.2.3 Mitigation Measures

No additional mitigation measures were determined to be necessary to avoid unacceptable impacts.

4.2.4 Irreversible and Irretrievable Commitment of Resources

There would be no irreversible and irretrievable commitment of resources to air quality.

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4.3 Climate Change and Greenhouse Gases

4.3.1 Direct and Indirect Impacts

Table 4.3-1 summarizes the CO_2e emissions for the No Action Alternative, Proposed Action, and Partial Mining Alternative. Under the Proposed Action, the total saleable coal is approximately 57.3 Mt of coal, while the Partial Mining Alternative would include approximately 51.0 Mt. Under the No Action Alternative, the amount of saleable coal totals approximately 10.0 Mt. GHG emissions include those associated with coal extraction, employee commute, shipment via rail and/or truck and ship, and the combustion of the coal. By far the largest source of GHG emissions is associated with coal combustion comprising over 96 percent of GHG emissions for all three actions. The Proposed Action has the highest overall CO_2e emissions.

GHG emissions generated from mining, transporting, and coal combustion under the No Action Alternative (22.0 Mt- CO_2e) and under the Proposed Action (126.3 Mt-CO_2e) would have a net difference of 104.3 Mt CO_2e over the remaining life of Mine. While the Partial Mining Alternative in comparison to the No Action Alternative has a net difference of 88.2 Mt CO_2e over the remaining life of Mine. The No Action Alternative's total GHG emissions from all sources (mining, transport and combustion) over 1 year (22.0 Mt CO_2e) is about 8.7 percent of the Federal coal emission projected short-term life-of-project GHG emissions from Montana (253.8 Mt CO_2e). (BLM 2024).

Table 4.3-1. Estimated Mine-Related CO_2e Emissions for Each Alternative

Segment	No Action	Proposed Action	Partial Mining Alternative
Saleable Coal (Mt)	10	57.3	51
Mine operations (tons CO_2e)	39,850	228,341	199,250
Rail transport (tons CO_2e)	239,234	1,370,811	1,196,171
Seaport operations (tons CO_2e)	6,145	35,210	30,724
Ocean transport (tons CO_2e)	480,208	2,751,594	2,401,042
Coal combustion (tons CO_2e)	21,280,283	121,936,020	106,401,414
Haul truck transport (tons CO_2e)	902	5,169	4,510
Total (tons CO_2e)	22,046,622	126,327,145	110,233,110

Mt = million tons; CO_2e = carbon dioxide equivalent

Details on how the estimated emissions by alternative are calculated are presented for each segment (Mine operations, rail, haul truck transportation, seaport handling, ocean transport, and overseas combustion) in **Appendix C**, **Section C.7** and in **Exhibits 1** through **6** (respectively). Annual emissions are presented on a 1.0 Mt production basis. Findings of the analysis of alternatives are summarized in the following sections.

4.3.1.1 No Action Alternative

Mining activities under the No Action Alternative would recover approximately 10.0 Mt of saleable non-Federal coal over a period of 1 year (as discussed in **Section 2.3**, the 10.0 Mt of saleable coal would be mined at the rate of approximately 10.0 Mtpy for 1 year). Most of the GHG emissions attributable to the No Action Alternative are associated with international coal combustion, and it is not anticipated that carbon capture technology will be applied at overseas power plant locations.

The BLM *Specialist Report on Annual Greenhouse Gas Emissions and Climate Trends* (BLM 2024) presents the estimated emissions of GHGs attributable to coal produced on land and mineral estate managed by BLM. Under the No Action Alternative, the total GHG emissions from all sources (mining, transport and combustion) over the entire life of the Proposed Action (22 Mt CO_2e) would be equivalent to about 9 percent of the Montana Federal coal GHG emissions projected short-term life-of-project (254 Mt CO_2e). (BLM 2024).

Mine Operation

Information on the Mine operating hours and load from the mining equipment operating both above ground and below ground was provided by SPE under the No Action Alternative. This information was used to estimate GHG emissions in conjunction with the same type of information for stationary equipment operating at the Mine and the electricity from the power grid to estimate the potential GHG emissions resulting from Mine operations under the No Action Alternative.

The BLM *Specialist Report on Annual Greenhouse Gas Emissions and Climate Trends* (BLM 2024) presents the estimated emissions of GHGs attributable to fossil fuels produced on lands and mineral estate managed by BLM. More specifically, the report estimates GHG emissions from coal, oil, and gas development that are occurring and are projected to occur on the Federal onshore mineral estate. The No Action Alternative's GHG emissions from Mining operations (0.04 MT CO_2e) would be about 1.2 percent of Montana's Federal coal extraction projected short-term life-of-project emissions (3.2MT CO_2e) (BLM 2024).

Rail Transport

Rail transport emissions are presented as pounds per mile traveled, reflecting distribution of impacts over the 2,780 miles trains travel round-trip, including rail line segments that see both loaded and unloaded rail traffic from both loaded and empty coal cars. Separate emissions are calculated for loaded and unloaded trains and combined to estimate total round-trip emissions (**Appendix C, Section C.7, Exhibit 2**). GHG emissions would extend over the 1-year duration that the Mine will operate under the No Action Alternative. Total GHG emissions from rail transport (0.24 MT CO_2e) is about 5 percent of Montana's Federal coal total transport emissions projected short-term life-of-project emissions (4.7 MT CO_2e) (BLM 2024).

Seaport Handling

All coal exported to the west coast of North America is anticipated to occur through Vancouver, British Columbia through Westshore Terminal. GHG emissions while at the terminal are based on historical average hoteling time of 51.6 hours (**Appendix C, Section C.7, Exhibit 3)**. GHG emissions would extend over the 1-year duration that the Mine will operate under the No Action Alternative. Total GHG emissions from seaport handling (0.006 MT CO_2e) is less than 1 percent of Montana's Federal coal total transport emissions projected short-term life-of-project emissions (4.7 MT CO_2e) (BLM 2024).

Ocean Transport

Estimated annual GHG emissions related to transporting coal from the Westshore Terminal to Japan, ROK, Chile, and Hong Kong are presented as pounds per mile traveled round-trip (**Appendix C, Section C.7**, **Exhibit 4)**. The GHG emissions are estimated using the average bulk carrier power, engine size, service speed, and number of calls. This is the same information as was used for the non-GHG emissions. GHG emissions from ocean transport would extend over the 1-year duration that the Mine will operate under the No Action Alternative. Total GHG emissions from ocean transport (0.48 MT CO_2e) is about 10 percent of Montana's Federal coal total transport emissions projected short-term life-of-project emissions (4.7 MT CO_2e) (BLM 2024).

Overseas Combustion

Estimated annual GHG emissions related to combusting coal for power generation in Japan, ROK, Chile, and Hong Kong. CO_2 emissions are calculated from the typical carbon content of the Mine's coal (58.15 percent) (SPE 2025). All but 1.0 percent of carbon is assumed to react during combustion to become CO_2, and the molecular weights of carbon and CO_2 are used to convert carbon mass emissions to CO_2 emissions. Emission factors for CH_4 and N_2O used are as identified in the EPA Mandatory GHG Reporting rule (40 CFR 98.33, Table C-2) are converted to pounds of emissions per ton of coal using a typical heat content (expressed as British thermal units, Btu) for the Mine's coal (10,194 Btu/pound or Btu/lb) (SPE 2025). Details of the emission calculations are reported in **Appendix C, Section C.7**, **Exhibit 5)**. Total GHG emissions from combustion (21.3 MT CO_2e) is about 8.7 percent of Montana's Federal coal total combustion projected short-term life-of-project emissions (245 MT CO_2e) (BLM 2024).

4.3.1.2 Proposed Action

Under the Proposed Action, the Mine would continue to recover saleable coal at an average annual mining rate of approximately 7.1 Mtpy for up to 9 years. The GHG emissions modeling for the Proposed Action assumes that all of the coal will be combusted for power generation.

GHG emissions over the life of the Proposed Action would be 5.7 times larger in comparison to the No Action Alternative because of the longer period of Mine production. Most of the GHG emissions are associated with coal combustion and it is not anticipated that carbon capture technology will be applied at overseas power plant locations. The BLM Specialist Report on Annual Greenhouse Gas Emissions and Climate Trends (BLM 2024) presents the estimated emissions of GHGs attributable to coal produced on lands and mineral estate managed by BLM.

The Proposed Action's total GHG emissions from all sources (mining, transport, and combustion) over the entire life of the Proposed Action (126 Mt CO_2e) would be equivalent to 50 percent of the Montana Federal coal GHG emissions projected short-term life-of-project (254 Mt CO_2e) (BLM 2024).

Mining Operation

Information on the operating hours and load from the mining equipment operating both above ground and below ground was provided by SPE under the Proposed Action. This information was used to estimate GHG emissions in conjunction with the same type of information for locomotives and stationary equipment operating at the Mine and the electricity from the power grid to estimate the potential GHG emissions resulting from Mine operations under the Proposed Action. The Proposed Action's GHG emissions from Mining extraction operations (0.23 MT CO_2e) is about 7 percent of Montana's Federal coal extraction projected short-term life-of-project emissions (3.2MT CO_2e) (BLM 2024).

Rail Transport

Rail transport emissions are calculated based on a travel distance of 2,780 miles round-trip and includes both loaded and unloaded coal cars. Separate emissions are calculated for loaded and unloaded trains and combined to estimate total round-trip emissions (**Appendix C, Section C.7, Exhibit 2**). GHG emissions would extend over the 9-year duration that the Mine will operate under the Proposed Action. Total GHG emissions from rail transport (1.4 MT CO_2e) would be about 29 percent of Montana's Federal coal total transport emissions projected short-term life-of-project emissions (4.7 MT CO_2e) (BLM 2024).

Seaport Handling

All coal exported from the west coast of North America is anticipated to travel through Vancouver, British Columbia. GHG emissions while at the terminal are based on historical average hoteling time of 51.6 hours (**Appendix C, Section C.7, Exhibit 3)**. GHG emissions would extend over the 9-year duration that the Mine will operate under the Proposed Action. Total GHG emissions from seaport handling (0.035 MT CO_2e) is less than 1 percent of Montana's Federal coal total transport emissions projected short-term life-of-project emissions (4.7 MT CO_2e) (BLM 2024).

Ocean Transport

Estimated annual GHG emissions related to transporting coal from the Vancouver, British Columbia to Japan, ROK, Chile, and Hong Kong are presented as pounds per mile traveled round-trip (**Appendix C, Section C.7**, **Exhibit 4)**. The GHG emissions are estimated using the average bulk carrier power, engine size, service speed, and number of calls. This is the same information as was used for the non-GHG emissions. GHG emissions from ocean transport would extend over the 9-year duration that the Mine will operate under the Proposed Action. Total GHG emissions from ocean transport (2.8 MT CO_2e) is about 59 percent of Montana's Federal coal total transport emissions projected short-term life-of-project emissions (4.7 MT CO_2e) (BLM 2024).

Overseas Combustion

Estimated annual GHG emissions related to combusting coal for power generation in Japan, ROK, Chile, and Hong Kong. CO_2 emissions are calculated from the typical carbon content of the Mine's coal (58.15 percent) (SPE 2025). Emission factors for CH_4 and N_2O used are as identified in the EPA Mandatory GHG Reporting rule (40 CFR 98.33, Table C-2) are converted to pounds of emissions per ton of coal using a typical heat content (expressed as British thermal units, Btu) for the Mine's coal (10,194 Btu/pound or Btu/lb) (SPE 2025). Details of the emission calculations are reported in **Appendix C, Section C.7**, **Exhibit 5)**. Total GHG emissions from combustion (122 MT CO_2e) is about 50 percent of Montana's Federal coal total combustion projected short-term life-of-project emissions (245 MT CO_2e) (BLM 2024).

4.3.1.3 Partial Mining Alternative

This alternative would authorize mining of Federal coal for approximately 5 years through 2030, and additional mining of Federal coal after this period would require a subsequent approved mining plan modification. The Partial Mining Alternative assumes that the approximate 5-year authorization would coincide with the years 2026 through 2030 at a rate of approximately 10.0 Mt of saleable coal per year and that all of the coal mined will be combusted for power generation.

GHG emissions over the life of the Partial Mining Alternative would be 5.0 times larger in comparison to the No Action Alternative because of the longer period of Mine production. Most of the GHG emissions are associated with coal combustion and it is not anticipated that carbon capture technology will be applied at overseas power plant locations. The BLM *Specialist Report on Annual Greenhouse Gas Emissions and Climate Trends* (BLM 2024) presents the estimated emissions of GHGs attributable to coal produced on land and mineral estate managed by BLM.). The Partial Mining Alternative's total GHG emissions from all sources (mining, transport and combustion) over the entire life of the Project (110 Mt CO_2e) would be equivalent to 43 percent of the Montana Federal coal GHG emissions projected short-term life-of-project (254 Mt CO_2e). (BLM 2024).

Mining Operation

Information on the operating hours and load from the mining equipment operating both above ground and below ground was provided by SPE under the Proposed Action. This information was used to estimate GHG emissions in conjunction with the same type of information for locomotives and stationary equipment operating at the Mine and the electricity from the power grid to estimate the potential GHG emissions resulting from Mine operations under the Partial Mining Alternative. The Partial Mining Alternative's GHG emissions from Mining extraction operations (0.20 MT CO_2e) is about 6 percent of Montana's Federal coal extraction projected short-term life-of-project emissions (3.2MT CO_2e) (BLM 2024).

Rail Transport

Rail transport emissions are calculated based on a travel distance of 2,780 miles round-trip and includes both loaded and unloaded coal cars. Separate emissions are calculated for loaded and unloaded trains and combined to estimate total round-trip emissions (**Appendix C, Section C.7, Exhibit 2**). GHG emissions would extend over the 5-year duration that the Mine will operate under the Partial Mining Alternative. Total GHG emissions from rail transport (1.2 MT CO_2e) is about 26 percent of Montana's Federal coal total transport emissions projected short-term life-of-project emissions (4.7 MT CO_2e) (BLM 2024).

Seaport Handling

All coal exported to the west coast of North America is anticipated to occur through Vancouver, British Columbia. GHG emissions while at the terminal are based on historical average hoteling time of 51.6 hours (**Appendix C Section C.7, Exhibit 3)**. GHG emissions would extend over the 5-year duration that the Mine will operate under the Partial Mining Alternative. Total GHG emissions from seaport handling (0.031 MT CO_2e) would be less than 1 percent of Montana's Federal coal total transport emissions projected short-term life-of-project emissions (4.7 MT CO_2e) (BLM 2024).

Ocean Transport

Estimated annual GHG emissions related to transporting coal from the Vancouver, British Columbia to Japan, ROK, Chile, and Hong Kong are presented as pounds per mile traveled round-trip (**Appendix C, Section C.7**, **Exhibit 4)**. The GHG emissions are estimated using the average bulk carrier power, engine size, service speed, and number of calls. This is the same information as was used for the non-GHG emissions. GHG emissions from ocean transport would extend over the 5-year duration that the Mine will operate under the Partial Mining Alternative. Total GHG emissions from ocean transport (2.4 MT CO_2e) is about 52 percent of Montana's Federal coal total transport emissions projected short-term life-of-project emissions (4.7 MT CO_2e) (BLM 2024).

Overseas Combustion

Estimated annual GHG emissions related to combusting coal for power generation in Japan, ROK, Chile, and Hong Kong. CO_2 emissions are calculated from the typical carbon content of the Mine's coal (58.15 percent) (SPE 2025). Emission factors for CH_4 and N_2O used are as identified in the EPA Mandatory GHG Reporting rule (40 CFR 98.33, Table C-2) are converted to pounds of emissions per ton of coal using a typical heat content (expressed as British thermal units, Btu) for the Mine's coal (10,194 Btu/pound or Btu/lb) (SPE 2025). Details of the emission calculations are reported in **Appendix C, Section C.7**, **Exhibit 5)**. Total GHG emissions from combustion (106 MT CO_2e) is about 43 percent of Montana's Federal coal total combustion projected short-term life-of-project emissions (245 MT CO_2e) (BLM 2024).

4.3.2 Impacts from Past, Present, and Reasonably Foreseeable Future Actions

4.3.2.1 Climate Change Impacts - Adaptation and Resiliency

The Mine operator has explored preparations for climate change and extreme weather events. The Mine is an underground mine with less than 1,000 acres of surface disturbance for the rail loop, cleaning plant, and other facilities. The Mine has a long operational history and has experienced extreme weather events and multiple wildfires over the past 15 years and is prepared to respond to future events in similar fashion under each alternative while the Mine continues to operate, and where possible, during closure activities.

4.3.2.2 Climate Projections and Recent Historical Events

The 2017 Montana Climate Assessment projects little change in the frequency of dry and wet events in Montana although uncertainty is considered high (Whitlock et al. 2017). Similarly, multi-year droughts will continue to be a re-occurring feature in Montana's climate; rising temperatures will exacerbate drought and increase potential for wildfires. The USGS National Climate Viewer (USGS 2023) projects that rainfall, generally during the spring between 2025 and 2049, may increase monthly average rainfall by up to 0.3 inch and decrease slightly during the summer months depending on GHG emission projections assumed (**Figure 4.3-1**). Annual average temperatures are projected to continue to increase in Montana with annual average temperatures expected to increase (2025 through 2049) by 1.8° C relative to 1981–2010 under a "middle of the road" (SSP245) GHG emission reduction strategy (**Figure 4.3-2**).

Figure 4.3-1. Change in Precipitation – Musselshell County

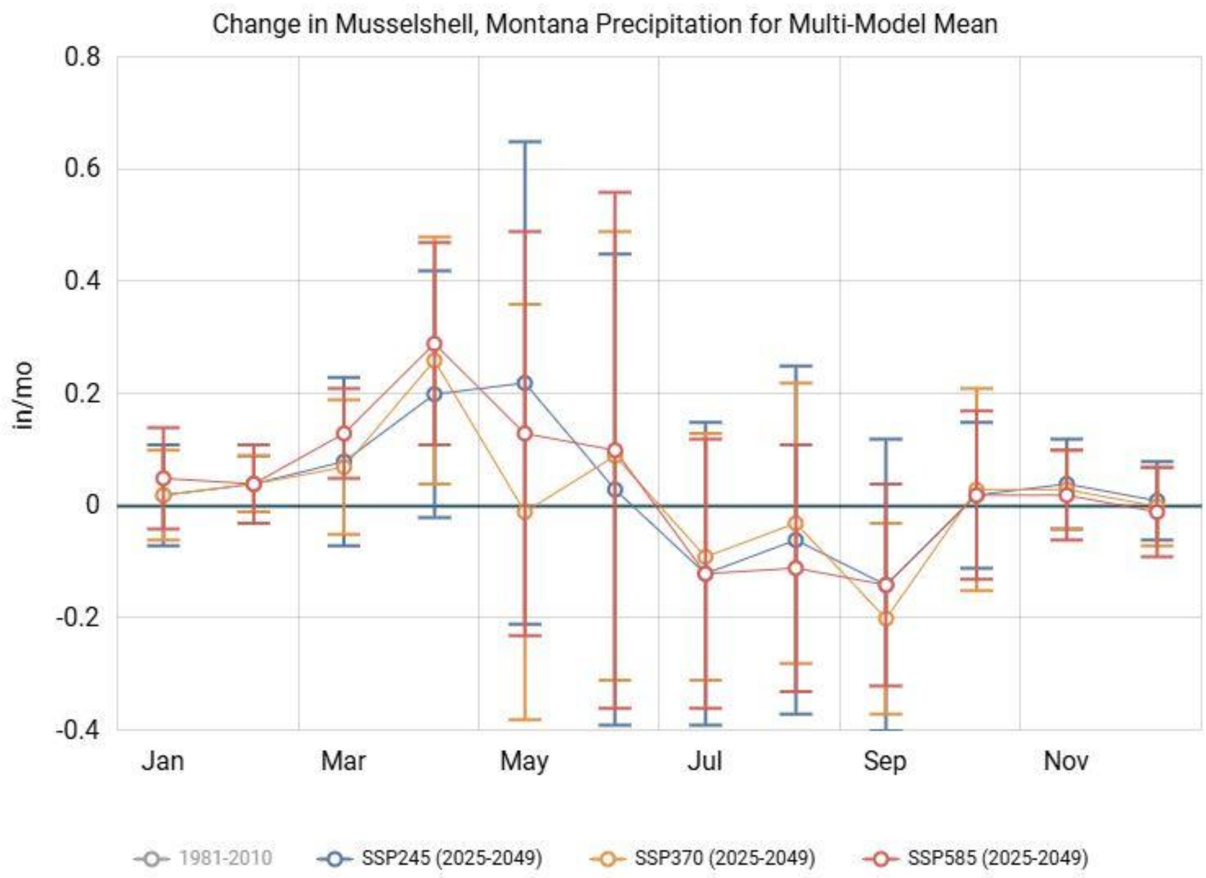
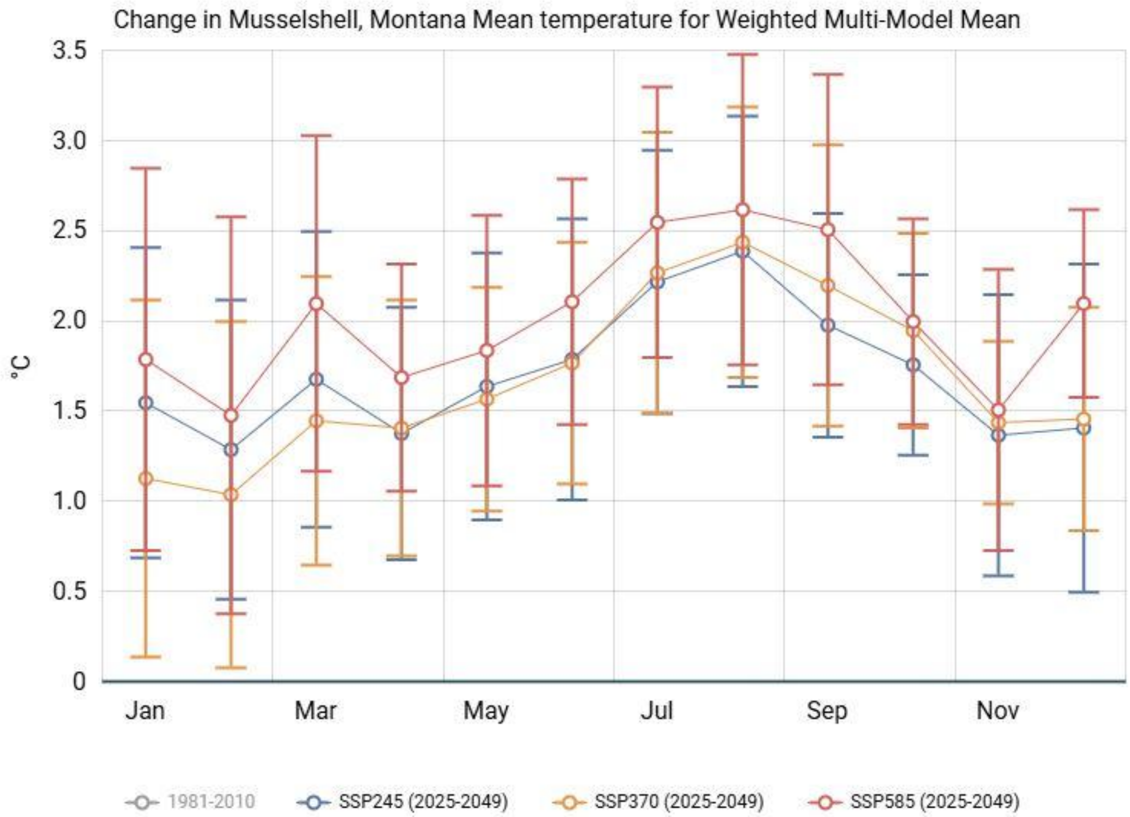


Figure 4.3-2. Change in Mean Temperature – Musselshell, MT



4.3.2.3 Historical Disruptions

During the past 15 years, the Mine has had short-term operational disruptions (e.g., wildfire evacuation) and voluntarily shut down, or limited production, for short timeframes to aid neighboring homeowners, ranchers, and the town of Roundup with equipment and manpower. The Mine operator anticipates that this same short-term operational disruption can be anticipated at the Mine during extreme weather events. Based on past resilience during extreme wildfire and flooding events, long-term Mine operational disruptions are unlikely.

4.3.2.4 Wildfire Events

Starting with the Hawk Creek Fire of 1984, several large wildfires have occurred in the area surrounding the Mine. The Mine operator's surface equipment, such as dozers, graders, and water trucks, have been deployed for quick fire response. The Mine operator's Madison wells have been used and could be used again for emergency fire suppression. Helicopters have dipped and filled their buckets in Madison Pond at the Mine to aid in fire suppression. Mine operators project the same level of assistance in future fire events.

4.3.2.5 Flooding Events

In 2017, the Montana Climate Assessment reported the most severe flooding event in the vicinity of Mine occurred in May and June 2011 (Whitlock et al. 2017). This 50-to-100-year recurrence event measured 7.36 inches of rainfall at the Mine. The majority of May rain fell in three separate storms totaling 6.87 inches in just 118 hours. This led to the most severe flooding event on the Musselshell River, which flooded the nearby town of Roundup for much of the month. The Highway 87 bridge over the Musselshell River was engulfed in 5 feet of water, stranding many Mine employees who lived in Roundup. The Mine provided equipment and employees to help build dikes in the town of Roundup. Following this flooding event, some minor changes to surface facilities were completed to improve future resilience to extreme precipitation events.

Other severe rainfall events include August 2014 and September 2024 in which 3.61 and 3.62 inches, respectively, fell in just 24 hours. Despite the heavy rainfall during these storm events, the Mine's ponds, ditches, and roads only required minor maintenance following the storms.

4.3.2.6 Engineering Design and Analyses

Engineered designs within the existing MDEQ mining permit are expected to be sufficient to withstand any expected climate change impacts over the remaining life of Mine. Engineering standards designed to minimize impact from severe precipitation events include:

- Sediment ponds and spillway are designed to include a 100-year event peak flow in the design analysis. See Appendix 315-1 in Mine Permit C1993017.
- Sediment ponds and spillway are designed in compliance with the ARM 17.24.315, 17.24.603 and 17.24.639. Each of the pond and spillway designs is prepared by, or under the direction of, and certified by a qualified licensed professional engineer, experienced in designing impoundments. Sediment ponds are inspected at a minimum quarterly.
- Additionally, culvert, collection ditch and diversion ditch designs include a 100-year event peak flow in the design analysis. See Appendix 314-1 in Mine Permit C1993017.

4.3.3 Mitigation Measures

The Mine does not currently employ any Carbon Capture Utilization and Storage (CCUS) technology, and there are no permit requirements to employ CCUS or reduce GHG emissions through other means; therefore, GHG emissions from the No Action Alternative, Proposed Action, and Partial Mining Alternative, and any resulting climate impacts, are unavoidable impacts throughout the life of the Mine (LOM). **Section 2.5** discusses a number of alternatives to reduce GHG that were considered for alternative analysis but did not warrant detailed analysis because they were not technically and economically feasible and would not meet the purpose and need of the EIS. Finally, given the relatively short period of continued Mine operation (up to 9 years) and based on available projection models, such as the 2017 Montana Climate Assessment and the USGS Climate Viewer, it is not anticipated that future climate conditions during the remaining LOM will yield more extreme weather events than those events that have already been observed. Current engineered designs and operations have proven their resiliency to extreme weather events and additional climate adaptation and a resiliency plan are considered unnecessary.

The State of Montana has developed Montana's Climate Solutions Plan (Montana Climate Solutions Council 2020). The plan includes an interim goal of net GHG neutrality for average annual electric loads in the state by no later than 2035. Under the No Action Alternative, Proposed Action, and the Partial Mining Alternative, mining operations will have ceased by 2035 and would have no impact on achieving this interim goal.

In collaboration with various State agencies and stakeholders, MDEQ developed the Montana Climate Pollution Reduction Priorities, published in March 2024 (MDEQ 2024) and submitted to the EPA. The Climate Pollution Reduction Priorities establishes the Montana Pollution Reduction Plan that identifies pollution reduction measures that are considered eligible for Federal funding under the next phase of the EPA's Climate Pollution Reduction Grant program. While none of the measures targets reduction in coal mining, the statewide 2019 CO_2e emissions associated with coal mining make up just 1.1 percent of the total state emissions. The single largest priority measure identified is to mitigate and extinguish coal seam fires that, if implemented, would reduce total GHG emissions by approximately 20 million metric tons (MMt) CO_2e by 2050.

4.3.4 Unavoidable, Irreversible and Irretrievable Commitment of Resources

The Mine does not employ any GHG emission reduction strategy; therefore, GHG emissions from the Project and their contribution to global GHG concentration levels and associated climate change are unavoidable and irretrievable throughout the LOM. Indirect GHG emissions associated with the combustion of the mined coal will contribute to worldwide GHG emissions depending upon if GHG emission controls are used at the point of combustion. Climate change impacts may be irreversible, depending on what future steps are taken to address the removal of GHG from the atmosphere and the future GHG emissions worldwide—that is, if the world is unable to limit the buildup of GHG concentrations in the atmosphere, climate change impacts may be irreversible.

4.4 Water Resources

4.4.1 Methods of Analysis

Impacts to water resources from the Proposed Action and alternatives may occur from a number of sources including expansion and dewatering of the underground mine, subsidence of the overlying strata, runoff and seepage from the waste disposal areas (WDAs), processing activities that use groundwater, the release of storm water and excess mine water to PM Draw and Rheder Creek, and land disturbances that alter drainage patterns or change rates of erosion and sedimentation. Potential impacts to surface water and groundwater from continued development of the Mine were evaluated using a numerical groundwater flow and solute transport model (groundwater model) and an infiltration model (WET 2024b, 2024c, 2025). The groundwater model was developed using the United States Geologic Survey (USGS) modeling code MODFLOW-USG and simulates potential impacts to groundwater levels and changes in groundwater chemistry which are expected to occur from operation of the Mine. The Infiltration model was prepared using the EPA Hydrologic Evaluation of Landfill Performance (HELP) model and evaluates potential impacts to alluvial groundwater by seepage from the WDAs (**Appendix F**). The conceptual hydrologic model (CHM) for the site and details about the groundwater and infiltration models are discussed in the following sections.

4.4.1.1 Conceptual Hydrologic Model

Overview of Mining Operations

Surface facilities for the Mine are located in PM Draw, a tributary to Rehder Creek. They consist of the Mine offices, an equipment shop, parking areas, equipment storage areas, water management facilities, coal stockpiles, coal processing and loading facilities, a railroad loop, and the Mine portal (**Figure 2.2-1**).

The Mine produces coal using both continuous mining and longwall mining methods. The mains, gate roads, and areas of room and pillar mining are developed by continuous miners. They are supported by unmined coal pillars that are designed to not crush and collapse during the LOM. Although continuous mining areas are designed to remain stable during mining, they may or may not subside at a future date and may or may not result in a surface expression of subsidence.

Longwall mining removes all coal from panels that are separated by pillars and gate roads. Each longwall panel is about 1,250 feet wide and 15,000 to 23,000 feet long. The height of the panels varies from about 8 to 14.5 feet depending on the thickness of the coal seam. Longwall mining results in subsidence of the overlying strata. The observed surface subsidence above longwall panels at the Mine has typically been equal to about 70 percent of the mined thickness (SPE 2017). Subsidence effects beyond panel edges are limited by the angle of draw, which is estimated to be 22.5 degrees (Agapito 1990 and 1996). This angle predicts that surface subsidence may extend up to 140 feet beyond panel edges at a mining depth of 330 feet and 230 feet at a mining depth of 780 feet (Agapito 1990).

Coal produced by continuous and longwall mining is conveyed via gate roads and mains to processing facilities in PM Draw. Processing includes crushing and washing to remove fines and impurities such as sandstone and shale. Coal processing wastes (CPW) and mine development wastes are currently placed in WDA 1 and compacted to increase stability and reduce infiltration of meteoric water. WDA 2 is under construction and will be used to store CPW and mine development waste once WDA 1 is full. After the WDAs are filled to their permitted capacity, they will be covered with topsoil and vegetated in accordance with SPE's permit requirements.

Groundwater that seeps into the Mine during operation is collected in sumps and pumped to the surface where it is used for coal processing and dust suppression. Any water in excess of the Mine's operational demand is released to PM Draw or Rehder Creek via MPDES permitted outfalls. Groundwater inflow to the Mine has varied over time and is affected by a number of factors related to geology, the rate of mining, and the location and depth of mining. The average discharge from the Mine sumps was estimated to be 213 gallons per minute (gpm) for the period between 2013 and 2017 (WET 2024a). Beginning in 2018, groundwater inflow increased during mining of longwall panels 6 and 7, and during 2020, the average discharge from the Mine sumps was estimated to be about 890 gpm (WET 2024a). Sump discharge rates can vary by more than 1,000 gpm over a timespan of a few months. The observed minimum and maximum average monthly sump discharge rates between January 2021 and June 2023 were 309 and 1,386 respectively (WET 2024a).

Prior to 2019, three wells completed in the Madison Formation were used to supplement mine water for coal processing and dust suppression (**Figure 2.2-1**). The wells are over 8,000 feet deep and are isolated from shallow groundwater by multiple layers of low-permeability strata. The combined permitted flow rate for the Madison wells is 730 gpm, but the average pumping rate between 2016 and 2019 was less than 60 gpm (WET 2024a). Groundwater from the Madison wells is geothermal (165.4 °F) and contains elevated concentrations of hydrogen sulfide, fluoride, and radionuclides (WET 2024a). No groundwater from the Madison wells has been used by the Mine since 2019.

Potable water for the Mine offices and locker room showers is provided by the Office Supply Well, which is completed in the UB-2A sandstone. The average pumping rate for the Office Supply Well is about 4 gpm (WET 2024a).

Groundwater Occurrence and Patterns of Flow

Groundwater within the study area occurs in alluvium and bedrock. Alluvium is present along valley floors and is saturated in the lower reaches of Rehder Creek and Fattig Creek. Alluvium in the upper reaches of study area drainages is unsaturated except in response to seasonal snowmelt and precipitation (WET 2024a). Alluvial groundwater flows away from upland areas under unconfined conditions and may either provide recharge to, or receive recharge from, underlying bedrock. Alluvial groundwater levels can fluctuate by 20 feet or more seasonally depending on climatic conditions (WET 2024a).

Groundwater in bedrock occurs in localized perched systems and as part of a deeper continuously saturated flow system. Groundwater in perched systems typically flows short distances to discharge at springs. Groundwater in the deeper system flows northwest toward the Musselshell River and is unconfined to semi-confined near recharge areas and confined at depth near the axis of the syncline (WET 2024a). Groundwater in the Mammoth Coal and overburden is connected to alluvial groundwater in the lower reaches of Rehder and Fattig Creeks where the units crop out below alluvium in the stream drainages (WET 2024b).

Hydrologic Effects of Subsidence

Subsidence associated with longwall mining has predictable effects on the hydrologic characteristics of overlying strata (Kendorski 1993 and Esterhuizen et al. 2009). Kendorski (1993) recognizes hydrologic changes in five zones above high extraction coal mines. The zones include a caved zone with increased permeability and complete disruption of the strata immediately above the mined horizon, a fractured zone with increased vertical fracturing and permeability above the caved zone, a dilated zone with increased storage but little or no change in vertical permeability above the fractured zone, a constrained zone in which permeability and storage are largely unaffected above the dilated zone, and a surface fracture zone in which potentially transmissive surface cracks form. The vertical extent of each zone depends on several factors including the longwall width, height of mining, overburden characteristics, and the thickness of overlying strata. The characteristics and typical thicknesses of the subsidence zones defined by Kendorski (1993) are summarized in **Table 4.4-1.**

Table 4.4-1. Conceptual Model of Hydrologic Impacts Related to Mine Subsidence

Subsidence Impact Zone	Location / Thickness	Effect
Caved Zone	Typically extends 2 to 10 times the mined thickness starting at the top of the coal seam.	Strata are completely disrupted, which is accompanied by significant increases in permeability. The thickness of the zone in competent strata, such as sandstone or limestone, is typically limited to less than 6 times the mining height. In weaker strata such as shale, the zone can extend up to 10 times the mining height. In area of shallow cover, the caved zone can result in surface collapse or merge with the Surface Fracture Zone to form continuous pathways for surface water to enter the Mine.
Fractured Zone	Overlying the Caved Zone. May extend up to 24 times the mined thickness above the coal seam.	Strata crack and settle but do not fall and detach, which results in increased vertical permeability related to increased fracturing, opening of bedding planes, and shearing and dislocation of beds. Groundwater or surface water intersected by the Fracture Zone will drain into the Mine. In area of shallow cover, the Fracture Zone can intersect the surface or merge with the Surface Fracture Zone to form continuous pathways for surface water to enter the Mine.
Dilated Zone	Overlying the Fractured Zone. May extend up to 60 times the mined thickness above the coal seam.	Strata are subject to beam deformation in which bedding sags and dilates but does not develop connected fractures that drain into the underlying zones and mine. The effect of dilation is to increase the ability of the zone to store more water without increasing its ability to transmit water vertically. Groundwater or surface water intersected by the Dilated Zone will experience temporary decreases in water level or flow as water moves into the increased

Subsidence Impact Zone	Location / Thickness	Effect
		storage volume, but water levels and flow will recover with time as the additional storage is filled.
Constrained Zone	Overlying the Dilated Zone extending to the base of the Surface Fracture Zone	Strata are subject to beam deformation but do not fracture or dilate. Changes to the permeability and storage capacity of the strata are minimal and the effects on surface water and groundwater are difficult to separate from other influences such as seasonal and long-term variations in precipitation.
Surface Fracture Zone	May Extend to about 50 feet below ground surface.	Surface fractures generally occur at panel edges and are related to areas of local extension. The fractures are usually shallow, less than about 50 feet, and may heal over time. They typically do not provide pathways for surface water or groundwater to enter the Mine unless they intersect the Fractured Zone or Caved Zone.

Source: Kendorski 1993

Overburden above the Mine includes interbedded sandstone, siltstone, shale, claystone, coal, and clinker (baked rock layers). A few thin freshwater limestones also occur but they represent an insignificant percentage of the overburden thickness. With the exception of clinker and overburden unit OB-5, strata above the Mine have relatively low permeability and yield only small quantities of water to wells (WET 2024a). Clinker is present at the surface of high mesas within the study area and is more permeable than other overburden, but it is largely unsaturated (WET 2024a). OB-5 is a 40- to 80-foot thick massive sandstone that occurs 80 to 140 feet above the Mammoth Coal. It is saturated in areas that would be undermined, and testing indicates that the lower portion of OB-5 is more permeable than most of the other overburden strata (WET 2024a). Given the conceptual model in **Table 4.4-1**, development of the Fracture Zone above longwall panels is expected to affect OB-5, allowing groundwater in the unit to drain into the Mine. Underburden strata, including UB2A, which supplies potable water for the Mine and is proposed as a source of mitigation water for mining impacts, would not be affected by changes in hydrologic properties associated with subsidence. UB2A is located approximately 300 feet below the Mammoth Coal.

The CHM also considers the importance of mudstone layers, which are interpreted to be resistant to subsidence induced changes in vertical permeability, even if substantial fracturing occurs from undermining (WET 2024b). Fracturing from undermining is assumed to affect the horizontal permeability of mudstone layers but not the vertical permeability, which is assumed to reseal shortly after subsidence. These assumptions are based on interpretation of observed water level responses in mining affected wells and calibration of the groundwater model (WET 2024b).

Springs in the study area are typically fed by perched groundwater and are not in direct hydrologic contact with the continuously saturated groundwater flow system (WET 2024a). The springs occur where precipitation infiltrates locally and then flows laterally for short distances before discharging at lower elevations. Although springs are not typically in direct contact with the continuously saturated groundwater flow system, mining related subsidence has the potential to disrupt or alter spring flows. Impacts to springs may be temporary or permanent depending on the hydrogeologic setting and location of mining relative to the springs. The thickness of overburden above the mining area is variable, ranging from about 150 to 800 feet (WET 2024a). Permanent reductions or complete cessation of spring flows may occur in areas of low overburden thickness where the subsidence Fracture Zone intersects the Surface Fracture Zone or ground surface. Temporary impacts or no impacts to spring flows are more likely in areas with greater overburden thickness where the springs occur in or above the Dilated Zone. Subsidence related surface fractures are typically concentrated in areas of tensional stress along the edges and ends of longwall panels. They also tend to occur in areas with steep surface slopes. The surface above the center of panels is under compression and typically does not develop surface fracturing. Surface fractures can result in increased infiltration of precipitation and runoff, but they typically fill in and reseal over time (Kendorski 1993). Surface fractures are monitored and reclaimed by SPE in accordance with the MDEQ approved reclamation plan.

Numerical Groundwater Model

The groundwater model for the Bull Mountains Mine No. 1 was developed using the USGS modeling code MODFLOW-USG and the Block-Centered Transport module. It encompasses an area of about 542 square miles and includes 19 layers that simulate groundwater flow in strata extending from ground surface to 150 feet below UB-2A. Water is simulated to enter the model by recharge from precipitation and exit at drain cells in ephemeral stream channels and along the model edges. The top and bottom elevations of the model layers are assigned based on structural maps provided by SPE. Input parameters for hydraulic conductivity (i.e., permeability), specific storage, and specific yield are based on site-specific testing data discussed in **Section 3.4.4.3.** Assigned values for effective porosity and dispersity are estimated from literature. A detailed discussion of the model structure and input values is presented in the groundwater modeling report for AM 6 (WET 2024b).

The groundwater model was developed in three parts: an initial steady state model calibrated to the 2004 pre-mining groundwater flow field; a transient model that used the steady state flow field as the starting point and simulates observed mine inflows and groundwater drawdowns between 2004 and 2023; and a predictive model based on the calibrated transient that simulates future impacts of mining including groundwater inflow to the underground mine, drawdown of groundwater levels in the study area, and increases in total dissolved solids (TDS) concentrations downgradient of the Mine. Calibration procedures and the results of a sensitivity analysis for the steady state model are presented in the groundwater modeling report for AM 6 (WET 2024b). The sensitivity analysis indicates that the steady state flow field is most sensitive to changes in input parameters for hydraulic conductivity and recharge.

Mine dewatering in the transient calibration and predictive model are simulated using drain cells that advance in time and location as mains and gate roads are developed. The mains and gate roads are completed in new mining areas prior to longwall mining and have been observed to dewater the coal locally (WET 2024a and 2024b). Mining and subsidence related increases in hydraulic conductivity are simulated using exponential decay functions that attenuate with distance above the mined horizon. Increases in hydraulic conductivity are assumed to be greatest in areas of high differential subsidence near the edges of longwall panels. A lower multiplier is used for the center of panels. The vertical hydraulic conductivity of layers representing strata composed of at least 25 percent mudstone with a thickness greater than 10 feet are not adjusted. The hydraulic conductivity of gob (material left over from coal mining) that collapses into longwall panels is assumed to be two orders of magnitude greater than the original coal, and the hydraulic conductivity of open voids in continuous mining areas is increased by a factor of 2,000. Lateral seepage through sealed portions of the Mine is assumed to occur through coal pillars and concrete seals that are assigned the same hydraulic conductivity as undisturbed coal. The specific yield of mined out areas of the Mammoth Coal is adjusted upward for the reflooding analysis to represent post-mining increases in void space. This adjustment is only applied to dewatered cells to avoid artificially introducing water into the model between simulations.

The solute transport simulation uses water quality analyses for gob and the groundwater flow field from the predictive model to evaluate potential increases in TDS downgradient from the underground mine. Based on three samples, the average TDS of water in contact with gob is 2,897 milligrams per liter (mg/L) which is compared to1,395 mg/L, the weighted average TDS concentration of groundwater in overburden, Mammoth Coal, and underburden (WET 2024b) As a simplification, model cells for the gob source term are assigned a constant concentration of 1,500 mg/L and groundwater outside of the Mine is assigned an initial concentration of 0 mg/L. The results of the solute transport model are interpreted to represent the expected change in TDS concentration above background.

In addition to the transport analysis for the underground mine, the groundwater model was used to evaluate impacts to alluvial water quality in Rehder Creek alluvium by seepage and runoff from the WDAs and by water produced from the underground mine (**Appendix F**). The seepage chemical loading terms were developed from meteoric water mobility tests (MWMTs) performed for three samples of coal reuse from WDA 1 (**Appendix F**). The EPA HELP 4 (EPA 2020) model was used to assess input seepage rates from the WDAs based on site specific testing data for the hydrologic characteristics of the coal refuse (**Appendix F**). WDA runoff water quality was estimated from water quality samples from WDA Pond 1 and MPDES Outfall 008. Discharge mine water flow rates and water quality were estimated from pumping records and gob water quality analyses.

The predictive model for the Proposed Action is used to estimate average annual groundwater inflow to the Mine during operation and changes to groundwater water levels at the end of mining and 50 years post mining. The transport simulations for the Proposed Action evaluate changes in TDS concentrations at 50 and 100 years post mining. Potential impacts to springs are not evaluated by the groundwater model because the water sources for spring are perched and not part of the continuously saturated groundwater flow system.

4.4.2 Direct and Indirect Effects

Direct and indirect effects to surface water may include:

- Changes in the timing, volume, or duration of spring and ephemeral stream flows
- Changes in pond levels
- Changes in spring locations or the creation of new springs
- Changes in spring, pond, and ephemeral stream water quality
- Changes in surface water availability to users
- Changes surface water suitability for designated beneficial uses

Direct and indirect effects to groundwater may include:

- Changes in groundwater levels
- Changes in groundwater quality

- Changes in groundwater availability to users
- Changes groundwater suitability for designated beneficial uses

Direct and indirect effects to the Rehder Creek alluvial valley floor (AVF) may include:

- Changes in alluvial groundwater levels
- Changes in alluvial groundwater quality
- Changes in alluvial groundwater availability to users
- Changes alluvial groundwater suitability for designated beneficial uses

Direct and indirect effects to water rights may include:

- Reduction in available water quantity and quality from springs
- Reduction in available water quantity and quality from groundwater
- Reduction in available water quantity and quality from surface water

4.4.2.1 No Action Alternative

Surface Water

Impacts from Surface Facilities and Waste Disposal Areas

Potential impacts to surface water from the surface facilities and WDAs under the No Action Alternative would be similar to those for the Proposed Action but would occur for a shorter period of time. Mining under the No Action Alternative would be complete in 1 year, approximately 8 fewer years than the No Action Alternative. Under the No Action Alternative, less coal would be mined and processed than under the Proposed Action, and the volume of CPW placed in the WDAs would be proportionally less.

SPE would continue to process coal from the Mine and place CPW in the WDAs which would be reclaimed at the end of mining in accordance with the MDEQ approved reclamation plan.

Impacts from Mining

Under the No Action Alternative, the remaining Federal coal in AM 3 would not be mined, and the ground surface would not subside. The No Action Alternative would result in the undermining of 2.1 fewer miles of ephemeral stream channels in the Fattig Creek and Railroad Creek drainages, and one less spring. Pond 52227 at the northwest end of Panel 11 would also not be undermined and subsided.

Mining would still occur in AM 6 and, with the exception of the area near Panel 1 East, impacts to surface water under the No Action Alternative are expected to be similar to currently observed impacts. Development of longwall Panel 1 East under the No Action Alternative would result in undermining and subsidence of the ephemeral drainage at the head of Railroad Creek. The depth of mining below the drainage is approximately 300 feet. The coal thickness that would be recovered by the panel is about 14 to 14.5 feet (Permit C1993017 Map 322-1 [SPE 2023a]). Based on the conceptual model presented in **Table 4.4-1**, mining of Panel 1 East is expected to result in about 10 feet of subsidence in the Railroad Creek drainage, and surface cracks may form at the edges of the longwall panel and in areas with steep changes in slope. The Fractured Zone above the mined horizon could extend to a maximum of 24 times the mined thickness (about 340 feet) and may intersect the ground surface in the drainage or merge with the Surface Fracture Zone providing open pathways that could capture or reduce ephemeral stream flows. However, the conceptual model by WET (2024b) suggests that fractures in overburden with siltstone beds may reseal minimizing changes in vertical permeability caused by subsidence. The orientation of Panel 1 East perpendicular across Railroad Creek will increase the likelihood that regrading will be required to reestablish the concave shape of the drainage profile after subsidence. Areas with surface cracks would be reclaimed by SPE in accordance with the approved reclamation plan and potential impacts to ephemeral stream flows in Railroad Creek from the No Action Alternative are expected to be short term and negligible to minor because of fracture resealing, reclamation of surface cracks, and the limited watershed area above Panel 1 East.

Development of Panel 1 East under the No Action Alternative would not result in the undermining of springs, and no springs are located within the angle of draw of the longwall panel. Room and pillar mining would occur below spring 71355. The spring is located in a tributary to Railroad Creek at an elevation of about 4,000 feet above mean seal level (amsl). It issues from overburden unit OB-5 and is reported to have frequent ponding (WET 2024a). Although spring 71355 would not be affected by subsidence of the underlying room and pillar mining area, the water table in overburden is mapped to be at a similar elevation as the spring (WET 2024a) suggesting that the spring is connected to the continuously saturated groundwater system. If correct, drawdown associated with mine dewatering under the No Action Alternative has the potential to reduce or eliminate flows from spring 71355. Other springs close to Panel 1 East (53315, 53325, 53335, and 61155) occur at elevations that are inferred to be above the groundwater table. These springs are not expected to be affected by drawdown of water levels related to mining. Potential reductions in flow from Spring 71355 under the No Action Alternative may be moderate to significant and long term to permanent but would be mitigated in accordance with the Mine Permit resulting in minor long-term to permanent effects to water availability for existing uses.

Groundwater

Impacts from Surface Facilities and Waste Disposal Areas

Potential impacts to groundwater from the surface facilities and WDAs under the No Action Alternative would be similar to those for the Proposed Action but would occur for a shorter period of time. Mining under the No Action Alternative would be complete in 1 year, approximately 8 fewer years than the Proposed Action. Under the No Action Alternative less coal would be mined and processed than under the Proposed Action, and the volume of CPW placed in the WDAs would be proportionally less.

Impacts from Mining

Alluvium

Potential impacts to alluvial groundwater levels under the No Action Alternative are expected to be similar to the Proposed Action and not be measurable during mining. After mining ends and the Mine is allowed to flood, alluvial water levels in the lower reaches of Rheder Creek may increase because of seepage from the Mine pool but impacts to alluvial groundwater levels in Fattig Creek are not predicted. Alluvium in the upper reaches of Fattig Creek within the AM 3 area would not be undermined, and mining related seepage losses to bedrock that could shorten the period of seasonal saturation during a typical year in the AM 3 area would not occur. Impacts to TDS concentration Fattig Creek Alluvial groundwater are also not predicted to occur under the No Action Alternative.

Bedrock

Under the No Action Alternative, groundwater drawdown in the Mammoth Coal and underburden are predicted to be similar in magnitude but smaller in area than under the Proposed Action (**Appendix G**, **Figures 4.4-1 through 4.4-8**). Groundwater levels in overburden would not be affected in unmined portions of the AM 3 during mining of Panel 1 East, but 50 years after mining, overburden groundwater levels in the western portion of the unmined area are predicted to decrease by about 10 feet (**Appendix G**, **Figure 4.4-4**). The No Action Alternative is also predicted to increase groundwater levels by about 20 feet in the Mammoth Coal and UB1A in the Panel 1 East Area at 50 years after the end of mining (**Appendix G, Figure 4.4-5 and 4.4-6**). This is modeled to occur because subsidence and fracturing of overburden above the panel would increase seepage to the mined out workings, and the down-dip flow path that drains Panel 1 East into the main mine pool under the Proposed Action would not exist (WET 2024c). Impacts to bedrock groundwater levels under the No Action Alternative would be moderate and long term to permanent but less than under the Proposed Action.

Post mining impacts to TDS in bedrock groundwater under the No Action Alternative would be similar in magnitude to the Proposed Action and would affect approximately the same area downgradient from the mains (northwest) but would be less in the unmined portion of AM 3 (**Appendix G, Figures 4.4-7 and 4.4-8**). The area that is predicted to be affected by increased TDS northwest of Panel 1 East would also be slightly larger than under the Proposed Action.

Rehder Creek Alluvial Valley Floor

Potential impacts to the Rehder Creek AVF from the surface facilities and WDAs under the No Action Alternative would be similar to those for the Proposed Action but would occur for a shorter period of time. Mining under the No Action Alternative would be complete in 1 year, approximately 8 fewer years than the Proposed Action. Under the No Action Alternative less coal would be mined and processed than under the Proposed Action and the volume of CPW placed in the WDAs would be proportional less.

Wetlands

Under the No Action Alternative, the proposed mining plan modification would not be approved by the ASLM, and SPE would continue to mine for 1 year to recover saleable non-Federal coal remaining in the permit area. To date, approximately 1,041.3 acres of ground surface have been disturbed within the permit area. Under this alternative, approximately 2.9 acres of additional surface disturbance would occur as a result of subsidence repairs (**Table 2.3-1**). No ground disturbance from subsidence repairs under the No Action Alternative are anticipated to occur in wetlands.

Water Resource Usage

Current surface and groundwater uses in and adjacent to the Mine area include public water supply, private water supply, livestock, wildlife, irrigation, and industrial uses. Registered surface water and groundwater rights in the permit area are listed in Tables 8-1, 8-2 and 8-3 of the AM 6 cumulative hydrologic impact analysis (CHIA) prepared by MDEQ. (MDEQ 2024a).

SPE owns many of the water rights for wells and springs within the permit area. Other major holders of water rights to wells and springs include AAM III Enterprises LLC, Charter Ranch Inc, My Green Earth LP, and Parrot Creek (1, 3, 4, CW, or MW) LLC. SPE owns all but two of the surface water rights within the Mine permit area. My Green Earth LP and BLM hold the two remaining surface water rights.

According to ARM 17.24.648, a mine operator must replace water rights or water supply interrupted by mining and the supply of water for domestic, agricultural, industrial or other uses is protected from diminution, contamination or interruption resulting from coal mining. As required by the Mine's permit conditions, SPE would be required to replace water sources affected by mining, and there would be no direct impacts on water rights.

4.4.2.2 Proposed Action

Surface Water

Impacts from Surface Facilities and Waste Disposal Areas

Under the Proposed Action, mining would continue for up to 8 additional years as compared to the No Action Alternative. The surface facilities of the Mine are located in PM Draw, a tributary to Rehder Creek, and include coal processing, storage and loading facilities, unpaved roads, a rail loop, equipment fueling and storage areas, shops, the Mine portal, and the Mine offices. Additional peripheral infrastructure and facilities such as unpaved roads, crib pads, boreholes, power lines, and other improvements are located throughout the permit area as needed to support mining operations. WDA 1 is located in an unnamed ephemeral tributary to Rehder Creek immediately east of the facilities area. The WDA 1 area includes the waste fill, plate press facility, equipment fueling and storage area, water storage tank, and a small office. A conveyor and slurry and water pipelines run from the main facilities area to WDA 1. In 2017, Major Revision 3 (TR3) approved development WDA 2 and an increase in the capacity of WDA 1. WDA 2 is located immediately southeast of WDA 1 in a different unnamed tributary of Rehder Creek and will begin receiving waste once WDA 1 is near full capacity. All waste to date has been placed in WDA 1, and the only disturbance at WDA 2 is associated with the construction of a sediment pond (WDA Pond 3). There are no springs or human-made channels within the WDA 1 or WDA 2 footprints.

The WDAs are used to store CPW and mine development waste. CPW includes shale, sandstone, mudstone, and fines that are removed from the mined coal to make it marketable. Mine development waste includes sedimentary rocks and poor-quality coal that are removed from the underground workings to access saleable coal. CPW makes up more than 90 percent of the material currently stored in WDA 1. Mine waste and CPW are placed in the facilities in two-foot lifts and compacted to minimum density of 90 percent to promote geotechnical stability and reduce infiltration of meteoric water. Prior to 2018, up to 4 percent fly ash was added to CPW as a drying agent. The fly ash source was tested and approved by MDEQ and is considered to be a non-hazardous waste under the MDEQ Solid Waste Program (WET 2024a). Fly ash has not been added to CPW since 2018 because the plate presses currently used to dewater the material provide greater moisture reduction than the previously used belt presses. The WDAs will be graded to blend with the surrounding topography, covered with 4 feet of soil, and vegetated after they have been filled to final capacity.

Mine water and runoff from the surface facilities and WDAs are detained within ponds to settle suspended solids before discharge to the ephemeral drainages for Rehder Creek and PM Draw. The discharges are regulated and monitored in accordance with MPDES Permit MT0028983. Sediments removed from the settling ponds are disposed of in the WDAs. Each MPDES-permitted outfall at the facility is associated with a sediment pond designed to contain the runoff from a 10-year, 24-hour rainfall event. Sediment ponds are discharged periodically by pumping to retain pond storage capacity once the required retention time has been met. Outfalls 001 and 008 are the primary MPDES outfalls used to control the release of storm water and mine water to PM Draw and Rehder Creek respectively. Water released to PM Draw and Rehder Creek flows a short distance in ephemeral drainages before infiltrating to alluvium.

Precipitation that falls on the WDAs either runs off, evaporates, or infiltrates through the contained CPW and mine waste into alluvium. Currently, surface runoff from WDA 1 is collected in ditches and routed to sediment ponds where it evaporates, infiltrates to alluvium, is used for dust suppression, or is discharged to Rheder Creek via MPDES Outfall 001. Runoff from WDA 2 will be managed in a similar manner. WDA Pond 1 also receives excess water from the underground mine that is not used for coal processing. Although the sediment ponds are designed to evaporate or infiltrate the volume of runoff generated during an average precipitation year, use of the ponds for mine water management has required regular discharges from the MPEDS permitted outfalls.

In addition to MPDES permits for specific outfalls, SPE has a Multi-Sector General Permit (MSGP) for storm water discharges associated with industrial activity (MTR000499) and general permits for storm water discharges associated with construction activity (MTR106575, MTR110051, MTR110025, and MTR109874). A septic tank/drain field treats sewage and other wastewater from potable systems at the facilities area. The Mine also treats water from the deep underburden for use as a public water supply for the office area. Best management practices for containing and treating sediment runoff are required under the Montana Strip and Underground Mine Reclamation Act (MSUMRA). These practices are also implemented under a SPE's Storm Water Pollution Prevention Plan separate from the MSUMRA permit.

Under the Proposed Action, surface water quantities in the ephemeral drainages for PM Draw and Rehder Creek would be affected by retention of runoff in sediment ponds and by discharges from MPEDS outfalls. Discharge from the MPDES outfalls includes both runoff and water from the underground mine. Depending on the timing of releases, volume of mine water, and recent precipitation or dry conditions, the Proposed Action may either decrease or increase flows in the affected drainages. The impacts to surface flows in PM Draw and Rheder Creek would be long term, occurring during mining and reclamation, but would be negligible because the captured runoff area is small compared to the area of the Rehder Creek HUC 12 Subwatershed, and surface flows below the permitted MPDES Outfalls persist for only a short distance before infiltrating to alluvium. No springs or ponds are located downstream or downgradient from the sediment ponds and WDAs, and impacts to spring and pond water quantities from the Mine surface facilities are not expected.

The quality of water discharged from the MPDES outfalls is variable, but the observed median TDS concentration is lower than the median for baseline stream water quality samples (1,865 mg/L) (WET 2024a). It is noted, however, that the variability of TDS in the discharged water is greater than that of the stream baseline (WET 2024a). Measured arsenic, lead, mercury, and nickel concentrations in the discharged water have also periodically exceeded stream baseline values and MDEQ-7 human health standards (WET 2024a). Because of the ephemeral natures of PM Draw and Rheder Creek and the limited durations of releases from the sediment ponds, impacts to stream water quality below the MPDEs discharges are expected to be minor and temporary. No springs or ponds are located downstream or downgradient from the sediment ponds and WDAs, and impacts to spring and pond water quality from the Mine surface facilities are not expected.

Impacts from Mining

Ephemeral Streams

Potential impacts to streams from mining under the Proposed Action are primarily related to subsidence. The Proposed Action would develop new longwall panels below 8.9 miles of ephemeral drainages tributary to Fattig Creek and Railroad Creek. Panel 1 East would also extend a short distance into the headwater drainage for Dutch Oven Creek.

Surface expressions of subsidence includes linear surface fractures, minor rockslides, and trough and sink-like depressions. Continued mining under the Proposed Action would create surface subsidence features similar to those observed to date. Where subsidence features occur within established ephemeral watercourses, the profiles of the drainages may be modified by small ridges held up over barriers, pillars, mains, and gate roads, and by depressions over the longwall panels. The coal in Panel 1 East is projected to be up to 14.5 feet thick with approximately 200 to 600 feet of overburden. The depth of Panel 1 East below the main stem of Railroad Creek would be about 300 feet (Permit C1993017 Map 322-2 [SPE 2023b]). Subsidence over Panel 1 East is generally expected to be about 6 to 9 feet but could be up to 11 feet (MDEQ 2024). Coal in the AM 3 mining area is projected to be between 13.5 and 14.5 feet. The depth of mining below tributaries to Fattig Creek would range from more than 400 feet to less than 200 feet (Permit C1993017 Map 322-2 [SPE 2023b]). Subsidence over longwall panels in AM 3 is also generally expected to be 6 to 9 feet but could be up to 11 feet.

Subsidence related impacts to water quantity in ephemeral drainages may include changes in grade that cause increases or decreases in flow velocity, ponding of water over longwall panels and reduction or loss of ephemeral flows in surface fractures. LIDAR surveys of the ground surface above previously mined panels reveal that drainages gently ‘sag’ between gate roads (Permit C1993017 Map 900-5 [SPE 2017]). Drainages with steep gradients in the upper watersheds of Fattig Creek and Railroad Creek are the most likely to naturally re-establish concave longitudinal profiles because of higher flow velocities and potential erosivity (MDEQ 2024). Drainage segments with flatter slopes and areas with thicker coal and greater subsidence may be more likely to require corrective grading over gate roads to re-establish concave drainage profiles. Additionally, the perpendicular orientation of Panel 1 East across Railroad Creek will increase the likelihood that the drainage will require regrading to reestablish the drainage profile. According to ARM 17.24.634, drainages and drainage basins must be reclaimed to allow channels to remain in dynamic equilibrium with the drainage basin and must provide an average channel gradient that exhibits a concave longitudinal profile. Permit conditions require that the Mine operator repair features that significantly disrupt the hydrologic balance (MDEQ 2024). Channel gradients are monitored by SPE using remote sensing data that are periodically transmitted to MDEQ to review and determine if grading is required to restore proper hydrologic function (MDEQ 2024). The orientation of Panel 1 East perpendicular across Railroad Creek will increase the likelihood that regrading will be required to reestablish the concave shape of the drainage profile after subsidence. Potential impacts to ephemeral stream flows in Fattig and Railroad Creek by changes in drainage profiles are expected to be short term and minor because of ongoing monitoring and reclamation.

Subsidence under the Proposed Action may result in surface fractures at the edges of longwall panels and in areas with steep changes in slope. The Fractured Zone above the mined horizon could extend to a maximum of 24 times the mined thickness (about 325 to 350 feet in new mining areas) and may intersect the ground surface in drainages or merge with the Surface Fracture Zone providing open pathways that could capture or reduce ephemeral stream flows. The conceptual model by WET (2024b) suggests that fractures in overburden with siltstone beds reseal soon after formation and would act to reduce the potential for loss or reduction of ephemeral flows in open fractures. Areas with surface cracks would be reclaimed by SPE in accordance with the approved reclamation plan. Potential impacts to ephemeral stream flows in Fattig and Railroad Creek by infiltration through open fractures are expected to be short term and negligible to minor because of fracture resealing, reclamation of surface cracks, and the limited watershed areas affected by subsidence.

Under the Proposed Action, impacts to water quality in ephemeral drainage are anticipated to be limited to temporary increases in sediment load caused by changes in the drainage profiles or by subsidence reclamation activities. The changes are expected to be short term and minor because of ongoing monitoring, the implementation of best management practices (BMPs), and reclamation.

Ponds

Potential impacts to ponds from Proposed Action are primarily related to subsidence. Surface fracturing may cause ponds to leak, and subsidence can affect drainages that contribute surface water flow to the ponds. Ponds that receive water from springs may also have diminished inflows if the source spring is impacted by subsidence. Potential pond water quality changes are expected to be limited to mostly increased suspended solids.

One pond near the northwest end of Panel 11 (Pond 52227) would be undermined by the Proposed Action. The coal below the pond is projected to be about 10 feet thick. The overburden thickness is about 375 feet. Subsidence at the surface below the pond is expected to be about 7 feet, and the maximum extent of the subsidence Fracture Zone above the Mine is projected to be less than 240 feet. The pond is located near the center of the panel and is considered to have lower potential to be affected by surface fracturing than if it were located near the panel edge. Based on the conceptual model presented in **Section 4.4.1**, the Proposed Action is expected to have low potential to impact the pond water level or volume. Impacts, if they occur would be mitigated in accordance with the MDEQ approved mitigation plan (SPE 2023c) and are expected to be negligible to minor and short term. Required mitigation includes replacement of water supplies for livestock and wildlife to ensure that land uses are not adversely impacted.

The Proposed Action is expected to have low potential to impact water quality in Pond 52227. Impacts, if they occur, are expected to be limited increased suspended solids and would be negligible to minor and short term.

Springs

A total of 133 springs are inventoried in the study area (**Figure 3.4-5**). Forty-three of the spring have been undermined by previous mining (MDEQ 2024). Twenty-nine of the springs will be undermined by the Proposed Action, and 61 of the springs are outside of the area that will be undermined.

Potential impacts to springs from Proposed Action are mainly related to mining-induced subsidence. Subsidence can cause changes in spring flows including increases, decreases, or the complete cessation of flows, changes in spring location, and the formation of new springs. These changes may be negligible to significant and temporary or permanent. Based on the conceptual model presented in **Table 4.4-1**, the depth of mining, the thickness of mined coal, and the location of a spring and its recharge area relative to longwall panels and areas of continuous mining are primary factors that influence a spring's susceptibility to impacts. Susceptibility to impacts may also be affected by geologic factors and topography.

The potential for individual springs to be impacted by the Proposed Action was rated as being low, moderate, or high by assigning numerical criteria to three metrics: the depth of mining below the spring, the location of the spring relative to longwall panels and areas of continuous mining, and the theoretical maximum vertical extent of the Fractured Zone described in **Table 4.4-1**. Springs with total scores of 5 or less were ranked as having low potential to be impacted. Springs with scores ranging from 6 to 10 were ranked as having moderate potential to be impacted, and springs with scores greater than 10 were ranked as having high potential to be impacted. The rating system for undermined spring susceptibility to mining impacts is summarized in **Table 4.4-2.**

Table 4.4-2. Rating System for Undermined Spring Susceptibility to Mining Impacts

Depth of Mining	Assigned Value
< 200 feet	10
201 to 300 feet	4
301 to 400 feet	3
401 to 500 feet	2
> 500 feet	1
Location	Assigned Value
Above Edges of Longwall Panels	5
Above Gate Roads	3
Above Center of Longwall Panels	1
Above Room and Pillar Mining	1
Not Undermined	0
Fracture Zone Projected to Intersect Surface or Surface Fracture Zone	Assigned Value
No	5
Yes	0

No peer reviewed numerical criteria are available to evaluate a spring's susceptibility to subsidence impacts. The following analysis relies on substantial professional judgement, and potential impact scores are considered to be relative to other springs that would be undermined. An impact to a spring could be a change in location, flow quantity, or water quality. For example, spring 53125 is located over the center Panel 11, the depth of mining is about 600 feet, and the maximum extent of the Fractured Zone above the Mine is estimated to be 322 feet. The spring has a total potential impact score of 2 and is rated as having low potential to be affected by mining. Although it is unlikely that this spring would lose or cease to flow because of undermining, its location could change because of subsidence-related changes in topography. The potential for springs to be impacted by undermining is summarized in **Table 4.4-3.**

Table 4.4-3. Subsidence Impact Potential Rating for Springs Undermined by the Proposed Action

Spring ID	Estimated Overburden Thickness (ft)	Estimated Coal Thickness (ft)	Maximum Fracture Zone Thickness (ft)	Estimated Subsidence (ft)	Location Above	Fracture Zone Intersects Surface	Score				Impact Potential
							Depth of Mining	Location Above Mining	Overburden - Fracture Zone	Overall Score	
14115	620	13.3	319	9.3	Panel Edge	No	1	5	0	6	M
14155	600	13.3	319	9.3	Panel Edge	No	1	5	0	6	M
14165	590	13.5	324	9.5	Panel Edge	No	1	5	0	6	M
14255	500	12.9	310	9.1	Gate road	No	2	3	0	5	L
14405	400	9.4	226	6.6	Panel Center	No	3	1	0	4	L
52125	490	13.4	322	9.4	Gate road	No	2	3	0	5	L
52145	390	13.5	324	9.5	Panel Center	No	3	1	0	4	L
52165	300	13.6	326	9.5	Gate road	Yes	5	3	5	13	M
52225	370	10.3	247	7.2	Panel Edge	No	3	5	0	8	M
52235	390	10.1	242	7.1	Gate road	No	3	3	0	6	M
52255	400	9.9	238	6.9	Gate road	No	3	3	0	6	M
52275	300	10.5	252	7.4	Panel Edge	Yes	5	1	5	11	H
52455	170	13.2	317	9.2	Gate road	Yes	10	3	5	18	H
53115	500	13.4	322	9.4	Panel Edge	No	2	5	0	7	M
53125	600	13.4	322	9.4	Panel Center	No	1	1	0	2	L
53145	400	13.4	322	9.4	Panel Edge	No	3	5	0	8	M
53155	390	13.3	319	9.3	Gate road	No	3	3	0	6	M
53175	240	13.8	331	9.4	Panel Center	Yes	5	1	5	11	H
53225	350	14.0	336	9.8	Panel Center	Yes	3	1	5	9	M
53245	190	14.0	336	9.8	Panel Edge	Yes	10	5	5	20	H
53525	250	13.8	331	9.4	Panel Edge	Yes	5	5	5	15	H
53535	300	13.8	331	9.4	Panel Edge	Yes	5	5	5	15	H
53545	200	13.7	329	9.6	Panel Edge	Yes	10	5	5	20	H
71115	600	13.8	331	9.7	Gate road	No	1	3	0	4	L
71125	700	13.8	331	9.7	Panel Center	No	1	1	0	2	L
1402S	605	13	322	9.0	Panel Edge	No	1	5	0	6	M
5301S	400	13.3	319	9.3	Gate road	No	3	3	0	6	M
5302S	380	14.0	336	9.8	Panel Edge	Yes	3	5	0	13	H
71355	100	14.6	350	10.2	Room & Pillar	N/A	10	0	0	10	M

Source: SPE 2023a and 2023b

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Based on the analysis presented in **Table 4.4-3**, 7 of the springs that would be undermined by the Proposed Action have low potential for being impacted by subsidence, 14 have moderate potential, and 8 have high potential. In addition to impacts that may result from undermining the physical location of springs, the flow and water quality of springs may be impacted by undermining of the recharge areas that are the source of water for the springs. A list of springs that will not be undermined but that are located in drainages that will be affected by subsidence from longwall mining is presented in **Table 4.4-4**. Detailed descriptions of springs, their probable sources, and potential to be impacted by mining under the Proposed Action are presented in WET 2024a and MDEQ 2023 and 2024. Seven of the springs that will not be undermined (52655, 53455, 53465, 53475, 53486, 53495 and 53855) occur in a tributary of Fattig Creek (**Figure 3.4-5**). The springs are sourced from alluvium, Mammoth Coal, OB-6, or underburden or (a combination of these units) that are connected to the continuously saturated groundwater flow system. These springs are likely to be affected by diminished flows related to mine dewatering under the Proposed Action. Spring 71355, which is located over planned room and pillar mining in AM 6, would not be affected by subsidence, but the water table in overburden is mapped to be at a similar elevation as the spring (WET 2024a), suggesting that it is connected to the continuously saturated groundwater system. If correct, drawdown associated with mine dewatering under the Proposed Action has the potential to reduce or eliminate flows from spring 71355.

Table 4.4-4. Springs not Undermined but Located in Watersheds Affected by Subsidence under the Proposed Action

Spring ID	Undermined Watershed
52655*	Fattig Creek
53045	Fattig Creek
53065	Fattig Creek
53085	Fattig Creek
53315	Fattig Creek
53325	Fattig Creek
53335	Fattig Creek
53415	Fattig Creek
53455*	Fattig Creek
53465*	Fattig Creek
53475*	Fattig Creek
53485*	Fattig Creek
53486*	Fattig Creek
53495*	Fattig Creek
53605	Fattig Creek
53615	Fattig Creek
53635	Fattig Creek
53685	Fattig Creek
53755	Fattig Creek
53855*	Fattig Creek
61155	Dutch Oven Creek
71425	Railroad Creek
71445	Railroad Creek
71465	Railroad Creek

Notes:
Spring locations developed from MDEQ 2024
* indicates that the spring is likely connected to the continuously saturated groundwater flow system and has higher potential to be affected by groundwater drawdown associated with mine dewatering.

SPE routinely measures discharge and water quality at springs to monitor for potential impacts from mining (**Figure 3.4-5**). As longwall mining approaches monitored springs, the monitoring frequency increases from monthly or quarterly to weekly so that potential impacts may be detected and mitigated in accordance with the MDEQ approved mitigation plan (SPE 2023c). Required mitigation includes replacement of water supplies for livestock and wildlife to ensure that land uses are not adversely impacted.

A total of 43 springs have been previously undermined by longwall panels 1 through 11 and 3 springs have been undermined by or are immediately adjacent to the East Main Gate Road. This includes five new springs (1602S, 1701S, 1702S, 1703S and 1704S) that formed after mining passed below the surface (**Figure 3.4-5**). Subsidence related declines in discharge have occurred at 2 springs (14325 [Busse Spring] and 72125 [Mountain Spring]), and 12 of the undermined springs have exhibited reduced flows from causes that could be related to mining or to lower than average precipitation from 2020 through 2022 (MDEQ 2024). Interim mitigation plans have been developed for Busse and Mountain Springs and five of the springs (16135, 16145, 16165, 16255, and 16275) with reduced flows from uncertain causes (MDEQ 2023 and 2024).

Although most springs in the study area are not sourced from the continuously saturated flow system, drawdown from mine dewatering has been observed to affected discharge from Lake Louise Spring (53755). Lake Louise Spring is located 0.9 mile southeast of Portal 4 and issues from the Mammoth Coal (**Figure 3.4-5**). Flows from the spring and water levels in the spring pond declined starting in June 2022 during mining of the East Main Gate Road extension. MDEQ determined that mining activity contributed to the decline in spring flow and pond water level based on the groundwater level response in nearby wells and initiated an interim mitigation plan (MDEQ 2024).

Potential impacts to springs under the Proposed Action, including increases, decreases, or the complete cessation of flows, changes in location, and the formation of new springs, may be negligible to significant and temporary to permanent but would be mitigated in accordance with the MDEQ approved mitigation plan (SPE 2023c).

Under the Proposed Action, the water quality of springs and associated ponds could be affected by changes in the flow paths or sources of shallow perched groundwater that supply the springs, or by reductions in flow that result in greater evaporative concentration of water in spring pools. The water quality of springs that are connected to the continuously saturated groundwater flow system downgradient of the Mine could also be affected after mining by increased TDS concentrations from the flooded underground mine.

After mining, groundwater pumping from the Mine sumps will end and the Mine and gob will be allowed to flood. Water in contact with gob is expected to have TDS concentrations near 3,000 mg/L, which exceed background concentrations of spring water sourced from the alluvium, Mammoth Coal, OB-6 and UB-1 by about 1,500 mg/L. Based on three samples of groundwater in contact with gob, seepage from the underground mine is also expected to have nickel concentrations that exceed MDEQ 7 standards for groundwater and surface water and concentrations of sulfate and manganese that exceed Federal secondary drinking water standards (WET 2024a). Contaminant transport modeling results indicate groundwater from the Mine will migrate generally northward with a fraction of the water discharging to alluvium in Fattig and Rehder Creeks. Several springs in Fattig Creek including 52655, 53455, 53465, 53475, 53486, 53495 and 53855, are sourced from alluvium, Mammoth Coal, OB-6, underburden, or a combination of these units. TDS concentrations for these springs are modeled to increase by 10 to 100 mg/L 100 years after mining (WET 2024b). Potential changes in sulfate, manganese and nickel concentrations in spring water have not been evaluated.

Potential changes to spring water quality under the Proposed Action are expected to be negligible to minor and temporary to permanent depending on the spring source and location relative to mining.

Groundwater

Potential impacts to groundwater quantity under the Proposed Action include changes in level and availability by pumping for mine dewatering and water supply, subsidence, infiltration from sediment ponds, and by flooding of the underground mine after the end of operations. Potential impacts to groundwater quality may occur by seepage from the WDAs, infiltration of water from sediment ponds, and by contact with gob in the underground mine after the end of mining.

Impacts from Surface Facilities and Waste Disposal Areas

Alluvium

Alluvial groundwater levels in the study area are currently affected by discharges from MPDES outfalls and by infiltration from sediment ponds (MDEQ 2024). The impacts include temporary increases in alluvial water levels in PM Draw and Rehder Creek, which are minor to moderate and will continue throughout the LOM. After mining is complete, the surface facilities, WDA, and sediment ponds will be reclaimed, MPDEs discharges will cease, and alluvial groundwater levels will fluctuate in response to climatic conditions similar to the pre-mining condition.

Alluvial water quality in PM Draw and Rehder Creek is currently affected by the operation of the SPE facilities area, primarily in the form of increased TDS related to MPDES discharges and infiltration of water from sediment control ponds (MDEQ 2023 and 2024). Monitoring data also indicate sporadic concentrations of aluminum, iron, lead, manganese, nickel, and nitrogen that exceed drinking water quality standards. Seepage from the WDAs also contributes additional solute load to alluvial groundwater in the Rheder Creek Drainage.

Numerical modeling (**Appendix F**) indicates that currently observed impacts to alluvial water quality in PM Draw and Rehder Creek are primarily related to the discharge of mine water from MPDES permitted outfalls and that the WDAs are a relatively minor source of TDS loading to alluvial groundwater. Impacts to alluvial groundwater quality in PM Draw and Rheder Creek during mining under the Proposed Action are predicted to be minor to moderate, long term, and localized. After the end of mining and reclamation, impacts to alluvial groundwater quality in PM Draw and Rheder Creek are predicted to be negligible and indistinguishable from natural variation in background water quality.

Bedrock

Water management activities and the operation of surface facilities in PM Draw and Rehder Creek under the Proposed Action are not anticipated to result in discernable impacts to bedrock groundwater levels or water quality. No impacts to bedrock groundwater levels or water quality have been observed from the surface facilities to date, and future impacts from the facilities are not expected.

Impacts from Mining

Alluvium

Mine dewatering and subsidence are not expected to measurably affect alluvial groundwater levels in the saturated lower reaches of Rehder and Fattig Creeks during operation (WET 2024b), but after mining ends and the Mine is allowed to flood, increased water levels are predicted in some areas of alluvium (MDEQ 2024). Mining induced subsidence of the upper reaches of study area drainages may increase alluvial seepage losses to bedrock and shorten the period of seasonal saturation during a typical year. The potential impacts to alluvial groundwater quantity in subsided areas is expected to be negligible to minor and short-term to permanent.

Under the Proposed Action, the TDS of alluvial groundwater in the Fattig Creek drainage is modeled to increase by up to 100 mg/L 100 years after mining. During mining, groundwater would be pumped from the Mine, the direction of groundwater flow would be toward the underground workings, and there would be no seepage from the Mine. After mining is complete, the underground workings would be allowed to flood and groundwater levels in the workings along the northwest edge of the mining area would be higher than pre-mining background levels. Under the flooded conditions, seepage from the Mine and transport of constituents in groundwater would occur in the Mammoth Coal and adjacent strata with some discharge of the seepage to alluvium in Fattig Creek. Analytical data for groundwater in contact with gob indicate that mine seepage is expected to have nickel concentrations that exceed the DEQ 7 standard for groundwater and TDS, sulfate, and manganese concentrations that exceed Federal secondary drinking water standards (WET 2024b).

Groundwater in Fattig Creek alluvium is a Class III groundwater that has a median baseline TDS of 1,940 mg/L (MDEQ 2024). Increases in TDS from mine seepage would not change the classification of the alluvial groundwater or its potential beneficial use. The water would remain marginally suitable for livestock and wildlife use (MDEQ 2024). Potential TDS impacts to alluvial groundwater in the Fattig Creek drainage under the Proposed Action are expected to be minor and long term to permanent. Potential increases in the concentration of other constituents in alluvial groundwater have not been evaluated.

Seasonal alluvial groundwater in the upper reaches of study area drainages, including Railroad Creek, would not receive seepage from the underground mine, and impacts to water quality under the Proposed Action are not expected.

Bedrock

Mine dewatering, subsidence, and groundwater pumping for water supply and mitigation would affect groundwater levels in bedrock under the Proposed Action. During mining, groundwater that enters the underground workings would be collected in sumps and pumped to the surface for use in coal processing or to be infiltrated to alluvium via sediment ponds or discharged to surface drainages. The average discharge from the underground mine is modeled to increase from about 800 gpm in 2024 to a maximum of about 1,100 in 2029 before declining to about 950 gpm during the last year of mining (WET 2024b).

Subsidence above longwall panels would result in fracturing of the overburden to a height of up to about 350 feet above the Mine and would drain groundwater in overburden units OB-7 through OB-5 into the underground workings. Groundwater in overburden above OB-5 including perched groundwater may also drain into the Mine or be affected by temporary changes in water level according to the conceptual model described in **Table 4.4-1.** Groundwater pumping from mine sumps would also lower groundwater levels in underburden unit UB-1A. The modeled groundwater drawdowns for overburden units OB-5 through OB-7, the Mammoth Coal and underburden UB-1A at the end of mining are shown in **Appendix G, Figures 4.4-1, 4.4.2** and **4.4-9.**

Pumping from the Office Supply Well under the Proposed Action would also lower waters level in underburden unit UB-2A. The modeled drawdown in UB-2A at the end of mining is shown in **Appendix G, Figure 4.4-3**. Pumping from the Madison Wells would not be needed to support the Proposed Action, and because of their significant depth (over 8,000 feet), even if used, there would be no impacts to groundwater levels in strata that could be reasonably accessed for domestic use or livestock watering.

At the end of mining, pumping from the Mine sumps would be discontinued, and the underground workings would be allowed to fill with groundwater. Groundwater levels in overburden above the Mine would continue to decrease over several decades by vertical seepage into the underground workings, with maximum modeled drawdowns exceeding 50 feet above the center of the Mine 50 years post mining (**Appendix G, Figure 4.4-10**). At 50 years post mining, water levels in the deepest part of underground workings (i.e., along the East Mains) and adjacent underburden are modeled to be up to 50 feet higher than pre-mining water levels. Water levels in up-dip areas to the south are modeled to be up to 40 feet lower than pre mining water levels (**Appendix G, Figures 4.4-11** and **4.4-12**). Pumping from the Office Supply Well would also be discontinued at the end of mining and water levels in underburden unit UB-2A are modeled to recover to pre-mining levels by 50 years post mining (**Appendix G, Figure 4.4-13**). Impacts to bedrock groundwater levels under the Proposed Action would be moderate and long term to permanent.

Potential impacts to bedrock groundwater quality are expected to be negligible to minor during mining because groundwater entering the Mine would be pumped to the surface to be used for coal processing or to be infiltrated to alluvium via sediment ponds or discharged to surface drainages. Groundwater flow in bedrock during operation would be toward the Mine, and potential contaminants would not be transported outside of the footprint of the underground workings. Mining subsidence has the potential to affect groundwater quality in overburden by the creation of new flow paths that would expose groundwater to rocks with different chemical characteristics, but the potential changes are expected to be within the range of currently observed background values.

Post mining, water in the flooded underground workings is expected to have elevated concentrations of TDS, sulfate, manganese, and nickel that would be transported northward in groundwater that flows through the underground mine. The transport would primarily occur in the Mammoth Coal and immediately adjacent strata. Modeled TDS concentrations outside of the Mine footprint at 100 years post mining are shown in **Appendix G, Figures 4.4-7** through **4.4-8**. The modeled TDS increase in the Mammoth Coal outside of the Mine footprint is generally less than 1,000 mg/L, with most areas outside of the Mine footprint predicted to experience 100 mg/L or less water quality change. TDS in seepage from the flooded mine would not change the class of the receiving groundwater and would not prohibit existing or potential future beneficial uses of the groundwater (MDEQ 2024). The transport of other constituents in mine water has not been evaluated.

Rehder Creek Alluvial Valley Floor

Potential impacts to the Rehder Creek AVF under the Proposed Action include changes in alluvial groundwater levels and quality from MPDES discharges, the infiltration of runoff and mine water in sediment ponds, site runoff, and seepage from the WDAs.

MDEQ has evaluated existing impacts to Rehder Creek AVF and determined that although the surface facilities for the Mine have contributed to increased water levels, TDS, SC, and SAR in AVF groundwater, the changes do not affect the ability of the AVF to support agricultural activities (MDEQ 2023). The observed changes are attributed to both natural causes and water management activities. The current specific conductance (SC) of Rehder Creek alluvial groundwater, which is reported to range from 2,140 to 2,800 microSiemens/centimeter (μS/cm) in well BMP053, upgradient of the AVF is acceptable for irrigation of wheat (threshold SC of 6,000 μS/cm) and grasses (threshold SC of 3,000 μS/cm), but the water would be considered above the threshold value for alfalfa (threshold SC of 2,000 μS/cm) (MDEQ 2023). MDEQ calculated that the range of SC values observed at well BMP053 would translate to a 1 to 6 percent potential reduction in alfalfa crop productivity, which MDEQ considered to not be a significant impact to the use of the AVF.

Impacts to the Rehder Creek AFV under the Proposed Action are expected to be similar to currently observed impacts and would be long term occurring thought the life of the Mine. After mining and reclamation of the site is complete, impacts to the AVF would end and alluvial water levels and water quality would be similar to pre-mining conditions.

Wetlands

Impacts to wetlands under the Proposed Action would be greater than those described for the No Action Alternative, with 0.01 acre of surface disturbance for subsidence repair. Surface disturbance under the Proposed Action would total 24.5 acres. Of these total acres, 13.4 acres would be from subsidence repair, 8.0 acres from borehole pads and air portals, and 3.1 acres from roads. Direct and indirect impacts to wetlands associated with the Proposed Action would increase compared to the No Action Alternative due to the increase in potential surface disturbance. Surface disturbance from subsidence cracks and repair to wetlands under the Proposed Action would be considered minor and long term.

Water Resource Usage

Potential impacts to water rights would be the same as for the No Action Alternative. Sources of water for registered water rights would be replaced if affected by mining and impacts to water rights would not occur.

4.4.2.3 Partial Mining Alternative

Surface Water

Impacts from Surface Facilities and Waste Disposal Areas

Under the Partial Mining, mining would be authorized for approximately 5 years—through 2030. Potential impacts to surface water from the surface facilities and WDAs under the Partial Mining Alternative would be similar to those for the Proposed Action. SPE would continue to process coal from the underground mine and place CPW in the WDAs that would be reclaimed at the end of mining in accordance with the MDEQ-approved reclamation plan.

Impacts from Mining

Potential impacts to surface water from mining under the Partial Mining Alternative would be similar to those for the Proposed Action, but the length of ephemeral stream channels and area of watershed that would be undermined would be less (by 0.9 mile) than under the Proposed Action. The Partial Mining Alternative would also eliminate undermining of spring 53245, which is rated as having high potential to be impacted by subsidence (**Table 4.4-3**).

Groundwater

Impacts from Surface Facilities and Waste Disposal Areas

Potential impacts to groundwater from the surface facilities and WDAs under the Partial Mining Alternative would be similar to those for the Proposed Action. SPE would continue to process coal from the Mine and place CPW in the WDAs that would be reclaimed at the end of mining in accordance with the MDEQ-approved reclamation plan.

Impacts from Mining

Potential impacts to groundwater from mining under the Partial Mining Alternative would be approximately the same as those for the Proposed Action. Elimination of mining in panel 15 would result in negligible differences in impacts to groundwater quantities and quality from those that would occur under the Proposed Action.

Rehder Creek Alluvial Valley Floor

Potential impacts to the Rehder Creek AVF from the surface facilities and WDAs under the Partial Mining Alternative would be similar to those for the Proposed Action. SPE would continue to process coal from the underground mine and place CPW in the WDAs that would be reclaimed at the end of mining in accordance with the MDEQ-approved reclamation plan.

Wetlands

Potential impacts to wetlands under the Partial Mining Alternative would be the same as those for the Proposed Action.

Water Resource Usage

Potential impacts to water rights under the Partial Mining Alternative would be the same as those for the Proposed Action.

4.4.3 Impacts from Past, Present, and Reasonably Foreseeable Future Actions

4.4.3.1 Surface Water

Current and reasonably foreseeable future actions that would contribute to surface water impacts in the analysis area include:

- Current and future mining and reclamation
- Current and future agricultural activities, primarily livestock grazing
- Past, present, and future wildland fires

Current and future coal mining and reclamation by SPE and other companies in the region could affect surface water resources in ways similar to those from the Proposed Action. Past and current coal-mining activities have impacted surface water in the region by changing flows and water levels in undermined springs, streams, and ponds and water quality in drainages that receive mine wastes and discharged mine water. As such, ongoing and future mining activities would contribute to regional impacts on surface water.

4.4.3.2 Groundwater

Reasonably foreseeable future actions that would contribute to groundwater impacts in the region include:

- Current and future mining and reclamation
- Current and future agricultural activities

Current and future coal mining and reclamation by SPE and other companies in the region could affect groundwater quality in ways similar to those from the Proposed Action. Past and current coal-mining activities have impacted groundwater in the region by altering water levels and water quality above mining panels by subsidence and mine dewatering. Water levels and the quality of groundwater and downgradient from underground mines has also been impacted by mine dewatering and the infiltration of dewatering discharge into alluvium.

Agricultural activities, including irrigation and stock watering, may use groundwater and lower groundwater levels adjacent to pumped wells. Ongoing and future mining activities would contribute to regional impacts to groundwater levels.

4.4.3.3 Rehder Creek Alluvial Valley Floor

Current and reasonably foreseeable future actions that would contribute to impacts on the AFV in Rehder Creek include:

- Current and future mining and reclamation in the drainages for PM Draw and Rehder Creek
- Current and future agricultural activities in the PM Draw and Rehder Creek drainages

Future coal mining and reclamation by SPE could affect groundwater in the AFV quality in ways similar to those that are currently observed including changes to groundwater water quality and water levels in the AVF. Agricultural activities, including irrigation and stock watering, may also withdraw groundwater from the AVF resulting in additional impacts to groundwater levels.

4.4.3.4 Wetlands

Reasonably foreseeable future actions that would contribute to wetland impacts in the analysis area include:

- Current and future mining and reclamation
- Current and future agricultural activities, primarily livestock grazing
- Past, present, and future wildland fires

Current and future coal mining and reclamation by SPE and other companies in the region could affect wetlands in ways similar to those from the Proposed Action. Past and current coal-mining activities have impacted surface and groundwater in the region by changing flows and water levels in undermined springs, streams, and ponds in drainages and subsidence. As such, ongoing and future mining activities would contribute to regional impacts on wetlands.

4.4.3.5 Water Resource Usage

Current and reasonably foreseeable future actions that could contribute to impacts to water rights include agricultural activities and stock watering. Agricultural activities including irrigation and stock watering use groundwater and surface water could result in additional impacts to water rights in the study area.

4.4.4 Mitigation Measures

4.4.4.1 Surface Water

No additional mitigation measures for surface water are planned under the Proposed Action.

4.4.4.2 Groundwater

MSUMRA requires permit holders to employ measures to minimize disturbance to the hydrologic balance on and off the Mine permit area and to prevent material damage to the hydrologic balance outside the permit area. Among these measures are requirements and performance standards given for a variety of processes and activities. These include requirements and standards for drainage control, pond design and maintenance, sediment control, road design and maintenance, reclamation, permitted discharges to surface water, and protection of undisturbed drainages.

Specific provisions for protection of and minimization of impacts to groundwater include requirement for prevention or control of harmful mine drainage into groundwater (ARM 17.24.643), restoration of the approximate recharge capacity (ARM 17.24.644), selective placement of acid and toxic forming materials in mine backfill to prevent leaching (ARM 17.24.501, 17.24.643), and permanent sealing of drilled holes (ARM 17.24.632).

4.4.4.3 Rehder Creek Alluvial Valley Floor

MSUMRA requires permit holders to employ measures to minimize disturbance to the hydrologic balance on and off the Mine permit area and to prevent material damage to the hydrologic balance outside the permit area. Among these measures are requirements and performance standards given for a variety of processes and activities. These include requirements and standards for drainage control, pond design and maintenance, sediment control, road design and maintenance, reclamation, permitted discharges to surface water, and protection of undisturbed drainages. No additional mitigation measures for the AFV are planned under the Proposed Action.

4.4.4.4 Wetlands

No additional mitigation measures for wetlands are planned under the Proposed Action.

4.4.4.5 Water Resource Usage

No mitigation measures for water rights other than those required under ARM 17.24.648 would occur under the Proposed Action.

4.4.5 Irreversible and Irretrievable Commitment of Resources

For each alternative, the Mammoth Coal aquifer within new mining areas would be irreversibly and irretrievably lost due to mining. The coal would be replaced by gob that would have different hydrologic characteristics and water quality. Groundwater levels and water quality in the gob would be different than before mining and would be irreversibly altered.

There is potential that flow from some undermined springs could be irreversibly altered or irretrievably lost because of mining. Potential impacts to individual springs are difficult to predict and are dependent on a number of factors including geologic conditions, the depth of mining, the thickness of mined coal, and the location of a spring and its recharge area relative to longwall panels and areas of continuous mining. These impacts may or may not occur at any given spring location but are more likely in areas with thin overburden.

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4.5 Land Use

This section discusses the direct and indirect impacts, as well as impacts from past, present, and RFFAs, on land use resulting from the No Action Alternative, Proposed Action, and Partial Mining Alternative. The analysis area is described in **Section 3.5**. Definitions related to the nature, intensity, and duration of impacts associated with each alternative are described in **Section 4.0.**

4.5.1 Direct and Indirect Impacts

4.5.1.1 No Action Alternative

Under the No Action Alternative, the proposed mining plan modification would not be approved, and approximately 1,239.6 acres of Federal coal lands and approximately 1,840.7 acres of non-Federal coal lands would not be mined. Mining would continue in the Mine permit area to recover non-Federal coal remaining within the permit area over a 1-year period. These ongoing mining operations would result in 576.8 acres of subsidence on non-Federal land (**Table 2.3-1**), and 2.9 acres of surface disturbance as a result of subsidence repair. Subsidence over longwall mined areas may result in localized slope instability, rock toppling, and alteration of topography at the interface between mined and un-mined areas. This may result in minor impacts to patterns of use in the short term during mining activities but would not have long-term impacts on use of the land.

4.5.1.2 Proposed Action

Under the Proposed Action, leasing of the coal for underground longwall mining would not result in surface modifications within the permit area that would limit or change current surface uses. The Proposed Action would result in approximately 24.5 acres of surface disturbance, occurring primarily in the Grazing Land/Fish and Wildlife Habitat/Recreation land use type (**Table 4.5-1**). This surface disturbance would occur as a result of surface facilities (8 acres), road construction (3.1 acres), and subsidence repairs (13.4 acres). Surface disturbing activities would occur within the permit area for up to 9 years. Following reclamation land would be restored to pre-mining uses. As such, surface disturbing activities would be long term and moderate during mining operations but would be negligible once reclaimed at the conclusion of mining operations.

Table 4.5-1. Surface Disturbance by Land Type – Proposed Action

Land Use Type	Surface Disturbance (Acres)
Grazing Land/Fish and Wildlife Habitat/Recreation	24.4
Residential/Fish and Wildlife Habitat/Recreation	0.1
Special-Use Pasture/Fish and Wildlife Habitat/Recreation	0.0
Industrial/Commercial	0.0
Grazing Land/Fish and Wildlife Habitat/Industrial/Commercial	0.0
Special-Use Pasture/Fish and Wildlife Habitat/Industrial/Commercial	0.0
Cropland/Grazing Land	0.0
Developed Water Resources	<0.1

Source: SPE 2023.

The Proposed Action would also result in 1,033.4 acres of subsidence on Federal land and 1,635.8 acres of subsidence on non-Federal land (**Table 2.3-1**). Subsidence over longwall mined areas may result in localized slope instability, rock toppling, and alteration of topography at the interface between mined and un-mined areas. This may slightly alter patterns of use in the short term during subsidence but would not have long-term or permanent impacts on use of the land once the land is returned to its pre-mining uses.

Surface structures located within the permit area that may be affected by subsidence include fences, roads, and trails in all sections, water conveyance pipeline for livestock, building structures, home sites, spring developments (including ponds, water tanks, and pipes) for livestock and wildlife, and wells sites. SPE would be required to conduct a pre-mine survey to determine the status of all structures above the mine area, monitor subsidence during and after mining, and immediately repair damage to the structures. SPE would also post a reclamation bond to insure availability of funds to repair damages to identified structures. This bond would not cover construction of structures to be built after mining or subsidence damage to undeveloped rangeland. In addition, Musselshell County would require that SPE repair any damage to Fattig Creek County Road. Accordingly, the impacts from subsidence are likely to range from minor to moderate in the short term, however, following reclamation impacts to surface structures and associated land uses are anticipated to be negligible.

As a result of surface disturbing activities and subsidence in the permit area, the Proposed Action may have long-term impacts on livestock grazing and wildlife uses throughout the permit area. Impacts to livestock grazing resources would include a loss of available grazing area and restriction or alteration in livestock movement. The primary impact to livestock grazing would be loss of available grazing area as a result of Project fencing, however due to the expansive nature of the permit area, these impacts would be moderate in nature. Wildlife (particularly big game) may also be displaced, or experience movement restrictions while mining and reclamation efforts are underway (impacts to wildlife are discussed in detail in **Section 4.12**). Indirect impacts to both livestock grazing and wildlife would include minor impacts from dust and noise. Following reclamation, the land would be suitable for grazing and wildlife and no permanent impacts to these resources are anticipated.

Hunting is the primary recreational activity in the permit area; however, no portions of the permit area are directly managed for this specific land use. Hunters would experience closures of public land in active mining areas throughout the life of the mine, displacing some individuals onto other nearby lands for hunting and other recreation opportunities. Hunting opportunities on mine-related disturbance areas within the analysis area would be lost until revegetation and forage production are comparable to pre-mining levels associated with adjacent land. Thus, direct impacts on recreation would be long term and moderate in nature under the Proposed Action. No indirect impacts to recreation are anticipated under the Proposed Action.

4.5.1.3 Partial Mining Alternative

Impacts to land use under the Partial Mining Alternative would be consistent with those described for the Proposed Action but would be shorter in duration and would cover fewer acres. The Partial Mining Alternative would result in approximately 23.1 acres of surface disturbance, occurring primarily in the Grazing Land/Fish and Wildlife Habitat/Recreation land use type (**Table 4.5-2**). This surface disturbance would occur as a result of surface facilities (8 acres), road construction (3.1 acres), and subsidence repairs (12.0 acres). Surface disturbing activities would impact the surface in the permit area in a manner consistent with those discussed under the Proposed Action.

Table 4.5-2. Surface Disturbance by Land Type – Partial Mining Alternative

Land Use Type	Surface Disturbance (Acres)
Grazing Land/Fish and Wildlife Habitat/Recreation	23.0
Residential/Fish and Wildlife Habitat/Recreation	0.1
Special-Use Pasture/Fish and Wildlife Habitat/Recreation	0.0
Industrial/Commercial	0.0
Grazing Land/Fish and Wildlife Habitat/Industrial/Commercial	0.0
Special-Use Pasture/Fish and Wildlife Habitat/Industrial/Commercial	0.0
Cropland/Grazing Land	0.0
Developed Water Resources	<0.1

Source: SPE 2023.

The Partial Mining Alternative is anticipated to result in 854.0 acres of subsidence on Federal land and 1,539.6 acres of subsidence on non-Federal land (**Table 2.3-1**). Impacts to land uses from anticipated subsidence would be consistent with those described under the Proposed Action and would alter patterns of use in the short term during mining activities but would not have a long-term or permanent impact on use of the land once the land is returned to pre-mining uses.

Impacts to livestock grazing, wildlife, and recreation would be the same as described in the Proposed Action but would similarly occur over a shortened period of time and across fewer acres. As such, the direct and indirect impacts related to livestock grazing, wildlife, and recreational uses would be moderate and short term in nature.

4.5.2 Impacts from Past, Present, and Reasonably Foreseeable Future Actions

The analysis area for evaluation of impacts from past, present, and RFFAs on land use includes the permit area (see **Figure 3.0-1**).

Related past, present, and reasonably foreseeable future actions that would contribute to impacts on land use sources include:

- Past, present, and future mining and reclamation at the Mine, including subsidence, impacts to local infrastructure, fencing, and land closures.
- Past, present, and future agricultural activities, primarily livestock grazing.

The impacts on land use from past, present, and RFFAs include a reduction of livestock grazing and subsequent revenues, a reduction in habitat for some species of wildlife (particularly big game species), and loss of recreational access to public lands (particularly for hunters). Within the permit area, there would be incremental, moderate, long-term impacts on livestock grazing wildlife, and recreational land uses. Depending on the timing of actions associated with these activities, impacts on land use may be incrementally greater within the study area. Following Project reclamation, the land would be suitable for grazing and wildlife uses, which are the historic land uses.

Land use in the areas surrounding the Mine is unlikely to change substantially given that the existing land uses are well-established and consistent with the types of use under the Proposed Action. The areas surrounding, but outside the permit area could continue to be grazed or used by the landowners for agricultural purposes.

4.5.3 Mitigation Measures

No additional mitigation measures were determined necessary to avoid unacceptable impacts.

4.5.4 Irreversible and Irretrievable Commitment of Resources

For all alternatives, grazing land, wildlife habitat, and recreation land from mine-related disturbance would be lost until revegetation and forage production are reclaimed and are comparable to pre-mining levels associated with adjacent land. There would be no irreversible or irretrievable commitment of resources.

4.6 Topography and Physiography

This section discusses the direct, and indirect impacts, as well as impacts from past, present, and RFFAs, on topography and physiography resulting from the No Action Alternative, Proposed Action, and Partial Mining Alternative. The analysis area is described in **Section 3.6**. Definitions related to the nature, intensity, and duration of impacts associated with each alternative are described in **Section 4.0**.

4.6.1 Direct and Indirect Impacts

4.6.1.1 No Action Alternative

Under the No Action Alternative, the proposed mining plan modification would not be approved, and approximately 1,239.6 acres of Federal coal lands and approximately 1,840.7 acres of non-Federal coal lands would not be mined. Mining would continue in the Mine permit area to recover non-Federal coal remaining within the permit area, which would occur over a 1-year period. These ongoing mining operations would result in a 576.8-acre area of subsidence on private land and 2.9 acres would be disturbed from subsidence repairs on non-Federal lands (**Table 2.3-1**). In general, subsidence would be uniform over broad areas. Impacts from subsidence would occur on steep slopes and along rock outcrops where localized slope failure and rock toppling may occur.

Subsidence over the mined panels would alter the overburden and affect the stability of sandstone outcrops and steeper slopes. The surface impacts from subsidence depend on characteristics of the overburden as well as depth of mining below the surface, height of the coal seam removed, Mine layout, and Mine direction. The trough of subsidence would be deepest in the center of the panels, graduating to little or no subsidence at the boundary of coal removal. Along a particular subsidence trough, slope failure and toppling of sandstone rocks that outcrop may occur. Slope instability and failure, rock toppling, and alteration to topography and drainage patterns are most likely to occur where steep slopes, weathered materials, and unstable structural conditions exist.

Typically, a direct permanent impact of coal mining and reclamation is topographic moderation. After reclamation, the restored land surfaces are generally gentler, with more uniform slopes and restored basic drainage networks. Under the No Action Alternative, the post-mining landscape of the analysis area would be restored following mining operations to the approximate original contour to facilitate post-mine land uses. However, following reclamation, the average post-mining topography would be slightly lower in elevation than the pre-mining topography due to removal of the coal. The removal of the coal would be partially offset by the swelling that occurs when the overburden and interburden are blasted, excavated, and backfilled.

The overall impacts to topography and physiography from mining-related subsidence would be minor over the short term (one to six months after mining) and negligible over the long term, following reclamation. However, there may be local variations in the impacts. In most cases, subsidence-related failures would be an acceleration of the slower natural processes of weathering, erosion, sloughing and toppling.

4.6.1.2 Proposed Action

Under the Proposed Action, the proposed mining plan modification would be approved, and approximately 1,239.6 acres of Federal coal lands and approximately 1,840.7 acres of non-Federal coal lands would be mined up to 9 years, resulting in the recovery of approximately 22.8 Mt of saleable Federal coal and approximately 34.5 Mt of adjacent saleable non-Federal coal. The proposed mining operations would result in 1,033.4 acres of subsidence on Federal land and 1,635.8 acres of subsidence on non-Federal land (**Table 2.3-1**). Impacts from subsidence over longwall mined areas would be similar to those discussed under the No Action Alternative but would take place over 2,092.4 additional acres and occurring over an additional 8-year period. A total of 5.2 acres would be disturbed from subsidence repairs on non-Federal lands. Approximately 8.2 acres of disturbance would occur from subsidence repairs, 2.0 acres from the development of air portals. 6.0 from borehole pads, 3.1 acres from the development of roads for a total of 19.3 acres of surface disturbance on Federal land. Additionally, operation of WDA 2 would result in permanent topographic impacts from the placement of CPW on this facility.

In addition to the impacts discussed under the No Action Alternative, the impacts from subsidence to topography and physiography may also be associated with impacts to other resources such as water, wetlands, soils, vegetation, ownership and use of land, and cultural resources.

Impacts to topography and physiography as a result of the Proposed Action are expected to be minor but long term.

4.6.1.3 Partial Mining Alternative

Impacts to topography and physiography under the Partial Mining Alternative would be consistent with those described for the Proposed Action but would be shorter in duration and would cover fewer acres. Under the Partial Mining Alternative, 12.0 acres would be disturbed over approximately 5 years as a result of subsidence repairs and an additional 11.1 acres would be disturbed by facilities such as borehole pads, portals, and roads (**Table 2.3-1**). Additionally, subsidence would occur over 854.0 acres of Federal land and 1,539.6 acres of non-Federal land over the approximate 5-year duration (**Table 2.3-1**). Any mining of Federal coal within the permit area beyond this 5-year approval would require reevaluation of the mining operations by OSMRE and a new mining plan modification before any further disturbance could occur.

Impacts to topography and physiography as a result of the Partial Mining Alternative are expected to be minor and short term.

4.6.2 Impacts from Past, Present, and Reasonably Foreseeable Future Actions

The analysis area for evaluation of impacts from past, present, and RFFAs on topography and physiography includes the permit area (see **Figure 3.0-1**).

Related past, present and reasonably foreseeable future actions that would contribute to impacts on topography and physiography include:

- Past, present and future mining and reclamation at the Mine
- Past, present and future exploration activities
- Past, present and future residential development

Additional underground mining in the Bull Mountains would have minor long-term impacts on topography and physiography while surface facilities are active. The facilities could include coal storage piles, soil stockpiles, and waste disposal areas that would affect topography and physiography due to the removal of geologic outcrops and slight differences in the pre-mine topography versus the post-mine topography. After mining is complete, these areas would be reclaimed. General pre-mining topography and physiography would be approximated. Impacts from past, present, and RFFAs would be minor.

Impacts of such additional underground mining would also include subsidence over the mined areas. Subsidence would be expected to be relatively uniform over large areas. Short-term impacts of subsidence may include slope failure, surface cracking and rock toppling. There may be small areas that would require mitigation to restore surface drainage patterns or to treat the impacts of rock toppling, but overall, the impacts from subsidence to topography and physiography would be minor.

Dispersed residential development would have localized impacts to topography and physiography from construction of buildings, roads and infrastructure. It is expected that this development would remain dispersed and that impacts from past, present, and RFFAs would be minor.

4.6.3 Mitigation Measures

No additional mitigation measures were determined necessary to avoid unacceptable impacts.

4.6.4 Irreversible and Irretrievable Commitment of Resources

Under the No-Action Alternative, operation of WDA 1 would continue to result in irreversible topographic impacts, while the Proposed Action and Partial Mining Alternative would result in irreversible topographic impacts from the operation of WDA 2. For all alternatives there would be no irretrievable commitment of resources for topography physiography.

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4.7 Geology, Minerals, and Paleontology

This section discusses the direct, and indirect impacts, as well as impacts from past, present, and RFFAs, on geology, minerals, and paleontology resulting from the No Action Alternative, Proposed Action, and Partial Mining Alternative. The analysis area is described in **Section 3.6**. Definitions related to the nature, intensity, and duration of impacts associated with each alternative are described in **Section 4.0**.

4.7.1 Direct and Indirect Impacts

4.7.1.1 No Action Alternative

Under the No Action Alternative, the proposed mining plan modification would not be approved, and approximately 1,239.6 acres of Federal coal lands and approximately 1,840.7 acres of non-Federal coal lands would not be mined. Mining would continue in the Mine permit area to recover approximately 10.0 Mt of non-Federal saleable coal remaining within the permit area over a 1-year period. To date, approximately 1,041.3 acres have been disturbed within the permit area. Under the No Action Alternative, approximately 2.9 acres of additional surface disturbance would occur as a result of subsidence repairs (**Table 2.3-1**). These ongoing mining operations would also result in a 576.8-acre area of subsidence on non-Federal land.

Nearly all of the surface disturbance proposed under this alternative would occur in PFYC Class 4 (2.8 acres), with minor impacts occurring in PFYC 2 (0.1 acre). However, surface disturbing activities and mining operations are unlikely to disrupt important vertebrate or invertebrate fossils, except in the coal seam that would be removed by longwall mining. Collapse features associated with underground mining have the potential to disrupt stratigraphic continuity and data associated with paleontological resources at the surface. However, the low potential for disturbance of resources in conjunction with the limited surface-disrupting activities would minimize the potential impact to paleontological resources that might be in the area of Federal coal.

Indirect impacts to the geology, mineral resources, or paleontological resources of the leased area would include subsidence over the mined areas. In general, subsidence would be uniform over broad areas. Strata would subside as a block and retain their internal structure. Except for the removal of the coal bed, the overall nature of the geology and mineral resources of the area would not change.

Overall, impacts to geology, minerals, and paleontology as a result of the No Action Alternative are expected to be minor but permanent as the geological features subject to longwall mining practices would be permanently changed as they are replaced with backfill material during reclamation

4.7.1.2 Proposed Action

Under the Proposed Action, the proposed mining plan modification would be approved, and approximately 1,239.6 acres of Federal coal lands and approximately 1,840.7 acres of non-Federal coal lands would be mined over the course of 9 years, resulting in the recovery of approximately 22.8 Mt of saleable Federal coal and approximately 34.5 Mt of adjacent saleable non-Federal coal.

Under the Proposed Action, 13.4 acres (5.2 acres on Federal lands and 8.2 on non-Federal lands) would be disturbed as a result of subsidence repairs. An additional 11.1 acres would be disturbed by surface facilities such as borehole pads, portals, and roads for a total of 24.5 acres of surface disturbance. Impacts from surface disturbance would be consistent with those discussed under the No Action Alternative but would occur over 21.6 additional acres. All of the surface disturbance anticipated under the Proposed Action would occur in PFYC 4; however, surface disturbing activities are unlikely to disrupt important vertebrate or invertebrate fossils, as discussed under the No Action Alternative.

Additionally, the proposed mining operations would result in 1,033.4 acres of subsidence on Federal land and 1,635.8 acres of subsidence on non-Federal land (**Table 2.3-1**). Under the Proposed Action, impacts from subsidence over longwall mined areas would be similar to those discussed under the No Action Alternative but would occur over an additional 2,092.4 acres. Similarly, surface disturbing activities and mining operations are anticipated to impact paleontological resources in a similar manner as those discussed under the No Action Alternative with subsidence occurring over 2,092.4 additional acres.

Overall, impacts to geology, minerals, and paleontology as a result of the Proposed Action are expected to be moderate and permanent.

4.7.1.3 Partial Mining Alternative

Impacts to geology, minerals, and paleontology under the Partial Mining Alternative would be consistent with those described for the Proposed Action but would be shorter in duration and would occur over fewer acres. Under the Partial Mining Alternative, 12.0 acres would be disturbed over an approximate 5-year period as a result of subsidence repairs and an additional 11.1 acres would be disturbed during this time by facilities such as borehole pads, portals, and roads for a total of 23.1 acres of surface disturbance (**Table 2.3-1**). Additionally, subsidence would occur over 854.0-acres of Federal land and 1,539.6 acres of non-Federal land over the 5-year approval period (**Table 2.3-1**). Under the Partial Mining Alternative, approximately 18.6 Mt of saleable Federal coal and approximately 32.2 Mt of adjacent saleable non-Federal coal would be recovered. Any mining of Federal coal within the permit area beyond this approximate 5-year duration would require reevaluation of the mining operations by OSMRE and a new mining plan modification before any further disturbance could occur.

4.7.2 Impacts from Past, Present, and Reasonably Foreseeable Future Actions

The analysis area for evaluation of impacts from past, present, and RFFAs on geology, minerals, and paleontology includes the permit area (**Figure 3.0-1**).

Related past, present and reasonably foreseeable future actions that would contribute to impacts on geology, minerals, and paleontology include:

- Past, present and future mining and reclamation at the Mine; and
- Past, present and future exploration activities.

The impacts of additional underground mining in the Bull Mountains would primarily include removal of large portions of the Mammoth Coal seam. Other geologic features, mineral resources and paleontology in the overburden of the coal would subside in place and largely be intact. No unique or significant paleontological resources have been identified or are suspected to exist in the permit area and the likelihood of encountering significant paleontological resources is very small. Impacts from past, present, and RFFAs to these resources would be minor but long term.

Dispersed residential development would have very localized impacts on geology, mineral resources and paleontology. The overall impacts from past, present, and RFFAs of the development of these subdivisions would be minor and short term.

4.7.3 Mitigation Measures

No additional mitigation measures were determined necessary to avoid unacceptable impacts.

4.7.4 Irreversible and Irretrievable Commitment of Resources

For all alternatives, removal of the coal and associated development rock needed to access the coal would be an irreversible and irretrievable impact on geologic features and coal reserves. This would represent an irreversible impact on area geology.

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4.8 Solid Waste and Hazardous Materials

This section describes the environmental consequences for solid and hazardous waste generation and storage and hazardous materials management in the analysis area related to mining operations under the No Action Alternative, Proposed Action, and Partial Mining Alternative. The environmental consequences analysis for solid and hazardous waste generation and storage and are described in **Section 4.8.1**. The environmental consequences analysis for hazardous materials management is described in **Section 4.8.2**.

Hazardous materials and solid waste can represent potential risks to both human health and to the environment when not managed properly. Issues related to hazardous materials and solid waste are the potential impacts to the environment from an accidental release of hazardous materials and improper disposal of solid waste. In addition to hazardous materials, this section summarizes the solid wastes that are generated during mining operations. Other issues relate to the potential presence of uncontrolled hazardous materials sites where releases have potentially impacted the environment.

4.8.1 Direct and Indirect Impacts

4.8.1.1 No Action Alternative

Solid Waste

Under the No Action Alternative, the proposed mining plan modification would not be approved by the ASLM. SPE would continue to mine for 1 year to recover approximately 10.0 Mt of saleable non-Federal coal remaining within the permit area that is economically recoverable without accessing Federal coal (**Table 2.3-1**). Under the No Action Alternative, the life of mine would be shortened by approximately 8 years relative to the Proposed Action.

Under the No Action Alternative, the types and quantities of solid and hazardous waste would continue to be generated from continued non-Federal coal mining operations. Approximately 2.2 Mt of Coal Processing Waste (CPW) is disposed annually on site in the existing approved WDA 1s (Weber 2023). Generation and disposal of CPW would continue for the duration of mining operations under the approved Mine Permit. Approximately 2.5 Mt of CPW would be generated and placed in WDA 1 and WDA 2 under the No Action Alternative.

Non-hazardous solid waste that is disposed at a municipal landfill is generated at a volume of about 400 tons per year (tpy). Generation of non-hazardous solid waste would continue for the duration of mining operations under the No Action Alternative. Existing operations generate approximately 3,500 gallons of used oil, The used oil generated would continue to be hauled by a contracted third-party waste hauler to a licensed used oil management facility, and universal waste (e.g., bulbs, batteries) would continue to be hauled by a contracted third-party to a licensed universal waste management facility. The types and quantities of non-hazardous solid waste generated under the No Action Alternative would be similar to that of existing operations. Continued mine operation under the No Action Alternative is not expected to affect the mine’s status as a Small Quantity Generator of hazardous waste.

Hazardous Materials

Under the No Action Alternative, transport, storage, and use of hazardous materials at surface facilities and current approved BMPs and procedures for hazardous materials management would continue to be implemented. Fuels, oils, and lubricants are the hazardous materials that would be used in the largest quantities under the No Action Alternative. Quantities of hazardous materials under the No Action Alternative would be similar to quantities used under existing conditions. The estimated annual use of these materials is listed in **Table 3.8-1**. Hazardous materials management would continue for the estimated 1 year duration of Mine production for the No Action Alternative.

4.8.1.2 Proposed Action

Solid Waste

Under the Proposed Action, approximately 22.8 Mt of saleable Federal coal and approximately 34.5 Mt of adjacent saleable non-Federal coal would be produced (**Table 2.3-1**). The Proposed Action would also include the development of MR279 (a shortened-width panel (Panel 15)) and additional placement of CPW in WDA 2. Under this alternative, mining would continue for approximately 9 years. The Proposed Action would not result in an increase in saleable coal recovery, only an increase in the number of years production would continue within the Mine permit area.

Under the Proposed Action, at the estimated recovery rate of 80 percent, approximately 14.8 Mt of CPW (6.0 Mt Federal CPW and 8.8 Mt non-Federal CPW) would be placed on WDA 1 and WDA 2, as capability allows. The amount of CPW generated from the Proposed Action would be approximately a factor of 6 greater than would be generated under the No Action Alternative. WDA 2 would compass approximately 223.0 acres and would be constructed, operated, and reclaimed in a manner comparable to existing WDA 1.

The types and quantities of non-hazardous solid waste generated from the Proposed Action would be similar to that of the No Action Alternative. As the Proposed Action would not result in an increase in annual saleable coal recovery, the annual rate of waste generation would be similar to that of the No Action Alternative but of a longer duration. Non-hazardous solid waste would continue to be managed in municipal landfills and used oil and universal waste management facilities. The increased duration of non-hazardous solid waste generation under the Proposed Action is not expected to result in waste management and disposal capacity constraints on off-site municipal solid waste landfills and other waste management facilities. Continued mine operation under the Proposed Action is not expected to affect the mine’s status as a Small Quantity Generator of hazardous waste.

Hazardous Materials

Under the Proposed Action, similar types and quantities of hazardous materials would be transported, stored, and used as under the No Action Alternative, based on the anticipated Proposed Action average recovery rate of approximately 7.1 Mtpy of saleable coal. As the Proposed Action would involve Mine production in Federal coal areas, the locations at which hazardous materials (e.g., diesel fuel, gasoline) would be greater than that for the No Action Alternative, and, therefore, hazardous materials management plans and control plans, including the SPCC Plan, would need to be revised and updated to encompass the larger areas in which hazardous materials would be stored and used and hazardous storage units installed in the Federal coal production areas. Hazardous materials transport, storage, and use in Federal coal areas would continue for the estimate 9 years of operation under the Proposed Action and would be subject to the same hazardous materials management procedures, secondary containment requirements, and spill prevention, control, and countermeasures procedures, including provisions of the revised and updated SPCC Plan and hazardous materials management plans. These management procedures would minimize the potential for hazardous materials spills and releases from the Proposed Action.

4.8.1.3 Partial Mining Alternative

Solid Waste

The Partial Mining Alternative would set an approximate 5-year approval to mine Federal coal within AM 3 until approximately 2030, at which time no additional Federal coal would be mined unless SPE applied for, and obtained, a separate mining plan authorization to mine the remaining Federal coal. Under this alternative, mining in AM 3 would be sequenced over a 5-year period at a rate of approximately 10.0 Mtpy of saleable coal. Annual Mine production rate of the Partial Mining Alternative would be similar the annual Mine production rate of the No Action Alternative. The duration of Mine production would be approximately 4 more years than the No Action Alternative and approximately 3 fewer years than the Proposed Action. During the Partial Mining Alternative 5-year operating period approximately 50.9 Mt of coal would be mined from the AM 3 area. Annual generation rates of CPW, non-hazardous solid waste, and hazardous waste would be similar to that of the Proposed Action but of a shorter duration.

Hazardous Materials

The Partial Mining Alternative would set an approximate 5-year term to mine Federal coal within AM 3 unless a new mining plan modification approval is obtained that would extend that term. The types and quantities of hazardous materials transported, stored, and used under the Partial Mining Alternative would be similar to that of the Proposed Action, based on the anticipated Partial Mining Alternative recovery rate of approximately 10.0 Mt saleable coal per year, but of a shorter duration based on the approximate 5-year operating limit. As for the Proposed Action, the SPCC Plan and hazardous materials management plans would be revised and updated to encompass the additional locations of hazardous materials use in Federal coal areas. practices and procedures under the Partial Mining Alternative would be similar to that of the Proposed Action. Hazardous materials management plans and procedures would be the same as for the Proposed Action. These management procedures would minimize the potential for hazardous materials spills and releases from the Proposed Action.

4.8.2 Impacts from Past, Present, and Reasonably Foreseeable Future Actions

4.8.2.1 Solid Waste

The impacts from past, present, and RFFAs related to the generation, storage, transport, and disposal of solid waste in the past, present, and RFFA effects study area are represented by the affected environment description. The RFFAs, such as development and other mining projects, would generate solid and hazardous wastes during construction, operations, and reclamation. and these wastes would also require transport and offsite disposal. Generation and disposal of wastes by RFFAs in addition to generation and disposal of solid and hazardous waste by the Proposed Action is not expected to result in impacts on offsite solid and hazardous waste disposal capacity. If solid and hazardous wastes from RFFAs are mismanaged, their release into the environment could lead to contamination and increased management risks in or near the past, present, and RFFA effects study area, particularly if a release is not identified and responded to in a sufficient manner.

The Proposed Action would require the transport, storage, handling, and disposal of solid and hazardous wastes during construction, operations, and reclamation, but these activities would be completed in accordance with permits and regulations and managed through implementation of a waste management plan, thereby minimizing the risk of mismanagement of solid and hazardous wastes. Past and present actions in the permit area and RFFAs would also be required to meet permit and regulatory requirements for the management of solid and hazardous wastes.

4.8.2.2 Hazardous Materials

The impacts from past, present, and RFFAs related to hazardous materials management in the past, present, and RFFA effects study area are represented by the affected environment description. The RFFAs, such as development and other mining projects, would transport, store, and use hazardous materials, including diesel fuel and gasoline, during construction, operations, and reclamation. If hazardous materials at RFFAs are mismanaged, their release into the environment could lead to contamination and increased management risks in or near the past, present, and RFFA effects study area, particularly if a release is not identified and responded to in a sufficient manner.

The Proposed Action would require the transport, storage, handling, and disposal of hazardous materials during construction, operations, and reclamation, but these activities would be completed in accordance with permits and regulations and managed through implementation of an SPCC Plan and hazardous management plans, thereby minimizing the risk of mismanagement hazardous materials. Past and present actions in the permit area and RFFAs would also be required to meet permit and regulatory requirements for the management of hazardous materials, minimizing the potential for hazardous material releases.

4.8.3 Mitigation Measures

No additional mitigation measures were determined necessary to avoid unacceptable impacts.

4.8.4 Irreversible and Irretrievable Commitment of Resources

There is no irreversible or irretrievable commitment of resources related to solid or hazardous waste because waste is not considered a resource.

4.9 Human Health and Safety

This section analyzes potential impacts on human health in the study area resulting from the No Action Alternative, Proposed Action, and Partial Mining Alternative as well as impacts from past, present, and RFFAs.

The human health analysis of the alternatives is informed by the methodological guidance of the EPA (2016, 2024), NRC (2011), CDC (2020), and ICMM (2010). Recognizing that no single formula exists for assessing overall public health impacts under NEPA, this analysis integrates qualitative evidence, quantitative data, and professional judgment. It comprehensively considers the environmental, economic, demographic, and social factors relevant to public health (see **Section 3.9**; NRC 2011). Key considerations include exposure pathways, the magnitude and likelihood of impacts, and their duration, with both beneficial and adverse impacts considered. Population density in affected areas is factored into determining the impact's magnitude and the probability of occurrence.

4.9.1 Direct and Indirect Impacts

The direct effects study area includes the permit area and portions of the county roads used for accessing the Mine where Mine traffic occurs. The population within the vicinity of the direct effects study area is sparse with some scattered residences within five miles of the permit area. The health and safety of on-site Mine employees and contractors are covered under regulations as required by MSHA; as such, this evaluation focuses on impacts to the public. The indirect effects study area is the same as the study area described in **Section 3.9**, which includes Musselshell and Yellowstone Counties where broader safety impacts could occur from air quality, transportation, noise, and water impacts.

The action alternatives have the potential to impact human health through the contamination of air, soil, and water from mining, transport, and coal combustion emissions. These contaminants could lead to exposure through inhalation, ingestion, or skin contact, with possible health risks including respiratory issues, cancer, and other adverse impacts. Noise and vibration from mining activities may also contribute to stress and hearing disturbances. This evaluation of potential human health impacts is based on and incorporates by references **Section 4.2**, **Section 4.3**, **Section 4.4**, **Section 4.8**, **Section 4.10**, **Section 4.15**, and **Section 4.16**. The potential impacts that will be investigated in this section are outlined below in **Table 4.9-1**, and the findings of this evaluation are summarized in **Section 4.9.2**.

Table 4.9-1. Potential Impact Areas

Contaminant/Exposure Pathway	Environmental Media	Potential Health Consideration
Emissions from Mining, Transport, and Coal Combustion	Air	Potential for respiratory and cardiovascular impacts due to exposure to particulate matter. Possible risk of carcinogenic and non-carcinogenic health effects.
Metals in Coal Dust (e.g., arsenic, cadmium, lead)	Air, Soil, Water	Potential cancer risk and other health considerations from exposure through inhalation or contact with contaminated media.
Contamination of Surface and Groundwater	Water	Possible health risks from using or consuming water exposed to contaminants.
Noise and Vibration	Physical Environment	Potential for hearing loss, sleep disturbances, stress, and related impacts from prolonged exposure.
Fugitive Dust	Air, Soil	Potential respiratory or skin irritation from exposure to dust, with possible ingestion risks.
Consumption of Contaminated Food (fish, produce, etc.)	Food (fish, produce, livestock)	Possible health considerations from consuming foods exposed to contaminants, including long-term systemic impacts.
Social/Economic Impacts	N/A	Impacts on community health and well-being due to changes in funding for social services.

Please see **Section 4.1.1**, for details on the terminology used to describe the level of significance and duration of impacts.

4.9.1.1 No Action Alternative

Under the No Action Alternative, the proposed mining plan modification would not proceed, leading to a significant reduction in the scale and duration of mining activities compared to the Proposed Action. The mining of Federal coal lands and additional non-Federal coal lands would be excluded, shortening the life of the Mine by approximately 8 years, as described in **Section 2.3.1**. The No Action Alternative would include the development of the east longwall panel and minor blocks, as well as the continuation of longwall mining in Panel 1 East and minor blocks, under previously approved revisions.

The potential impacts to health from air quality and GHGs under the No Action Alternative are anticipated to be minor in significance and short term in duration. Continued mining operations over the next 1 year would produce PM_{10} and $PM_{2.5}$ and coal dust emissions that could be detected and potentially impact local air quality, particularly affecting residents near the Mine and along access roads. However, due to the limited timeframe of continued operations, these impacts would not be significant and would diminish after the cessation of mining activities.

Soil contamination under the No Action Alternative would be minor, primarily due to the limited deposition of metals like arsenic, lead, and cadmium from coal dust within the study area. Although the mining operations would disturb the soil, the impacts would be temporary, with disturbances ceasing once mining ends. Reclamation activities would then work to restore soil quality. However, even slight contamination from the deposition of these hazardous metals could result in minor but persistent long-term health risks, particularly in areas affected by surface disturbances and subsidence repairs. Long-term exposure to these metals could pose health risks such as respiratory and neurological disorders, especially if contaminants migrate into water sources or are inhaled from dust (Shetty et al. 2023). However, due to the sparse population and reclamation efforts, health impacts would be negligible to minor.

Under the No Action Alternative, significant public health impacts related to water quality are not expected. While mining in the current permit area may cause minor long-term changes to groundwater and surface water, mitigation measures such as sourcing replacement water and complying with Montana Pollutant Discharge Elimination System (MPDES) permits would minimize these impacts. Short-term impacts on springs and streams are expected to be minor and manageable. Overall, with mitigation in place, water quality and availability for public use are expected to see negligible to minor impacts.

Noise and vibration impacts are likely to be minor in significance and short-term in duration. The continued use of heavy equipment and blasting activities could cause detectable but slight noise and vibration impacts on nearby residents. According to **Section 4.15**, the new fan added under the No Action Alternative would result in a maximum of 46 dBA at the nearest residence, which is equivalent to the volume of a suburban area at night (Yale Environmental Health & Safety n.d.). Noise would slightly increase along the rail line, but not by enough to be considered significant (below the 3 dBA threshold). These impacts would cease once mining operations conclude. No impacts to human health would occur as a result of noise or vibration.

Food chain contamination is expected to have negligible to minor impacts under the No Action Alternative. The limited timeframe of continued mining, sparse population, and planned reclamation reduces the likelihood of significant contamination of locally grown produce, livestock, or fish. Any potential food chain impact would be short term and not cause significant stress to local food resources.

Under the No Action Alternative, the decline in Mine production and associated revenue would significantly reduce funding for community and social services, including the cessation of the Signal Peak Community Foundation's scholarship program after 2025. This reduction would impact local economies, particularly in Yellowstone and Musselshell Counties, limiting resources for essential services. The loss of funding could lead to diminished access to education and social programs, potentially affecting public health by reducing community support systems. Without alternative revenue sources, these impacts could contribute to long-term economic and social challenges, resulting in a minor to moderate impact.

Under the No Action Alternative, health impacts from air quality, soil, water, and food contamination are minor and short-term. Noise and vibration would have a negligible impact on health. Reduced Mine production would lower funding for community services, potentially leading to minor to moderate long-term social and health challenges. Overall, the impacts are generally not considered significant and would be mitigated through reclamation efforts after mining operations cease. The duration of impacts is primarily short-term, with no anticipated long-term or permanent impacts following reclamation aside from economic impacts.

4.9.1.2 Proposed Action

Air Quality and Greenhouse Gases

Because the Proposed Action involves a lower annual saleable coal recovery rate than the No Action Alternative, it would result in a reduced rate of rail transport. The indirect impacts from coal dust generation would be negligible. Although the impacts would continue for 9 more years under the Proposed Action (compared to 1 year under the No Action Alternative), the air quality impacts are still considered short term. However, as with the No Action Alternative, coal dust deposited in soil and water would remain in the long term.

In the direct effects study area, DPM and fugitive dust are the most likely sources of risk to public health. Using data from the air quality analysis (see **Section 3.2** and **Section 4.2** related to air quality, and **Section 3.3** and **Section 4.3** related to climate change and GHGs), the risk from DPM is localized and would most likely affect those working in proximity of heavy machinery. The air quality analysis indicates that DPM emissions and fugitive coal dust are largely confined to the permit area. Air concentrations of DPM and PM from coal dust drops off precipitously at the Mine permit area, and neither are detectable in the vicinity of population centers in Yellowstone or Musselshell Counties.

Based on this information, the analysis considers DPM and PM from coal dust where exposure is likely to occur (i.e., direct effects study area). As described in **Section 3.9**, workers at the Bull Mountains Mine are protected under MSHA regulations, and the Mine is obligated to comply with MSHA and OSHA, which include standards for protecting miner health and safety. Therefore, workers at the Mine are covered by MSHA regulations and impacts to them were not considered in this analysis. The radius for exposure includes the permit area and the access roads where Mine-related traffic would travel.

Limited exposure to the public within the direct effects study area may occur when access (county) roads are used by the public and for recreation use on adjacent areas. The public's exposure to DPM and fugitive dust, including coal dust, would be low due to limited exposure time and extent. Direct impacts on public health from air quality would include exposure to emissions from Mine operations, processing and handling of permit area coal, and post-mine reclamation of the area. Sources may include fugitive dust from mining activities (topsoil removal and unloading; overburden drilling, blasting, and removal; coal drilling, blasting, removal, loading, dumping, crushing, and conveying; haul and access roads; and wind erosion of disturbed areas), explosives used for overburden and coal blasting, and DPM emissions from mobile and stationary sources' engines (see **Section 3.2** and **Section 4.2**, for a complete discussion of these sources).

Air concentrations for both PM_{10} and $PM_{2.5}$ fall below NAAQS and MAAQS in the study area, and Project impacts would result in a short-term, minor adverse impact on public health within the study area and public access roads. The concentrations of PM, along with other COPCs found in DPM and coal dust, drop off outside the permit area to levels well below the MAAQS and NAAQS levels. Additionally, there would be few if any members of the public permitted within the study area where PM and other hazardous substances would be present at higher concentrations. There are no residents within the study area where risk of exposure to PM and DPM would be greatest. Population density in the immediate vicinity of the study area is sparse. There are no subsistence farmers within the study area or immediate vicinity. There would be potential for incidental exposure to PM, DPM, and coal dust for persons traveling along county roads adjacent to the study area. Emissions are expected to remain below NAAQS and MAAQS thresholds in the indirect impacts study area.

Because exposure would be incidental and short in duration, the risk to the public health of the overall population and to sensitive subpopulations would be short term and negligible. Any potential exposure of sensitive receptors to PM would be incidental and limited in duration. Therefore, the impacts on public health from $PM_{2.5}$ and PM_{10}, including from DPM and coal dust, would be short term, negligible to minor, and adverse.

Soil Contamination

Impacts to human health resulting from soil contamination due to the Proposed Action could result from coal dust deposition on soil as well as surface disturbance and soil erosion from mining activities.

Coal dust contains metals like arsenic, cadmium, and lead that can lead to health risks such as cancer and neurological disorders if individuals are exposed to these metals through direct contact or accidental ingestion from soils (Shetty et al. 2023). Continued implementation of BNSF's Coal Loading Rule (BNSF 2015, 2017) ensures that coal dust emissions are minimized on BNSF owned and operated rail lines; thereby minimizing the potential for coal dust emissions and subsequent deposition to soil and water. The data presented in **Appendix B** suggests that human health impacts from coal dust would be negligible due to the large area of potential dispersal, sparse population, and low likelihood of human exposure to contaminated soils.

Surface disturbances from mining would lead to soil erosion within the direct effects study area. This can result in the displacement of contaminated soil, potentially increasing dust generation and the spread of contaminants. Indirect impacts are unlikely due to the small dispersion area of fugitive dust and limited spatial area where surface disturbance would occur. See **Section 3.10** and **Section 4.10**.

Any waste materials meeting the definition of "hazardous" would be handled in accordance with RCRA and other applicable regulations (see **Section 3.8** and **Section 4.8**). Workers would be required to wear protective gear and would follow procedures to reduce or eliminate risk from exposure to hazardous waste, in compliance with OSHA. Because regulatory compliance with applicable Federal and State laws would reduce or eliminate the risk of the public being exposed to contaminated soil from Project activities, the direct and indirect impacts of the Proposed Action on public health from soil contamination would be negligible.

Water Quality

The following analysis examines the potential impacts of the Proposed Action on water quality and associated risks to human health, as detailed in **Section 4.4**. While mining activities have the potential to affect both surface and groundwater, the impacts under the Proposed Action are expected to be controlled and mitigated, with minimal risks to nearby communities and livestock. Impacts to water availability and quality are expected to decrease with distance from the Mine, and replacement water would be sourced in accordance with the Mine Permit if required.

Elevated levels of heavy metals, such as arsenic or lead, may pose health risks if they infiltrate drinking water supplies (Fatoki and Badmus 2022). Changes in groundwater levels or quality due to mining could also affect the availability and quality of drinking water for nearby communities.

Groundwater contamination from extended mining operations is projected to be moderate and long term in deeper overburden aquifers, but negligible and short term in shallow overburden and alluvial groundwater sources where human consumption is more likely.

Although mining activities could result in minor, short-term impacts to surface water, particularly during subsidence and surface facility construction, these impacts would be mitigated by water management practices and erosion control BMPs. Compliance with the Montana Pollutant Discharge Elimination System (MPDES) permits ensures that any impacts to surface water quality would remain minor. There is no significant risk of public health impacts from recreational use of surface water, as water-based recreation in the direct effects study area is limited, with minimal exposure pathways for human health risks.

Some springs may experience reduced discharge or cessation, especially those sourced by deeper overburden layers. However, long-term impacts to affected groundwater and surface water uses would be mitigated in accordance with the Mine Permit, ensuring that water is replaced, and impacts do not rise to a level of significance. Monitoring of downgradient groundwater and domestic wells would continue to ensure compliance with water quality standards. Although elevated levels of radium and fluoride have been observed in some monitoring wells, these concentrations have not exceeded human health standards (see **Section 3.4**).

The most likely exposure pathways from surface water would be through recreational activities or incidental contact, but water quality in the indirect effects study area generally meets or exceeds standards, and no adverse impacts to municipal or residential drinking water sources, such as the Yellowstone River, are anticipated (National Parks Service 2022). Overall, with the implementation of BMPs, monitoring, and mitigation measures, the public health risks associated with the Proposed Action are expected to be low, with any indirect effects on public health considered to be negligible and short term.

Noise and Vibration

Prolonged mining operations, as described in **Section 4.15,** are expected to generate continuous noise within the direct effects study area. Indirectly, noise may extend to the broader study area, potentially affecting communities in Musselshell and Yellowstone Counties.

Prolonged mining operations under the Proposed Action are expected to generate noise for approximately 9 years, 8 years longer than the No Action Alternative. Noise-generating activities would expand in new locations as mining progresses, as detailed in **Section 4.15**. Notable sources of noise include a ventilation fan, which could produce moderate, short-term impacts at nearby residences, with noise levels reaching approximately 54 dBA. Rail transport associated with the Project would generate minor noise impacts, consistent with the No Action Alternative, with no significant vibration impacts expected. Though these noise impacts would occur over a longer period, they are still considered short term, diminishing after mining ends and ceasing once reclamation is complete.

Mine workers and equipment operators who are in close proximity to noise sources are required to wear protective hearing devices in accordance with MSHA regulations. The noise levels under the Proposed Action would reach levels similar to a household refrigerator at the nearest residences and would be under the 55 dBA EPA threshold of annoyance (EPA 1974; Yale Environmental Health & Safety n.d.). Therefore, impacts to human health from noise and vibration would be negligible.

Economic Impact

The Proposed Action would support continued revenues and jobs at the Mine, which indirectly fund local community resources in the indirect effects study area. As detailed in **Section 4.16**, the Proposed Action would extend mining operations by 9 years and would generate substantial additional revenue, providing $635 million (2 percent discount rate) at the local and county levels. This continued funding would support essential programs, helping to maintain public health resources, education, and social services that benefit local residents. The delay in Mine closure and layoffs would reduce immediate economic and social stress, potentially preventing adverse health outcomes linked to unemployment and reduced access to services. However, long-term environmental and health impacts from mining activities would persist until reclamation efforts are completed. Extending the Mine's life by 9 years would continue to support public health services and health insurance availability for Mine employees and their families within the direct and indirect effects study area.

The sustained economic benefits and job security from the Mine would continue to fund social services and access to healthcare for an additional 9 years in both the direct and indirect effects study areas. Overall, the economic benefits of the Proposed Action are expected to have a short-term, moderate, and beneficial impact on community well-being in both the direct and indirect effects study areas.

4.9.1.3 Partial Mining Alternative

The Partial Mining Alternative proposes a more limited approach to coal mining, focusing on an approximate 5-year duration versus the 9-years proposed under the Proposed Action. Both alternatives require comprehensive reclamation, but the extent of surface disturbances is larger in the Partial Mining Alternative due to the concentrated mining activity within a shorter timeframe.

The Partial Mining Alternative proposes a shorter, approximate 5-year mining duration, focusing on selected portions of the AM 3 area. The impacts on human health under this alternative would be largely similar to those under the Proposed Action, with key differences primarily in the duration and extent of the impacts.

Air Quality and Greenhouse Gases

Similar to the Proposed Action, the Partial Mining Alternative would result in emissions from mining operations and equipment use. However, these impacts would be confined to a 5-year duration rather than the 9-year period of the Proposed Action. Public exposure to these emissions would remain low, with risks to human health being short-term and negligible to minor, just as with the Proposed Action.

Soil Contamination

The potential for soil contamination from coal dust deposition and surface disturbances would also be similar to the Proposed Action. However, the reduced scale and duration of mining activities would likely result in fewer opportunities for soil erosion and dust generation. The overall impacts on human health from soil contamination would be negligible.

Water Quality

The risks of water contamination from mining operations under the Partial Mining Alternative would be similar to those of the Proposed Action, though limited to the 5-year term. As with the Proposed Action, the impacts on human health due to potential water contamination would be short-term, negligible to minor, with mitigation measures in place to minimize risks.

Noise and Vibration

Noise and vibration impacts would be comparable to those under the Proposed Action but confined to the shorter duration of mining. Residents near the study area would experience similar levels of noise and vibration, with the same negligible impacts on health due to the distance of sensitive receptors from the study area.

Economic Impact

The Partial Mining Alternative would sustain revenues and jobs for a shorter period, providing moderate, short-term economic benefits to local communities and public health services, similar to the Proposed Action but over a more limited timeframe.

Overall, the human health impacts under the Partial Mining Alternative would mirror those of the Proposed Action in terms of nature and intensity, though they would be limited to the shorter 5-year duration, reducing the long-term exposure risks. The impacts would be short-term, negligible to minor, and adverse, with moderate economic benefits.

4.9.2 Impacts from Past, Present, and Reasonably Foreseeable Future Actions

The past, present, and RFFA effects study area for the public health analysis encompasses the direct and indirect effects study areas for the Proposed Action and alternatives. The impacts from past, present, and RFFAs on human health are influenced by a range of related past, present, and foreseeable future actions, such as:

- Agricultural activities, primarily livestock grazing.
- Mining and reclamation at the Mine, including subsidence, impacts to local infrastructure, fencing, and land closures.
- Municipal and industrial water uses and discharges
- Wildland fires
- Climate change
- Other air pollutant sources and emissions

The impacts from past, present, and RFFAs including the Proposed Action, agriculture, rail transport, and industrial operations, contribute to ongoing air and noise emissions that can impact public health. These combined sources of emissions, such as PM and pollutants from industrial processes and vehicle traffic, increase the risk of respiratory and cardiovascular conditions, particularly among vulnerable populations. Agricultural practices and rail transport add to these emissions, compounding the impact to public health. While these activities have adverse environmental impacts, they also provide economic benefits that support public health and social services.

In addition to Mine-related noise, other potential sources of noise near the Mine include exploration activities, residential uses, and agricultural activities. Impacts from past, present, and RFFAs on noise near the Mine associated with the Proposed Action as discerned by the public would be moderate but short term, as described in **Section 4.15**, but are not predicted to reach levels that would impact human health.

Surface water usage and discharges are also a concern, with impacts from past, present, and RFFAs on water resources potentially leading to long-term adverse impacts on public health if pollutants are not adequately managed, particularly during significant precipitation events. Wildland fires present another risk to public health and well-being, with both short- and long-term impacts (see **Section 3.11** and **Section 4.11**). These fires can degrade air quality and contribute to climate change, as well as cause property loss and population displacement. While the Proposed Action does not directly contribute to wildland fire risks, it may have a negligible impact through its contribution to climate change.

Climate change itself poses a significant long-term threat to public health, potentially exacerbating extreme weather events, wildland fires, air quality issues, and the spread of infectious diseases. The impacts of climate change on environmental health and well-being are expected to be major and adverse, with the Proposed Action contributing negligibly. Other sources of air pollution, such as fugitive dust from unpaved roads and vehicle emissions, also contribute to environmental health risks. Although population density in the region is low, and exposure to emissions is minimal, these sources still contribute to regional air quality impacts. Overall, the impacts from past, present, and RFFAs on human health from the various factors in the study area range from minor to major, with the Proposed Action contributing negligibly to these impacts.

4.9.3 Mitigation Measures

No additional mitigation measures were determined to be necessary to avoid unacceptable impacts.

4.9.4 Irreversible and Irretrievable Commitment of Resources

There would be no irreversible or irretrievable commitment of resources related to human health and safety.

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4.10 Soils

This section discusses the direct, and indirect impacts, as well as impacts from past, present, and RFFAs, on the soil resource resulting from the No Action Alternative, Proposed Action, and Partial Mining Alternative. The area of analysis is described in **Section 3.10**. Definitions related to the nature, intensity, and duration of impacts associated with each alternative are described in **Section 4.0**.

4.10.1 Direct and Indirect Impacts

4.10.1.1 No Action Alternative

Under the No Action Alternative, the mining plan modification would not be approved by the ASLM, and SPE would continue to mine for 1 year to recover saleable non-Federal coal remaining in the permit area. To date, approximately 1,041.3 acres of ground surface have been disturbed within the permit area. Under this alternative, approximately 2.9 acres of additional surface disturbance would occur as a result of subsidence repairs (**Table 2.3-1**). Disturbance of the ground surface would remove vegetative cover exposing the soil and would also disrupt the existing soil profile.

At the conclusion of mining, Mine facilities would be removed on a schedule approved by MDEQ, and all surface disturbances would be reclaimed in accordance with the Mine Permit. Under this action, workforce would be limited primarily to reclamation and closure activities. Reclamation is estimated to take approximately 16 months after the end of mining (SPE 2017). Subsidence features would be reclaimed as necessary to restore the pre-mining land use unless they occur on slopes greater than 20 percent. Due to the surface damage that may occur at this slope, these repairs would occur at the direction of the MDEQ (SPE 2017).

No soil or suitable material salvaging is anticipated for this alternative. Existing MDEQ permit requirements for material replacement and reclamation of surface features would remain as previously approved by MDEQ for other amendment areas and areas authorized for development at the Mine.

The expansion of underground mining for the No Action Alternative is predicted to result in little surface disturbance, resulting in 2.9 acres for subsidence repairs (**Table 2.3-1**). Boreholes may be drilled from the surface as unpredicted underground conditions are encountered, but no pads or crib pads are proposed (MDEQ 2024).

Secondary impacts may occur as a result of the surface soil disturbance through subsidence cracks. These impacts are generally localized and occur at a low frequency. Where subsidence cracks have occurred in steep terrain of southern aspect slopes, the greatest impacts occur. These slopes are challenging for equipment access and repair, and the southern aspect proves difficult to establish vegetation. These subsidence surface crack features may experience increased soil erosion compared to adjacent areas until filling with sediment or equilibrating naturally, but the extent would be relatively small (MDEQ 2024).

Proposed mining activities under the No Action Alternative may further increase the potential of the ground surface directly above the Mine panels and within the angle of draw to be adversely affected by subsidence. Shallow sink-like depressions, linear surface fractures, and minor rockslides associated with previous subsidence have not had a noticeable impact upon the soil profile (MDEQ 2024).

Upon completion of mining, subsidence cracks that interrupt the flow of water or sustain soil disturbance and that can be safely accessed without causing damage to the existing land surface would be repaired. Where subsidence cracks are unsafe to access, do not interrupt the flow of water, or contribute to soil erosion, they would be left to recover naturally. If a natural recovery does not occur, repairs would be initiated. Over the life of the permit the subsidence is monitored and managed to reduce or eliminate long-term impacts. Most subsidence cracks to date have been ameliorated in approximately 2 years or less (MDEQ 2024). Repairs consist of windrowing topsoil to allow room for repair work, subsidence crack manipulation or filling if necessary, and then respreading topsoil. This practice has been observed for current mining crack repairs and demonstrates no discernable loss of topsoil into these features. Repair of subsidence features can create additional damage to soils and may not be warranted. However, repair or mitigation of subsidence features would be completed when necessary to restore stream profiles, drainages, and to ensure that pre-mine land use is maintained (MDEQ 2024).

The exact location of any boreholes, pads, roads, subsidence cracks, and/or crack repair actions cannot yet be determined. SPE would be required to submit specific permit revisions and supplemental information, including maps certified by a professional engineer before the surface features and activities would be authorized by MDEQ under MSUMRA (MDEQ 2024).

Short- and long-term impacts to soils would be minimized by soil handling and revegetation methods specified in the Mine Permit and MDEQ regulations pertaining to mining. Minor, temporary and short-term soil impacts by subsidence cracks and repairs may occur in the No Action Alternative area. Minor, long-term impacts may occur with road or bore hole impacts but would be reclaimed to approved post-mine land uses.

4.10.1.2 Proposed Action

Impacts to soil under the Proposed Action would be similar to those described for the No Action Alternative but would occur over a larger area and for a longer duration of time. Surface disturbance under the Proposed Action would total 24.5 acres. Of these total acres 13.4 acres would be from subsidence repair, 8.0 acres from borehole pads and air portals, and 3.1 acres from roads. Overall, direct and indirect impacts to the soil resource associated with the Proposed Action would increase from the No Action Alternative due to the increase in potential surface disturbance. Surface disturbance from subsidence cracks and repair to the soil resource under the Proposed Action would be considered minor, temporary and short-term. Minor, long-term impacts to soils would occur associated with borehole pads, air portals and roads but would be reclaimed to approved post-mine land uses.

4.10.1.3 Partial Mining Alternative

The Partial Mining Alternative would approve mining of Federal coal for approximately 5-years within AM 3, at which time no additional Federal coal would be mined unless SPE sought and the ASLM approved an additional mining plan modification. Under the 5-year Partial Mining Alternative, 12.0 acres would be disturbed as a result of subsidence repairs and an additional 11.1 acres would be disturbed by surface facilities such as borehole pads, air portals, and roads (**Table 2.3-1**). The impacts to the soil resources would be similar to those described for the Proposed Action but would occur on fewer acres and for a shorter period of time. SPE would adhere to reclamation requirements and the ground surface would be restored using reclamation techniques, as discussed above. Surface disturbance from subsidence cracks and repair to the soil resource under the Partial Mining Alternative would be considered minor, temporary and short term.

4.10.2 Impacts from Past, Present, and Reasonably Foreseeable Future Actions

The analysis area for evaluation of impacts from past, present, and RFFAs on soils includes the study area plus the HUC 12 subwatersheds for Rehder Creek, Halfbreed Creek, Parrot Creek, Upper Fattig Creek, Upper Railroad Creek, Upper Pompeys Pillar Creek, Upper Razor Creek, and Middle Razor Creek (see **Figure 3.0-1**).

Related past, present and reasonably foreseeable future actions that would contribute to impacts on soils include:

- Past, present and future mining and reclamation at the Mine;
- Past, present and future agricultural activities, related to ground tillage and crop planting;
- Past, present and future wildland fires; and
- Past, present and future exploration activities.

Past and current coal mining and reclamation by SPE and future coal mining by other companies in the region could affect soils in ways like those described for the study area. Past and current coal-mining activities have altered the soil resources in the region by changing the soil profile, collapse of the overburden into the mine void, exposing the ground surface to wind and water erosion, and disrupting the microbiology and nutrient cycling of the soil by stockpiling. As such, ongoing and future mining activities would contribute to regional impacts on soil.

Historical fires have impacted a large portion of the Mine permit area and the past, present, and RFFA effects study area, particularly the western-most areas of the permit area. Although some erosion has occurred in the short term following fires, all fire-affected lands are relatively stable and have revegetated to an extent that supports livestock grazing and provides forage for wildlife. The long-term impacts of any future wildland fires are expected to be similar, resulting in minor impacts to soil.

Exploration activities have and would continue to be conducted outside of the permit area. However, new roads are not constructed during these efforts, and surface disturbance is minimized. All disturbances are revegetated in accordance with the requirements of prospecting permits, ensuring long-term impacts to the ground surface are negligible.

Past, present, and future mining at the Mine would continue to have an adverse impact on soil until revegetation activities and final reclamation are completed. Impacts from past, present, and RFFAs on soils resulting from these activities and natural processes are expected to be minor, but long term.

4.10.3 Mitigation Measures

No additional mitigation measures were determined necessary to avoid unacceptable impacts.

4.10.4 Irreversible and Irretrievable Commitment of Resources

For all alternatives, surface disturbance would result in an irretrievable and irretrievable resource commitment of soil productivity, while disturbed areas are used for Mine-related activities and until the disturbed soils are returned to pre-mining conditions. Irreversible and irretrievable effects on soil productivity would also result from prolonged soil storage in stockpiles and at disturbance areas that would not be reclaimed until the end of mine life, such as surface facilities and haul roads. These irreversible and irretrievable effects on soil productivity would take many years to return to pre-mine productivity levels. Ground disturbance from subsidence cracks would result in irretrievable and irretrievable resource commitment due to the permanent alteration of the soil structure, soil horizon mixing, and loss of topsoil into the subsided cavern.

4.11 Vegetation

This section discusses the direct and indirect impacts, as well as impacts from past, present, and RFFAs, on vegetation resulting from the No Action Alternative, Proposed Action, and Partial Mining Alternative. The study area and past, present, and RFFA effects study area are described in **Section 3.11**. Definitions related to the nature, intensity, and duration of impacts associated with each alternative are described in **Section 4.0**. Vegetation impacts are of concern because of the role vegetation plays in providing wildlife habitat, protecting soils, supporting agricultural operations, and providing other ecosystem functions. In addition, ground-disturbing activities have the potential for the introduction and spread of noxious weeds.

4.11.1 Direct and Indirect Impacts

4.11.1.1 No Action Alternative

Under the No Action Alternative, the mining plan modification would not be approved. However, mining would continue in the Mine permit area to recover non-Federal coal remaining within the permit area. To date, approximately 1,041.3 acres have been disturbed within the permit area. Under this alternative, approximately 2.9 acres of additional surface disturbance would occur as a result of subsidence repairs (**Table 2.3-1**). Projected disturbances would occur in shrubland, burned ponderosa pine, ponderosa pine forest, and grassland habitats. Removal of vegetation would temporarily eliminate associated livestock forage and wildlife habitat provided by existing vegetative cover. While this surface disturbance may result in the removal of vegetation that could be used as livestock forage and wildlife habitat impacts are anticipated to be short term and minor in nature.

At the conclusion of mining, all Mine facilities would be removed, and all surface disturbances would be reclaimed in accordance with the Mine Permit. Following final grading and soil placement, disturbed areas would be promptly seeded with seed mixes identified in the State-approved Mine Permit. The approved seed mixes are selected to be compatible with surrounding vegetation types and to support the approved post-mine land uses. Reclaimed native plant communities would likely exhibit less overall diversity and possibly less woody plant density (depending on the community) in the short term. In the long term, reclamation requirements and associated bonding would ensure that vegetation communities support the desired post-mining land use at least to the extent capable before mining. Reclamation is estimated to take approximately 16 months after the end of mining (SPE 2017). Subsidence features would be reclaimed as necessary to restore the pre-mining land use, unless they occur on slopes greater than 20 percent. Due to the surface damage that may occur at this slope, these repairs would occur at the direction of the MDEQ (SPE 2017).

Direct and indirect impacts to vegetation could also include the spread of noxious weed species known to occur in the permit area and potential introduction of other invasive plant species. Vehicles and mine equipment could potentially spread noxious weeds along roadways, Mine facilities, and associated construction sites. State regulations (ARM 17.24.716) require SPE to control noxious weeds on all disturbed and reclaimed areas and the noxious weed control plans (SPE 2023a, 2023b) specify controls on non-disturbed portions of the permit area. While implementation of weed control measures reduces the spread of noxious weeds, these species are well-adapted to establish in disturbed areas and could spread to native areas adjacent to disturbances and persist following mining, although they would be prevented from spreading to an extent that would substantially affect land uses.

Accordingly, impacts to vegetation as a result of the No Action Alternative are expected to be minor and short term. However, following reclamation, impacts to vegetation communities would be negligible.

4.11.1.2 Proposed Action

Impacts to vegetation resulting from the Proposed Action would be similar to those described for the No Action Alternative but would occur over a larger area. Under the Proposed Action, 13.4 acres would be disturbed as a result of subsidence repairs and an additional 11.1 acres would be disturbed by surface facilities such as borehole pads, air portals, and roads. While a variety of habitats would be affected, burned ponderosa pine stands would be most affected, with up to 10.8 acres disturbed, followed by grassland with a total of 5.2 acres disturbed. **Table 4.11-1** lists the acreages of surface disturbance for each vegetation type under the Proposed Action.

Table 4.11-1. Surface Disturbance by Vegetation Community Type – Proposed Action

Vegetation Community and Land Types Supporting Vegetation	Acres	Percent of Total
Burned Ponderosa Pine Stands	10.8	44.1
Grassland	5.2	21.2
Shrub Grassland	4.3	17.5
Pine Forest and Pine Savannah	4.2	17.1
Tame Pastureland	0.0	0.0
Cropland	0.0	0.0
Thin Breaks and Rock Outcrop	0.0	0.0
Disturbed Areas	0.0	0.0
Water & Miscellaneous Areas	<0.01	0.0
Total	*24.5*	*100.0*

Source: SPE 2023c

Noxious weeds would continue to be present and could potentially spread in the permit area as a result of the Proposed Action in a manner similar to that described for the No Action Alternative. Noxious weeds would be controlled and prevented from spreading to an extent that would substantially affect native vegetation communities. SPE would adhere to reclamation requirements and vegetation would be restored using reclamation seed mixtures approved by MDEQ, as discussed above.

Impacts to vegetation as a result of the Proposed Action are expected to be minor but long term. However, following reclamation, impacts to vegetation communities would be negligible.

4.11.1.3 Partial Mining Alternative

Under the Partial Mining Alternative, SPE would be limited to mining Federal coal within AM 3 for approximately 5-years; additional mining beyond this term would require an additional mining plan modification to be approved. Under the Partial Mining Alternative, 12.0 acres would be disturbed as a result of subsidence repairs and an additional 11.1 acres would be disturbed by surface facilities such as borehole pads, air portals, and roads (**Table 2.3-1**). The impacts to the vegetation communities in the study area would be similar to those described for the Proposed Action but would occur on fewer acres and for a shorter period of time. **Table 4.11-2** lists the acreages of surface disturbance for each vegetation type under the Proposed Action.

Table 4.11-2. Surface Disturbance by Vegetation Community Type – Partial Mining Alternative

Vegetation Community and Land Types Supporting Vegetation	Acres	Percent of Total
Burned Ponderosa Pine Stands	10.4	45.0
Grassland	4.9	21.2
Shrub Grassland	4.3	18.6
Pine Forest and Pine Savannah	3.6	15.6
Tame Pastureland	0.0	0.0
Cropland	0.0	0.0
Thin Breaks and Rock Outcrop	0.0	0.0
Disturbed Areas	0.0	0.0
Water & Miscellaneous Areas	<0.01	0.0
Total	*23.1*	*100.0*

Source: SPE 2023c

Noxious weeds would continue to be present and could potentially spread in the permit area under the Partial Mining Alternative in a manner similar to that described for the No Action Alternative. Noxious weeds would be controlled and prevented from spreading to an extent that would substantially affect native vegetation communities. SPE would adhere to reclamation requirements and vegetation would be restored using reclamation seed mixtures approved by MDEQ, as discussed above.

Impacts to vegetation as a result of the Partial Mining Alternative are expected to be minor but long term. However, following reclamation, impacts to vegetation communities would be negligible.

4.11.2 Impacts from Past, Present, and Reasonably Foreseeable Future Actions

The analysis area for evaluation of impacts from past, present, and RFFAs on vegetation includes the study area plus the HUC 12 subwatersheds for Rehder Creek, Halfbreed Creek, Parrot Creek, Upper Fattig Creek, Upper Railroad Creek, Upper Pompeys Pillar Creek, Upper Razor Creek, and Middle Razor Creek (see **Figure 3.0-1**).

Related past, present and reasonably foreseeable future actions that would contribute to impacts on vegetation include:

- Past, present and future mining and reclamation at the Mine;
- Past, present and future agricultural activities, primarily livestock grazing;
- Past, present and future wildland fires;
- Past, present and future noxious weed infestations resulting from sources not related to the Mine; and

- Past, present and future exploration activities.

Past and current coal mining and reclamation by SPE and future coal mining by other companies in the region could affect vegetation in ways like those described for the study area. Past and current coal-mining activities have altered the vegetation communities in the region by reducing vegetation cover, reducing vegetation diversity, and changing species composition during mining activities. As such, ongoing and future mining activities would contribute to regional impacts on vegetation.

Agricultural development in the past, present, and RFFA effects study area consists primarily of livestock grazing. Continued agriculture activities would continue to alter vegetation within the study area and may increase noxious and invasive weeds within the past, present, and RFFA effects study area.

Wildland fire affects vegetation through plant mortality, loss of seed sources, and altering of vegetation communities (including community structure and vegetation patterns). Past wildland fires in the past, present, and RFFA effects study area altered or eliminated vegetation composition in the burn areas and likely reduced tree and shrub cover within those areas. Wildland fires can potentially increase introduced or noxious weed species if a seed source for those invasive species is present. Wildland fires can also remove existing invasive species and allow for an increase in native species or new vegetation communities. Fires can also contribute nutrients to the soil for vegetation and kill insect pests that may have adverse impacts on native vegetation. Additionally, fires are part of the natural ecosystem, and many native plant communities are accustomed to periodic fires. As such, periodic wildland fires could contribute both beneficial and adverse impacts on vegetation.

The inherent nature of noxious weeds and other invasive plants contributes to continued expansion throughout Yellowstone and Musselshell Counties, including the permit area. Natural distribution occurs as a result of wind, water, and wildlife. Human activities, particularly activities involving movement of vehicles, machinery and livestock from weed impacted areas to other areas, can also contribute to expansion of noxious weeds. Continued application of herbicide and other measures to control noxious weeds would help limit this expansion, but noxious weeds are difficult to eradicate and are likely to be present to some extent in the vicinity of the Mine and surrounding counties into the foreseeable future. The impacts from past, present, and RFFAs would be minimized through continued implementation of noxious weed control plans, likely preventing substantial adverse impacts to vegetation or associated land uses.

Exploration activities have and would continue to be conducted outside of the permit area. However, new roads are not constructed during these efforts, and surface disturbance is minimized. All disturbances are revegetated in accordance with the requirements of prospecting permits, ensuring long-term impacts are negligible.

Past, present and future mining at the Mine would continue to have an adverse impact on vegetation until reclamation has reestablished vegetative communities. Impacts from past, present, and RFFAs to vegetation resulting from these activities and natural processes are expected to be minor, but long-term.

4.11.3 Mitigation Measures

No additional mitigation measures were determined necessary to avoid unacceptable impacts.

4.11.4 Irreversible and Irretrievable Commitment of Resources

All alternatives would disturb vegetation communities dominated by native species, the effects of which would be subsequently mitigated by revegetation. Surface disturbance would result in an irretrievable resource commitment of vegetation cover and vegetative productivity while disturbed areas are used for Mine-related activities and until the soils and vegetative cover return to pre-mining conditions.

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4.12 Wildlife

4.12.1 Direct and Indirect Impacts

This section discusses the direct, and indirect impacts, as well as impacts from past, present, and RFFAs, on wildlife resulting from the No Action Alternative, Proposed Action, and Partial Mining Alternative. The analysis area is described in **Section 3.12**.

4.12.1.1 No Action Alternative

Under the No Action Alternative, the proposed mining plan modification would not be approved, and the Mine operations would continue into 2026. Approximately 1,041.3 acres have been disturbed within the permit area. Under the No Action Alternative, approximately 2.9 acres of additional surface disturbance would occur as a result of subsidence repairs on non-Federal lands (**Table 2.3-1**). Projected disturbances would occur in shrubland, burned ponderosa pine, ponderosa pine forest, and grassland habitats. Local wildlife populations would continue to be directly affected by ongoing mining activities until 2026 and by subsequent reclamation activities.

Direct impacts would include road kills by Mine-related traffic; restrictions to animal movement due to activity, noise, disturbance, and habitat fragmentation; and displacement due to avoidance of mining activities and associated habitat loss and modification. Species that are less mobile (e.g., amphibians, reptiles, small mammals, nesting birds) could suffer direct mortality due to construction activities (e.g., ground clearing), particularly if such construction would occur during seasons when they are most vulnerable (e.g., nesting season). Coal dust deposited in soil and water contain concentrations of heavy metals potentially harming plants and animals (Trimming 2013).

Minor long-term impacts direct and indirect impacts to wildlife may occur due to changes to vegetation community composition and structure; permanent improvements to roads; or changes to water quality, quantity, and distribution. Wildlife may also experience direct and indirect impacts due to noxious weed infestations and associated changes to habitats.

Indirect impacts to wildlife may occur due to the impacts from subsidence and associated changes to water resources and vegetative communities in association with surface disturbances and reclamation, including those dependent on surface water and the associated vegetation (e.g. waterfowl, shorebirds, and several songbirds) and those that are wider ranging and use the water during their movements throughout a larger home range (e.g. bats, upland game birds, raptors, deer and elk). These impacts are expected to be minor and short term, to the extent reclamation practices successfully reclaim or replace the habitats required for wildlife. Direct impacts may occur from surface cracks due to subsidence that may create a surface hazard to wildlife that traverse these areas. These impacts are expected to be minor.

Species sensitive to human noise and presence could be displaced from adjacent habitats not directly affected by Project activities. Displaced animals could be incorporated into adjacent populations which could, in turn, experience increased inter-and intra-specific competition, increased energy expenditure, increased mortality, decreased reproductive rates, or other compensatory or additive responses depending on variables such as species behavior, density, and habitat quality. Unsuitable habitat resource selection by displaced wildlife could lead to a sink in population.

Railroad operation noise and vibration could cause direct and indirect impacts on wildlife.

Species-specific habitat impacts under the No Action Alternative are presented in **Table 4-12.1.** The No Action Alternative would have no impacts on pronghorn habitat, "general" habitat for mule deer, or wintering habitat for white-tailed deer. The analysis assumes that for underground facilities (mined and unmined areas) half of one percent of the acreage of underground activities would be subject to subsidence repair and would therefore have potential to impact surface habitat.

Table 4.12-1. No Action Alternative Wildlife Habitat Impacts

Impact	Activity Type	Underground	Surface Impacts*
Sharp-tailed Grouse Habitat	Proposed Surface Disturbance		
	Borehole Pad		6.0
	Portal		2.0
	Road		3.1
	Unmined (AM 3)	2,393.6	12.0
Total Acres			**23.1**
Greater Sage-Grouse Executive Order General Habitat	Unmined (AM 6)	60.1	0.3
Total Acres			**0.3**
Elk (General) and Mule Deer (winter) Habitat	Unmined (AM 6)	508.2	2.5
	Unmined (MR 280)	68.6	0.3
Total Acres			**2.8**
White-tailed Deer General Habitat	Unmined (MR 280)	42.9	0.2
Total Acres			**0.2**
Pronghorn Habitat	No Impacts		0.0
Total Acres			**0.0**

* The analysis assumes half of one percent of the acreage of underground activities would be subject to subsidence repair and would therefore have potential to impact surface habitat.

Big Game and Predators

Direct and indirect impacts of the No Action Alternative on big game and predators are expected to include those described above. The study area is outside of priority migration areas for big game species (MFWP 2022); therefore, the No Action Alternative would have no impact on priority migration areas of big game species.

Indirect impacts to vegetation arising from subsidence would not impact the survivorship and productivity of big game and predator species in the study area. Impacts to big game and predators as a result of the operation of existing surface facilities, including the rail spur to Laurel, would not change as a result of the No Action Alternative.

Raptors and other Birds

Direct and indirect impacts of the No Action Alternative on raptors and other birds are expected to include those described above. Many of the raptor and other bird species identified in species list in **Appendix D** nest within the Mine permit area and may be directly affected should new disturbances occur during the nesting season or if mining activities occur in such proximity that breeding or nesting is disrupted. Raptor nests occur in relatively close proximity (within 500 feet) to proposed roads and other facilities and other undiscovered nests are likely present within the Mine permit area, including newly constructed nests.

The limited surface disturbance that would occur under the No Action Alternative would have little impact on small mammal communities, which are prey for raptor species; therefore, impacts on foraging raptors would be negligible and short term.

Sharp-tailed grouse leks occur in the permit area and vicinity, some of which have not been active in recent years. Lekking activities may be disrupted by nearby disturbance and equipment use, particularly at leks nearest to the surface facilities area. While some leks may be avoided or have reduced attendance due to Mine activities, impacts on local grouse populations are expected to be minor and short term. Impacts on other games birds including wild turkey, ring-necked pheasant, gray partridge, and greater sage-grouse are expected to be minor and short term. Impacts to raptors and other bird as a result of the operation of existing surface facilities, including the rail spur to Laurel, would not change as a result of the No Action Alternative.

While greater sage-grouse is considered to have low potential to be present in habitats in the study area and near the rail transportation route, direct and indirect impacts could occur on greater sage-grouse general habitat that is situated within approximately 4,513 acres of the permit area and approximately 17 miles (10,864 acres) of the rail transportation route to Laurel (**Figure 3.12-4**). While some leks may be avoided or have reduced attendance due to Mine or rail activities, impacts on local greater sage-grouse populations are expected to be minor and short term.

Bats

Direct and indirect impacts of the No Action Alternative on bats are expected to include those described above, including injury or mortality due to collision, avoidance of habitat due to noise or Mine activity, and reduction or loss of foraging habitat. Potential impacts from habitat loss on bats would be minor and long term. Impacts to bats as a result of the operation of existing surface facilities, including the rail spur to Laurel, would not change as a result of the No Action Alternative.

Amphibians, Reptiles, and Aquatic Species

Direct and indirect impacts of the No Action Alternative on amphibians, reptiles, and aquatic species are expected to include those described above. Direct impacts may occur from surface cracks due to subsidence that may create a surface hazard to amphibians and reptiles that traverse these areas. These impacts are expected to be minor. Impacts to amphibians, reptiles, and aquatic species as a result of the operation of existing surface facilities, including the rail spur to Laurel, would not change as a result of the No Action Alternative.

In summary, direct impacts on wildlife would be limited to the vicinity of proposed and existing disturbances and surface activity and would be moderate (at most) and short term. Minor impacts on wildlife habitats would persist in the long term after reclamation is complete and utility of the area for wildlife and land uses is restored.

4.12.1.2 Proposed Action

Under the Proposed Action, the mining operation would continue mining through 2033. Impacts to wildlife resulting from the Proposed Action would be similar to those described for the No Action Alternative but would encompass a larger area and timeframe. As with the No Action Alternative, most of the direct impacts of the Proposed Action, including habitat loss, would be limited to the vicinity of proposed and existing disturbances. Under the Proposed Action, 13.4 acres would be disturbed as a result of subsidence repairs and 11.1 acres would be disturbed by facilities including borehole pads, portals, and roads. While a variety of habitats would be affected, burned ponderosa pine stands would be most affected, with up to 10.8 acres (44.1 percent) disturbed, followed by grassland with a total of 5.2 acres disturbed.

Species-specific habitat impacts under the Proposed Action are presented in **Table 4.12-2**.

Table 4.12-2. Proposed Action Wildlife Habitat Impacts

Impact	Activity Type	Underground	Surface Impacts*
Sharp-tailed Grouse Habitat	Proposed Surface Disturbance		
	Borehole Pad		6.0
	Portal		2.0
	Road		3.1
	Unmined (AM 3)	2,435.5	12.0
	Unmined (MR279)	233.7	1.2
Total Acres			**24.3**
Greater Sage-Grouse Executive Order General Habitat	Unmined (AM 3)	14.8	0.1
Total Acres			**0.1**
Elk (General) and Mule Deer (winter) Habitat	Proposed Surface Disturbance		
	Borehole Pad		6.0
	Portal		2.0
	Road		3.1
	Unmined (AM 3)	2,435.5	12.2
	Unmined (MR279)	233.7	1.2
Total Acres			**24.5**
White-tailed Deer General Habitat	Proposed Surface Disturbance		
	Borehole Pad		1.5
	Road		0.3
	Unmined (AM 3)	979.0	4.9
	Unmined (MR279)	136.5	0.7
Total Acres			**7.4**
Pronghorn Habitat	No Impacts		0.0
Total Acres			**0.0**

* The analysis assumes half of one percent of the acreage of underground activities would be subject to subsidence repair and would therefore have potential to impact surface habitat

Big Game and Predators

Direct and indirect impacts under the Proposed Action on big game and predators are expected to include those described above but would encompass a larger area and a longer timeframe. Because the study area is outside of current priority migration areas for big game species (MFWP 2022); the Proposed Action would have no impact on priority migration areas of big game species. Indirect impacts could involve avoidance of the area surrounding the Project area due to increased noise and activity levels. Indirect impacts to vegetation arising from subsidence under the Proposed Action would not impact the survivorship and productivity of big game and predator species in the Project area. The direct and indirect impacts related to the Proposed Action on big game and predators would be moderate and short term.

Raptors and Other Birds

Direct and indirect impacts under the Proposed Action on raptors and other birds are expected to include those described above. New infrastructure and Mine activity may cause increased habitat avoidance. Many of the raptor and other bird species identified in species list in **Appendix D** nest within the Mine permit area and may be directly affected should new disturbances occur during the nesting season or if mining activities occur in such proximity that breeding or nesting is disrupted. Raptor nests occur in relatively close proximity (within 500 feet) to proposed roads and other facilities and other undiscovered nests are likely present within the Mine permit area, including newly constructed nests. The direct and indirect impacts related to the Proposed Action on raptors would be moderate and short term.

Minor impacts on local sharp-tailed grouse populations may also occur in the short term due to construction of new infrastructure and may include habitat avoidance, lower annual survival, and reduced territory establishment. Operations in the vicinity of WDA 2 may cause abandonment or relocation of three sharp-tailed grouse leks, which may affect local sharp-tailed grouse populations in the short term. Such impacts are expected to be minor, as those leks have exhibited low attendance (relative to leks on Dunn Mountain) in recent years of monitoring (see **Section 3.7**). If lek re-establishment occurs, sharp-tailed grouse impacts would be further reduced in the long term. The direct and indirect impacts related to the Proposed Action on sharp-tailed grouse would be moderate and short term.

While greater sage-grouse is considered to have low potential to be present in habitats in the study area and near the rail transportation route, direct and indirect impact could occur on greater sage-grouse general habitat that is situated within approximately 4,513 acres of the permit area and approximately 17 miles (10,864 acres) of the rail transportation route to Laurel (**Figure 3.12-4**). Some leks may be avoided or have reduced attendance due to Mine or rail activities, however, impacts on local greater sage-grouse populations are expected to be minor and short term.

Bats

Direct and indirect impacts under the Proposed Action on bats are expected to include those described above, including injury or mortality due to collision, avoidance of habitat due to noise or Mine activity, and increased reduction or loss of foraging habitat. Potential impacts of habitat loss on bats related to the Proposed Action, including the rail spur to Laurel, would be minor and long term.

Amphibians, Reptiles, and Aquatic Species

Direct and indirect impacts under the Proposed Action on amphibians, reptiles, and aquatic species are expected to include those described above.

Other impacts on wildlife would be comparable to the No Action Alternative but would occur over a larger area for a longer period of time. Direct impacts on wildlife would be limited to the vicinity of proposed and existing disturbances and surface activity and would be moderate (at most) and short term.

4.12.1.3 Partial Mining Alternative

Species-specific habitat impacts under the Partial Mining Alternative are presented in **Table 4.12-3**.

Table 4.12-3. Partial Mining Alternative Wildlife Habitat Impacts

Impact	Activity Type	Underground	Surface Impacts*
Sharp-tailed Grouse Habitat	Proposed Surface Disturbance		
	Borehole Pad		6.0
	Portal		2.0
	Road		3.1
	Unmined (AM 3)	2,393.6	12.0
Total Acres			**23.1**
Greater Sage-Grouse Executive Order General Habitat	Unmined (AM 3)	14.8	0.1
Total Acres			**0.1**
Elk (General) and Mule Deer (winter) Habitat	Proposed Surface Disturbance		
	Borehole Pad		6.0
	Portal		2.0
	Road		3.1
	Unmined (AM 3)	2,393.6	12.0
Total Acres			**23.1**
White-tailed Deer General Habitat	Proposed Surface Disturbance		
	Borehole Pad		1.5
	Road		0.3
	Unmined (AM 3)	937.1	4.7
Total Acres			**6.5**
Pronghorn Habitat	No Impacts		0.0
Total Acres			**0.0**

* The analysis assumes half of one percent of the acreage of underground activities would be subject to subsidence repair and would therefore have potential to impact surface habitat

Under the Partial Mining Alternative, SPE would be authorized to mine Federal coal within AM 3 for approximately 5 years, and mining would continue through 2030 unless SEP obtained a new mining plan modification. Under the 5-year Partial Mining Alternative, 12.0 acres would be disturbed as a result of subsidence repairs and 11.1 acres would be disturbed by facilities such as borehole pads, portals, and roads (**Table 2.3-1)**. The impacts to the habitats in the study area would be similar to those described for the Proposed Action but would occur on fewer acres and for a shorter period of time. The impacts would be the same as those described for the Proposed Action but would occur on fewer acres and for a shorter period of time.

4.12.2 Impacts from Past, Present, and Reasonably Foreseeable Future Actions

Species-specific habitat impacts from past, present, and RFFAs are presented in **Table 4.12-4** through **Table 4.12-9**.

Table 4.12-4. Impacts From Past, Present, and RFFAs on Mule Deer Distribution

Activity Type	Activity Subtype	Underground	Surface Impacts*
Winter Distribution			
Existing Surface Disturbance	Ancillary		375.7
	Borehole Pad		26.9
	Portal		7.2
	Road		24.1
	Subsidence Reclamation		25.1
	WDA		274.8
Authorized For Development Surface Disturbance	Ancillary		11.3
	Borehole Pad		6.0
	Road		22.2
	Soil Stockpiles		46.2
	WDA		211.7
Proposed Surface Disturbance	Borehole Pad		6.0
	Portal		2.0
	Road		3.1
Existing Disturbance	Mined Out (AM 2)	3,533.1	17.7
	Mined Out (AM 3)	1,801.1	9.0
	Mined Out (AM 4)	273.4	1.4
	Mined Out (AM 6)	0.4	0.0
No Action Alternative	Unmined (AM 6)	498.0	2.5
	Unmined (MR 280)	39.8	0.2
Proposed Action	Unmined (AM 3)	2,422.9	12.1
	Unmined (MR 279)	233.4	1.2
Reasonably Foreseeable Mining	New Proposed Coal (AM 5)	1,161.5	5.8
Reasonably Foreseeable Surface Disturbance	Road		7.0
Outside Mine Features	Rail Disturbance		24.1
	Road Disturbance		1,111.9
	Transmission Disturbance		374.9

Activity Type	Activity Subtype	Underground	Surface Impacts*
General Distribution			
Existing Surface Disturbance	Portal		4.9
	Road		1.6
Outside Mine Features	Rail Disturbance		140.1
	Road Disturbance		658.3
	Transmission Disturbance		539.5

* The analysis assumes half of one percent of the acreage of underground activities would be subject to subsidence repair and would therefore have potential to impact surface habitat

Table 4.12-5. Impacts From Past, Present, and RFFAs on White-tailed Deer Distribution

Activity Type	Activity Subtype	Underground	Surface Impacts*
General Distribution			
Existing Surface Disturbance	Ancillary		316.6
	Borehole Pad		14.6
	Portal		0.9
	Road		9.6
	Subsidence Reclamation		0.5
	WDA		145.3
Authorized For Development Surface Disturbance	Ancillary		11.3
	Borehole Pad		2.8
	Road		15.0
	Soil Stockpiles		38.7
	WDA		211.7
Proposed Surface Disturbance	Borehole Pad		1.5
	Road		0.3
Existing Disturbance	Mined Out (AM 2)	661.4	3.3
	Mined Out (AM 3)	144.8	0.7
	Mined Out (AM 4)	225.3	1.1
No Action Alternative	Unmined (MR 280)	19.1	0.1
Proposed Action	Unmined (AM 3)	968.3	4.8
	Unmined (MR 279)	136.1	0.7
Reasonably Foreseeable Mining	New Proposed Coal (AM 5)	864.5	4.3
Reasonably Foreseeable Surface Disturbance	Road		7.0
Outside Mine Features	Rail Disturbance		30.5
	Road Disturbance		890.0
	Transmission Disturbance		327.5
Winter Distribution			
Outside Mine Features	Road Disturbance		113.8
	Transmission Disturbance		31.3

* The analysis assumes half of one percent of the acreage of underground activities would be subject to subsidence repair and would therefore have potential to impact surface habitat

Table 4.12-6. Impacts From Past, Present, and RFFAs on Elk General Distribution

Activity Type	Activity Subtype	Underground	Surface Impacts*
Existing Surface Disturbance	Ancillary		375.7
	Borehole Pad		26.9
	Portal		12.1
	Road		25.7
	Subsidence Reclamation		25.1
	WDA		274.8
Authorized For Development Surface Disturbance	Ancillary		11.3
	Borehole Pad		6.0
	Road		22.2
	Soil Stockpiles		46.2
	WDA		211.7
Proposed Surface Disturbance	Borehole Pad		6.0
	Portal		2.0
	Road		3.1
Existing Disturbance	Mined Out (AM 2)	3,533.1	17.7
	Mined Out (AM 3)	1,801.1	9.0
	Mined Out (AM 4)	273.4	1.4
	Mined Out (AM 6)	0.4	0.0
No Action Alternative	Unmined (AM 6)	498.0	2.5
	Unmined (MR 280)	39.8	0.2
Proposed Action	Unmined (AM 3)	2,422.9	12.1
	Unmined (MR 279)	233.4	1.2
Reasonably Foreseeable Mining	New Proposed Coal (AM 5)	1,161.5	5.8
Reasonably Foreseeable Surface Disturbance	Road		7.0
Outside Mine Features	Rail Disturbance		29.5
	Road Disturbance		1,352.9
	Transmission Disturbance		382.8

* The analysis assumes half of one percent of the acreage of underground activities would be subject to subsidence repair and would therefore have potential to impact surface habitat

Table 4.12-7. Impacts From Past, Present, and RFFAs on Pronghorn General Habitat

Activity Type	Activity Subtype	Surface Impacts
No Action Alternative	None	0.0
Proposed Action	None	0.0
Outside Mine Features	Rail Disturbance	124.9
	Road Disturbance	538.7
	Transmission Disturbance	512.0

Table 4.12-8. Impacts From Past, Present, and RFFAs on Sharp-tailed Grouse

Activity Type	Activity Subtype	Underground	Surface Impacts*
Existing Surface Disturbance	Ancillary		375.7
	Borehole Pad		26.9
	Portal		12.1
	Road		25.7
	Subsidence Reclamation		25.1
	WDA		274.8
Authorized For Development Surface Disturbance	Ancillary		11.3
	Borehole Pad		6.0
	Road		22.2
	Soil Stockpiles		46.2
	WDA		211.7
Proposed Surface Disturbance	Borehole Pad		6.0
	Portal		2.0
	Road		3.1
Existing Disturbance	Mined Out (AM 2)	3,533.1	17.7
	Mined Out (AM 3)	1,801.1	9.0
	Mined Out (AM 4)	273.4	1.4
	Mined Out (AM 6)	0.4	0
No Action Alternative	Unmined (AM 6)	498.0	2.5
	Unmined (MR 280)	39.8	0.2
Proposed Action	Unmined (AM 3)	2,422.9	12.1
	Unmined (MR 279)	233.4	1.2
Reasonably Foreseeable Mining	New Proposed Coal (AM 5)	1,161.5	5.8
Reasonably Foreseeable Surface Disturbance	Road		7.0
Outside Mine Features	Rail Disturbance		164.2
	Road Disturbance		1,770.2
	Transmission Disturbance		914.3

* The analysis assumes half of one percent of the acreage of underground activities would be subject to subsidence repair and would therefore have potential to impact surface habitat

Table 4.12-9. Impacts From Past, Present, and RFFAs on Greater Sage-Grouse Executive Order General Habitat

Activity Type	Activity Subtype	Underground	Surface Impacts*
Existing Surface Disturbance	Borehole Pad		4.7
	Portal		11.1
	Road		8.6
	Subsidence Reclamation		24.6
Authorized For Development Surface Disturbance	Borehole Pad		3.2
	Road		20.6

Activity Type	Activity Subtype	Underground	Surface Impacts*
	Soil Stockpiles		25.8
Existing Disturbance	Mined Out (AM 2)	1,593.7	8.0
	Mined Out (AM 3)	689.1	3.4
	Mined Out (AM 4)	186.1	0.9
No Action Alternative	Unmined (AM 6)	60.0	0.3
Proposed Action	Unmined (AM 3)	14.8	0.1
Outside Mine Features	Rail Disturbance		123.1
	Road Disturbance		796.1
	Transmission Disturbance		556.8

* The analysis assumes half of one percent of the acreage of underground activities would be subject to subsidence repair and would therefore have potential to impact surface habitat

Most peripheral activities and disturbance related to mining (e.g., monitoring activities, noise, and traffic) would primarily occur in the surrounding 1-mile buffer where wildlife monitoring is conducted. Impacts from past, present, and RFFAs in this area would result from implementation of the Proposed Action, future mining, coal exploration, livestock grazing, noxious weed infestations, habitat loss and modification from agriculture, and habitat alteration as a result of wildfires. Small impact areas have occurred during longwall mining additional longwall panels could induce additional surface disturbance areas associated with subsidence additional panels, which would contribute to impacts to wildlife from mining and agriculture in the study area.

Intensive livestock grazing can reduce forage available for wildlife and lead to reduced vegetative cover, increases in vegetation that is less palatable to wildlife, and invasion by noxious weeds. Livestock grazing can reduce habitat quality for small mammals that are prey for raptors and mammalian predators. Predator control activities in the vicinity of the Mine would adversely affect predator populations. Future mining or coal exploration activities and access roads can facilitate wind and water erosion that degrades wildlife habitat.

Drilling associated with coal exploration could further disturb wildlife due to human presence and noise. Drillhole disturbance is typically small and limited to the drillhole and surrounding spread cuttings. Exploration impacts on wildlife are expected to be negligible and short term.

Residential housing occurs in the vicinity of the Mine and further development may occur in the future. Residential developments can lead to habituation of wildlife and food-conditioning of some wildlife species, such as ravens, red fox, and black bear. Residential development leads to habitat alteration, habitat fragmentation, habitat edge effects, and loss of wildlife habitat, and presence of free-ranging pets, which can increase mortality risk for wildlife. Roads and increased traffic levels associated with residential development increase the mortality risk of wildlife due to collisions with vehicles. Also, increased vehicle traffic can interfere with the behavior of migratory birds.

Based on the projected distribution of Mine disturbances and distribution of subdivided tracts, large patches of various habitats would remain in the permit area and vicinity to provide habitat for those species sensitive to or displaced by development. Successful reclamation of mining- disturbed areas would lessen the long-term impacts of loss of habitat. Consequently, the impacts from habitat loss and displacement are expected to be minor, but long term, as residential uses, roads, and agricultural activities (including trail use and maintenance) would continue long after reclamation is complete.

All habitats may be affected by periodic fires, which have historically converted ponderosa pine and shrubland habitats to grassland. Ponderosa pine habitat is slow to reestablish and future fires could affect remaining forested areas in the permit area, thereby affecting species that prefer forested and shrub habitats. Impacts to species affected by habitat loss would be offset by habitat creation as the fires and subsequent plant establishment and regeneration naturally transform the landscape. While future fires could have substantial impacts on the habitats in which they occur, overall, those impacts would likely be comparable to the impacts of recent and historical fires, resulting in minor long-term changes to the landscape and habitat availability as a whole. Forest fires, as opposed to prairie fires, may be beneficial to cavity nesting birds (e.g., mountain bluebird, Lewis's woodpecker) and grassland species such as sharp-tailed grouse.

Noxious weed infestations would likely continue to persist and possibly expand in the Mine vicinity in the long term, affecting the habitats in which they occur and, in turn, displacing wildlife dependent on those habitats. While infestations can have moderate and long-term localized impacts, compliance with laws requiring noxious weed control would prevent such impacts from reaching the level of significance in the landscape as a whole.

Exploration activities have and would continue to be conducted outside of the permit area. However, new roads are not constructed during these efforts, and surface disturbance would be minimized. All disturbances to habitat would be revegetated in accordance with the requirements of prospecting permits, ensuring long-term impacts are negligible.

While Mine impacts on habitats would be minor in the long term, habitats could be adversely impacted to a moderate extent through the combined impacts of fragmentation, fires, and noxious weed infestation. The impacts from past, present, and RFFAs on wildlife would be moderate and long-term in nature.

4.12.3 Mitigation Measures

No additional mitigation measures were determined necessary to avoid unacceptable impacts.

4.12.4 Irreversible and Irretrievable Commitment of Resources

For all alternatives, surface disturbance would result in an irretrievable resource commitment of vegetation cover and wildlife habitat while disturbed areas are used for Mine-related activities and until the soils, vegetative cover, and wildlife habitat return to pre-mining conditions.

4.13 Threatened, Endangered, and Special Status Species

The USFWS Information for Planning and Consultation (IPaC) query results (USFWS 2025) for the study area indicated the potential for Project activities to affect two species in the study area: Rufa red knot and monarch butterfly. Previous consultation with the United States Fish and Wildlife Service (USFWS) determined that there are no Threatened or Endangered species, Proposed species, or Critical Habitat within the study area (USFWS 2023); subsequent to that consultation, monarch butterfly was proposed for listing as a threatened species and Suckley's cuckoo bumble bee was proposed for listing as an endangered species. There is no proposed or designated critical habitat for ESA-listed species situated within the study area (USFWS 2025).

In the event that any listed threatened or endangered species are found in the permit area, State regulations (ARM 17.24.751) require SPE to promptly report the discovery to MDEQ and the USFWS to ensure mining operations do not adversely affect the species.

4.13.1 Direct and Indirect Impacts

Special status species present in the permit area including BLM-sensitive species and Montana Species of Concern (SOC), would be directly and indirectly affected by the Proposed Action in a manner similar to other wildlife, as discussed in **Section 4.12**.

Mining activities would directly affect vegetation through surface disturbance. Projected disturbances would occur in shrubland, burned ponderosa pine, ponderosa pine forest, and grassland habitats. Removal of vegetation would temporarily eliminate associated wildlife habitat provided by existing vegetative cover (OSMRE 2018). Facilities would be removed when they are no longer needed and disturbances reclaimed and revegetated with seed mixes identified in the State-approved Mine Permit. While reclaimed native plant communities would likely exhibit less overall diversity and potentially less woody plant density (depending on the community) in the short term, in the long term, reclamation requirements and associated bonding would ensure that vegetation communities support the desired post-mining land use. Direct and indirect impacts to vegetation could include the spread of noxious weed species known to occur in the permit area and potential introduction of other invasive plant species via vehicles and mine equipment.

Subsidence would be limited to small areas of cracking, sloughing of some steep slopes and rock toppling that could create a surface hazard to wildlife that traverse these areas (BLM 2011) and may affect surface drainage patterns and result in local changes to surface and groundwater flow and to the distribution of vegetation communities. This may affect the distribution of resources available to wildlife.

Coal dust deposited in soil and water contain concentrations of heavy metals potentially harming plants and animals (Trimming 2013).

Such impacts would be moderate (at most) and primarily short term, although some minor impacts to habitats would persist in the long term.

4.13.1.1 No Action Alternative

ESA Listed Wildlife Species

Under the No Action Alternative, the proposed mining plan modification would not be approved, and the Mine operations would continue into 2026. Approximately 1,041.3 acres have been disturbed within the permit area. Under the No Action Alternative, approximately 2.9 acres of additional surface disturbance would occur as a result of subsidence repairs on non-Federal lands (**Table 2.3-1**). Projected disturbances would occur in shrubland, burned ponderosa pine, ponderosa pine forest, and grassland habitats. Local wildlife populations would continue to be directly affected by ongoing mining activities until 2026 and by subsequent reclamation activities. Projected disturbances would occur in shrubland, burned ponderosa pine, ponderosa pine forest, and grassland habitats.

Federally threatened or endangered species have very limited potential to occur in the study area and low potential to be affected by currently ongoing mining activities. Specific ESA listed species known from the region are discussed below.

Rufa Red Knot

There is potential for the rufa red knot to occur within the study area or vicinity during migration. Mining and/or rail transport may displace the red knot in search of other suitable habitat (i.e., resource selection). Migrating rufa red knot individuals may be affected by visual, operation lights, or noise disturbance from human activity in the study area and along the BNSF railroad spur and mainline into Laurel. The rufa red knot may be disturbed by anthropogenic activities from approximately 1,000 m (3,281 feet) distance (NDGF 2015). Mining activities could increase the risk of injury or death (e.g., collisions with construction equipment or vehicles); however, red knots not likely to loiter within the railway and Mine area and are more likely to avoid these areas entirely due to anthropogenic activities. In 2021, OSMRE also analyzed the impacts of rail transport of coal on the federally threatened red knot. OSMRE made determinations of no effect for rufa red knot. The USFWS concurred with OSMRE on December 13, 2021, and stated "the Service acknowledges OSMRE’s no effect determinations for red knot." The impacts to rufa red knot as a result of the operation of existing surface facilities, including the rail spur to Laurel, would not change as a result of the No Action Alternative.

Monarch Butterfly

Direct impacts on individual breeding, foraging, or migrating monarch butterfly individuals could occur as a result of new construction activities or vegetation clearing activities that could cause individuals to be struck or crushed during construction work, leading to injury or mortality. Depending on the time of year when construction is performed, all life stages of monarch butterfly (i.e., breeding adults, eggs, larvae, and pupae) could be affected. Fire could directly and indirectly affect monarch butterfly through direct mortality or destruction of suitable foraging and/or breeding habitat. Potential indirect impacts on potentially suitable foraging and/or breeding habitat for monarch butterfly adjacent to the Project work area may include the introduction of invasive plant species, erosion, sedimentation, chemical spills during construction, and dust and pollutants associated with vehicles and machinery. The monarch butterfly is extremely wide-ranging within the continental U.S., it has potential to occur in the study area and to breed in suitable habitat containing milkweed within the study area. Three species of milkweed are expected to occur in the mine vicinity (MTNHP & MFWP 2025). Catena (2023) has documented incidental observations of all three milkweed species in the vicinity of the Mine permit area. While these milkweed species may occur in grasslands, they have primarily been associated with drainages, floodplains and other riparian areas in the study area. Potential impacts on monarch butterfly will be minimized by compliance with the operations plan and the Bull Mountains Mine No. 1 Fish and Wildlife Plan which includes avoidance of riparian areas and seasonal avoidance of vegetation removal (April through July). Direct and indirect impacts on monarch butterfly under the No Action Alternative would be minor and short term.

Suckley's Cuckoo Bumble Bee

Direct impacts on Suckley's cuckoo bumble bee could occur as a result of new construction activities or vegetation clearing activities that could cause individuals to be struck or crushed during construction work, leading to injury or mortality. Fire could directly and indirectly affect Suckley's cuckoo bumble bee through direct mortality or destruction of suitable foraging and/or breeding habitat. Potential indirect impacts on potentially suitable foraging and/or breeding habitat for Suckley's cuckoo bumble bee adjacent to the Project work area may include the introduction of invasive plant species, erosion, sedimentation, chemical spills during construction, and dust and pollutants associated with vehicles and machinery. Potential impacts on Suckley's cuckoo bumble bee will be minimized by compliance with the operations plan and the Bull Mountains Mine No. 1 Fish and Wildlife Plan which includes avoidance of riparian areas and seasonal avoidance of vegetation removal (April through July).

Black-Footed Ferret

Black-footed ferret is not expected to occur within the study area; therefore, there would be no direct or indirect impacts on black-footed ferret under the No Action Alternative.

Northern Long-eared Bat

No ESA-listed bats have positively been documented in the study area. A recent re-analysis of bat acoustic data (ESI 2024) by Montana northern long-eared bat experts at Montana Fish, Wildlife and Parks (FWP) and at the Montana Natural Heritage Program (MTNHP) indicates that northern long-eared bat is unlikely to occupy the local Bull Mountains area. USFWS agrees with the conclusions reached independently by FWP and MTNHP; specifically, that: 1) the acoustic data provided do not reasonably support the ESI report's conclusion of northern long-eared bat presence; and 2) the northern long-eared bat is unlikely to occupy the local Bull Mountains area (USFWS 2025). The most recent USFWS range map for northern long-eared bat indicates that the westernmost edge of the range is in eastern Montana. There would be no direct or indirect impacts on listed bat species under the No Action Alternative, because of lack of species occurrence.

Whooping Crane

There is low potential for the whooping crane to occur within the study area or vicinity during migration. Disturbance to whooping crane would be similar to those for red knot. In 2021, OSMRE also analyzed the impacts of rail transport of coal on the federally threatened red knot (*Calidris canutusrufa*) and the federally endangered whooping crane. OSMRE made determinations of no effect for rufa red knot and whooping crane. The USFWS concurred with OSMRE on December 13, 2021, and stated "the Service acknowledges OSMRE's no effect determinations for red knot and whooping crane." Impacts to whooping crane as a result of the operation of existing surface facilities, including the rail spur to Laurel, would not change as a result of the No Action Alternative.

Grizzly Bear

There is potential for the grizzly bear to occur within the Mine area or vicinity. On November 9, 2021, the USFWS reviewed the OSMRE November 9, 2021, cover letter and OSMRE's internal memorandum (i.e., biological assessment) dated November 5, 2021, regarding the impacts of rail transport of coal on species listed under the Endangered Species Act of 1973. Specifically, OSMRE analyzed the impacts of the Proposed Action on the grizzly bear. OSMRE made a determination of *may affect, not likely to adversely affect* for the grizzly bear. On December 13, 2021, OSMRE received a letter of concurrence from the USFWS stating that this species is not likely to be adversely affected (USFWS 2021). The study area is outside of the areas where grizzly bear "may be present" as identified by the USFWS Grizzly Bear Recovery Program (2020); outside of USFWS-identified grizzly bear Recovery Zones (MFWP 2024); and the MFWP online Grizzly Bear Mortality Dashboard that provides up-to-date information (updated daily) on known state-wide grizzly bear mortalities and contributing factors displayed no mortality events in the study area as of February 2025. Impacts to grizzly bear as a result of the operation of existing surface facilities, including the rail spur to Laurel, would not change from the 2021 letter of concurrence determination as a result of the No Action Alternative.

Special-Status Species

This section discusses special status wildlife species that are not federally listed under the ESA. This includes BLM sensitive and Montana Species of Concern. Federally listed species are described in the preceding section.

Eagles

Mining under the Proposed Action would move progressively farther from the nearest probable golden eagle nest on Dunn Mountain, reducing potential impacts to that nest over time. Proposed activities would not further encroach on the other golden eagle nest located 1.6 miles northwest of the surface facilities area. On April 4, 2018, SPE proposed a revision to the Mine Permit (MR 252) noting the new eagle nest within the Mine permit area and incorporating reference to mitigation measures identified by USFWS (2018) to minimize potential eagle impacts. No bald eagle nests have been observed in the study area. Impacts to eagles as a result of the operation of existing surface facilities, including the rail spur to Laurel, would not change as a result of the No Action Alternative.

Other Special Status Species

Special status species present in the study area (**Table 3.13-1**), including BLM-sensitive species and Montana Species of Concern (SOC), would be directly and indirectly affected by the Proposed Action in a manner similar to other wildlife, as discussed in **Section 3.12**. Such impacts would be moderate (at most) and primarily short term, although some minor impacts to habitats would persist in the long term.

4.13.1.2 Proposed Action

Under the Proposed Action, impacts to wildlife resulting from the Proposed Action would be similar to those described for the No Action Alternative but would encompass a larger area and timeframe. As with the No Action Alternative, most of the direct impacts of the Proposed Action, including habitat loss, would be limited to the vicinity of proposed and existing disturbances. Under the Proposed Action, 13.4 acres would be disturbed as a result of subsidence repairs and 11.1 acres would be disturbed by facilities including borehole pads, portals, and roads. While a variety of habitats would be affected, burned ponderosa pine stands would be most affected, with up to 10.8 acres disturbed, followed by grassland (5.2 acres disturbed), shrub grassland (4.3 acres disturbed), and pine forest and pine savannah (4.2 acres disturbed) (**Table 4.11-1**).

ESA Listed Wildlife Species

Rufa Red Knot

Direct and indirect impacts under the Proposed Action on rufa red knot is expected to include those described above under the No Action Alternative but would encompass a larger area and longer timeframe. New infrastructure and Mine activity may cause increased habitat avoidance. Impacts on red knot under the Proposed Action would be minor and short term.

Monarch Butterfly

Direct and indirect impacts under the Proposed Action on monarch butterfly are expected to include those described above under the No Action Alternative but would encompass a larger area and longer timeframe. New infrastructure and Mine activity may cause increased loss of habitat that supports the monarch butterfly’s larval host plant (milkweed). Impacts on monarch butterfly under the Proposed Action would be minor and short term.

Suckley's Cuckoo Bumble Bee

Direct and indirect impacts under the Proposed Action on Suckley’s cuckoo bumble bee are expected to include those described above under the No Action Alternative but would encompass a larger area and longer timeframe. New infrastructure and Mine activity may cause increased loss of potentially suitable foraging and/or breeding habitat. Impacts on Suckley’s cuckoo bumble bee under the Proposed Action would be minor and short term.

Black-Footed Ferret

Black-footed ferret is not expected to occur within the study area; therefore, there would be no direct or indirect impacts on black-footed ferret under the Proposed Action.

Northern Long-eared Bat

No ESA-listed bat species, including northern long-eared bat, are expected to occur within the study area; therefore, there would be no direct or indirect impacts on ESA-listed bat species under the Proposed Action.

Whooping Crane

Direct and indirect impacts under the Proposed Action on whooping crane is expected to include those described above under the No Action Alternative but would encompass a larger area and longer timeframe. New infrastructure and Mine activity may cause increased habitat avoidance. Impacts on whooping crane under the Proposed Action would be negligible and short term.

Grizzly Bear

Direct and indirect impacts under the Proposed Action on grizzly bear is expected to be similar to those described above under the No Action Alternative but would encompass a larger area and longer timeframe. New infrastructure and Mine activity may cause increased habitat avoidance. Impacts on grizzly bear under the Proposed Action would be minor and short term.

Special-Status Species

Eagles

Direct and indirect impacts on eagles and eagle nests that may occur under the Proposed Action include those described above but would encompass a larger area and longer timeframe, including avoidance of habitat due to noise or Mine activity, and increased reduction or loss of foraging habitat. Potential impacts of habitat loss on eagles related to the Proposed Action, including the rail spur to Laurel would be minor with incorporation of mitigation measures and long term.

Other Special Status Species

Direct and indirect impacts on special status species under the Proposed Action may include those described above but would encompass a larger area and longer timeframe, including avoidance of habitat due to noise or Mine activity, and increased reduction or loss of foraging habitat. The potential impacts of the Proposed Action would be minor and short term.

4.13.1.3 Partial Mining Alternative

Under the Partial Mining Alternative, SPE would be limited mining Federal coal within AM 3 for approximately 5-years—through 2030; any mining beyond that date would require an additional approved mining plan modification. Under the Partial Mining Alternative, 12.0 acres would be disturbed as a result of subsidence repairs and 11.1 acres would be disturbed by facilities such as borehole pads, portals, and roads (**Table 2.3-1**). The impacts to the habitats in the study area would be similar to those described for the Proposed Action but would occur on fewer acres and for a shorter period of time (**Table 4.11-2**). The impacts would be the same as those described for the Proposed Action but would occur on fewer acres and for a shorter period of time.

4.13.2 Impacts from Past, Present, and Reasonably Foreseeable Future Actions

The analysis area for evaluation of impacts from past, present, and RFFAs on special-status wildlife species includes the study area and the HUC 12 subwatersheds for Rehder Creek, Halfbreed Creek, Parrot Creek, Upper Fattig Creek, Upper Railroad Creek, Upper Pompeys Pillar Creek, Upper Razor Creek, and Middle Razor Creek (see **Figure 3.0-1**).

Impacts from past, present, and RFFAs on special-status wildlife species include:

- Past, present and future mining and reclamation at the Mine, including surface disturbances and impacts from subsidence;
- Past, present and future agricultural activities, primarily livestock grazing;
- Past, present and future noxious weed infestations;
- Past, present and future exploration activities; and
- Past, present and future wildland fires.

Under the No Action Alternative, the proposed mining plan modification would not be approved, and the Mine operations would continue into 2026. Approximately 1,041.3 acres have been disturbed within the permit area and under the No Action Alternative; approximately 2.9 acres of additional surface disturbance would occur as a result of subsidence repairs and are projected to occur in shrubland, burned ponderosa pine, ponderosa pine forest, and grassland habitats. Federally threatened and endangered species have very limited potential to occur in the study area; monarch butterfly is expected to occur in the study area; all special-status species have low potential to be affected by currently ongoing mining activities. The incremental contribution of the continued mine operation to impacts on special-status species under the No Action Alternative is expected to be minor.

Under the Proposed Action, the mining operation would continue mining through 2033. Impacts to wildlife resulting from the Proposed Action would be similar to those described for the No Action Alternative but would encompass a larger area and timeframe; most of the direct impacts of the Proposed Action, including habitat loss, would be limited to the vicinity of proposed and existing disturbances. Under the Proposed Action, disturbance to 13.4 acres would occur from subsidence repairs and disturbance to 11.1 acres would occur from facilities including borehole pads, portals, and roads. While a variety of habitats would be affected, burned ponderosa pine stands would be most affected, with up to 10.9 acres disturbed, followed by grassland with a total of 5.3 acres disturbed. Because federally proposed, threatened, and endangered species and other special-status species have low potential to be affected by currently ongoing mining activities, the incremental contribution of the continued mine operation to impacts on special-status species under the No Action Alternative is expected to be minimal.

Under the Partial Mining Alternative, SPE would be limited to an approximately 5-year term to mine Federal coal within the permit area, and mining would continue through 2030; 12.0 acres would be disturbed as a result of subsidence repairs and 11.1 acres would be disturbed by facilities including borehole pads, portals, and roads. The impacts to the habitats in the study area would be similar to those described for the Proposed Action. Because federally proposed, threatened, and endangered species and other special-status species have low potential to be affected by currently ongoing mining activities, the incremental contribution of the continued mine operation under the Partial Mining Alternative is expected to be minimal.

Overall, anticipated impacts of underground mining on special-status species would be minor, and there are no categories of impacts that are likely to accumulate to a moderate or severe level. The resources are expected to recover after the mining operations are complete.

Impacts from past, present, and RFFAs on from vehicle transportation and electrical transmission associated with the No Action Alternative and Proposed Action would be the same as described in the 2018 OSMRE EA. Because of the uncertain nature of the number and location of accidents (including train derailments and spills) that may occur along the rail transport route, impacts associated with the No Action Alternative and Proposed Action, in combination with other impacts from past, present, and RFFAs, cannot be determined (OSMRE 2020).

4.13.3 Mitigation Measures

No additional mitigation measures were determined necessary to avoid unacceptable impacts.

4.13.4 Irreversible and Irretrievable Commitment of Resources

For all alternatives, surface disturbance would result in an irretrievable resource commitment of vegetation cover and wildlife habitat while disturbed areas are used for Mine-related activities and until the soils, vegetative cover, and wildlife habitat return to pre-mining conditions.

4.14 Cultural Resources

Cultural resources may be affected by surface disturbing activities during facility construction, subsidence repair, or other equipment operations. Cultural resources on steep slopes and in areas of cliffs and rock outcrops may be affected by subsidence movement resulting from underground mining. Potential indirect impacts can occur through the introduction of visual, auditory, or atmospheric (dust) elements that diminish the integrity of historic properties. Increased access to remote areas through road development can also result in potential indirect impacts because of the associated increase in human activity could lead to a greater potential for illegal artifact collection, vandalism, and trampling. All impacts to cultural resources are permanent as, once disturbed, a cultural resource or sacred site cannot be restored to its original context. Before conducting mining related activities in areas to be affected, all areas to be undermined or potentially affected by surface disturbing activities undergo the National Historic Preservation Act (NHPA) Section 106 process, which requires consultation with the State Historic Preservation Office (SHPO), Federally-recognized Tribes, and other appropriate consulting parties about potential impacts to sites potentially eligible listing on the National Register of Historic Places (NRHP).

4.14.1 Direct and Indirect Impacts

4.14.1.1 No Action Alternative

Under the No Action Alternative, the proposed mining plan modification would not be approved, and approximately 1,239.6 acres of Federal coal lands and approximately 1,840.7 acres of non-Federal coal lands would not be mined. SPE would continue to mine for 1 year to recover saleable non-Federal coal remaining within the permit area that is economically recoverable without accessing Federal coal. Approximately 576.8 acres of subsidence on non-Federal land (**Table 2.3-1**) is anticipated from these mining activities. Additionally, approximately 2.9 acres of surface disturbance is anticipated from subsidence repairs on non-Federal lands under the No Action Alternative.

Both the 576.8 acres of subsidence area and 2.9 acres of surface disturbance under the No Action Alternative has the potential to affect 9 known cultural resources, one of which, site 24YL2144, has previously been recommended as eligible for the NRHP. The other 8 sites have either been determined ineligible or are recommended as not eligible for the NRHP and all 9 of these sites are on private property. A Data Recovery Plan has been prepared and approved by MDEQ and Montana State Historic Preservation Office for site 24YL2144 to address the potential impacts to the site due to the possibility of subsidence (MDEQ 2024). MDEQ has agreed to allow alternative mitigation for site 24YL2144 in the form of an ethnographic or land use study in place of data recovery. Should SPE decide to pursue this avenue of mitigation, the plan would need to be in place and approved for this undertaking before mining under 24YL2144 (MDEQ 2024). Sites that are recommended or determined eligible for listing in the NRHP must be avoided by surface-disturbing activities. Sites that are recommended eligible for the NRHP or have unresolved or undetermined NRHP eligibility are treated as NRHP eligible sites and must be avoided by surface-disturbing activities until such time as additional investigation and evaluation can be performed upon these sites and NRHP eligibility can be determined by MDEQ and SHPO.

There is also potential for the discovery of unknown cultural resources during construction activities within the disturbance areas. Unanticipated discoveries during Mine construction and operations can cause displacement or destruction of the cultural resource resulting in major, permanent, and localized impacts to unknown cultural resources not identified through previous inventories. Damaging unknown cultural resources would compromise their integrity for evaluation as historic properties and result in the loss of information that may have otherwise been available for future recovery.

An increased human presence due to proposed construction and operation activities could result in a greater chance for illegal artifact collection, vandalism, and trampling. Visual or auditory intrusions could also be introduced from proposed construction and operation activities that could diminish the integrity of a historic property's significant features, including setting and feeling. These indirect impacts could result in major, permanent, and localized impacts to known and unknown cultural resources.

If any potentially NRHP eligible cultural resources could be affected by the No Action Alternative, SHPO would be consulted regarding those effects under the NHPA Section 106 process and under MSUMRA. If adverse effects to historic properties would occur, all parties would seek options to avoid, minimize, or mitigate those effects. Isolated finds and other sites determined not eligible for listing on the NRHP do not require further investigation or avoidance. Direct and indirect impacts on cultural resources from the No Action Alternative are anticipated to be negligible, permanent, and localized.

4.14.1.2 Proposed Action

Impacts on cultural resources under the Proposed Action would be the same as those described for the No Action Alternative, except that under the Proposed Action there would be a net increase of approximately 2,092.4 acres of subsidence area, and 21.6 acres of surface disturbance compared to the No Action Alternative. The Proposed Action would result in an approximate total of 24.5 acres of surface disturbance from mining, surface facilities, portals, borehole pads, roads, and soil stockpiles. Approximately 13.4 acres of surface disturbance is anticipated from subsidence repairs. Both the 2,669.2 acres of subsidence area and 24.5 acres of surface disturbance under the Proposed Action have the potential to affect 22 known cultural resources, one of which is recommended eligible for the NRHP (site 24YL2144) and five of which are unevaluated for NRHP eligibility (Petersen and Ferguson 2024, GCM 2017). However, OSMRE, with SHPO concurrence, determined that the undertaking would not adversely effect these sites (Montana Historical Society 2024). The remaining 16 sites are either ineligible or recommended not eligible for the NRHP (Petersen and Ferguson 2024, GCM 2017).

A Data Recovery Plan has been prepared and approved by MDEQ and Montana State Historic Preservation Office for site 24YL2144 to address the potential impacts to the site due to the possibility of subsidence (MDEQ 2024). Though site 24YL2144 lies within the boundary of AM 3, it is within the mining area for AM 6, which is not a part of this Proposed Action. As discussed under the No Action Alternative, MDEQ has agreed to allow alternative mitigation for site 24YL2144 in the form of an ethnographic or land use study in place of data recovery. Should SPE decide to pursue this avenue of mitigation, the plan would need to be in place and approved for this undertaking prior to mining under 24YL2144 (MDEQ 2024). Sites that are recommended or determined eligible for listing in the NRHP must be avoided by surface-disturbing activities. Sites that are recommended eligible for the NRHP or have unresolved or undetermined NRHP eligibility are treated as NRHP eligible sites and must be avoided by surface-disturbing activities until such time as additional investigation and evaluation can be performed upon these sites and NRHP eligibility can be determined by SHPO. Per Section 106 of the NHPA, if avoidance of surface-disturbing activities is not possible, additional consultation with OSMRE and SHPO would be required.

Overall, impacts on cultural resources from the Proposed Action would be similar to those described under the No Action Alternative—negligible, permanent, and localized, but with a greater potential for impacts due to the increased amount of surface disturbance and subsidence areas proposed under the Proposed Action. However, if any potentially NRHP eligible cultural resources could be affected, NHPA Section 106 consultation would be required to avoid, minimize, or mitigate those effects.

4.14.1.3 Partial Mining Alternative

Impacts on cultural resources under the Partial Mining Alternative would be the same as those described for the No Action Alternative, except that under the Partial Mining Alternative there would be a net increase of approximately 1,816.8 acres of subsidence area and 20.2 acres of surface disturbance compared to the No Action Alternative. The Partial Mining Alternative would result in an approximate total of 11.1 acres of surface disturbance from mining, surface facilities, portals, borehole pads, roads, and soil stockpiles. Approximately 12.0 acres of surface disturbance is anticipated from subsidence repairs. Both the 2,393.6 acres of subsidence area and 23.1 acres of surface disturbance under the Partial Mining Alternative has the potential to affect 18 known cultural resources, one of which is recommended eligible for the NRHP (site 24YL2144) and four of which are unevaluated for NRHP eligibility (Petersen and Ferguson 2024). However, OSMRE, with SHPO concurrence, determined that the undertaking would not adversely effect these sites (Montana Historical Society 2024). The 13 remaining sites are either ineligible or recommended not eligible for the NRHP (Petersen and Ferguson 2024, GCM 2017).

Though site 24YL2144 lies within the boundary of AM 3, it is within the mining area for AM 6, which is not a part of this Partial Mining Alternative. As discussed under the No Action Alternative, a Data Recovery Plan has been prepared and approved by MDEQ and Montana State Historic Preservation Office for site 24YL2144 to address the potential impacts to the site due to the possibility of subsidence (MDEQ 2024). MDEQ has agreed to allow alternative mitigation for site 24YL2144 in the form of an ethnographic or land use study in place of data recovery. Should SPE decide to pursue this avenue of mitigation, the plan would need to be in place and approved for this undertaking prior to mining under 24YL2144 (MDEQ 2024). Sites that are recommended or determined eligible for listing in the NRHP must be avoided by surface-disturbing activities. Sites that are recommended eligible for the NRHP or have unresolved or undetermined NRHP eligibility are treated as NRHP eligible sites and must be avoided by surface-disturbing activities until such time as additional investigation and evaluation can be performed upon these sites and NRHP eligibility can be determined by SHPO. Per Section 106 of the NHPA, if avoidance of surface-disturbing activities is not possible, additional consultation with OSMRE and SHPO would be required.

Overall, impacts on cultural resources from the Partial Mining Alternative would be similar to those described under the No Action Alternative—negligible, permanent, and localized, but with a greater potential for impacts compared to the No Action Alternative and a lower potential compared to the Proposed Action due to the amount of surface disturbance and subsidence areas proposed under the Partial Mining Alternative. However, if any potentially NRHP eligible cultural resources could be affected, NHPA Section 106 consultation would be required to avoid, minimize, or mitigate those effects.

4.14.2 Impacts from Past, Present, and Reasonably Foreseeable Future Actions

Past, present, and RFFAs with the potential to cause adverse effects to cultural resources in the past, present, and RFFA effects study area include land-use authorizations (i.e., leases, permits, and ROW authorizations) and actions that could result in surface disturbance including mining, recreations uses, and transportation or trail improvements. These activities would also increase the amount of human presence in the region, thereby increasing the likelihood of illegal artifact collection, vandalism, displacement, and trampling. Surveys ensure cultural resources are identified and Federal law ensures that sites eligible (or unevaluated and potentially eligible) for listing on the NRHP are avoided or impacts are otherwise mitigated. Isolated finds and other sites not eligible for listing on the NRHP could be adversely affected by the undertaking and RFFAs. As a result, impacts from past, present, and RFFAs on cultural resources are anticipated to be negligible, permanent, and localized.

4.14.3 Mitigation Measures

No additional mitigation measures were determined necessary to avoid unacceptable impacts to cultural resources. If cultural resources are discovered during construction or operation, NHPA Section 106 consultation would be required to evaluate the resource to determine NRHP eligibility and, if it is determined the site is eligible for the NRHP, additional consultation would be required to avoid, minimize, or mitigate those effects.

4.14.4 Irreversible and Irretrievable Commitment of Resources

For all alternatives, there would be no foreseeable or predicted irreversible or irretrievable resource commitments.

4.15 Noise and Vibration

The noise and vibration impact analysis focuses on potential impacts on sensitive receptors in the study area and within a 1-mile radius of the permit area. The primary issues related to noise and vibration are the potential for Project-related activities to exceed local noise criteria at nearby sensitive receptors, the potential for increased rail traffic to exceed STB standards, and potential for increased vibration events from rail and mining. The analysis of rail transportation evaluates levels on volume increase segments where gross ton miles are forecast to increase by 100 percent or more compared to the No Action Alternative.

4.15.1 Direct and Indirect Impacts

4.15.1.1 No Action Alternative

Mine Vicinity

Recovery of saleable coal under the No Action Alternative would occur at an anticipated average rate of 10 Mpty over a 1-year period. However, mining operations under the No Action Alternative are not expected to increase noise levels compared to existing mining operations.

Use of the ventilation fan at the East Mains would remain the same as existing conditions and would be operated for an approximately 1-year period. As described in **Section 3.15.4**, the ventilation fan produces a noise level of 75 dBA at 150 feet. Given that the nearest residences are over one mile away from the fan location, the fan is unlikely to be audible above background ambient levels.

Outside the surface facilities area, noise would continue to be generated along roads, at borehole pads, air portals and in the vicinity of subsidence repairs. The level and extent of noise generation would be comparable to the existing conditions and would occur at new locations as mining progresses to the east. Activity to the north would potentially result in noise from heavy equipment near residences along Fattig Creek Road, but any use of heavy equipment in these areas would be intermittent and short term.

Reclamation involves the use of heavy equipment on an intermittent basis and is ongoing during Mine operation. Once mining is complete after approximately 1-year, the surface facility, transport areas, and remaining areas of disturbance would be reclaimed, which is estimated to take up to 16 months (SPE 2017). Reclamation of lands used for rail transport and surface facilities could occur within 1,000 feet of residences near areas of surface disturbance along the western Mine permit area. The use of heavy equipment could be up to 60 dBA 1-hour Leq in this situation, but this would only occur intermittently during the reclamation of these areas.

Noise and vibration impacts would be considered minor and short term, as the duration of mining would be extended by 1-year. Noise produced by heavy equipment would diminish after mining concludes and would cease after reclamation is complete.

Rail Transportation Corridor

Under this alternative, the average train volume of 1.8 trains per day (loaded and unloaded) is not expected to increase relative to existing conditions. The volume of trains under the No Action Alternative represents a negligible increase in train noise on the United States segments on the broader rail network, which would include a volume of freight trains in the range of 14.5 to 70 trains per day (see **Section 3.1.4**). Rail noise on these segments would increase by less than 1 dBA under the No Action Alternative. Because the noise due to increased train volume would increase by less than the STB increase threshold of 3 dBA, impacts from the No Action Alternative would be considered minor.

Based on the lack of noise-related impacts associated with the No Action Alternative, no corresponding change or impacts relative to FTA human annoyance vibration criteria guidelines would be expected. While vibration from train activity would occur as a result of the No Action Alternative and be most pronounced in close proximity to the rail line, using FTA (2018) evaluation criteria, vibration impacts would not increase substantially between Laurel and Westshore Terminal as the average volume of trains is not expected to increase compared to existing conditions. As such vibration impacts due to increased rail use would be considered minor.

Overall, noise and vibration impacts from rail would be considered minor and short term, as the duration of mining would be extended by 1-year.

4.15.1.2 Proposed Action

Mine Vicinity

Surface activities associated with the Proposed Action would continue to generate noise for approximately 9 years in a manner comparable to the No Action Alternative, but the location of noise generating activities and facilities would expand further into AM 3. Additional noise generating activities in the surface facilities area would include construction and operation of the proposed WDA 2, which is expected to have noise levels comparable to WDA 1. Outside the surface facilities area, noise would be generated along existing and new roads, at borehole pads, and in the vicinity of subsidence repairs. The level of noise generation would be comparable to that generated from existing activities and facilities but would occur for a longer duration and at new locations as mining progresses to the northeast. Noise from heavy equipment used within AM 3 could potentially be perceptible on an intermittent basis at residences along Fattig Creek road.

The ventilation fan may be moved from its current location in the East Mains and installed at new longwall panel locations as mining progresses to the northeast. Noise from the ventilation fan would potentially be above 50 dBA, or 10 dBA above assumed ambient levels at a distance of 1,000 feet. In situations where the fan is installed near Fattig Creek Road, noise levels from the fan would be 10 dBA or more above ambient levels at residences located in this area. This would result in a noticeable increase in ambient noise over the No Action Alternative conditions at these locations. This would potentially result in a noise impact on a short-term basis. Mitigation measure NOI-1 should be implemented in situations where the ventilation fan would result in a substantial increase in ambient noise levels at nearby residences.

The expansion of mining activity northeastward as mining progresses would be coupled with reduced activity at previously mined panels as facilities outside of the surface facilities area are decommissioned and reclaimed. The distance to receptors at residences and public roads would change as boreholes and associated facilities are added or decommissioned. Noise impacts during reclamation would be the same as those described under the No Action Alternative. While noise impacts would occur over a longer period under the Proposed Action when compared to the No Action Alternative, the duration is still considered short term, as the impacts would diminish after mining concludes and cease after reclamation has been completed.

Vibration from use of heavy equipment at surface facilities and use of longwall equipment in the tunnels would produce ground borne vibration in a localized area, at levels of less than 0.1 in/sec PPV at 150 feet from the source. This would be well below thresholds and not perceptible at the nearest receptors. No blasting would be required for maintenance of the previously permitted WDA 2. As such, the impact of vibration is considered to be minor.

Rail Transportation Corridor

The average rail transport rate under the Proposed Action of 1.3 loaded train trips per day would be the same as the No Action Alternative but would last for an additional 8 years as compared to the No Action Alternative. Accordingly, noise impacts from the Proposed Action would be considered minor and generally consistent with the No Action Alternative. While noise and vibration impacts would occur over a longer period under the Proposed Action as compared to the No Action Alternative, the duration would still be considered short term as the impacts would cease after mining concludes.

4.15.1.3 Partial Mining Alternative

Mine Vicinity

Noise and vibration levels from mining and reclamation activities associated with the Partial Mining Alternative would be the same as the Proposed Action, as the same types of equipment would be used in the same locations, however the duration of mining would be shorter because mining activities would extend for approximately 5 years, rather than 9 years under the Proposed Action. This would be a short-term impact as noise and vibration would diminish after mining concludes. Noise impacts during reclamation would be the same as those described under the No Action Alternative.

Use of the ventilation fan would potentially result in a noise impact on a short-term basis, if moved to a location within 1,000 feet of residences along Fattig Creek Road. This would result in a noticeable increase in ambient noise over No Action Alternative conditions at these locations, similar to the Proposed Action. Mitigation measure NOI-1 should be implemented in situations where the ventilation fan would result in a substantial increase in ambient noise levels at nearby residences.

Rail Transportation Corridor

The average rail transport rate under the Partial Mining Alternative of 1.8 loaded train trips per day would be the same as the No Action Alternative but would continue for up to 5 additional years compared to the No Action Alternative. While noise and vibration impacts would occur over a longer period under the Partial Mining Alternative compared to the No Action Alternative, the duration would still be considered short term as the impacts would cease after mining concludes.

4.15.2 Impacts from Past, Present, and Reasonably Foreseeable Future Actions

In addition to Mine-related noise contributions, other potential sources of noise near the Mine include exploration activities, neighborhood noise from residential use, and agricultural activities. Once reclamation is complete ambient sound levels would return to existing conditions. The impacts from past, present, and RFFAs on noise and vibration would be short term and similar to impacts described under the Proposed Action.

Noise from rail transport would combine with past, present and reasonably foreseeable rail activity. As discussed in **Section 3.1**, rail transport is forecasted to increase along most segments of the rail line between Laurel and Westshore Terminal and rail line owners and operators are expected to make changes to rail systems in response to traffic forecasts. Noise and vibration impacts of future actions related to rail operations would be evaluated by FRA, STB, and/or other permitting authorities in the context of existing regulations. Avoidance, minimization and mitigation measures would be adopted in association with approvals, as needed, to reduce rail-related noise impacts to acceptable levels and avoid major impacts related to noise and vibration. Mitigation measures include but are not limited to wheel treatments to reduce wheel/rail interaction, use of sound barriers, use of wayside horns versus locomotive horns, and use of quiet zones.

4.15.3 Mitigation Measures

- No additional mitigation measures were determined necessary to avoid unacceptable impacts.

4.15.4 Irreversible and Irretrievable Commitment of Resources

For all alternatives, there would be no foreseeable or predicted irreversible or irretrievable resource commitments.

4.16 Socioeconomics

This section qualitatively describes the alternatives' impacts on economic conditions and local economic activity, generally expressed as projected changes in employment, labor income, and economic output.

Table 4.16-1 compares total estimated revenue under the No Action Alternative, Proposed Action, and Partial Ming Alternative based on current tax and revenue rates as discussed in **Section 3.16**, mining duration (years), 2023 average coal price in Montana, and total tons of saleable coal.

4.16.1 Direct and Indirect Impacts

4.16.1.1 No Action Alternative

Local Economy

Under the No Action Alternative, the Mine would produce approximately 10.0 Mt of saleable coal over 1 year, ending in 2026, which is 47.3Mt and up to 8 fewer years than the Proposed Action. Total revenue (in 2023$, 2 percent discount rate) would be approximately $173 million, including approximately $100 million at the local and county-level, $71 million in State revenue, and $1 million Federal revenue (**Table 4.16-1**). The Signal Peak Community Foundation would cease its scholarship activities immediately as would other local charitable contributions from SPE. Capital infrastructure investments would fall from $18 million per year to $0 during the last 12 months of operations (either 2025 or 2026), rise to $1.8 million annually during 16 months of reclamation (sometime during 2026-2028), and cease in 2027 or 2028 after reclamation (SPE 2017 and 2024).

Local businesses, Yellowstone County, and in particular, Musselshell County would see a decline in revenue associated with Mine activities, and no replacement revenue sources have been identified.

Recreation and agricultural industries would continue to experience adverse impacts for 2.3 years (through reclamation). During this time, grazing and recreation near the Mine would continue to be obstructed. However, following reclamation, adverse impacts these industries currently experience because of the Mine should cease. Train traffic would cease on the spur from the Mine to Broadview and decrease nearly 50 percent on the mainline from Broadview to Laurel years earlier than under either action alternative, reducing adverse impacts to nearby residents, workers, and businesses from air and noise emissions. Mine closure and reclamation may also alleviate other costs associated with adverse local environmental, health, and safety impacts from the Mine.

During the 1-year period of continued mining, revenue from the No Action Alternative would result in moderate, short-term impacts to the local economy, and minor direct and indirect impacts at the state and national level.

Table 4.16-1. Differences Between the Total Estimated Revenues of the No Action Alternative, Proposed Action, and Partial Mining Alternative (2023 dollars, 2 percent discount rate)

	No Action Alternative[7]	Proposed Action[7]		Partial Mining Alternative[7]	
Revenue Source / Category	Revenue	Revenue	Difference from No Action Alternative	Revenue	Difference from No Action Alternative
Estimated Local and County Revenue from Mine Activities					
Wages and Benefits[1]					
Musselshell County	11,326,779	74,749,822	63,423,043	49,060,429	37,733,650
Yellowstone County	30,580,879	201,815,117	171,234,238	132,456,987	101,876,108
Other Counties	1,632,766	10,775,257	9,142,491	7,072,107	5,439,341
Local Business Transactions					
Musselshell County	13,297,120	81,854,498	68,557,377	54,085,669	40,788,548
Yellowstone County	37,636,670	231,684,048	194,047,379	153,086,111	115,449,442
Gross Proceeds Tax (County Share)[2]					
Musselshell County	5,327,643	28,487,066	23,159,423	26,028,797	20,701,154
Yellowstone County	378,240	2,022,458	1,644,219	1,847,932	1,469,692
Community Foundation[3]	0	2,953,344	2,953,344	0	0
Other Charity in Musselshell County	0	184,584	184,584	0	0
Charity in Yellowstone County	0	73,834	73,834	0	0
Subtotal	100,180,097	634,600,028	534,419,932	423,638,032	323,457,935
Estimated State Revenue from Mine Activities[4]					
Severance Tax	18,222,306	97,355,462	79,133,156	89,027,120	70,804,814
Gross Proceeds Tax (State Share)	5,705,882	30,509,524	24,803,642	27,876,729	22,170,846
Resource Indemnity Trust Fund	1,825,882	9,763,067	7,937,185	8,920,573	7,094,691
State Land Surface Lease	1,882	14,176	12,294	9,196	7,314
State Coal Mineral Royalty[5]	45,647,059	244,076,193	198,429,134	223,013,828	177,366,770
Federal Coal Royalty (State Share)	0	38,905,978	38,905,978	32,743,071	32,743,071
Subtotal	71,403,012	420,624,400	349,221,388	381,590,518	310,187,506
Estimated Federal Revenue from Mine Activities[4]					
Federal Surface Lease	7,882	59,362	51,480	38,510	30,628
Federal Coal Royalties	0	38,905,978	38,905,978	32,743,071	32,743,071

	No Action Alternative[7]	Proposed Action[7]		Partial Mining Alternative[7]	
Revenue Source / Category	Revenue	Revenue	Difference from No Action Alternative	Revenue	Difference from No Action Alternative
Abandoned Mine Reclamation	941,176	5,032,499	4,091,322	4,598,223	3,657,047
FOB/Black Lung[6]	431,373	2,306,562	1,875,189	2,107,519	1,676,146
Subtotal	1,380,431	46,304,401	44,923,970	39,487,323	38,106,892
Total	172,963,540	1,101,528,830	928,565,290	844,715,873	671,752,333

[1] Includes the portion that would be paid as State and Federal income tax. Wages would be higher if employment rises to achieve saleable coal recovery of approximately 10.0 Mtpy under the No Action Alternative or Partial Mining Alternative.
[2] Estimated allocations to Musselshell County (93%) and Yellowstone County (7%) (Source: SPE 2024).
[3] Musselshell County only (Source: SPE 2024).
[4] Excludes the portion that would be paid as State and Federal income tax.
[5] Equals 10% of estimated coal sales (assuming $46.56 2023 average coal price in Montana and Mine production evenly spread across years of operation) (Sources: SPE 2024, USEIA 2024).
[6] Assumes 4% of total saleable coal is sold domestically with a $1.10 per ton tax rate.
[7] Assumes mining operations would continue 1 year under the No Action Alternative at a rate of 10.0Mtpy of saleable coal, 8.1 years at a rate of 7.1Mtpy under the Proposed Action, and 5.1 years at a rate of 10.0Mtpy under the Partial Mining Alternative.

Population

Under the No Action Alternative, the Musselshell and Yellowstone County populations are likely to continue increasing in 2025 but may slow or temporarily reverse, beginning in 2026 as laid-off Mine employees, other residents with jobs dependent on mining activity, and their families move away.

Employment

Under the No Action Alternative, Mine employment is anticipated to remain the same in 2025 and possibly 2026, followed by layoffs, potentially beginning in 2026. Most reductions in employment would likely occur in 2026 when mining ceases and the Mine lays off 85-90 percent of its employees. The Mine would lay off its remaining employees in 2027 or 2028 after reclamation. In the near-term, unemployment in Musselshell County could rise as currently no additional local industries can employ all workers that the Mine would lay off.

Housing

In Roundup, where there is already surplus housing, housing availability could increase to the extent workers and their families move away from Roundup to accept new employment.

Local Government Facilities and Services

Under the No Action Alternative, local governments are expected to lose revenue, beginning in 2026, as the Mine ceases operations, which may result in cuts to local government facilities and services. At least initially, these cuts are likely to exceed the reduction in demand for services resulting from workers and their families moving away and local health, safety, and environmental risks associated with the Mine diminishing.

4.16.1.2 Proposed Action

Local Economy

The Proposed Action would extend the duration of mining by up to 9 years (up to 8 additional years relative to the No Action Alternative), and the Mine would be expected to produce an additional 57.3 Mt of saleable coal (47.3 Mt relative to the No Action Alternative). All impacts of the No Action Alternative would occur under the Proposed Action, but the revenue decline, Mine closure, and associated layoffs would be delayed approximately 8 years. Approximately $1.10 billion dollars of revenue would be generated under the Proposed Action, which is $930 million more than the No Action Alternative (**Table 4.16-1**). The revenue (relative to the No Action Alternative) would be greatest at the local and county level (approximately $534 million), followed by State revenue (approximately $349 million) and Federal revenue (approximately $4 million). Mine capital infrastructure investments would be $18 million per year into 2033, declining to $0 in 2034 (SPE 2024).

Recreation and agricultural industries would continue to experience adverse impacts for up to 10.3 years (through reclamation). During this time, grazing and recreation near the Mine would continue to be obstructed. However, following reclamation, adverse impacts these industries currently experience because of the Mine should cease. The Proposed Action would result in current levels of rail traffic continuing for up to an additional 8 years relative to the No Action Alternative.

Consequently, nearby residents, workers, and businesses would continue to experience negligible to minor adverse impacts from air and noise emissions resulting from Mine-related rail traffic for an additional 8 years before overall rail traffic decreases by approximately 50 percent with the Mine's closure and reclamation, after which Mine-related rail traffic impacts would be negligible. The Proposed Action would also result in other costs associated with adverse local environmental, health, and safety impacts from mining activities, but these costs would be alleviated following reclamation.

During the approximately 9-year period of continued mining, revenue from the Proposed Action would result in moderate, short- and long-term impacts to the local economy, and minor direct and indirect impacts at the state and national level.

Population

The negative impact on population in Musselshell and Yellowstone Counties would be delayed up to 8 additional years relative to the No Action Alternative.

Employment

No additional employees are anticipated under the Proposed Action relative to the No Action Alternative, although the duration of employment would continue up to 8 years longer than under the No Action Alternative (until approximately 2034). At the end of mining, layoffs would occur and Mine-related revenue would eventually cease as it does for the No Action Alternative.

Housing

Because no new jobs would be created, availability of housing units would not be adversely impacted during the mining term. After mining, availability of housing in Musselshell County would potentially increase, similar to the No Action Alternative, unless a new industry is identified.

Local Government Facilities and Services

Cuts to government facilities and services (as well as the decline in demand for these services resulting from workers and their families moving away and local health, safety, and environmental risks from the Mine diminishing during and after reclamation) would be delayed up to 8 additional years relative to the No Action Alternative.

4.16.1.3 Partial Mining Alternative

Local Economy

The Partial Mining Alternative would extend the duration of mining by approximately 5 years (4 additional years relative to the No Action Alternative), and the Mine would produce approximately 50.9 Mt of saleable coal (40.9 Mt more than under the No Action Alternative) during that time. All impacts of the No Action Alternative would occur under the Partial Mining Alternative, but the revenue decline, Mine closure, and associated layoffs would be delayed for 4 years. Approximately $840 million dollars of revenue would be generated under the Partial Mining Alternative, which is $670 million more than the No Action Alternative (**Table 4.16-1**). The revenue (relative to the No Action Alternative) would be greatest at the local and county level (approximately $323 million), followed by State revenue (approximately $310 million) and Federal revenue (approximately $38 million). Mine capital infrastructure investments would be $18 million or more per year through 2029, declining from $18 million to $0 during 2030 unless the mine received additional mining approval in the future (SPE 2024).

Recreation and agricultural industries would continue to experience adverse impacts for approximately 6.3 years (through reclamation). During this time, grazing and recreation near the mine would continue to be obstructed. However, following reclamation, adverse impacts these industries currently experience because of the Mine should cease. Additionally, the current levels of rail traffic would continue for an additional 4 years relative to the No Action Alternative. Consequently, nearby residents, workers, and businesses would continue to experience negligible to minor adverse impacts from air and noise emissions resulting from Mine-related rail traffic for an additional 5 years before overall rail traffic decreases by approximately 50 percent with the Mine's closure and reclamation, after which Mine-related rail traffic impacts would be negligible. The Partial Mining Alternative would result in costs associated with adverse local environmental, health, and safety impacts from mining activities, but these costs would be alleviated following reclamation.

During the 5-year period of continued mining, revenue from the Partial Mining Alternative would result in moderate, short- and long-term impacts to the local economy, and minor direct and indirect impacts at the state and national level.

Population

The negative impact on population in Musselshell and Yellowstone Counties would be delayed 4 years relative to the No Action Alternative.

Employment

No additional employees are anticipated under Partial Mining Alternative relative to the No Action Alternative, although the duration of employment would continue 4 years longer than under the No Action Alternative (until approximately 2030). However, because the Mine would have an incentive to maximize Mine production before the permit expires in 2030, employment could be slightly higher through 2030 than under the Proposed Action. At the end of mining, layoffs would occur, and Mine-related revenue would eventually cease as it does for the No Action Alternative.

Housing

After mining, availability of housing in Musselshell County would potentially increase, similar to the No Action Alternative, unless a new industry is identified.

Local Government Facilities and Services

Cuts to government facilities and services (as well as the decline in demand for these services resulting from workers and their families moving away and local health, safety, and environmental risks from the Mine diminishing during and after reclamation) would be delayed 4 years relative to the No Action Alternative.

4.16.2 Impacts from Past, Present, and Reasonably Foreseeable Future Actions

Impacts from past, present, and RFFAs on socioeconomics, related to the Proposed Action, include impacts at a local, county, state, and national level, such as agriculture, recreation, rail and automotive transport, industrial operations, exploration activities, and residential activities. These activities contribute to economic productivity but also to ongoing air and noise emissions that adversely affect individuals and businesses in the study area. Impacts from noise associated with past, present, and RFFAs would be moderate but short term, as described in **Section 4.15**. Wildland fires present direct risks of health damage, loss of life, loss of property, and displacement of residents and business within the study area, in the short and long term. Increasing flood, drought, and wildfire risks are expected to contribute to both short- and long-term significant and adverse impacts, resulting from indirect impacts on health and economic opportunities within the past, present, and RFFA effects study area. The Proposed Action would contribute negligibly to these risks. Reductions in livestock grazing, habitat for wildlife species, and recreational access to public lands are expected to contribute to adverse impacts on economic activity related to agriculture and recreation. The Proposed Action's contributions to impacts on economic activity in agriculture and recreation are expected to be incremental, moderate, long-term, and limited to the permit area. Potential new energy projects (e.g., natural gas exploration in Musselshell County and electricity generation in Yellowstone County) could contribute to local revenue, income, and employment (partly offsetting expected declines under the No Action Alternative), as well as pollution and congestion. Overall, impacts from past, present, and RFFAs from various factors in the study area range from negligible to significant, with negligible to moderate contributions from the Proposed Action.

The impacts of the Proposed Action would be a smaller part of the economy as the scale of analysis is increased from a local level to a national scale, whereby the greatest impacts would be nearer to the Mine (i.e., the cities of Roundup and Billings and Musselshell and Yellowstone Counties) where Mine activities and revenues compose a larger portion of the economy. At the local and county level, impacts from past, present, and RFFAs on socioeconomics are expected to be moderate but short-term (approximately 11 years), delaying impacts that could occur at the time of Mine closure if new industries are not added to employ laid-off workers and replace revenue. At the state and national level, Mine-generated revenue is a small portion of budgets that are continually changing as old revenue sources decline and new revenue sources are identified; therefore, the continuation of mining and eventual Mine closure would have minor and short-term impacts on state and Federal government.

4.16.3 Mitigation Measures

No mitigation measures specific to reducing socioeconomic impacts are necessary to avoid unacceptable impacts.

4.16.4 Irreversible and Irretrievable Commitment of Resources

For all alternatives, there would be no irreversible or irretrievable resource commitments.

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4.17 Visual Resources

This section discusses the direct and indirect impacts, as well as impacts from past, present, and RFFAs on visual resources resulting from the No Action Alternative, Proposed Action, and Partial Mining Alternative. The analysis area is described in **Section 3.17**. Definitions related to the nature, intensity, and duration of impacts associated with each alternative are described in **Section 4.0**.

4.17.1 Direct and Indirect Impacts

Because underground mining activities cannot be seen by the public, this analysis focuses on aboveground surface disturbances that have the potential to be seen by the public.

4.17.1.1 No Action Alternative

Under the No Action Alternative, the proposed mining plan modification would not be approved, but mining would continue to recover non-Federal coal remaining within the permit area over a 1-year period, approximately 8 fewer years than under the Proposed Action. To date, there have been approximately 1,041.3 acres of surface disturbance authorized within the permit area. Under the No Action Alternative, visible features associated with the Mine would be largely consistent with existing conditions and include what is currently visible to the public. These ongoing mining operations would result in approximately 2.9 acres of additional surface disturbance that would result from subsidence repairs on non-Federal lands (**Table 2.3-1**). No other surface facilities, air portals, borehole pads, roads, or soil stockpiles would be created under the No Action Alternative.

Subsidence over longwall mined areas may result in localized slope instability, rock toppling, and alteration of topography at the interface between mined and unmined areas. However, the majority of publicly available views of the permit area are centralized along public roadways in the residential areas east of Highway 87 and south of the surface facility area, and it is unlikely that areas of subsidence, including new areas of subsidence, would be visible from publicly accessible vantages. If visible, it is not anticipated that new areas of subsidence would negatively affect views because subsidence repairs would ensure that the landscape appears largely intact and consistent with existing conditions. Because no new facilities would be constructed under the No Action Alternative, lighting associated with the Mine is anticipated to remain consistent with existing conditions.

Once mining has been completed, Mine facilities would be removed, and all surface disturbances would be reclaimed within approximately 16 months after the end of mining (SPE 2017). The intent of reclamation is to restore the landscape to a condition that approximates the original surface contour, blends with the surrounding natural area, and supports grazing. Although permanent landscape scars are likely to remain, reclamation would remove built features, like the two silos, and restore the landscape so that the visual impacts of mining would be greatly reduced post-reclamation. In addition, lighting levels in the study area would be reduced post-reclamation after existing sources of lighting associated with the Mine would be removed. Visual changes associated with the No Action Alternative are consistent with BLM VRM Class III objectives where change may attract attention but is not dominant.

4.17.1.2 Proposed Action

Impacts to visual resources resulting from the Proposed Action would be greater than those described for the No Action Alternative. There would be 223 aces of impacts through the creation of new surface facilities associated with WDA 2. However, visual impacts associated with WDA 2 were previously analyzed as part of the 2018 Environmental Assessment (EA). This EA stated that lighting at the surface facilities area could increase in the short term as WDA 2 is constructed, and before closure and reclamation of WDA 1, after which lighting at WDA 1 would not likely be needed. Therefore, lighting impacts would be considered minor. This is because facility lighting would only be employed at active facilities so the location of lighting would change over time as mining progresses (OSMRE 2018). Since WDA 2 was authorized under this previous permit, visual impacts associated with WDA 2 are not subject to analysis under this EIS. Therefore, the primary visual changes associated with surface disturbances for the Proposed Action are limited to those associated with subsidence repairs and the creation of new air portals, borehole pads, and roadways. Instead of the 2.9 acres of subsidence repair under the No Action Alternative, there would be a total of 13.4 acres of subsidence repairs under the Proposed Action. In addition, there would be 2.0 acres of surface disturbance through the creation of new air portals, 6.0 acres from borehole pads, and 3.1 acres from roads. These surface disturbances would occur over an approximate 9-year timeframe.

Like the No Action Alternative, subsidence over longwall mined areas may result in localized slope instability, rock toppling, and alteration of topography at the interface between mined and unmined areas under the Proposed Action. However, the majority of publicly available views of the permit area are centralized along public roadways in the residential areas east of Highway 87 and south of the surface facility area. Although it is unlikely that areas of subsidence, including new areas of subsidence, would be visible from publicly accessible vantages, there is a greater chance that some areas could be visible under the Proposed Action due to the larger area of surface disturbance that could occur. If visible, it is not anticipated that new areas of subsidence would negatively affect views because subsidence repairs would ensure that the landscape appears largely intact and consistent with existing conditions.

New air portals consist of highwall pads, and borehole pads include concrete foundations for high-capacity air compressors, electrical sub-stations, storage hoppers and batch systems, fuel storage, and other necessary equipment. Similar to the No Action Alternative, new facilities would be shielded from view from Highway 87 by natural terrain but could be visible from Fattig Creek Road under the Proposed Action. If visible from public roadways in the residential areas east of Highway 87 and south of the surface facility area, new air portals and borehole pads would result in visual impacts to site-specific locations that can be seen from publicly accessible vantage points, whereas roadways would wind through the landscape and result in narrow, curvilinear corridors of visual impact that would be 15 to 20 feet wide. New air portals, borehole pads, and roadways would occur on land with varying topography in shrubland, burned ponderosa pine, ponderosa pine forest, and grassland habitats. Air portals and borehole pads would not be expected to be highly visible to the public due to intervening terrain and vegetation and distance from publicly available vantage points. In addition, air portals and borehole pads would be reclaimed when they are no longer needed, making them visible in the landscape for several years and then minimally visible once reclaimed. However, roadways would be seen winding through the landscape; however, such roadways are a common visual element in the permit area vicinity and consistent with what viewers would expect to see in the landscape. Therefore, visual impacts associated with surface disturbances would be minor and relatively short term in nature.

Aboveground Project elements would not contribute to a substantial increase reflective daytime or nighttime glare because exposed surfaces would be expected to be consistent with existing facilities that do not appear to be overly bright. Facility lighting would only be employed at active facilities, so the location of lighting would change over time as mining progresses. Exterior lighting that could be employed at facilities outside the surface facilities area (e.g., new ventilation fans), located primarily within AM 3, could have lights that could be visible from Fattig Creek Road and nearby residences (dwellings). Fattig Creek Road, and associated residences located along this road, constitute the main location of public views that could be affected by new sources of nighttime lighting. Per **Chapter 2**, final locations of surface disturbing elements outside the surface facilities areas (which may or may not include exterior lighting) would be permitted as a revision to the State-approved Mine Permit, therefore the actual location or lighting impacts of these elements is not currently available. Although the proposed locations of lighting are unknown lighting impacts would be anticipated to be minor depending on the proximity of lights to individual residences along Fattig Creek Road and lighting would be removed as individual facilities are decommissioned. impact In addition, lighting at some locations may be only temporary, which further reduces the duration of impacts. However, lighting could negatively affect sensitive receptors if not properly designed. In particular, light-emitting diode (LED) lighting can negatively affect humans by increasing nuisance light and glare, in addition to increasing ambient light glow, if proper shielding is not provided and blue-rich white light lamps (BRWL) are used (American Medical Association 2016; International Dark-Sky Association 2010a, 2010b, 2015, 2016). Studies have found that a 4000 Kelvin (K) white LED light causes approximately 2.5 times more pollution than high pressure sodium lighting with the same lumen output, which would affect sensitive receptors, and more than double the perceived brightness of the night sky (Aubé et al. 2013; Falchi et al. 2011, 2016). This would result in a substantial source of nighttime light and glare that would adversely affect nighttime views in the area if lighting were not properly designed and shielding is not employed. The mitigation measure detailed in **Section 4.17.3** would lessen light and glare impacts caused by Project lighting.

After mining has been completed under the Proposed Action, Mine facilities would be removed, and all surface disturbances would be reclaimed within approximately 16 months after the end of mining, like the No Action Alternative (SPE 2017). The intent of reclamation is to restore the landscape to a condition that approximates the original surface contour, blends with the surrounding natural area, and supports grazing. Although permanent landscape scars are likely to remain, reclamation would remove built features, like the two silos, and restore the landscape so that the visual impacts of mining would be greatly reduced post-reclamation. In addition, lighting levels in the study area would be reduced post-reclamation after existing sources of lighting associated with the Mine would be removed.

Although visual impacts from new disturbances would be minor under the Proposed Action, as most changes would occur where the visual character is already altered by existing operations, new surface disturbances would occur over a larger area than the No Action Alternative. Therefore, this increases the potential for surface disturbances under the Proposed Action to be more visible to the public from locations east of Highway 87 and south of the surface facilities area than the No Action Alternative. While visual impacts would occur over a longer period of time under the Proposed Action (up to 8 years longer than the No Action Alternative), the duration is still relatively short term. In addition, the impacts would cease after mining concludes and reclamation is performed. Therefore, long-term visual impacts of surface disturbances would be negligible due to the mitigating impacts of reclamation, as described for the No Action Alternative. Visual changes associated with the Proposed Action are consistent with BLM VRM Class III objectives where change may attract attention but is not dominant.

4.17.1.3 Partial Mining Alternative

Impacts to visual resources under the Partial Mining Alternative would be largely the same as described in the Proposed Action. The primary differences would be that there would be a slight decrease in the area of subsidence repair and the duration of mining would be decreased. Instead of the 13.4 acres of subsidence repair under the Proposed Action, there would be a total of 12.0 acres of subsidence repairs under the Partial Mining Alternative. This 1.4-acre difference is considered negligible and would not result in a noticeable change in the landscape given the limited potential for such changes to be visible, due to intervening terrain and vegetation, and because subsidence repairs would ensure that the landscape appears largely intact and consistent with existing conditions. Under the Partial Mining Alternative, mining in AM 3 would be sequenced over a 5-year duration at a rate of approximately 10.0 Mt of saleable coal per year.

Per **Figure 2.3-3**, mining would progress in approximately 0.25-mile-wide strips moving northeastward within the AM 3 area. The Year 1 start of Federal coal mining would begin approximately 0.75-mile to the northeast of the boundary between AM 2 and AM 3. The mining of Federal coal would stop approximately 0.25- to 0.5-mile from the northeast and northwest edges of AM 3. However, the nature of changes to the visual landscape from surface disturbances and changes in light and glare under the Partial Mining Alternative would be the same as described for the Proposed Action and consistent with BLM VRM Class III objectives where change may attract attention but is not dominant. As such, the direct and indirect impacts related to visual resources would be minor and short term in nature, and mitigation measures for the Partial Mining Alternative would be the same as for the Proposed Action (refer to **Section 4.17.3**).

4.17.2 Impacts from Past, Present, and Reasonably Foreseeable Future Actions

Impacts from past, present, and RFFAs on visual resources include the visual impacts of aboveground Mine facilities and aboveground impacts of Mine operations, such as subsidence and subsidence repair and reclamation. Per **Section 4.17.3** below, SPE would be required to minimize the impact of outdoor lighting on the surrounding environment. Therefore, although lighting locations associated with Mine operations that would be located outside of the surface facilities area are anticipated to change, according to the location of belowground operations, they would be temporary and decommissioned as mining operations are relocated. This would not cause substantial impacts over time. In addition, scenic values within and proximal to the Mine's landscape in the Bull Mountains are most notably affected by fires and residences in subdivided tracts. Fires have altered vegetation in the permit area and vicinity, reducing the extent of conifer forests in favor of the now prevalent grassland and shrub-grassland communities.

Yard lights associated with local residences provide scattered illumination in an otherwise rural landscape. Subdivided tracts without existing residences could become occupied in the future, increasing the number of parties affected by mining activities and possibly further affecting the visual character of the area. While these changes could occur, the landscape is expected to remain a rural setting and the impacts from past, present, and RFFAs on visual resources are expected to be minor in the short term and very minor in the long term as Mine facilities and lighting would be removed and disturbances would be reclaimed.

Mitigation measures for impacts from past, present, and RFFAs would be the same as for the Proposed Action.

4.17.3 Mitigation Measures

SPE is prepared to implement the following mitigation measure to limit the long-term impacts on visual resources under the Proposed Action:

- All artificial outdoor lighting will be limited to safety and security requirements, designed using Illuminating Engineering Society's design guidelines and in compliance with International Dark-Sky Association approved fixtures.
- All lighting is designed to have a minimum impact on the surrounding environment and will use downcast, cut-off type fixtures that direct the light only towards objects requiring illumination. Shielding will be used, where needed, to ensure light pollution is minimized. Therefore, lights will be installed at the lowest allowable height and cast low-angle illumination while minimizing incidental light spill onto adjacent properties, open spaces, or backscatter into the nighttime sky.
- The lowest allowable illuminance level will be used for all lighted areas and the number of nighttime lights needed to light an area will be minimized to the highest degree possible.
- Light fixtures will have non-glare finishes that will not cause reflective daytime glare. Lighting will be designed for energy efficiency and have daylight sensors or be timed with an on/off program. Lights will provide good color rendering with natural light qualities with the minimum intensity feasible for security, safety, and personnel access. Lighting, including light color rendering and fixture types, will be designed to be aesthetically pleasing.
- LED lighting will avoid the use of blue-rich white light lamps and use a correlated color temperature that is no higher than 3,000 Kelvin (International Dark-Sky Association 2010a, 2010b, 2015, 2016). Wherever possible and pragmatic, SPE will use fixtures and lighting control systems that conform to International Dark-Sky Associations Fixture Seal of Approval program. In addition, LED lights will use shielding to ensure nuisance glare and that light spill does not affect sensitive residential viewers.
- Technologies to reduce light pollution evolve over time and design measures that are currently available may help but may not be the most effective means of controlling light pollution once the Project is designed. Therefore, all design measures used to reduce light pollution will employ the technologies available at the time of Project design to allow for the highest potential reduction in light pollution.

4.17.4 Irreversible and Irretrievable Commitment of Resources

For all alternatives, there would be no foreseeable or predicted irreversible or irretrievable resource commitments.

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Chapter 5

Consultation and Coordination

5.1 Public Comment Process

OSMRE developed a NEPA-specific website that provided legal notices, outreach notice letters, mailing address, and an email address for comments to be sent. The website can be accessed at https://www.osmre.gov/laws-and-regulations/nepa/projects.

OSMRE issued a NOI to prepare an EIS in the *Federal Register* and announced the NOI through a news release and on its website on August 7, 2023. The initial 30-day public scoping period began on August 7, 2023, and ended September 6, 2023. OSMRE requested public scoping comments to identify any additional relevant issues concerning the Mine expansion that should be evaluated in the EIS. OSMRE mailed letters to Federal agencies, State agencies, Tribes, counties, municipalities and conservation districts, non-government organizations, and individuals on August 7, 2023.

During the public scoping period, OSMRE hosted a public scoping meeting at the Roundup Community Center, Musselshell County, Montana on Wednesday, August 30, 2023, to provide information about the proposed Mine expansion and NEPA process and collect comments from the public. A total of 94 attendees participated in this meeting.

Several months after completion of the public scoping period, SPE submitted an application for AM 6 to the MDEQ on November 7, 2023, seeking approval to mine additional non-Federal coal. In addition, SPE submitted a letter to MDEQ on December 20, 2023, requesting a withdrawal of their previously submitted AM 5 application to Permit C1993017, as described in the public scoping notification letter (dated August 3, 2023) and presented at the public scoping meeting. On May 15, 2024, OSMRE distributed a letter to inform the public of these Project revisions and provide the public an opportunity to submit any additional comments for consideration. The second public notification period concluded on June 14, 2024.

The public was provided the opportunity to comment on the Project via mail, email, and scoping meeting. The OSMRE received a total of 311 comment submittals from individuals and representatives of private and public entities during the public scoping periods. Comment letters received during the public review period have been reviewed and a description of issues analyzed in this EIS are summarized in **Section 1.5**.

5.2 Section 7 Consultation Process with the U.S. Fish and Wildlife Service

The Endangered Species Act of 1973 (ESA), as amended, requires Federal agencies to consult with the USFWS to ensure their actions are not likely to jeopardize the continued existence of an endangered or threatened species or destroy or adversely modify designated critical habitat. The ESA also requires Federal agencies to confer with the USFWS on any agency action that is likely to jeopardize the continued existence of proposed species or result in the destruction or adverse modification of proposed critical habitat. Section 7 of the ESA (16 U.S.C. 1531 *et seq*.) outlines the procedures for Federal interagency cooperation to conserve federally listed species and designated critical habitats.

Where species or their habitats are present in the Project area and it is determined that the Project may affect those species or habitats, the USFWS must determine if implementation of a Project would jeopardize the continued existence of any species listed or proposed as threatened and endangered (T&E) under the ESA or adversely modify critical or proposed critical habitat. Here, after reviewing the Project and consulting with USFWS, OSMRE determined that no federally listed T&E species or their critical habitats are likely to exist within the direct and indirect effects study areas for this Project and that no additional consultation under the ESA was necessary.

A summary of the consultation history with USFWS is detailed below:

- On May 9, 2025, the USFWS provided an official letter and species list to OSMRE for the Project. The species list included the Rufa Red Knot (*Calidris canutus rufa*) (Federally Threatened), monarch butterfly (*Danaus plexippus*) (Federally Proposed Threatened), and Suckley's cuckoo bumble bee (*Bombus suckleyi*) (Federally Proposed Endangered). A biological assessment (BA) was submitted to the USFWS on May 9, 2025. The USFWS concurred with OSMRE's findings on May 23, 2025.
- On November 13, 2024, the USFWS informed OSMRE that the USFWS, Montana FWP Department, and MTNHP concurred that there is no presence of northern long-eared bat in the Project area based on acoustic data submitted during the public comment period. Further, the USFWS concluded that northern long-eared bat is unlikely to occupy the local Bull Mountains area and therefore, consider the USFWS's IPaC system exclusion of northern long-eared bat from the Project consultation list to be appropriate.
- On November 9, 2021, the USFWS reviewed OSMRE's November 9, 2021 cover letter and OSMRE's internal memorandum (i.e., biological assessment) dated November 5, 2021, regarding the impacts of rail transport of coal on species listed under the ESA. Specifically, OSMRE analyzed the effects of the Proposed Action on the federally listed grizzly bear (Ursus arctos horribilis). OSMRE made a determination of may affect, not likely to adversely affect for the grizzly bear and determinations of no effect for the red knot and the whooping crane. On December 13, 2021, OSMRE received a letter of concurrence from the Service stating that this species is not likely to be adversely affected. No critical habitat has been designated for this species; therefore, none would be affected. The USFWS acknowledged OSMRE's no effect determinations for red knot and whooping crane.
- A description of consultation and coordination that was conducted for the OSMRE's 2018 EA is provided in Appendix H of the 2018 EA. Additional consultation and coordination conducted during the preparation of OSMRE's 2020 EA is also provided in Appendix H of the 2020 EA.
- On June 21, 1990, BLM initiated consultation with USFWS regarding Meridian's permit application (BLM 2011). Accordingly, BLM requested a list of protected species from USFWS that could occur in the vicinity of the Project. On June 29, 1990, USFWS responded with a list indicating that the bald eagle, peregrine falcon (*Falco peregrinus*) and black-footed ferret constitute the protected species that could potentially occur within and near the life-of-mine Project area, rail spur right-of-way, powerline easement, and Huntley loadout. An updated species list was requested on November 20, 1991, and USFWS confirmed the original list on December 13, 1991. On February 21, 1992, a biological assessment for these species was prepared. The assessment concluded that the Project would not affect protected species named

on the USFWS's list. On March 3, 1992, USFWS concurred with the determination of no effect. Because no endangered or threatened wildlife or plant species would be affected by developing the Project, the Agency did not identify and analyze probable impacts to such species (BLM 2011).

Accordingly, USFWS and OSMRE were able to conclude that no federally listed T&E species or their critical habitats are likely to exist within the direct and indirect effects study areas for T&E species (see **Section 3.13**), and no further USFWS consultation is needed.

5.3 NHPA and Tribal Consultation

Section 106 of the NHPA as amended and its implementing regulations under 36 CFR Part 800 require all Federal agencies to consider effects of Federal actions on cultural resources eligible for or listed on the NRHP. OSMRE consulted with the Montana State Historic Preservation Office (SHPO) regarding the undertaking and one cultural resource identified during the Class I Cultural Resources Inventory as potentially eligible for listing on the NRHP. On December 2, 2024, Montana SHPO concurred with OSMRE that cultural resource 24ML0151 is not eligible for the NRHP and that the proposed undertaking in areas AM 3 and WDA 2 will have No Adverse Effect on Historic Properties.

In accordance with the 2022 DOI Policy on Consultation with Indian Tribes and 36 CFR § 800.2(c)(2)(ii), the regulations implementing Section 106 of the NHPA, Federal agencies are required to consult with interested parties, including Native American Tribes, who claim cultural affiliation with the affected lands to maintain government-to-government consultation responsibilities.

Traditional cultural properties (TCPs) are protected under section 106 of the NHPA as historic properties, and when applicable, have additional protections under the American Indian Religious Freedom Act of 1978 and the Native American Grave Protection and Repatriation Act of 1990. A TCP may be eligible for listing in the NRHP. Examples of TCPs include but are not limited to locations where Native Americans have performed ceremonies, traditional locations for resource gathering, and rural community land use patterns such as farming and ranching (see **Section 3.14**).

OSMRE initiated formal Tribal consultation with the Apache Tribe of Oklahoma, Crow Tribe of Montana, Fort Belknap Indian Community of the Fort Belknap Reservation of Montana, Nez Perce Tribe, Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation, Montana, and the Shoshone-Bannock Tribes of the Fort Hall Reservation about the identification of and potential effects from the Project on any TCPs and archeological sites of significance to the Tribes. Consultation was initiated through letters sent to each of the Tribes on August 3, 2023. A second round of consultation letters were distributed to the Blackfeet Nation, Fort Peck Assiniboine & Sioux Tribes, and Northern Arapahoe on December 10, 2024. No response was received to these rounds of letters.

On June 14, 2024, OSMRE sent a letter to the President of the Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation, Montana to offer the opportunity to comment on the Proposed Action and mining plan modification for Federal coal that would result in continued underground mining in the AM 3 area. If the mining plan modification is approved, SPE would eventually reach non-Federal coal where the Northern Cheyenne Tribe has royalty interests as codified by the NCLA.

OSMRE did not receive any communications in response to these letters. Each Tribe also was contacted during the two public scoping periods (see **Section 1.5**). None provided comments during either public scoping period.

5.4 Federal, State, and Local Agencies

OSMRE consulted with the following agencies during the development of this EIS:

- Montana Department of Environmental Quality
- Montana State Historic Preservation Officer
- BLM Billings Field Office
- Environmental Protection Agency
- U.S. Fish and Wildlife Service

5.5 Preparers and Contributors

OSMRE, BLM, and EPA personnel who contributed to the development of this EIS are included in **Table 5.5-1**.

Table 5.5-1. Federal Agency Personnel

Name	Organization	Project Responsibility
Marcelo Calle	OSMRE	Project Manager, Division Chief
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Christine Allen	OSMRE	NEPA Coordinator and Environmental Protection Specialist
Jeremy Iliff	OSMRE	Cultural Resources Specialist
Charlie Kwak	OSMRE	Federal Lands Specialist
John Sieving	OSMRE	Hydrology Specialist
Allison Travers	OSMRE	Environmental Protection Specialist
Erica Trent	OSMRE	Biological Resources Specialist
Jared Fischer	OSMRE	Geographer
Nathaniel Arave	BLM Billings FO	Cooperating Agency
Tessa Wallace	BLM Billings FO	Cooperating Agency
Carolyn Gleason	EPA	Cooperating Agency
Christopher Razzazian	EPA	Cooperating Agency

Third-party contractors who contributed to the development of this EIS are included in **Table 5.5-2**.

Table 5.5-2. Third-Party Contractor Personnel

Name	Organization	Project Responsibility
Charles Johnson	ICF	NEPA Project Manager
Katie Wilson	ICF	Deputy Project Manager, Soil and Wetland Resources Specialist
Sarah Pritchard	ICF	Project Coordinator, Lands Use and Vegetation Specialist
Lisa Bendixen	ICF	Transportation and Electrical Transmission Specialist
Edward Carr	ICF	Greenhouse Gas and Climate Change Specialist
Cathy Corlett	ICF	Visual Resources Specialist
Jennifer Stock	ICF	Visual Resources Specialist
Kimberly Davis	ICF	Wildlife and Threatened and Endangered Species Specialist
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Tatum Hastings	ICF	Soils and Vegetation Resources Specialist
Gray Jones	ICF	Human Health Specialist
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5.6 Distribution of the EIS

This EIS will be distributed to individuals who specifically request a copy of the document. It will also be made available electronically on the OSMRE website at the following link.

https://www.osmre.gov/laws-and-regulations/nepa/projects

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Chapter 6
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Appendix A
Mine Acreage Table

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			Existing Disturbance												No Action						Proposed Action						Partial Mining Alternative	
Condition Evaluated	Units	2015 MPDD Approved	Existing Disturbance (AM2)		Existing Disturbance (AM3)		Existing Disturbance (AM4)		Existing Disturbance (AM6)		Existing Disturbance MR300		**Total**		MR280		No Action (AM6)		**Total**		Amendment 3		MR279		**Total**		**Total**	
			Federal	Non-Federal	Federal	Non-Federal	Federal	Non-Federal	Federal	Non-Federal	Federal	Non-Federal	Federal	Non-Federal	Federal	Non-Federal	Federal	Non-Federal	Federal	Non-Federal	Federal	Non-Federal	Federal MR279	Non-Federal MR279	Federal	Non-Federal	Federal	Non-Federal
Saleable Federal Coal to be Mined	Mt	37.5*	1,095,966.5	NoData	7,584,496.0	0.0	0.0	0.0	0.0	0.0			8,680,462.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19,056,858.3		3,773,788.5	0.0	22,830,646.8	0.0	18,668,228	0
Saleable Non-Federal Coal to be Mined	Mt	96.6	0.0	NoData	0.0	31,294,459.7	0.0	4,018,648.4	0.0	1,132,683.6	0.0	425,018.5	0.0	36,870,810.2	0.0	517,486.7	0.0	9,633,753.7	0.0	10,151,240.4	0.0	32,795,306.6	0.0	1,665,163.3	0.0	34,460,469.9	0	32,191,669
Total	**Mt**	**135.0**	**1,095,966.5**	**NoData**	**7,584,496.0**	**31,294,459.7**	**0.0**	**4,018,648.4**	**0.0**	**1,132,683.6**	**0.0**	**425,018.5**	**8,680,462.5**	**36,870,810.2**	**0.0**	**517,486.7**	**0.0**	**9,633,753.7**	**0.0**	**10,151,240.4**	**19,056,858.3**	**32,795,306.6**	**3,773,788.5**	**1,665,163.3**	**22,830,646.8**	**34,460,469.9**	**18,668,228**	**32,191,669**
Other																												
Coal Lands	Acres	2,679.8	101.2	4,647.8	599.7	1,927.1	0.0	317.1	0.0	146.7	0.0	88.8	700.9	7,127.5	0.0	68.6	0.0	508.2	0.0	576.8	1,028.0	1,742.7	211.6	98.0	1,239.6	1,840.7	1,005.2	1,709.1
Subsidence Area	Acres	0.0	57.7	3,646.0	319.5	1,493.7	0.0	277.5	0.0	0.4	0.0	0.0	377.2	5,417.6	0.0	68.6	0.0	508.2	0.0	576.8	870.2	1,565.3	163.2	70.5	1,033.4	1,635.8	854.0	1,539.6
Surface Disturbance																												
Subsidence Repairs	Acres	26.0	0.0	18.2	1.6	7.5	0.0	1.4	0.0	0.0	0.0	0.0	1.6	27.1	0.0	0.3	0.0	2.5	0.0	2.9	4.4	7.8	0.8	0.4	5.2	8.2	4.3	7.7
Surface Facilities	Acres	356.0	0.0	650.5	0.0	223.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	873.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Air Portals	Acres	0.0	0.0	4.9	0.0	7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	2.0	0.0	2.0
Borehole Pads	Acres	21.0	0.0	16.8	0.0	16.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	6.0	0.0	6.0
Roads	Acres	72.0	2.9	19.0	4.2	7.2	0.0	14.6	0.0	0.0	0.0	0.0	7.1	40.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1	0.0	0.0	0.0	3.1	0.0	3.1
Soil Stockpiles	Acres	NA	0.0	0.0	5.4	40.9	0.0	0.0	0.0	0.0	0.0	0.0	5.4	40.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**Acres**	**475.0**	**2.9**	**709.4**	**11.2**	**301.8**	**0.0**	**16.0**	**0.0**	**0.0**	**0.0**	**0.0**	**14.1**	**1,027.2**	**0.0**	**0.3**	**0.0**	**2.5**	**0.0**	**2.9**	**4.4**	**18.9**	**0.8**	**0.4**	**5.2**	**19.3**	**4.3**	**18.8**

2015 Recoverable, 70% Washability
No Action and Proposed Action 80% Washability

223.0 acres moved from proposed non-federal to Existing AM 3 Non-Federal
Add 4.2 ac roads and 5.4ac soil stockpiles from authorized federal to existing AM3

Appendix B
Air Quality

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Air quality can be affected by emissions from naturally occurring and anthropogenic sources. Air pollutant emissions in and around the Project area occur from natural sources such as windblown dust and wildfires and anthropogenic air pollutant emissions occur from industrial facilities, vehicle exhaust, fugitive dust from vehicle traffic, and residential activities such as wood-burning stoves. The Project area is in a rural setting with few industrial sources that would contribute to air pollutant emissions. The industrial activities in the Project area include mining operations, and there is limited agriculture and grazing. The geographical analysis area for air quality is described in **Table 3.1-1**.

Unless otherwise noted, baseline (existing) air quality described in this Appendix reflects 2023 conditions, including direct effects from mining and indirect effects of rail transport, seaport handling, ocean transport, and combustion of 10 million U.S. tons (Mt) of saleable coal shipped.[1] (see **Table 2.1-1** of the EIS). Air quality considerations, baseline conditions, and applicable regulations and jurisdictions differ at each stage from mining to combustion, as discussed in this section.

B.1 Mining

B.1.1 Regulatory Setting

Under the CAA, EPA has established National Ambient Air Quality Standards (NAAQS) which are concentration levels for a set of seven common air pollutants judged "necessary, with an adequate margin of safety, to protect the public health" and "necessary to protect the public welfare from any known or anticipated adverse effects" [40 CFR § 50.2(b)]. These pollutants, referred to as "criteria pollutants," are carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), ozone, lead, and particulate matter (PM) with aerodynamic diameters less than or equal to 10 microns (PM_{10}) and less than or equal to 2.5 microns ($PM_{2.5}$). Ozone is not directly emitted from sources but is formed in the atmosphere from reactions of precursor compounds, primarily nitrogen oxides (NO_X) and volatile organic compounds (VOCs). Consequently, NO_X and VOC emissions are regulated as ozone precursors. States are generally responsible for ensuring these standards are met within their boundaries and may establish additional or more stringent standards. The NAAQS and Montana's Ambient Air Quality Standards (MAAQS) are presented in **Table B-1**. Tribal governments, with EPA approval, may also administer air quality standards within their boundaries, or they may default to EPA administration.

For each NAAQS, responsible administrative agencies are required to designate areas within their jurisdictions as either in compliance ("attainment"), out of compliance ("nonattainment"), or "unclassifiable" in areas where insufficient data exist to make a definitive designation. EPA often combines the latter two classifications into an "unclassifiable/attainment" designation. EPA designates as "maintenance" former nonattainment areas that have achieved compliance with the NAAQS. In general practice, air quality is monitored in areas with potential standards violations due

[1] The approximately 10.0 Mtpy baseline mining rate was established by SPE based on historical mining rates (see Section 2.1) and is conservative (high) compared to the emissions from the actual 2023 production of 7.56 Mtpy (Table 2.1-1). SPE is authorized to mine up to 15 million tons per year (Mtpy) raw coal under Montana Air Quality Permit (MAQP) #3179-13, which at an 80 percent recovery rate, yields 12.0 Mtpy of saleable coal. However, SPE is only capable of mining 14.3 Mtpy of raw coal, so the actual maximum quantity of saleable coal would be slightly less.

to the character and extent of the area's pollutant emissions sources. A nonattainment designation triggers extensive regulation designed to bring the area back into attainment. Official designations are listed at 40 CFR Part 81, Subpart C.

Musselshell and Yellowstone Counties, within which the Mine is located, are designated "unclassifiable/attainment" for all criteria pollutants. The nonattainment areas nearest the Mine are for PM_{10} at Lame Deer, Montana in the Northern Cheyenne Indian Reservation (95 miles southeast) and for SO_2 at Laurel, Montana (45 miles south).

Table B-1. National and Montana Ambient Air Quality Standards

Pollutant & Averaging Period	NAAQS	MAAQS
Carbon Monoxide (CO)		
Hourly	35 ppm [g]	23 ppm [g]
8-Hour	9 ppm [g]	9 ppm [g]
Hydrogen Sulfide		
Hourly	No standard	0.05 ppm [b]
Lead		
90-Day	0.15 μg/m^3 [l]	1.5 μg/m^3 [d]
Nitrogen Dioxide (NO_2)		
Hourly	100 ppb [a]	0.30 ppm [b]
Annual	53 ppb [c]	0.05 ppm [d]
Ozone		
Hourly	No standard	0.10 ppm [d]
8-Hour	0.070 ppm [e]	No standard
PM_{10}		
24-Hour	150 μg/m^3 [f]	150 μg/m^3 [g]
Annual	No standard	50 μg/m^3 [c]
$PM_{2.5}$		
24-Hour	65 μg/m	No standard
Annual	9.0 μg/m^3 [i]	No standard
Settled Particulate Matter		
30-Day Average	No standard	10 grams/m^2 [d]
Sulfur Dioxide (SO_2)		
Hourly	75 ppb [j]	0.50 ppm [k]
24-Hour	No standard	0.10 ppm [g]
Annual	10 ppb [i, m]	0.02 ppm [c]
Visibility (Class I areas only)		
Annual	No standard	3 x 10^{-5} per meter [d]

Sources: Federal – 40 CFR 50; Montana – ARM 17.8 Subchapter 2.
[a] 98th percentile of 1-hour daily maximum concentrations, averaged over 3 years.
[b] Not to be exceeded more than once over any 12-consecutive months.
[c] Annual mean.
[d] Not to be exceeded for the averaging time period as described in the state regulation.
[e] Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years.
[f] Not to be exceeded more than once per year on average over 3 years.

[g] Not to be exceeded more than once per calendar year.
[h] 98th percentile, averaged over 3 years.
[i] Annual mean, averaged over 3 years.
[j] 99th percentile of 1-hour daily maximum concentrations, averaged over 3 years.
[k] Not to be exceeded more than 18 times in any 12 consecutive months.
[l] Rolling 3-month average. Not to be exceeded.
[m] Secondary standard.
$\mu g/m^3$ = micrograms of pollutant per cubic meter of air; m^2 = square meters; ppb = parts per billion; ppm = parts per million.

MDEQ maintains a network of monitoring stations to measure ambient concentrations of specific air pollutants throughout the state. This monitoring network is reviewed annually and adjusted to ensure resources are directed toward areas of interest, including areas of possible high pollutant concentrations. The active ambient monitoring stations closest to the Mine are located in Billings (34 miles south), Lewistown (73 miles northwest), and Miles City (125 miles east). These monitoring stations are too distant for pollutant emissions from Mine-related activities to appreciably contribute to measured pollutant concentrations; therefore, reported concentrations at these stations are not considered to be associated with the Mine's affected environment.

The CAA also establishes areas, known as Class I areas and consisting primarily of national parks and wilderness areas, with special air quality protections. In addition to these "mandatory" areas, several tribal governments have applied for and have been granted Class I area status. The two closest Class I areas are both located approximately 85 to 90 miles from the Mine: the UL Bend Wilderness Area to the north and the Absaroka-Beartooth Wilderness Area to the southwest. Due to its low levels of qualifying air pollutant emissions, the Mine is not subject to Prevention of Significant Deterioration New Source Review (PSD-NSR) rules (see below) that would require it to evaluate potential impacts to Class I areas for permitting purposes.

Visibility degradation at Class I areas due to "regional haze" is a recognized concern. Regional haze is made up of microscopic particles that can travel long distances and that are mostly formed by chemical reactions in the atmosphere of gaseous air pollutants such as nitrogen and sulfur oxides. To prevent future and remedy existing visibility impairment in mandatory Class I areas, EPA promulgated the Regional Haze Rule in 1999 (40 CFR §§ 51.308 through 51.309). A component of that rule requires installation of pollutant emissions control technologies and applies to existing industrial sources that meet several criteria including industry type and pollutant emissions potential. The Mine does not meet any of these applicability criteria.

The CAA contains many provisions and programs to limit air pollutant emissions from stationary sources, including the Title V Operating Permit Program, the PSD-NSR construction permit program, and the National Emissions Standards for Hazardous Air Pollutants (NESHAP) program. The Title V Operating Permit Program and PSD-NSR program apply only to "major" stationary sources, where "major" is specifically defined based on, among other factors, a source's potential to emit regulated pollutants above defined threshold values (100 tons/year for Title V and 250 tons/year for PSD-NSR). The NESHAP program also generally applies only to "major" facilities, although some NESHAP standards apply to "area" (non-major) sources. A major source in accordance with the NESHAP rules has the potential to emit 10 or more tons/year of any single HAP or 25 tons/year of all HAPs combined. The Mine's highest potential emission rate of any Title V or PSD-NSR pollutant from qualifying sources is 20 tons/year, and its total potential emission rate of HAPs from qualifying sources is 0.3 tons/year (SPE 2024). The Mine is therefore classified as a "minor" and "area" emissions source. No other stationary emission sources located near the Mine are considered major stationary sources.

B.1.2 Mine-Related Emissions

Based on information included in MDEQ's Emission Inventory Detail document for Air Quality Permit #3179-13 (MDEQ 2023), the Mine's annual PM_{10} emission rate is estimated to be approximately four times greater than the rate for any other criteria pollutant. Approximately 98 percent of Mine-related PM_{10} emissions results from fugitive sources, such as haul truck traffic and wind erosion of exposed surfaces, and as a result air quality impacts tend to be localized to areas near these sources.

In 1991, a previous Mine owner (Meridian Minerals Company) performed an air dispersion modeling study to support an air quality permit application for the Mine. Although the 1991 study did not estimate any violations of the NAAQS, it had a number of limitations that preclude its use for the air quality analysis in this EIS. The 1991 study assumed a production rate of 3.48 Mtpy of clean coal, much less than the approximately 10.0 Mtpy of the No Action Alternative and Partial Mining Alternative or the approximately 7.1 Mtpy of the Proposed Action. The 1991 study used the Industrial Source Complex (ISC) ISCST2 and ISCLT2 models in accordance with the EPA guidance applicable at the time. However, in 2005, EPA released guidance on air quality models and the historic models were replaced with AERMOD in 2006. Since AERMOD's release EPA has released 17 updates that have included numerous bug fixes, model enhancements, and formulation updates. The underlying basis for dispersion modeling methodology has changed radically between ISC and AERMOD, which is based on current planetary boundary layer similarity theory rather than the Pasquil-Gifford stability classes used in ISC. Other elements of the 1991 study that are not consistent with current EPA and MDEQ guidance included the selection of model receptors (locations at which impacts are calculated), the omission of background concentrations, and the absence of results for $PM_{2.5}$. As a result, the 1991 dispersion modeling study would not accurately represent current air quality in the Mine area or the potential impacts of the current Proposed Action, so this EIS does not consider the 1991 study results in the impact evaluation.

SPE performed an air dispersion modeling study for the current Proposed Action and alternatives. Section 4.2.1.4 of the EIS summarizes this modeling study. A detailed report of the modeling and results is provided in **Appendix E**. The results are summarized in Table 1-1 of **Appendix E** and show that all estimated concentrations are less than the NAAQS and MAAQS for all averaging time periods. Therefore, no localized adverse air quality effects from Mine operations are anticipated under any alternative.

From 2010 to 2016, SPE was required to operate three monitoring stations at two sites (two stations co-located) near to the Mine to measure concentrations of PM_{10}. This network was intended to track localized impacts from the Mine and assure no ambient air quality standards were violated. In February 2017, MDEQ allowed SPE to discontinue this monitoring effort because during the seven years of measurements none of the monitor stations measured a PM_{10} MAAQS or NAAQS exceedance attributed to Mine operations (MDEQ 2017). Though $PM_{2.5}$ concentrations were not directly measured, $PM_{2.5}$ is a minor fraction of PM_{10} for sources with predominately fugitive dust emissions. **Table B-2** presents the maximum average PM_{10} concentration measured near the Mine for the last five years monitoring was conducted.

Table B-2. Summary of PM_{10} Ambient Monitoring Near the Mine

Year	Highest Measured Value [a] ($\mu g/m^3$)	2nd Highest Measured Value [a] ($\mu g/m^3$)
2016	93.3	40.3
2015	48.7	28.0
2014	24.0	20.3
2013	54.3	32.0
2012	24.0	20.3
NAAQS/MAAQS [b]	150	

Sources: IML 2012, 2013, 2014, 2015, 2016.
[a] Values are the average over all monitoring sites of highest and second-highest 24-hour values measured at monitors operated near the Mine.
[b] The 24-hr PM10 MAAQS is not to be exceeded more than once per calendar year, and the 24-hr PM10 NAAQS is not to be exceeded more than once per year on average over 3 years.
$\mu g/m^3$ = micrograms per cubic meter; PM_{10} = particulate matter 10 microns or less in diameter.

Mine activities that could adversely affect air quality are constrained by several conditions in MAQP #3179-13 (MDEQ 2023). Operating restrictions include:

- Limit raw coal production to no more than 15.0 Mt during any 12-month rolling average;
- Use fabric filter baghouses to control particulate emissions from surface crushing operations;
- Limit the size of surface coal and other stockpiles to prescribed areas;
- Limit crushing capacity to a prescribed throughput rate; and,
- Develop and follow a fugitive dust control plan that includes prescribed mitigation measures.

The Mine is also subject to several opacity limits which effectively limit fugitive dust emissions and is subject to the Federal Coal Preparation and Processing Plants New Source Performance Standards (40 CFR Part 60, Subpart Y). Annual reporting requirements and unscheduled periodic inspections help ensure compliance with all applicable conditions.

SPE (2024) estimated the Mine's potential maximum annual emissions of criteria pollutants of concern. **Appendix C** summarizes the results of those estimates and the portion attributed to each 1.0 Mt of saleable coal produced for reference in this analysis. **Table B-3** presents estimated annual emissions (tons per year) from Mine operations at the rate of approximately 10.0 Mt of saleable coal per year.

Table B-3. Estimated Total Criteria Air Pollutant Emissions from Producing Approximately 10.0 Mt of Saleable Coal in 2023

Description	PM_{10}	$PM_{2.5}$	NO_X [a]	SO_2	CO	VOC [b]
Estimated Emissions (tons)	349	51	104	23	73	9

[a] Oxides of nitrogen, commonly quantified as a surrogate for the criteria pollutant NO_2 and for ozone.
[b] Volatile Organic Compounds. As a major component in atmospheric reactions that form ozone, VOCs are generally regulated as an ozone surrogate.
Mt = million tons; PM_{10} = particulate matter 10 microns or less in diameter; $PM_{2.5}$ = particulate matter 2.5 microns or less in diameter; NO_x = nitrous oxides; SO_2 = sulfur dioxide; CO = carbon monoxide; VOC = volatile organic compounds.

B.2 Rail Transport

Section 2.2.8 and **Section 3.1** of the EIS describe the rail transport route considered in this analysis. From the Mine, coal is hauled approximately 1,390 miles (one way) through Montana, Idaho, and Washington to Westshore Terminal at the Port of Vancouver, British Columbia, Canada. The route does not pass through any Class I areas. The rail transport route passes through or near a designated nonattainment area for SO_2 in Laurel and maintenance areas in Helena, Missoula, and Thompson Falls in Montana. The route does not pass through any designated nonattainment areas in Idaho or Oregon. In Washington, the route passes through or near maintenance areas for CO and PM_{10} in Spokane, a maintenance area for $PM_{2.5}$ in Tacoma, and a nonattainment area for SO_2 in Whatcom County.

Historically on average about 3 percent of the coal is not shipped overseas. A little over 1 percent on average is shipped by rail to the Superior Midwest Energy Terminal at Superior, Wisconsin and then barged to end users, typically in the Great Lakes Area. A little less than about 1 percent on average is shipped by rail to other domestic destinations. At little more than 0.5 percent on average is shipped by truck to customers in the region around the Mine. These locations include Graymont, Roundup and Harding, MT. All of the coal sold by the Mine is used for electrical power generation with the exception of the trucked coal in MT which is used in lime production and for heating. In December 2023, the Mine revised its Air Permit to allow for possible increases to coal hauled by truck, but currently has no contract to do this.

The emissions analysis does not consider the domestic destinations separately but conservatively assumes that 100 percent of the coal is shipped overseas and is combusted, which results in an overestimate of emissions because of the longer travel distances.

B.2.1 Locomotive Emissions

Under the CAA, EPA has issued emission standards for locomotives (40 CFR 92.8). States and localities are prohibited from creating statutes or rules that apply to mobile source emissions. Some municipalities, however, have coordinated with railroad operators to develop and implement plans to limit locomotive emissions at railyards.

Under current regulations (40 CFR Part 1033) EPA has established tiered emissions standards that apply to locomotive engines based on the year of manufacture or remanufacture. The standards, which limit emissions of NO_X, particulate matter, hydrocarbons, and carbon monoxide (CO), establish four tiers of increasingly stringent limits for newer engines. The most stringent limits (Tier 4) apply to engines manufactured or remanufactured in 2015 or later. Overall air pollutant emissions from locomotive fleets would decrease over time as old engines are retired and replaced with newer models.

Baseline criteria air pollutant emission rates for each 1.0 Mt of coal transported by rail between the Mine and Westshore Terminal were estimated using methods described in **Appendix C**. Those estimated emissions were used to estimate the total emissions from transporting approximately 10.0 Mt of saleable coal in 2023 (see **Table B-4**). Emission rates for each pollutant are estimated in tons per year as well as average pounds per mile (lb/mile) over the 2,780 miles trains travel round-trip, with the latter reflecting the transitory and distributed nature of locomotive emissions.

Table B-4. Estimated Total Criteria Air Pollutant Emissions from Transporting Approximately 10.0 Mt of Coal by Rail (Round-Trip) in 2023

Description	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC
Total Round-trip Emissions (tons)	58	58	2,111	2.4	615	91
Emissions Per Mile (lb/mile)	42	42	1,518	1.7	443	66

lb = pounds; Mt = million tons; NO_x = nitrous oxides; PM_{10} = particulate matter 10 microns or less in diameter; $PM_{2.5}$ = particulate matter 2.5 microns or less in diameter; SO_2 = sulfur dioxide; CO = carbon monoxide; VOC = volatile organic compounds.

PM_{10} and $PM_{2.5}$ emissions from diesel fuel combustion may also be referred to as diesel particulate matter (DPM), which is composed of elemental carbon particles with adsorbed organic compounds as well as condensed aerosols. EPA (2003, pg. 11) evaluated toxic effects of diesel exhaust, which includes DPM, and determined it is “likely to be carcinogenic to humans by inhalation from environmental exposures.” EPA (2003, pg. 9) also observed that DPM is a portion of ambient $PM_{2.5}$ and that the $PM_{2.5}$ NAAQS “would be expected to offer a measure of protection from effects associated with DPM.”

B.2.2 Coal Dust Emissions

Coal dust is generated by uncovered loaded coal trains as discussed in **Section 3.1** of the EIS. In addition to potential impacts related to rail safety, coal dust is identified as having potential to affect human health and environmental quality. Particulate emissions (i.e., PM_{10} and $PM_{2.5}$) can affect the heart and lungs and cause serious health effects (EPA 2022), and trace elements in coal could potentially affect the environment where coal dust deposition occurs.

In non-occupational settings, particulate matter and airborne dust are regulated by NAAQS. Because NAAQS regulate environmental exposure of the general population to all sources of particulate matter, these regulations are more stringent than standards regulating occupational exposure to coal dust at coal mines. There are no Federal or state guidelines or standards that identify acceptable levels specifically of ambient coal dust deposition.

B.2.3 BNSF Requirements and Actions Pertaining to Coal Dust

BNSF currently enforces the Safe Harbor provision in the BNSF Coal Loading Rule (BNSF 2015, 2017) to limit deposition (**Section 3.1.4** of the EIS). Since 2015, BNSF has also been operating a surfactant re-spray facility along its main line in Pasco, Washington to further limit coal dust. Coal trains traveling west along the main line route through the Columbia River Gorge are sprayed with a topper agent as it passes through to lessen potential coal dust release from rail cars (WDOE and Cowlitz County 2017).

On March 3, 2017, a consent decree (CASE NO. 2:13-cv-00967-JCC) was finalized between BNSF and the Sierra Club along with several other environmental groups settling a multi-year lawsuit over alleged coal and petroleum coke (petcoke) dust emissions from rail cars operating on rail routes in Washington State. Under this consent decree, BNSF will conduct a study on the feasibility of physical covers for coal and petcoke rail cars and pay $1 million to fund environmental projects across Washington State aimed at improving water quality or habitat. BNSF will also clean up coal and petcoke materials on or adjacent to BSNF’s right-of-way (on land only) at five locations in

Washington State and conduct follow-up inspections of each area two times during the period of the Consent Decree (WDOE and Cowlitz County 2017)

B.2.4 Coal Dust Generation, Dispersion, and Deposition

Comprehensive literature reviews on topics related to coal dust emissions, dispersion, and deposition were conducted by STB (2015) and WDOE and Cowlitz County (2017) to complete NEPA analyses for proposed projects involving coal transport by rail (with transport rates ranging from 10 to 70 trains per day). These prior analyses concluded that most coal dust from rail cars is generated from the top surface of the loaded rail car. The volume of dust emitted depends on several factors including the type and composition of the coal, moisture content, ambient wind speed and direction, precipitation, use of topper agents, size of rail car's top opening, the shape or profile of the coal surface in the car, the position of the car in the train, time and distance traveled, and train speed.

Connell Hatch (2008) estimated that rail cars, each containing approximately 90 tons of coal, could lose an average of 0.0035 percent of total load over trips between 100 and 300 miles (estimated 6 pounds for each car). WDOE and Cowlitz (2017) considered the estimate high given that the study did not make adjustments for moisture, including wetting or use of other dust control techniques such as toppers as required by the BNSF Coal Loading Rule.

STB (2015) modeling for a scenario with an additional 26.7 trains per day over current levels reported that at 50 meters from the rail line, the maximum annual increase in PM_{10} and $PM_{2.5}$ from coal dust would be 6.1 μg/m^3 and 1.2 μg/m^3, respectively. STB concluded that these predicted increases would be insufficient to lead to a violation of NAAQS for either PM_{10} or $PM_{2.5}$. Similarly, WDOE and Cowlitz (2017) concluded that adding predicted coal dust emissions from eight loaded and eight empty trains per day to background levels would not lead to a violation of NAAQS along the evaluated rail segments.

The distance between the rail and point of deposition (where dust settles on the ground) varies and depends primarily on the size of the particles, meteorological conditions including wind speed, and/or train speed (WDOE and Cowlitz County 2017). An Australian coal dust deposition study (as reported in Connell Hatch 2008, associated train traffic rates unknown) found that maximum dust deposition occurred at 3 meters from the track with a coal dust deposition rate of approximately 90 milligrams per square meter per day (mg/m^2/day). At 10 meters the deposition rate dropped to 30 mg/m^2/day. STB (2015) estimated the maximum modeled deposition rate would be 36 mg/m^2/day at 50 meters from the track for a scenario with an additional 26.7 loaded trains per day and use of topper agents.

B.2.5 Coal Dust and Human Health

From a human health perspective, inhalation of coal dust (particulate matter) is the primary exposure pathway of interest. Human exposure could also occur by ingestion of soil, sediment, water, agricultural products, fish, or other animals that have ingested soil or water affected by coal dust deposits. STB (2015) conducted dispersion modeling to assess potential health impacts from inhalation of coal dust. Based on model results, neither background conditions nor the addition of airborne coal dust from the high production level (26.7 trains per day) to the estimated background levels of particulate would cause particulate matter concentrations to exceed the NAAQS either alone or in combination with other Project-related PM_{10} or $PM_{2.5}$ particulate emissions, including exhaust emissions from locomotives and fugitive particulate matter from wind erosion.

STB (2015) used the air dispersion and deposition model in combination with a fate and transport model to estimate concentrations of chemicals in coal dust in soil, water, and sediment. The model results were used to analyze potential human health impacts from ingestion of coal dust based on applicable EPA screening levels. The study determined that concentrations of coal dust constituents (including trace elements in coal and the chemical constituents of coal topper agents) in soil, dust, water, and fish would be below EPA screening levels for human exposure for all evaluated pathways. Estimated concentrations in soil ranged from two to five orders of magnitude below the soil ingestion screening levels. For movement through soil to groundwater, none of the estimated trace metal concentrations exceeded the screening level values; most of these values were two to three orders of magnitude less than the screening levels.

B.2.6 Coal Dust and Ecological Health

As part of the same study noted above, STB (2015) combined the results of the modeling analysis discussed above to estimate chemical concentrations in soil, water, and sediment for evaluation of potential ecological impacts of the same project (26.7 loaded trains per day). Consistent with the study related to human health (ingestion), none of the chemical concentrations estimated for soil resulted in values greater than the EPA ecological soil screening levels for plants, soil invertebrates, avian wildlife, or mammalian wildlife.

STB (2015) estimated concentrations of coal dust constituents in surface water for the same project based on the average deposition from air over a modeled watershed and subsequent runoff and erosion into a modeled water body. Estimated values for water were well below available EPA freshwater screening benchmarks, with the exception of barium. However, based on the study's use of conservative assumptions, the concentration of barium in surface water was likely overestimated. When barium is released to water, the compound precipitates as barium sulfate, which has low solubility in water. As such, concentrations of soluble barium in surface water would not be expected to exceed benchmark or screening levels.

B.3 Seaport Handling

As discussed in **Section 2.1.7** of the EIS, nearly all coal from the Mine is shipped overseas from Westshore Terminal in British Columbia, Canada. Westshore Terminal is one of 27 major marine terminals that comprise the Port of Vancouver located in the Vancouver metropolitan area. The governments of Canada, British Columbia, and Metro Vancouver have developed several criteria pollutant ambient concentration standards and objectives as shown in **Table B-5**, and air quality is monitored in the Vancouver metropolitan area. Measured ambient pollutant concentrations at the station nearest to Westshore Terminal were all below the relevant air quality standards and objectives in 2020, the most recent year reported (Metro Vancouver 2022).

In 2013, an air quality study was conducted to evaluate local and regional baseline conditions and potential environmental impacts related to Westshore Terminal's proposed port improvement and expansion project (Westshore Terminal LP 2013). The study evaluated emissions from marine and rail traffic, cargo-handling equipment, and on-road vehicles. It projected air pollutant emissions that would result from terminal activities in 2018 under two scenarios of coal throughput: Scenario A—39.7 million tons per year (Mtpy) if the proposed expansion were to be completed, and Scenario B—36.4 Mtpy coal throughput if the project were not completed (the then-existing condition). Except for particulate emissions, the differences in criteria pollutant emission rates between the two scenarios were approximately 5 percent or less. The proposed port project was, however, expected to reduce particulate emissions by approximately 20 percent due to improvements in materials handling equipment. **Appendix C** presents estimated port-wide criteria pollutant emissions attributed to handling 1.0 Mt of coal based on existing port capacity and emission rates (i.e., Scenario B, above) as this reflects the more conservative (i.e., highest) estimated emission rates of the two scenarios (Westshore Terminal LP 2013). Although emission rates for some of Westshore Terminal's emitting units are not related to coal throughput by a direct linear correlation, the apportionment adequately describes the existing environment and is suitable for estimating emissions attributed to transferring approximately 10.0 Mt of coal from the Mine in 2023 (**Table B-6**).

Table B-5. Ambient Air Quality Criteria for Canada, British Columbia, and Metro Vancouver

Pollutant and Averaging Time	Canada CAAQS		British Columbia AQO		Metro Vancouver AQO	
	μg/m³	ppb	μg/m³	ppb	μg/m³	ppb
CO						
1-hour	NC	NC	14,900	13,000	14,900	13,000
8-hour	NC	NC	5,700	5,000	5,700	5,000
Formaldehyde						
1-hour	NC	NC	60	50	NC	NC
NO_2						
1-hour	79	42	113	60	113	60
Annual	23	12	32	17	32	17
Ozone						
1-hour	NC	NC	NC	NC	161	82
8-hour	117	60	NC	NC	122	62
PM_{10}						
24-hour	NC	NC	50	NA	50	NA
Annual	NC	NC	NC	NA	20	NA
$PM_{2.5}$						
24-hour	27	NA	25	NA	25	NA
Annual	8.8	NA	8	NA	8	NA
SO_2						
1-hour	170	65	196	75	183	70
24-hour	NC	NC	NC	NC	NC	NC
Annual	10	4	NC	NC	13	5

Sources: Government of British Columbia 2021, Tables 1 and 2; Metro Vancouver 2021, Table 1.
$\mu g/m^3$ = micrograms per cubic meter; AQO = Ambient Air Quality Objective; CAAQS = Canadian Ambient Air Quality Standard; CO = carbon monoxide; NA = not applicable; NC = no criterion has been established; NO_2 = nitrous dioxide; PM_{10} = particulate matter 10 microns or less in diameter; $PM_{2.5}$ = particulate matter 2.5 microns or less in diameter; ppb = parts per billion SO_2 = sulfur dioxide.

Table B-6. Estimated Total Criteria Air Pollutant Emissions from Transferring Approximately 10.0 Mt of Coal Through Westshore Terminal in 2023

Description	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC
Total Emissions (tons)	33	7	53	2	14	3

Mt = million tons; NO_x = nitrous oxides; PM_{10} = particulate matter 10 microns or less in diameter; $PM_{2.5}$ = particulate matter 2.5 microns or less in diameter; SO_2 = sulfur dioxide; CO = carbon monoxide; VOC = volatile organic compounds.

B.4 Ocean Transport

In 1973, the United Nations International Maritime Organization (IMO) developed the International Convention for the Prevention of Pollution from Ships. Modified in 1978, it is known as MARPOL 73/78. It forms a structure for regulations that help reduce and limit environmental damage from operational and accidental oil discharge, shipped cargo, sewage, garbage, and air pollutant emissions (IMO 2017). The last of these is addressed by Annex VI, "Regulations for the Prevention of Air Pollution from Ships," which entered into force in 2005 and was supported by 86 countries as of June 2016 (Čampcara et al. 2018). For the purposes of this assessment, Annex VI Regulations 13 and 14 are the most relevant.

- *Regulation 13:* Establishes three tiers of NO_X emission limits based on the year a vessel was manufactured and engine speed rating in units of revolutions per minute. Tier limits apply to manufacture dates as follows: Tier 1 after 1999, Tier 2 after 2010, and Tier 3 after 2015 (if operating in an Emissions Control Area, or ECA). ECAs apply for up to 200 nautical miles from the Canadian and United States Pacific coastline.
- *Regulation 14:* Limits SO_X and particulate matter in ship engine exhaust primarily by limiting sulfur content in fuel that is allowed to be combusted. It also establishes three tiers of limits based on the vessel manufacture date brackets. Different fuel sulfur limits apply to ships operating within and outside of designated ECAs.

Appendix C presents estimated criteria pollutant emissions from ocean transport of 1.0 Mt of coal. The one-way shipping distance was assumed to be 4,802 nautical miles, the approximate weighted average distance between Westshore Terminal and Japan, the South Korea, Hong Kong, and Chile. The weighted average distance accounts for the percentage of ocean transport trips to each location. Estimates reflect round-trip travel assuming the same emissions in both directions (i.e., emissions occurring over 9,604 nautical miles). Estimated baseline criteria air pollutant emissions from ocean transport of approximately 10.0 Mt of coal in 2023 are presented in **Table B-7.** Emission rates for each pollutant are estimated in total tons as well as lb/mile, with the latter reflecting the transitory and distributed nature of cargo vessel emissions.

Table B-7. Estimated Total Criteria Air Pollutant Emissions from Round-Trip Ocean Transport of Approximately 10.0 Mt of Coal in 2023 (units as shown)

Description	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC
Total Round-trip Emissions (tons)	301	277	12,017	1,672	872	412
Emissions Per Mile (lb/mile)	125	115	5,005	696	363	172

lb = pound; Mt = million tons; NO_x = nitrous oxides; PM_{10} = particulate matter 10 microns or less in diameter; $PM_{2.5}$ = particulate matter 2.5 microns or less in diameter; SO_2 = sulfur dioxide; CO = carbon monoxide; VOC = volatile organic compounds.

B.5 Overseas Combustion

As discussed in **Section 2.2.8** of the EIS, nearly all coal is sold to power generators in the South Korea, Japan, Hong Kong, and Chile. These countries therefore comprise the affected environment for analysis of overseas combustion effects on air quality. The three Asian countries maintain a structure of regulations designed to maintain or improve air quality by limiting pollutant emissions from coal-fired power plants. Chile has focused on retiring older coal power plants and with an aggressive schedule to decommission all but eight coal-fired power plants by 2025 (WRI, 2023).

B.5.1 South Korea

The ROK's (South Korea) Framework Act on Environmental Policy (ROK 2019) describes fundamental environmental policy goals for preventing pollution and managing natural resources for sustainable use. Air quality is managed under the Clean Air Conservation Act (ROK 2025). This act establishes examination and assessment of air pollutants, control on emissions of climate/ecosystem-changing substances, formulation of comprehensive plans to improve the atmospheric environment and permissible emission levels. This legislation establishes:

- A permitting and reporting system for facilities that emit one or more of 26 designated air pollutants;
- Permissible emission limits designed to progressively become more stringent as emissions control technology improves;
- Guidance programs and periodic inspections with the potential for prosecution related to noncompliance; and
- Improvement mandates and improvement charges in cases where emissions limits are exceeded.

B.5.2 Japan

Japan's Air Pollution Control Act directs the control and monitoring of air pollution under the direction of the Japan Ministry of the Environment (JMOE). JMOE has established environmental air quality standards for several pollutants (JMOE 2014). According to the United Nations Environment Programme, current standards are within World Health Organization targets, and "[a]ir quality in the country has improved dramatically over the past few decades even as the economy has grown, thanks to stringent legislation; Japanese cities [are] amongst [the] world's least polluted.…" (UNEP n.d.).

JMOE has established national standards limiting air pollutant emissions from stationary sources, and prefectural governors can set more stringent emissions standards within their jurisdiction as needed. Emission standards include: maximum permissible limits for each type and size of facility; special standards which are stricter for areas where air pollution has or is likely to exceed the limits; more stringent prefectural emission standard in areas where national emission standards might be insufficient to protect human health or living conditions; and standards for controlling total emissions that prescribe maximum limits for specific large-scale factories (UNEP n.d.).

B.5.3 Chile

Chile has laws and regulations in place to address air pollution under the Environmental Quality Law (20.417/2010). Here the Ministry of Environment (MMA) is responsible for policy design, regulatory drafting and information management. The MMA tracks six key performance indicators, some of them related to policy outcomes (e.g., incidence of severe air pollution episodes, number of non-attainment areas for air quality standards).

Chile has adopted broad array of emission standards, particularly in the area of air pollution control. The main elements of the environmental regulatory framework are environmental quality standards and sector-specific emission standards. Chile has adopted a range of regulatory requirements for air quality protection: a primary quality standard (designed to protect human health) for major pollutants, including fine particulate matter ($PM_{2.5}$), and national emission standards for furnaces, copper smelters and coal-fired power plants. National emission standards for coal fired power plants were established in 2011 (covering SO_X, NO_X, PM and mercury). The power plant emission standard is in effect for existing and new installations and has spurred investments in abatement and monitoring technology (OECD, 2016).

B.5.4 Hong Kong

The Environment and Ecology Bureau of Hong Kong Government has established emission allowances under the Hong Kong Air Pollution Control Ordinance. Since 2008 nine technical memorandums have been issued. The most recent ninth technical memorandum (Hong Kong, 2024) allowance retained the same emission caps for power plants as 2021 which caps annual emissions of SO_2, NO_X and respirable suspended particulates (RSPs) in 2026 and beyond. The emission allowances have dropped by 70 to 90 per cent as compared with those for 2010 set under the first technical memorandum. Hong Kong power companies will continue to acquire low-emission coal for electricity generation and maintain the performance of emission control devices to reduce emissions from coal-fired units while maximizing the generation of clean energy.

B.6 Mercury

Mercury emissions from coal combustion may be transported and deposited at considerable distances from the emission source. The deposited mercury can eventually accumulate in the food chain (EPA 2024). Exposure to mercury threatens human health, with developing fetuses and young children most at risk. Mercury pollution can also harm wildlife and ecosystems (EPA 2023a, 2023b). eventually depositing in rainfall or in dry gaseous form. Estimates of annual global mercury emissions from both natural and anthropogenic sources are in the range of approximately 5,500 to 8,800 tons per year, including re-emitted mercury (EPA 2024). Global emissions of mercury from anthropogenic sources are estimated at approximately 2,451 tons annually (UNEP 2019). **Table B-8** summarizes estimated 2015 mercury emissions from the US, Chile, Japan, Hong Kong, and South Korea.

Table B-8. Estimated Annual Mercury Emissions (US tons) in 2015

Sector	United States	Chile	Hong Kong	Japan	Republic of Korea
Stationary Fossil Fuel Combustion –Power Plants – Coal	21.1	1.2	0.6	1.4	1.9
Total Emissions, all sectors	40.0	20.9	1.6	16.5	7.7

Source: UNEP 2019.

Mercury emissions from both existing and new coal-fired power plants in the U.S. are regulated by EPA's Mercury and Air Toxics Standards (MATS) rule. EPA (2023b) estimates that the rule prevents approximately 90 percent of the mercury in coal burned in U.S. power plants from being emitted to the air. As domestic coal-fired power plants have worked to comply with these standards in recent years, mercury controls have also progressed and are available for coal-fired generation plants of various designs and ages in Chile, Hong Kong, Japan, and South Korea. Emissions reductions from these controls are reflected in the low levels of mercury emissions presented above in **Table B-8**.

B.7 Environmental Consequences

B.7.1 Direct and Indirect Effects

Effects on air quality are directly related to air pollutant emission rates that are generally proportional to the rate of saleable coal production across all segments as presented in **Section B.1.2** (above). Direct and indirect impacts are evaluated by quantifying annual emissions at the maximum rate of saleable coal production under each alternative for comparison to Mine production in 2023 as described in **Section B.1.2** (above).

Methods used to estimate emissions in this analysis are consistent with **Section B.1** of this Appendix and are further described in **Appendix C**, where annual emissions are presented on a 1.0 Mt basis.

B.7.1.1 No Action Alternative

Mining

Table B-9 shows estimated annual criteria pollutant emission rates related to Mine operations for saleable coal production rates under each alternative as well as a scenario of the Mine's potential maximum production rate.

Table B-9. Estimated Annual Total Criteria Air Pollutant Emissions from Mine Operations.

Saleable Coal Annual Production Rate	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC
No Action (approximately 10.0 Mt)	349	51	104	23	73	9
Proposed Action (approximately 7.1 Mt)	303	45	74	16	52	6
Partial Mining Action (approximately 10.0 Mt)	349	51	104	23	73	9
Potential Maximum Annual Production Rate (12.0 Mt) [a]	380	56	125	27	88	10

[a] The maximum annual production scenario was evaluated for dispersion modeling purposes and is not a NEPA alternative.
Mt = million tons; NO_x = nitrous oxides; PM_{10} = particulate matter 10 microns or less in diameter; $PM_{2.5}$ = particulate matter 2.5 microns or less in diameter; SO_2 = sulfur dioxide; CO = carbon monoxide; VOC = volatile organic compounds.

Mining activities under the No Action Alternative would continue to be controlled by the existing MAQP #3179-13 (MDEQ 2023) and the underlying regulations which are designed to prevent major impacts for 1 additional year (see **Section B.1.1** above). Potential emissions would not change, and the Mine would continue to qualify as a "minor" or "area" (i.e., non-major) stationary emissions source. The Mine would also continue, under the Regional Haze Rule, to be a non-regulated source and would not be expected to adversely impact air quality at any Class I area for 1 additional year.

Ambient air monitoring has demonstrated that the Mine's historical impacts to local air quality have been minor with respect to applicable air quality standards (NAAQS and MAAQS). Although actual annual emissions from the No Action Alternative could increase relative to historical rates, they would not increase beyond levels associated with the MAQP limits (MDEQ 2023). MAQP limits are designed to ensure acceptable air quality impacts. The annual production rate of approximately 10.0 Mt under the No Action Alternative is less than the MAQP production rate limit.

Therefore, the Mine operations' direct and indirect impacts to air quality are expected to be minor. This conclusion is supported by MDEQ's February 2017 approval to terminate local air monitoring for PM_{10} (MDEQ 2017). Air quality impacts related to the No Action Alternative would also be short-term, lasting for 1 additional year while mining continues and then declining and eventually ceasing as the Mine is fully reclaimed in accordance with the Mine Permit.

Rail Transport – Locomotive Emissions

Table B-10 presents estimated annual criteria pollutant emissions related to transporting coal by rail between the Mine and Westshore Terminal at annual saleable coal production rates for each alternative. Emissions are presented as pounds per mile traveled, reflecting distribution of impacts over the 2,780 miles trains travel round-trip including rail segments that may see both loaded and unloaded rail traffic from both loaded and empty trains. Evaluating emissions on a local scale (per mile of track, in this instance) is more informative of potential for localized impacts than evaluating total emissions.

Table B-10. Estimated Annual Total Criteria Air Pollutant Emissions from Rail Transport (lb/mile).

Alternative (Saleable Coal Annual Production Rate)	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC
No Action (approximately 10.0 Mt)	42	42	1,518	2	443	66
Proposed Action (approximately 7.1 Mt)	29	29	1,078	1	314	47
Partial Mining Action (approximately 10.0 Mt)	42	42	1,518	2	443	66
Potential Maximum Annual Production Rate (12.0 Mt)	50	50	1,822	2	531	79

Mt = megaton; PM_{10} = particulate matter 10 microns or less in diameter; $PM_{2.5}$ = particulate matter 2.5 microns or less in diameter; NO_x = nitrous oxides; SO_2 = sulfur dioxide; CO = carbon monoxide; VOC = volatile organic compounds.

At these emission rates, impacts on air quality from rail transport under the No Action Alternative are expected to be negligible and short-term, lasting 1 year. Emissions would be distributed over long distances and transitory in nature. As discussed in **Section B.1.2** (above), rail routes do not encroach on any Class I areas, and areas with historically degraded air quality are likely to have developed mitigation measures. Along routes passing through nonattainment areas, the increase in rail traffic under both Alternatives would be less than 50 percent and less than 3 trains per day (49 CFR § 1105.7), which is the threshold applied by STB for analysis of potential air quality impacts (STB 2015, Chapter 17).

Rail Transport – Coal Dust

WDOE and Cowlitz County (2017) and STB (2015) analyzed projects involving coal transport by rail at daily rates and a total duration greater than what would be undertaken under the No Action Alternative (1.8 loaded and 1.8 empty trains per day). These analyses concluded that potential adverse impact of coal dust is below regulatory standards for PM concentrations and below human health and ecological screening levels associated with subsequent deposition to soil and water. As such, there would be no measurable effect on human or ecological health. Given this, coal dust-related impacts associated with the No Action-related rail transport of coal would be negligible. Impacts on air quality would be short-term as the duration of mining and transport would be extended by 1 year. Coal dust deposited in soil and water would remain in the long term.

Seaport Handling

Table B-11 shows estimated annual criteria pollutant emissions related to transferring coal at Westshore Terminal at annual saleable coal production rates under each alternative.

Table B-11. Estimated Annual Total Criteria Air Pollutant Emissions from Operations at the Westshore Terminal

Alternative (Saleable Coal Annual Production Rate)	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC
No Action (approximately 10.0 Mt)	33	7	53	2	14	3
Proposed Action (approximately 7.1 Mt)	24	5	37	2	10	2
Partial Mining Action (approximately 10.0 Mt)	33	7	53	2	14	3
Potential Maximum Annual Production Rate (12.0 Mt)	40	8	63	3	17	3

lb = pound; Mt = million tons; NO_x = nitrous oxides; PM_{10} = particulate matter 10 microns or less in diameter; $PM_{2.5}$ = particulate matter 2.5 microns or less in diameter; SO_2 = sulfur dioxide; CO = carbon monoxide; VOC = volatile organic compounds.

At these emission rates, impacts on air quality from port operations under the No Action Alternative are expected to be negligible and short-term, lasting 1 year. As noted in **Section B.1.2**(above), measured ambient pollutant concentrations proximal to Westshore Terminal were all below the relevant air quality objectives and standards in 2014. Existing regulations would continue to ensure that individual emitting sources produce air quality impacts within regulatory limits protective of human and environmental health.

Ocean Transport

Table B-12 shows estimated annual criteria pollutant emissions related to transporting coal from the Westshore Terminal to Chile, Hong Kong, South Korea and Japan for each alternative. Emissions are presented as pounds per mile traveled round-trip because impacts are distributed over a large distance, similar to locomotive emissions, as discussed above.

Table B-12. Estimated Annual Total Criteria Air Pollutant Emissions from Ocean Transport (lb/mile)

Alternative (Saleable Coal Annual Production Rate)	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC
No Action (approximately 10.0 Mt)	5,005	125	115	363	172	696
Proposed Action (approximately 7.1 Mt)	3,554	89	82	258	122	494
Partial Mining Action (approximately 10.0 Mt)	5,005	125	115	363	172	696
Potential Maximum Annual Production Rate (12.0 Mt)	6,006	150	139	436	206	835

lb = pound; Mt = million tons; NO_x = nitrous oxides; PM_{10} = particulate matter 10 microns or less in diameter; $PM_{2.5}$ = particulate matter 2.5 microns or less in diameter; SO_2 = sulfur dioxide; CO = carbon monoxide; VOC = volatile organic compounds.

At these emission rates, impacts on air quality from ocean transport are expected to be negligible and short-term, lasting 1 year. Localized impacts would be negligible as emissions would be distributed over long distances and transitory in nature.

Overseas Combustion

Table B-13 shows estimated annual pollutant emissions related to combusting coal for power generation in Chile, Hong Kong, South Korea and Japan at annual rates for each alternative.

Table B-13. Annual Air Pollutant Emission Ranges from Combusting Coal in Japan, South Korea, Hong Kong, and Chile.

Alternative (Saleable Coal Annual Production Rate)	PM_{10} (tons)	$PM_{2.5}$ (tons)	NO_X (tons)	SO_2 (tons)	CO (tons)	VOC (tons)	Pb (lb)	Hg (lb)	As (lb)
Low Emission Range [a]									
No Action (approximately 10.0 Mt)	1,494	1,445	970	3,971	50	7	50	50	44
Proposed Action (approximately 7.1 Mt)	1,061	1,026	689	2,819	36	5	35	36	31
Partial Mining Action (approximately 10.0 Mt)	1,494	1,445	970	3,971	50	7	50	50	44
Potential Maximum Annual Production Rate (12.0 Mt)	1,793	1,734	1,164	4,765	60	8	60	60	52
High Emission Range [a]									
No Action (approximately 10.0 Mt)	2,938	2,287	38,750	19,855	625	88	994	306	873
Proposed Action (approximately 7.1 Mt)	2,086	1,624	27,513	14,097	444	62	705	217	620
Partial Mining Action (approximately 10.0 Mt)	2,938	2,287	38,750	19,855	625	88	994	306	873
Potential Maximum Annual Production Rate (12.0 Mt)	3,525	2,744	46,500	23,826	750	105	1,192	367	1,048

[a] Low emission range refers to higher emissions control efficiency and hence lower emissions from power plants; high emission range refers to lower emissions control efficiency and hence higher emissions from power plants.

As = arsenic; Hg = mercury; lb = pound; Mt = million tons; NO_x = nitrous oxides; Pb = lead; PM_{10} = particulate matter 10 microns or less in diameter; $PM_{2.5}$ = particulate matter 2.5 microns or less in diameter; SO_2 = sulfur dioxide; CO = carbon monoxide; VOC = volatile organic compounds.

As discussed in **Section B.5** (above), combustion activities at power plants in Chile, Hong Kong, South Korea, and Japan are subject to air quality control laws that would ensure emissions and resultant air quality are within acceptable (regulatory) limits considered protective of human health and the environment. The United Nations Environment Programme reports that ambient air quality standards in South Korea and Japan are within World Health Organization (WHO) targets (UNEP 2016a, 2016b). The United Nations Human Rights Office reports that ambient air quality standards in Chile are not within WHO targets (UNHRO 2023). The Hong Kong Environment Bureau reports that ambient air quality standards in Hong Kong are within WHO targets (HKEB 2021.) Given this, air quality impacts from combustion would be minor and would be short-term, lasting 1 year. Impacts in Chile could be greater in a relative sense because Chilean ambient air quality standards are not within WHO targets. Impacts from past, present, and RFFAs related to mercury are discussed below.

Proposed Action

Under the Proposed Action, the Mine would continue to produce and ship coal at an average annual production rate of approximately 7.1 Mtpy. Production would last for 9 years, or approximately 8 years longer than with the No Action Alternative. Annual emissions and air quality effects from the Proposed Action would be less than those resulting from the No Action Alternative because of the lower anticipated production rate of approximately 7.1 Mtpy but would continue for 9 years. Air quality impacts related to the Proposed Action would be minor for Mine operations (**Table B-9**) and negligible for rail and ocean transport (**Tables B-10** and **B-12**) and terminal operations (**Table B-11**). The degree of impacts from overseas combustion would depend on emission controls and local conditions within Chile, Hong Kong, South Korea and/or Japan but would be minor due to existing regulations in place that are considered protective of human health and the environment as noted above (**Table B-13**). Air quality impacts from all segments would be short-term, but under the Proposed Action would persist for 9 years compared to 1 year under the No Action Alternative. As discussed in **Section B.1.2** (above), impacts would be expected to decrease over time as equipment (e.g., locomotive engines, ship engines, boilers, etc.) that emits air pollutants is retired and replaced and as regulations become more stringent over time.

The Proposed Action would result in a lower rail transport rate than the No Action Alternative (approximately 1.3 loaded and 1.3 empty trains per day) and indirect impacts associated with generation of coal dust would be negligible. Though effects would occur for 9 years under the Proposed Action compared to 1 year under the No Action Alternative, the duration of air quality effects is still considered short-term as the effects would cease after rail transport of the Mine's coal concludes. As with the No Action Alternative, coal dust deposited in soil and water would remain in the long term.

B.7.2 Partial Mining Alternative – Alternative 1

This alternative would establish a 5-year term to mine federal coal within AM 3 until approximately 2030, at which time no additional federal coal would be mined. Under this alternative, mining in AM 3 would be sequenced over a 5-year period at a rate of approximately 10.0 Mt of saleable coal per year. Because the rate of approximately 10.0 Mt of saleable coal per year is the same as for the No Action Alternative, annual air quality effects also would be the same as with the No Action Alternative. However, under the Partial Mining Alternative effects would cease after 5 years rather than the 9-year period of the Proposed Action or the 1-year period of the No Action Alternative.

After the cessation of mining, effects from reclamation would be the same as for the Proposed Action and would persist for the same duration.

B.7.3 Impacts from Past, Present and Reasonably Foreseeable Future Actions

Assessment of impacts from past, present, and RFFAs is inherent to evaluation of air quality impacts due to the combined effects of multiple emission sources on an affected area, whether it be the air quality in the vicinity of a monitoring station, an airshed, a region, or the world as a whole. Air pollutant emissions directly related to mining and indirectly resulting from rail transport, port operations, ocean transport, and combustion occur in a highly regulated context, as described in **Section B.1** (above).

Mine-related emissions in the U.S. occur in a general environment of improving air quality. The EPA (2024) reports: "While some pollutants continue to pose serious air quality problems in areas of the U.S., nationally, criteria air pollutant concentrations have dropped significantly since 1990 improving quality of life for many Americans."

As in the US, government environmental agencies in Chile, Hong Kong, Japan and South Korea continually monitor ambient air quality to ensure maintenance of acceptable conditions and progress toward improvement where conditions are unacceptable. These multiple regulatory restrictions and monitoring programs help to address and minimize air quality impacts.

As discussed in **Section B.1.2** (above), most emissions affect air quality in areas proximal to the emissions source and result in short-term effects as they dissipate rather than accumulate over time. Though mercury air emissions also dissipate in the atmosphere, elemental mercury can travel long distances before depositing to soil and water where it accumulates and can be reemitted, resulting in long-term effects. Estimated mercury emissions from combusting approximately 10.0 Mt of coal (the Mine's maximum long-term output) would constitute approximately 0.05 percent to 0.25 percent of combined annual mercury emissions of Chile, Hong Kong, South Korea, and Japan (see **Section B.5**, above).

Total annual mercury emissions range from 0.025 to 0.15 tons under the No Action Alternative or the Partial Mining Alternative, and from 0.018 to 0.11 tons under the Proposed Action, accounting for between 0.0007 and 0.0062 percent of global mercury emissions (2,451 tons annually; UNEP 2019). Existing regulations in Chile, Hong Kong, South Korea and Japan and increasing implementation of mercury controls similar to those implemented in the U.S. (see **Section B.1.1**, above) are expected to reduce mercury accumulation in the environment in the short term and long term.

Though the extent of impacts from past, present, and RFFAs on air quality would vary with the specific related activity and location, the factors identified above indicate that overall impacts on air quality resulting from criteria pollutants and arsenic emissions would be minor and short-term. Mercury emissions would be minor and have long-term effects as they are combined with global emissions and accumulate in the environment.

Coal dust resulting from the No Action and Proposed Action would combine with dust generated from other past, present and reasonably foreseeable coal haulage. Continued implementation of BNSF's Coal Loading Rule (BNSF 2015, 2017) ensures that coal dust emissions are minimized on BNSF owned and operated rail lines, thereby minimizing the potential for coal-dust related emissions and subsequent deposition to soil and water. Increases to port capacity are not foreseeable, so the future rate of coal transport on the Main Line would not change significantly from recent shipping rates. Based on this and the findings of evaluations for other rail transport projects (WDOE and Cowlitz County 2017, STB 2015), Project-related coal dust emissions, dispersion and deposition would result in negligible long- term impacts on air quality and the environment.

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Appendix C
Air Emissions

Due to the large size of the complete Bull Mountains Mine Emissions Inventory, it is available upon request. Please submit all requests in writing to mcalle@osmre.gov.

This appendix provides supports the EIS's descriptions of the existing conditions in **Section 3.2** (Air Quality) and **Section 3.3** (Climate) and also supports the impact analysis for air quality and climate in **Sections 4.2** and **4.3**, respectively, and **Appendix B**. Content is organized to separately evaluate emissions from the following "segments": mining operations, rail transport, seaport operations, ocean transport, and combustion in both ROK and Japan. This presentation has three objectives:

- Estimate emissions of pollutants of concern (i.e., "criteria" pollutants for which NAAQS are defined and heavy metal HAPs from coal combustion) resulting from mining, transport, and combustion of 1.0 Mt of coal from the Mine.
- Estimate GHG emissions as CO_2e emissions from mining, transport, and combustion of 1.0 Mt of coal from the Mine.
- Identify data, assumptions, and methods used to calculate the foregoing emissions estimates.

Mining activities, transport, and combustion locations described in EIS **Chapter 2** informed preparation of this appendix and attendant exhibits presenting emissions estimates. Emissions are estimated on a 1.0 Mt (shipped coal) basis to provide a means of comparing emissions associated with different annual production rates analyzed in the EIS.

C.1 Pollutant Emissions

The EIS evaluates existing air quality and future Project-related air quality impacts in part by quantifying potential emissions of criteria air pollutants PM_{10}, $PM_{2.5}$, NO_X (a surrogate for NO_2), SO_2, CO, and VOCs (as a surrogate for ozone), as well as heavy metals of concern from combustion (mercury, lead, and arsenic; lead is also a criteria pollutant). This section discusses emissions of these pollutants.

C.2 Mine Operations

Potential air pollutant emission rates were calculated to support the EIS consistent with the Mine's MAQP (#3179-13, December 2023). **Exhibit 1** summarizes the potential Mine operating emissions reported in the MAQP and estimates emissions for each 1.0 Mt of saleable coal produced for reference in the EIS.

CO_2e calculations presented in **Exhibit 1** are discussed below in **Section C.7.1.**

C.3 Rail Transport

Inputs and equations used to estimate locomotive engine emissions between the Mine and Westshore Terminal (see **Section 3.2** of the EIS) are presented in **Exhibit 2**. Calculations are based on emission factors derived from a projected 2023 locomotive age distribution of BNSF's fleet as presented in a draft EIS for the proposed Tongue River Railroad (STB 2015) (**Exhibit 1, Table E.1-8**). Those factors were checked against EPA national-average factors (EPA 2009) and found to closely agree, supporting their use in this analysis. While locomotive idling may occur in association with rail transport of coal from the Mine, specific locations and idle durations are not known; therefore, idling emissions are not included in locomotive emissions estimates.

Age-tiered pollutant emission factors prescribed by Federal rule 40 CFR Part 1033 are applied to the projected fleet age distribution to calculate weighted average factors for each air pollutant. Though the 2023-based factors are expected to decrease over time, they are considered adequate for this analysis. Over time, newer model locomotives with more stringent emissions limits will replace older models, thereby reducing fleet-wide emissions and emissions associated with coal transport.

Projected engine emission factors (STB 2015) relate the mass rate of pollutant emissions to a unit of energy expended to move coal (grams [g] of emissions per brake horsepower-hour [bhp-hr] of energy). To use these emission factors, the energy unit is first converted to fuel usage based on the amount of energy contained in a unit of diesel fuel. Because the original emission factor is expressed in units of “brake horsepower” rather than horsepower, the calculation includes a separate factor to derive usable energy from potential energy in diesel. That factor is calculated from constants reported by the EPA (EPA 1985). The resulting set of pollutant-specific emission factors is presented as tons of pollutant emissions per 1,000 gallons of diesel combusted (**Exhibit 2, Table E2-1**).

The amount of fuel required to transport a ton of coal is derived from BNSF’s 2023 fuel efficiency factor of 892 gross ton miles per gallon of diesel (BNSF 2023), where “gross ton miles” is “the weight of the train (excluding the locomotive) multiplied by the miles the train has traveled.” To derive pollutant-specific emission rates for transporting coal between the Mine and Westshore Terminal, this fuel efficiency factor is combined with the pollutant-specific emission factors (**Exhibit 2, Table E2-1**) and the following values:

- The distance between the Mine and Westshore Terminal, estimated to be 1,390 miles one-way (see EIS **Section 2.2**);
- The typical number of cars per coal train (125) and the total mass of coal per train (15,250 tons) (SPE 2017);
- The amount of coal one train can haul (15,250 tons) (SPE 2017); and
- The maximum weight of a train car loaded with coal (286,000 lb) (BNSF 2024).

The last three values are used to calculate loaded and empty train weights. Separate emissions are then calculated for a loaded train traveling to Westshore Terminal and an empty train returning to the Mine. These one-way emissions are combined to estimate total round-trip emissions per 1.0 Mt of shipped coal (**Exhibit 2, Table E2-1**). Those values are divided by the round-trip distance (2,780 miles) to estimate average pounds of emissions per round-trip mile (**Exhibit 2, Table E2-2**) for reference in the EIS.

CO_2e calculations presented in **Exhibit 2** are discussed below in **Section C.7.2.**

C.4 Seaport Operations

Estimated emissions related to coal handling at Westshore Terminal (see **Section B.3**) are presented in **Exhibit 3**. Emissions are estimated from information presented in a 2013 Environmental Impact Assessment (EIA) evaluating planned modifications at the facility (Westshore Terminal LP 2013). The EIA projected 2018 emission rates associated with annual seaport capacity of 36 Mt of coal (**Exhibit 3, Table E3-1**), reflecting conditions before modification (Westshore Terminal 2017a). The total emissions and seaport capacity are used to estimate the emissions attributed to each 1.0 Mt of coal transferred for reference in the EIS (**Exhibit 3, Table E3-2**).

CO_2e calculations presented in **Exhibit 3** are discussed below in **Section C.7.3.**

C.5 Ocean Transport

Inputs and equations used to estimate cargo vessel emissions between Westshore Terminal and Chile, Hong Kong, the ROK and Japan (see **Section B.4**) are presented in **Exhibit 4**. Calculations are based on emission factors that relate pollutant mass emissions in grams to the amount of energy a vessel's engine produces in one hour (kilowatt-hours, or kWh). Pollutant-specific factors are discussed below.

C.5.1 NO_X, SO_2, and Particulate Emission Factors

Exhibit 4, Table E4-2 shows NO_X emission limits established by the United Nations IMO for vessels manufactured after 1999. More stringent NO_X emission limits apply to ships operating within designated Emission Control Areas (ECAs), but they are not used because the only ECA within the coal shipping route extends about 200 miles from the Canadian Pacific coastline, a minor fraction of the overall ocean transport route. Vessels built before 2000 are not subject to the IMO NO_X limits. NO_X emissions from these older vessels are calculated using the larger of two fuel-dependent emission factors provided in the Westshore Terminal EIA (Westshore Terminal LP 2013, Appendix 1, page 25).

The IMO also limits the amount of sulfur a ship's fuel may contain. As with NO_X emissions limits, fuel-sulfur limits are based on vessel age and are different for ships operating within and outside an ECA. Consistent with assumptions made for NO_X, SO_2 and particulate emissions are calculated based on the limits that apply outside an ECA. The limits for three different vessel age brackets (pre-2012, 2012-2020, and post 2020) are shown in **Exhibit 4, Table E4-3**.

Calculated SO_2 emission factors are based on an average fuel consumption rate of 180 g of fuel per kWh of energy expended for 2-stroke main engines (Westshore Terminal LP 2013, Appendix 1, page 26). The amount of fuel combusted is converted into an amount of sulfur released based on the allowable sulfur content for each regulated vessel age group. An emission rate in units of grams SO_2 per kWh of energy is calculated for each age group assuming all sulfur is exhausted as SO_2.

Combustion particulate emissions are calculated from fuel sulfur content and particulate size factors using an equation provided in the Westshore Terminal EIA (Westshore Terminal LP 2013, Appendix 1, page 25).

Single emission factors for NO_X, SO_2, and particulate are calculated to represent the composite fleet of vessels that used Westshore Terminal in 2022. Age distributions are derived from 2022 vessel age data for the terminal (Olszewski 2023). These age distributions are combined with the age-group-specific emission rates to calculate emission factors (g/kWh) (**Exhibit 4, Table E4-4)**.

C.5.2 CO and VOC Emission Factors

The Westshore Terminal EIA (Westshore Terminal LP 2013, Appendix 1, page 25) presents CO and VOC emission factors (g/kWh) for an average ship's 2-stroke main engine.

C.5.3 Total Emissions

The following values are used to convert from g/kWh emission factors to emission rates per Mt of coal shipped (**Exhibit 4, Table E4-4)**.

- The main engine power rating (13,120 kW) is derived by interpolating between average values relating ship carrying capacity and engine power rating (MAN 2014).
- The engine load factor (0.8) is an average propulsion load under normal cruise speeds (Westshore Terminal LP 2013, page 24).
- Normal cruise speed (13 knots) is the median of a range reported in the Westshore Terminal EIA (2013, page 24).
- The average weight of coal per ship (145,000 tons/ship) is calculated from the total amount of coal shipped from Westshore Terminal in 2022 (28.4 Mt) (Westshore Terminal 2017b) and the number of ship calls that year (196 calls) (Olszewski, 2023).

Estimated emissions per 1.0 Mt of shipped coal are divided by the estimated average round-trip distance (9,604 miles) to calculate pounds of emissions per mile traveled for reference in the EIS (**Exhibit 4, Table E4-4**). Engine load, the primary factor determining cargo vessel air emissions, is about 10 percent lower for unloaded compared to fully loaded vessels. Vessel emissions are estimated assuming round trip loaded transport, which potentially overstates total emissions by up to approximately five percent.

CO_2e calculations presented in **Exhibit 4** are discussed below in **Section C.7.4.**

C.6 Overseas Combustion

Inputs used to estimate emissions from combusting coal for power generation in Chile, Hong Kong, the ROK and Japan (see **Section B.5**) are presented in **Exhibit 5**. Emissions are estimated using a combination of EPA emission factors and representative coal quality analysis. Due to national environmental regulations in all four countries, it is unlikely that a utility-scale generator would emit air pollutants without some means of emissions reduction. Therefore, calculations include estimated emissions control ranges for each non-GHG pollutant.

The EPA provides factors for emissions of criteria pollutants that result from uncontrolled coal combustion for several types of boiler and burner configurations (EPA 1998). Pulverized coal boilers are the most common boiler type used for utility-scale power generation. Therefore, pulverized coal boiler emission factors were reviewed, and the smallest and largest factors for each pollutant were used to establish ranges of potential emission rates for NO_X, SO_2, CO, filterable PM_{10}, and condensable particulate matter (C-PM). Filterable $PM_{2.5}$ emission factors are provided by EPA's Air Emissions Inventory Improvement Program (EPA 2001). Total PM_{10} and $PM_{2.5}$ emissions are the sum of filterable and condensable components. An EPA emissions background document (EPA 1993) provides a VOC emission factor for coal combustion in a pulverized coal boiler. Emission rates for trace metals are calculated assuming all metals present in the coal would be released in the exhaust.

Exhibit 5, Table E5-1 estimates minimum and maximum emissions control efficiencies for each pollutant selected based on nominal capabilities of typical control technologies most likely to be applied at utility-scale power generation facilities. The efficiency rate is the percentage of air pollutant that is removed from exhaust by the control device, whereby high efficiency would yield lowest emissions.

Control efficiencies are applied to the uncontrolled emission factors to estimate the range of controlled emissions resulting from coal combustion for reference in the EIS (**Exhibit 5, Table E5-2**). High emission estimates are the product of each pollutant's largest uncontrolled emission factor and its lowest control efficiency. Conversely, low emission estimates combine the smallest uncontrolled emission factor and the corresponding highest control efficiency.

CO_2e calculations presented in **Exhibit 5** are discussed below in **Section C.7.5.**

C.7 Greenhouse Gas Emissions

GHG emissions are estimated for each segment, from mining to combustion, to support analyses of potential climate impacts. The three primary GHGs of concern for combustion sources are CO_2, CH_4, and N_2O. Total GHG emissions are expressed as CO_2e emissions. CO_2e emission rates are calculated using Global Warming Potential (GWP) values from the latest Intergovernmental Panel on Climate Change (IPPC) Sixth Assessment Report (AR6) (IPCC, 2023), whereby non-CO_2 GHG emissions are converted to CO_2e emissions based on the energy each GHG absorbs relative to CO_2. As the reference gas, CO_2 has a GWP of 1.0 by definition.

Combined GHG emissions attributable to Mine operations, rail transport, seaport operations, ocean transport, and overseas combustion are presented in **Exhibit 7, Table E7-1**, which summarizes CO_2e emissions reported in **Exhibit 1 through Exhibit 6.** Additional details specific to CO_2e emissions estimates for each segment are presented in the following sections.

C.7.1 Mine operations

Information on the latest (2023) operating hours and load from the mining equipment operating both above ground and below ground was provided by Signal Peak Energy. This information was used to estimate GHG emissions along with operating information on stationary equipment operating at the mine, locomotives operating at the mine, and the electricity from the power grid to estimate the potential GHG emissions resulting from Mine operations. CO_2e emissions per 1.0 Mt of saleable coal (**Exhibit 1, Table E1-2**) are estimated using the same methods used for non-GHG emissions assuming a linear relationship between annual mine production and emissions as presented in **Section C.2**.

C.7.2 Rail Transport

Estimated emissions of CO_2, CH_4, and N_2O resulting from rail transport of 1.0 Mt of coal are calculated in the same manner as non-GHG emissions (see **Section C.3** above) and converted to CO_2e **(Exhibit 2, Table E2-1)**.

C.7.3 Seaport Operations

The Westshore Terminal LP 2022 ESG Report (2023) presented CO_2e emission rates per ton of shipped coal. The Westshore Terminals Annual Information Form for 2022 provided information on the amount of coal shipped in 2021. This estimate was used to estimate CO_2e emissions attributed to transferring 1.0 Mt of coal (**Exhibit 3, Table E3-2**).

C.7.4 Ocean Transport

CO_2e emissions from transporting 1.0 Mt of coal from Westshore Terminal to the ROK, Chile and Japan (**Exhibit 4, Table E4-5)** are estimated using the average bulk carrier power, engine size, service speed, and number of calls for the calculations. This is the same information as was used for the non-GHG emissions (see **Section C.5** above and **Exhibit 4**). GHG emissions calculations begin with an emission factor that relates emissions to power. GHG emissions are calculated based on the engine energy production using a combination of the main engine and auxiliary engine power needs and a set of emission factors (g/kWh for CO_2, CH_4, and N_2O). This information is combined with information on engine load, time in transit and propulsion power to determine emissions for each GHG emission and combined using their respective GWP to determine CO_2e. Non-GHG emissions are calculated in the same manner as GHG emissions.

C.7.5 Coal Combustion

Inputs and formulas used to estimate CO_2e emissions from combusting 1.0 Mt of coal from the Mine are presented in **Exhibit 5**. CO_2 emissions are calculated from the typical carbon content of the Mine's coal (58.15 percent) (SPE 2025). All but 1.0 percent of the carbon is assumed to react during combustion to become CO_2, and the molecular weights of carbon and CO_2 are used to convert carbon mass emissions to CO_2 emissions. Emission factors for CH_4 and N_2O provided in the EPA Mandatory GHG Reporting rule (40 CFR 98.33, Table C-2) are converted to pounds of emissions per ton of coal using a typical heat content (expressed as British thermal units, Btu) for the Mine's coal (10,194 Btu/pound or Btu/lb) (SPE 2025). Emissions are reported as tons of CO_2e emissions per 1.0 Mt of shipped coal (**Exhibit 5, Table E5-3**). These estimates are not specific to combustion overseas and would apply to any combustion location.

C.8 References

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Exhibit 1
Mine Operations Emissions

Table E1-1. Estimated Annual Emissions (tons per year) at the Mine from Producing 14.3 Mtpy of Raw Coal (SPE 2014, 2025; MDEQ 2023) [a,b]

Source Type	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC	CO_2e	CO_2	CH_4	N_2O
Mobile (Surface)	0.80	0.63	23.55	13.13	41.34	1.24	8,545	8,205	1.44	1.09
Mobile (Underground)	0.60	0.49	12.86	4.76	15.83	0.64	3,221	3,095	0.45	0.41
Locomotives (On-Site)	3.64	3.64	47.30	3.39	11.05	4.68	1,949	1,902	0.16	0.15
Stationary	1.43	1.38	20.29	1.45	4.81	2.02	1,093	1,052	0.12	0.14
Fugitive Dust	342.20	45.16	--	--	--	--	--	--	--	--
Electric-power needed	NA	NA	NA	NA	NA	NA	25,043	24,883	2.32	0.33
Total	348.66	51.30	104.01	22.73	73.02	8.58	39,850	39,138	4.49	2.12

Table E1-2. Estimated Total Mine Operations Emissions (tons) per 1.0 Mt of Saleable Coal [c,d]

	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC	CO_2e	CO_2	CH_4	N_2O
Tons Emitted per 1.0Mt Saleable Coal	206.43	30.86	10.40	2.27	7.30	0.86	3,985	3,914	0.45	0.21

Notes

General: "tons" are U.S. short tons. Mtpy - million tons per year

[a] Emissions estimates were prepared to represent the potential Mine emissions based on the extraction of 14.3 Mt tons of raw (unwashed) coal production per year. SPE estimates approximately 80 percent of raw coal becomes saleable coal, so 14.3 Mt of raw coal mined equates to approximately 11.4 Mt of saleable coal. This analysis conservatively assumes an annual saleable coal production rate of 10.0 Mt to result in a conservative emissions rate per 1.0 Mt of saleable coal.

[b] CO_2e values calculated using GWPs from the IPCC's Sixth Assessment Report.

[c] Emission rates from many of the Mine sources are estimated based on factors other than coal throughput rates (for example: engine size, disturbed exposed area, or vehicle miles traveled). Total Mine operations emissions therefore indirectly relate to coal production. Nevertheless, the assumption of a direct correlation between coal production and emissions over the range of annual throughput rates evaluated in the EIS (7.1 Mt to 12 Mt) adequately characterizes Mine operations emissions for the purpose of evaluating alternative actions. The resulting level of accuracy is commensurate with the level of accuracy inherent in the original estimates.

[d] Fugitive dust emissions from disturbed areas, coal stockpiles, and soil stockpiles (as provided in Exhibit 8) are assumed to remain constant under all alternatives evaluated in the EIS. The remaining fugitive dust emission sources are scaled dependent on the mining throughput rate of each alternative. Therefore, unlike the other air pollutant emissions, the PM_{10} and $PM_{2.5}$ fugitive dust emissions do not scale directly based on the mining throughput rates.

References for Exhibit 1

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Exhibit 2
Potential Locomotive Air Pollution Emissions Rail Transport from Mine to Westshore Terminal

NOTE: Values used to calculate emissions are identified by unique letters (i.e., "Value ID"). The source of values are either referenced or are calculated using the formulas provided, with inputs identified by Value ID.

Conversion Factors & Constants

Value		Units and Notes
453.6	*A*	g/lb
2,544	*B*	Btu/hp-hr
137,000	*C*	Btu/gal diesel; diesel fuel energy content (EPA 1995)
0.39	*D*	fraction of usable power, calculated [a]
2,000	*E*	lb/ton
Global Warming Potentials (unitless) (AR6 100-yr)		
These values are used to convert CO_2, CH_4, and N_2O emissions to CO_2e		
1	*F*	CO_2
29.8	*G*	CH_4
273	*H*	N_2O
Train and Transport Characteristics		
15,250	*I*	short tons coal/train (SPE 2017)
125	*J*	cars/train (SPE 2017)
286,000	*K*	lb/car, loaded (BNSF 2024)
143	*L*	tons/car, loaded; calculated $L = K / E$
17,875	*M*	tons/train; loaded train gross weight (without locomotives), calculated $M = J * L$
2,625	*N*	tons/train; empty train gross weight (without locomotives), calculated $N = M - I$
1,390	*Q*	mi/one-way trip [b]
2,780	*R*	mi/round trip; calculated
892	*S*	ton-mi/gal diesel, loaded gross weight basis [c] (BNSF 2023)

Table E2-1. Emission Factors and Estimated Round-trip Emissions from Transporting 1.0 Mt of Coal Round-Trip Between the Mine and Westshore Terminal.

	Pollutant Specific Emission Factor (g/bhp-hr)[d]	Emissions per 1,000 gallon of diesel fuel (tons)	One-way, Loaded train Emissions (tons)	One-way, Empty train Emissions (tons)	Total Round- trip Emissions (tons)
Value ID	*T*	*U*	*V*	*W*	*X*
Criteria Pollutants					
PM10	0.12	0.003	5.03	0.74	5.77
PM2.5	0.12	0.003	5.03	0.74	5.77
NOX	4.39	0.101	184	27.0	211.05
SO2	0.005	0.0001	0.21	0.03	0.24
CO	1.28	0.029	53.7	7.88	61.5
VOCs	0.19	0.004	8.0	1.17	9.1
Greenhouse Gases					
CO2	493.13	11.32	20,672	3,036	23,708
CH4	0.04	0.00	1.59	0.23	2
N2O	0.01	0.00	0.52	0.08	1
CO2e					23,923

Notes:

Table E2-1 Equations, with reference to Value IDs

$U = (T * C * D) / (A * B * E) * 10^3$

$V = [(U * Q) / (S * I)] * M * 10^3$

$W = [(U * Q) / (S * I)] * N * 10^3$

$X = V + W$

$CO2e = (X_{CO2} * F) + (X_{CH4} * G) + (X_{N2O} * H)$

Table E2-2. Estimated Average Emissions from Transporting 1.0 Mt of Coal per Mile between the Mine and Westshore Terminal

Description	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC	CO_2e	CO_2	CH_4	N_2O
Round-Trip Emissions Per Mile for each 1.0 Mt of Coal Transported (lb)	4.15	4.15	151.84	0.17	44.27	6.57	17,211	17,056	1.31	0.43

Note: "Per mile" here means per mile of route length, not per train-mile or other activity metric.

Table E2-2 Equations, with reference to Value IDs

Values = X * E / R

Notes

General: "tons" are U.S. short tons.

[a] Theoretical energy density of diesel is 53.8 hp-hr/gal. This is derived from the following conversion factors provided in AP-42, Appendix A (EPA 1985): 3.98E-04 hp/(Btu/hr) (mechanical) and 137,000 Btu/gal of diesel. EPA 2009 provides a factor to derive the usable power from a gallon of diesel combusted in a large line-haul locomotive: 20.8 bhp-hr/gal. The ratio of the usable (bhp-hr) and theoretical (hp-hr) energy is 0.39.

[b] See EIS Section 2.2.

[c] Indicates ability to move 892 tons of train (cargo plus train weight minus weight of locomotives) one mile with one gallon of diesel fuel (BNSF 2023).

[d] Values represent 40 CFR Part 1033 emissions standards weighted for estimated 2023 BNSF fleet make-up by locomotive manufacture/remanufacture date.

Provided by STB (2015)

References for Exhibit 2

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Exhibit 3
Potential Coal Terminal Emissions Westshore Terminal Operations

Input values

36 Mt/yr; Westshore Terminal projected coal handling [a] (Westshore Terminal LP 2013).

Table E3-1. Projected Westshore Terminal Emission Rates [a,b] (Westshore Terminal LP 2013).

Description	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC	CO_2e	CO_2	CH_4	N_2O
Total Emissions From 36 Mt Annual Port Throughput (tons)	119.68	24.11	189.51	8.95	51.45	10.49	22,122	22,048	0.88	0.18

Table E3-2. Estimated Westshore Terminal Emissions per 1.0 Mt of Saleable Coal Transferred.

Description	PM_{10}	$PM_{2.5}$	NO_X	SO_2	CO	VOC	CO_2e	CO_2	CH_4	N_2O
Emissions Attributed to each 1.0 Mt of Coal Transferred (tons)	3.32	0.67	5.26	0.25	1.43	0.29	614.49	612.44	0.024	0.005

Notes
General: "tons" are U.S. short tons.
[a] Coal throughput is converted to tons from reported metric tons (tonnes) in source (Westshore Terminal LP 2013). The coal throughput rate (36Mt) and emission rates are projected values for 2018 assuming the planned modifications are not implemented. The planned modifications are expected to allow for increased throughput and slightly decreased emissions per ton of coal.
[b] Individual GHGs derived from total CO2e emissions (Westshore Terminal LP 2013). Assumes AR2 GWPs based on Westshore Terminal analysis and GHG emissions profile for CO2, CH4, and N2O based on U.S. EPA emission factors for GHG inventories for heavy gas oils (U.S. EPA 2024).

References for Exhibit 3

Environmental Protection Agency (EPA). 2024. Emission Factors for Greenhouse Gas Inventories. Last Modified June 5, 2024

Westshore Terminal. 2013. Westshore Terminals Air Quality Study 2012-2018. Prepared by SNC-Lavalin Inc. for Westshore Terminals LP. September 19, 2013.

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Exhibit 4
Potential Cargo Vessel Air Pollution Emissions
Ocean Transport between Westshore Terminal and International Destinations

NOTE: Values used to calculate emissions are identified by unique letters (i.e., "Value ID"). The source of values are either referenced or are calculated using the formulas provided, with inputs identified by Value ID.

Table E4-1. Ship Characteristics

Propulsion Power (kW)	13,200			
Service Speed (kts)	14.50	@ 82.5% load		
Deadweight tons	125,509			
Route Characteristics				**Route Weighting (percentage of trips)**
Vancouver to Puerto Ventanas, Chile		5,903	nm	9.8%
Vancouver to Hong Kong		5,756	nm	4.7%
Vancouver to Kobe, Japan		4,550	nm	72.4%
Vancouver to Inchon, South Korea		5,027	nm	13.1%
Average weighted distance		4,802	nm	

Sources: SeaDistances.Org - https://sea-distances.org/; Email Correspondence between Dusty Weber, SPE, and Katie Wilson, ICF, on June 3, 2024.

Table E4-2. Ship Calls

25,800,000	metric tonnes coal shipped in 2016 from Westshore (Westshore Terminal 2017c)
100,407	average load per ship (MT) based upon being 80% loaded
257	Ship calls (total coal shipped ÷ average load per ship)

Table E4-3. Emission Factors – Transit

For Tier 1 ship running on 0.5% sulfur fuel. Starting 2020, 0.5% fuel must be used globally.
From Starcrest Consulting Group, Port of Los Angeles Inventory of Air Emissions - 2013, July 2014.
https://kentico.portoflosangeles.org/getmedia/9b47cda9-e282-458e-9a80-36b17e79c47c/2013_Air_Emissions_Inventory_Full_Report

	Emission Factors (g/kWh)								
Engine	NOx	PM10	PM2.5	CO	VOC	SOx	CO2	CH4	N2O
Propulsion	15.40	0.38	0.35	1.10	0.53	2.10	589	0.012	0.029
Auxiliary	11.57	0.38	0.35	1.10	0.42	2.30	696	0.008	0.029

Table E4-4. Loads – Transit

Propulsion Load Factor	0.75	
Speed	14.05	kts at 75% load
Auxiliary Load	580	kW
Time per Round Trip	684	hours

Notes: Based upon EEXI design
Source: International Maritime Organization, *2018 Guidelines on the Method of Calculation of the Attained Energy Efficiency Design Index (EEDI) for New Ships,* October 2018. https://wwwcdn.imo.org/localresources/en/KnowledgeCentre/IndexofIMO Resolutions/MEPCDocuments/MEPC.308(73).pdf

Table E4-5. Emissions – Transit

	Emissions (Metric Tons)								
	NO_X	PM_{10}	$PM_{2.5}$	CO	VOC	SO_X	CO_2	CH_4	N_2O
Per Trip	108.83	2.72	2.51	7.88	3.73	15.13	4,263	0.08	0.21
Per Year	27,965	700	644	2,025	959	3,887	1,095,324	22	53

Table E4-6. Loads and Times – Hoteling

Average Hoteling Time	51.6	hr
Average Auxiliary Load	501	kW
Average Boiler Load	156	kW
Total Calls	257	

Source: Starcrest Consulting Group, Port of Long Beach Air Emissions Inventory - 2021, August 2022
https://kentico.portoflosangeles.org/getmedia/f26839cd-54cd-4da9-92b7-a34094ee75a8/2021_Air_Emissions_Inventory

Table E4-7. Emission Factors – Hoteling

Location	Engine	NO_X	PM_{10}	$PM_{2.5}$	CO	VOC	SO_X [a]	CO_2	CH_4	N_2O
Vancouver	Auxiliary	11.57	0.19	0.17	1.10	0.42	0.42	696	0.008	0.029
	Boiler	1.97	0.20	0.19	0.20	0.11	0.59	962	0.002	0.075
Japan/Korea	Auxiliary	11.57	0.38	0.35	1.10	0.42	2.30	696	0.008	0.029
	Boiler	1.97	0.20	0.19	0.20	0.11	3.10	962	0.002	0.075

Sources:
Japan/Korea: Starcrest Consulting Group, Port of Los Angeles Inventory of Air Emissions - 2013, July 2014.
https://kentico.portoflosangeles.org/getmedia/9b47cda9-e282-458e-9a80-36b17e79c47c/2013_Air_Emissions_Inventory_Full_Report
Vancouver: Starcrest Consulting Group, Port of Long Beach Air Emissions Inventory - 2021, August 2022 [a] Vancouver uses 0.1% sulfur fuel while Japan/Korea will use 0.5% sulfur fuel.
[a] Vancouver uses 0.1% sulfur fuel while Japan/Korea will use 0.5% sulfur fuel.

Table E4-8. Emissions – Hoteling

	Emissions (Metric Tonnes)								
	NO_X	PM_{10}	$PM_{2.5}$	CO	VOC	SO_X	CO_2	CH_4	N_2O
Per Trip	0.63	0.02	0.02	0.06	0.02	0.10	51.44	0.00	0.003
Per Year	162	5	4	15	6	26	13,217	0.1	1

Table E4-9. Total Emissions (Hoteling plus transit) at Westshore Terminal

Emissions for total coal shipped: 25,800,000 metric tonnes coal shipped in 2016 from Westshore (Westshore Terminal 2017c)

	Emissions (Metric Tonnes)									
Time Period	NO_X	PM_{10}	$PM_{2.5}$	CO	VOC	SO_X	CO_2	CH_4	N_2O	CO_2e
Per Trip	109.46	2.74	2.52	7.94	3.75	15.23	4,314	0.08	0.21	4374
Per Year	28,127	704	649	2,041	965	3,912	1,108,541	22	54	1,123,957

Table E4-10. Total Emissions (Hoteling plus transit) per 1.0 million tons of Saleable Coal

	Emissions (Metric Tonnes)									
Time Period	NO_X	PM_{10}	$PM_{2.5}$	CO	VOC	SO_X	CO_2	CH_4	N_2O	CO_2e
Per year	1090.18	27.30	25.14	79.10	37.39	151.64	42,967	0.84	2.10	43,564

Table E4-11. Data Used for EIS Table C-7 (x10 for 10.0 MT/yr)

	Emissions (US Tons)									
Description	NO_X	PM_{10}	$PM_{2.5}$	CO	VOC	SO_X	CO_2	CH_4	N_2O	CO_2e
Per year	1,201.70	30.09	27.71	87.19	41.21	167.16	47,362	0.93	2.31	48,021
Per route mile (lb), 10.0 mt	5,005	125	115	363	172	696	197,270	4	10	200,013

Exhibit 5
Potential Coal Combustion Air Pollution Emissions
Power Generation in Chile, Hong Kong, Japan and Republic of Korea

NOTE: Values used to calculate emissions are identified by unique letters (i.e., "Value ID"). The sources of values are either referenced or are calculated using the formulas provided, with inputs identified by Value ID.

Conversion Factors

1,000,000	*A*	μg/g
2,000	*B*	lb/ton
1,000,000	*C*	Btu/MMBtu

Typical Bull Mountains Mine Coal Characteristics

Value	ID	Units and Notes
10,194	*D*	Btu/lb coal, as-received basis (SPE 2023)
0.44	*E*	weight % sulfur, as-received basis (SPE 2023)
5.81	*F*	weight % ash, as-received basis (SPE 2023)
19.57	*G*	weight % moisture, as-received basis (SPE 2023)
58.15	*H*	weight % carbon, as-received basis (SPE 2023)
0.03	*I*	μg/g mercury (Hg), dry basis (SPE 2023)
2.61	*J*	μg/g arsenic (As), dry basis (SPE 2023)
2.97	*K*	μg/g lead (Pb), dry basis (SPE 2023)
0.03	*L*	μg/g Hg as-received basis; calculated $L = I / (1 + G/100)$
2.2	*M*	μg/g As as-received basis; calculated $M = J / (1 + G/100)$
2.5	*N*	μg/g Pb as-received basis; calculated $N = K / (1 + G/100)$

CRITERIA POLLUTANT EMISSIONS CALCULATIONS

Input Terms for Calculating Uncontrolled Emission Factors (Pulverized, Bituminous Coal)[a]

Value	*ID*	Units and Notes
38	*O*	unitless SO_X emission factor multiplier; all pulverized coal (PC) firing configurations (EPA 1998, Table 1.1-3)
2.3	*P*	unitless filterable PM_{10} emission factor multiplier; PC dry bottom firing configurations (EPA 1998, Table 1.1- 3)
2.6	*Q*	unitless filterable PM_{10} emission factor multiplier; PC wet bottom firing configuration (EPA 1998, Table 1.1- 4)
0.6	*R*	unitless filterable $PM_{2.5}$ emission factor multiplier; PC dry and dry bottom tangential (EPA 2001)
1.48	*S*	unitless filterable $PM_{2.5}$ emission factor multiplier; PC wet bottom (EPA 2001)
95	*T*	weight % fuel sulfur emitted as SO_2 (EPA 1998, Table 1.1-3)
0.1	*U*	Unitless total condensable particulate matter factor; PC firing without FGD [b, c, d] (EPA 1998, Table 1.1-5)
0.03	*V*	Unitless total condensable particulate matter term; PC firing without FGD [b, c, d] (EPA 1998, Table 1.1-5)

Uncontrolled Emission Factors (Pulverized, Bituminous Coal) [d]

Value	*ID*	Units and Notes
16	*W*	lb SO_2/ton coal; calculated *W = O * E * (T/100)*
9.7	*X*	lb NO_X/ton coal; PC, dry bottom, tangentially-fired with low-NO_X burner (EPA 1998, Table 1.1-3)
31	*Y*	lb NO_X/ton coal; PC, wet bottom, wall-fired and PC dry bottom, cell burner (EPA 1998, Table 1.1-3)
0.5	*Z*	lb CO/ton coal; all pulverized coal firing configurations (EPA 1998, Table 1.1-3)
13	*AA*	lb filterable PM_{10}/ton coal; low end, calculated *AA = F * P*
15	*BB*	lb filterable PM_{10}/ton coal; high end, calculated *BB = F * Q*
3.5	*CC*	lb filterable $PM_{2.5}$/ton coal; low end, calculated *CC = F * R*
9	*DD*	lb filterable $PM_{2.5}$/ton coal; high end, calculated *DD = F * S*
0.01	*EE*	lb total condensable PM/MMBtu; calculated *EE= (E * U) - V*
0.29	*FF*	lb total condensable/ton coal; calculated *FF = EE * D * E / F*

Uncontrolled Emission Factors (Pulverized, Bituminous Coal) [d]

Value	ID	Units and Notes
0.000	*GG*	lb Hg/ton coal; calculated
		*GG = L * E / D*
0.004	*HH*	lb As/ton coal; calculated
		*HH = M * E / D*
0.005	*II*	lb Pb/ton coal; calculated
		*II = N * E / D*
0.07	*JJ*	lb VOC/ton coal; PC, dry bottom (EPA 1993)

Table E5-1. Coal Combustion Emissions Control Efficiency Range [e]

Control Efficiency Range	Filterable PM_{10} [f] (%)	Filterable $PM_{2.5}$ [f] (%)	Cond. PM [f] (%)	NO_X (%)	SO_X (%)	CO (%)	VOC (%)	Pb (%)	Hg[g] (%)	As (%)
Low	98	98	0.0	75	75	75	75	98	39	98
High	99.9	99.9	0.0	98	95	98	98	99.9	90	99.9

Note: Cond. = Condensable

Table E5-2. Estimated Controlled Criteria Pollutant and HAP Emissions Ranges per 1.0 Mt of Coal Combusted.

Pollutant Emission Range	PM_{10}[h] (tons)	$PM_{2.5}$[h] (tons)	NO_X (tons)	SO_X (tons)	CO (tons)	VOC (tons)	Pb (lb)	Hg (lb)	As (lb)
Low	149.4	144.5	97.0	397.1	5.0	0.7	5.0	5.0	4.4
High	293.8	228.7	3875.0	1985.5	62.5	8.8	99.4	30.6	87.3

Table E5-2 Example Equations
*High NO_X emissions = (1 - (low NO_X control efficiency / 100)) * Y * C / B*
*Low PM_{10} emissions = (1 - (high NO_X control efficiency / 100)) * (AA+ EE) * C / B*

Greenhouse Gas Emissions Calculations

Conversion Factors

453.6	*KK*	g/lb
0.99	*LL*	unitless; carbon-CO_2 conversion factor (AP-42, Table 1.1-20)
44	*MM*	lb/lb-mol; CO_2 molecular weight
12	*NN*	lb/lb-mol; carbon molecular weight

Global Warming Potentials (unitless) (AR6 100-yr)		
1.00	*OO*	CO_2
29.80	*PP*	CH_4
273.00	*QQ*	N_2O
GHG Emission Factors		
11	*RR*	g CH_4/MMBtu (40 CFR 98.33, Table C-2)
1.6	*SS*	g N_2O/MMBtu (40 CFR 98.33, Table C-2)
GHG Emissions		
4,222	*TT*	lb CO_2/ton of coal, calculated
		*TT = L / 100 * LL * MM / NN * E*
0.49	*UU*	lb CH_4/ton of coal, calculated
		*UU = RR * G * E / (KK * F)*
0.072	*VV*	lb N_2O/ton of coal, calculated
		*VV = UU * G * E / (KK * F)*
4,256	*WW*	lb CO_2e/ton of coal, calculated

Table E5-3. Estimated CO_2e Emissions From Combusting 1.0 Mt of Coal From the Mine

	Total Emissions (tons)	Value ID
Total CO_2e emissions from combusting 1.0 Mt of coal	2,128,028	*XX*

Formula: XX = (WW / B * 10^6)

Table E5-4. Estimated GHG Emissions From Combusting 1.0 Mt of Coal From the Mine

	CO_2e	CO_2	CH_4	N_2O
Total GHG emissions from combusting 1.0 Mt of coal	2,128,028	2,110,845	247	36.0

Notes

General: "tons" are U.S. short tons.

[a] EPA 1998 provides emission factors for various pulverized coal, cyclone, stoker, and fluidized bed boiler designs. Only pulverized coal designs are used substantially for generating utility-scale electrical power.

[b] Emission factor = 0.1*S - 0.03, where 'S' is the coal sulfur content as a percent.

[c] FGD = flue gas desulfurization.

[d] The emission factors are for "all PM controls." Applicable condensable PM emissions control efficiencies are assumed to be negligible.

[e] Except as noted, values are representative estimates selected by the preparers for use in this analysis.

[f] "F-" indicates filterable fraction; "C-" indicates condensable fraction. All condensable fraction is assumed to be less than 2.5 microns.

[g] UNEP 2014, pg. 21.

[h] PM_{10} and $PM_{2.5}$ values include filterable and condensable fractions.

References for Exhibit 5

Environmental Protection Agency (EPA). 1993. Emission Factor Documentation for AP-42 Section 1.1 Bituminous and Subbituminous Coal Combustion. EPA, Office of Air Quality Planning and Standards, Research Triangle Park, NC. April 1993. Table 4-1, Background Document Check.

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———. 2001. Air Emissions Inventory Improvement Program. Volume II, Chapter 14. Uncontrolled Emission Factor Listing for Criteria Air Pollutants. July 2001. Available at: https://www.epa.gov/air-emissions-inventories/air-emissions-inventory- improvement-program-eiip. Accessed December 28, 2017

Signal Peak Energy (SPE). 2023. July 27, 2023 electronic data transmittal from SPE to OSMRE in response to OSMRE Data Request on July 27, 2023 regarding the coal characteristics.

United Nations Environmental Programme (UNEP). 2014. Mercury Emissions Capture Efficiency with Activated Carbon Injection at a Russian Coal-Fired Thermal Power Plant. September 2014. Section 7.5 Findings and conclusions - Hg emission reduction. Pg. 21.

Exhibit 6
Potential Haul Truck Emissions
Coal Sale Deliveries to Graymont, MT; Roundup, MT; and Hardin, MT

DEIS Table 2.2-1. Coal Sales Between 2018 and 2023

U.S. Power Plant Destination	2018	2019	2020	2021	2022	2023	Average
Coal Sold	7.52 Mt	7.00 Mt	5.91 Mt	7.41 Mt	7.25 Mt	7.56 Mt	7.11 Mt
Westshore, BC (Railed)	96.69%	96.23%	98.73%	98.56%	95.08%	98.48%	97.27%
Duluth-Superior, WI (Railed)	2.36%	1.88%	0.53%	0.00%	3.00%	0.00%	1.31%
Other Domestic (Railed)	0.40%	1.34%	0.10%	0.97%	1.39%	0.58%	0.81%
Graymont, MT (Trucked)	0.50%	0.51%	0.59%	0.45%	0.52%	0.39%	0.49%
Roundup, MT (Trucked)	0.04%	0.04%	0.04%	0.02%	0.02%	0.02%	0.03%
Hardin, MT (Trucked)	0.00%	0.00%	0.00%	0.00%	0.00%	0.53%	0.09%

Table E6-1. Haul Truck Delivery Parameters (per 1.0 Mt of Saleable Coal)

U.S. Power Plant Destination	Percentage of Total Sales (Average %)	Tons Trucked per 1.0 Mt of Saleable Coal (Mt/yr)	One-Way, Loaded Haul Truck Trips [a] (trips/yr)	Total One-Way Haul Truck Trips (trips/yr)	Haul Truck Trip Length [b] (mi)	Annual Haul Truck VMT (veh-mi)
Graymont, MT (Trucked)	0.49%	0.0049	122.5	245	200	49,000
Roundup, MT (Trucked)	0.03%	0.0003	7.5	15	19	285
Hardin, MT (Trucked)	0.09%	0.0009	22.5	45	80	3,600

[a] Assumes 40 U.S. Tons per truck load.
[b] Haul Truck Trip Length 1-way per Dusty Weber (SPE) email to Marcelo Calle (OSMRE) 6/10/24

Table E6-2. Estimated Emission Factors from Haul Truck Travel[1]

	PM_{10} (g/mi)	$PM_{2.5}$ (g/mi)	NO_X (g/mi)	SO_2 (g/mi)	CO (g/mi)	VOC (g/mi)	CO_2e (g/mi)	CO_2 (g/mi)	CH_4 (g/mi)	N_2O (g/mi)
Emission Rates	0.139	0.056	2.855	0.005	1.602	0.072	1,547	1493.25	0.014	0.197

Assumes emission factors are equal to the diesel-fueled combination long-haul truck at 50 mph, per Appendix A MOVES4 modeling.

Haul Truck Emissions Equation

Haul Truck Emissions (tons/yr) = *VMT * EF * (1/A) * (1/B)*

Value	ID	Units and Notes
See Table 6-1	*VMT*	Annual haul truck VMT
See Table 6-2	*EF*	Estimated emission factors from haul truck travel
453.59	*A*	g/lb
2000	*B*	lb/ton

Table E6-3. Estimated Emissions from Haul Truck Travel per 1.0 Mt of Saleable Coal[1]

U.S. Power Plant Destination	PM_{10} (tons/yr)	$PM_{2.5}$ (tons/yr)	NO_X (tons/yr)	SO_2 (tons/yr)	CO (tons/yr)	VOC (tons/yr)	CO_2e (tons/yr)	CO_2 (tons/yr)	CH_4 (tons/yr)	N_2O (tons/yr)
Graymont, MT (Trucked)	0.0075	0.0030	0.1542	0.0003	0.0865	0.0039	83.5761	80.6553	0.0008	0.0106
Roundup, MT (Trucked)	0.0000	0.0000	0.0009	0.0000	0.0005	0.0000	0.4861	0.4691	0.0000	0.0001
Hardin, MT (Trucked)	0.0006	0.0002	0.0113	0.0000	0.0064	0.0003	6.1403	5.9257	0.0001	0.0008
Total	0.0081	0.0033	0.1664	0.0003	0.0934	0.0042	90.2025	87.0501	0.0008	0.0115

Haul Truck Loading Fugitive Dust Emissions Equation

Haul Truck Loading Emissions Factor (lb fugitive dust/ton loaded) = *C * (0.0032) * ((D/5)^(1/3)) / ((E/2)^1.4)*

Value	ID	Units and Notes
0.35	*C*	Particle Size Multiplier for PM_{10}
0.053	*C*	Particle Size Multiplier for $PM_{2.5}$
3	*D*	Average wind speed (m/s)
6	*E*	Average moisture content (%)

Table E6-4. Estimated Emission Factors from Haul Truck Loading [a]

Activity	PM_{10} (lb/ton)	$PM_{2.5}$ (lb/ton)
Truck Loading	0.00020	0.00003

[a] Emission factors for haul truck loading based on AP-42 13.2.4.3 (Revision 11/2006) and haul truck delivery rates.

Table E6-5. Estimated Emissions from Haul Truck Loading per 1.0 Mt of Saleable Coal

U.S. Power Plant Destination	PM_{10} (tons/yr)	$PM_{2.5}$ (tons/yr)	NO_X (tons/yr)	SO_2 (tons/yr)	CO (tons/yr)	VOC (tons/yr)	CO_2e (tons/yr)	CO_2 (tons/yr)	CH_4 (tons/yr)	N_2O (tons/yr)
Graymont, MT (Trucked)	0.99	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roundup, MT (Trucked)	0.06	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hardin, MT (Trucked)	0.18	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	1.24	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Total Emissions from Haul Truck Travel and Loading

Table E6-6. Estimated Emissions from Haul Truck Travel and Loading per 1.0 Mt of Saleable Coal

U.S. Power Plant Destination	PM_{10} (tons/yr)	$PM_{2.5}$ (tons/yr)	NO_X (tons/yr)	SO_2 (tons/yr)	CO (tons/yr)	VOC (tons/yr)	CO_2e (tons/yr)	CO_2 (tons/yr)	CH_4 (tons/yr)	N_2O (tons/yr)
Graymont, MT (Trucked)	1.00	0.15	0.15	0.00	0.09	0.00	83.58	80.66	0.00	0.01
Roundup, MT (Trucked)	0.06	0.01	0.00	0.00	0.00	0.00	0.49	0.47	0.00	0.00
Hardin, MT (Trucked)	0.18	0.03	0.01	0.00	0.01	0.00	6.14	5.93	0.00	0.00
Total	1.25	0.19	0.17	0.000	0.09	0.00	90.20	87.05	0.00	0.01

Other Assumptions

U.S. tons of coal per truckload	40	Source: Dusty Weber (SPE) email to Katie Wilson (ICF) 6/3/24

Exhibit 7
Combined Greenhouse Gas Emissions

Table E7-1. Estimated Mine-Related CO_2e Emissions per 1.0 Mt of Saleable Coal.

Segment	CO_2e Emissions (tons)
Mine operations	3,985
Rail transport	23,923
Seaport operations	614
Ocean transport	48,021
Coal combustion	2,128,028
Haul truck transport	90
Total	2,204,662

Table E7-2. Estimated Mine-Related CO_2e Emissions for each Alternative.

Segment	No Action	Proposed Action	Partial Mining Action	Maximum 1-Year Scenario
Annual Saleable Coal Production (Mt)	10	7.1	10	12
Duration (years)	1	9	5	1
Mine operations (tons CO_2e)	39,850	228,341	199,250	47,820
Rail transport (tons CO_2e)	239,234	1,370,811	1,196,171	287,081
Seaport operations (tons CO_2e)	6,145	35,210	30,724	7,374
Ocean transport (tons CO_2e)	480,208	2,751,594	2,401,042	576,250
Coal combustion (tons CO_2e)	21,280,283	121,936,020	106,401,414	25,536,339
Haul truck transport (tons CO_2e)	902	5,169	4,510	1,082
Total (tons CO_2e)	22,046,622	126,327,145	110,233,110	26,455,947

Exhibit 8
Particulate Matter Emissions

Table E8-1. Estimated Mine-Related Fugitive Particulate Matter Emissions by Emission Category

Emission Category	Pollutant	Total Emissions (tons/yr)
PM10 Emissions		
Coal Stockpiles	PM_{10}	102.59
Disturbed Areas	PM_{10}	72.00
Soil Stockpiles	PM_{10}	16.04
Paved Road Fugitive Dust	PM_{10}	1.29
Grader	PM_{10}	3.16
Compactor	PM_{10}	0.00
Haul Truck Komatsu	PM_{10}	87.60
Water Truck	PM_{10}	7.90
Front End Loader - Large	PM_{10}	2.10
Front End Loader - Small	PM_{10}	0.52
Bulldozer	PM_{10}	9.34
Medium Excavator	PM_{10}	0.06
Large Excavator	PM_{10}	0.26
Shop Backhoe	PM_{10}	0.02
Maintenance Truck	PM_{10}	1.40
OTR Truck on Unpaved Road	PM_{10}	9.39
Crew Cab	PM_{10}	1.97
Pickup Truck - Diesel	PM_{10}	0.98
Pickup/Utility Vehicle - Gasoline	PM_{10}	10.56
Farm Tractor	PM_{10}	0.90
Conveyor Transfers	PM_{10}	7.10
Train and Truck Loadout	PM_{10}	2.14
Baghouses	PM_{10}	4.88
Total (less mine ventilation)		342.20
PM2.5 Emissions		
Coal Stockpiles	$PM_{2.5}$	15.39
Disturbed Areas	$PM_{2.5}$	10.80
Soil Stockpiles	$PM_{2.5}$	2.41
Paved Road Fugitive Dust	$PM_{2.5}$	0.32
Grader	$PM_{2.5}$	0.32
Compactor	$PM_{2.5}$	0.00
Haul Truck Komatsu	$PM_{2.5}$	8.76
Water Truck	$PM_{2.5}$	0.79
Front End Loader - Large	$PM_{2.5}$	0.31
Front End Loader - Small	$PM_{2.5}$	0.08

Emission Category	Pollutant	Total Emissions (tons/yr)
Bulldozer	$PM_{2.5}$	1.40
Medium Excavator	$PM_{2.5}$	0.01
Large Excavator	$PM_{2.5}$	0.04
Shop Backhoe	$PM_{2.5}$	0.00
Maintenance Truck	$PM_{2.5}$	0.14
OTR Truck on Unpaved Road	$PM_{2.5}$	0.94
Crew Cab	$PM_{2.5}$	0.20
Pickup Truck - Diesel	$PM_{2.5}$	0.10
Pickup/Utility Vehicle - Gasoline	$PM_{2.5}$	1.06
Farm Tractor	$PM_{2.5}$	0.09
Conveyor Transfers	$PM_{2.5}$	1.06
Train and Truck Loadout	$PM_{2.5}$	0.22
Baghouses	$PM_{2.5}$	0.73
Total (less mine ventilation)		45.16

Source: Pace. 2025. Personal communication from Pace to ICF. "Bull Mountain Fugitive Particulate Emissions and Apportionment Rev1.xlsx". March 15, 2025.

Table E8-2. Estimated Mine-Related Fugitive Particulate Matter Emissions by Source Category

Emission Category	Pollutant	Total Emissions (tons/yr)
PM10 Emissions		
Unpaved Road Fugitive Dust	PM_{10}	136.16
Paved Road Fugitive Dust	PM_{10}	1.29
Disturbed Areas	PM_{10}	72.00
Conveyor Transfers	PM_{10}	7.10
Train and Truck Loadout	PM_{10}	2.14
Soil Stockpiles	PM_{10}	16.04
Coal Stockpiles	PM_{10}	102.59
Total Fugitive Sources	PM_{10}	337.32
Point Sources (Baghouses)	PM_{10}	4.88
Total Mine Sources	PM_{10}	342.20
PM2.5 Emissions		
Unpaved Road Fugitive Dust	$PM_{2.5}$	14.23
Paved Road Fugitive Dust	$PM_{2.5}$	0.32
Disturbed Areas	$PM_{2.5}$	10.80
Conveyor Transfers	$PM_{2.5}$	1.06
Train and Truck Loadout	$PM_{2.5}$	0.22
Soil Stockpiles	$PM_{2.5}$	2.41
Coal Stockpiles	$PM_{2.5}$	15.39
Total Fugitive Sources	$PM_{2.5}$	44.43
Point Sources (Baghouses)	$PM_{2.5}$	0.73

Emission Category	Pollutant	Total Emissions (tons/yr)
Total Mine Sources	$PM_{2.5}$	45.16

Source: Pace. 2025. Personal communication from Pace to ICF. “Bull Mountain Fugitive Particulate Emissions and Apportionment Rev1.xlsx”. March 15, 2025.

Exhibit 9
Combined Criteria Air Pollutant and Greenhouse Gas Emissions

Table E9-1. Estimated Mine-Related Criteria Pollutant and CO2e Emissions per 1.0 Mt of Saleable Coal. (tons per year)

Segment	PM_{10} [a]	$PM_{2.5}$ [a]	NO_X	SO_2	CO	VOC	CO_2e	CO_2	CH_4	N_2O
Mine operations	206.4	30.9	10.4	2.3	7.3	0.9	3,985	3,914	0.449	0.212
Rail transport	5.8	5.8	211.1	0.2	61.5	9.1	23,923	23,708	1.827	0.591
Seaport operations	3.3	0.7	5.3	0.2	1.4	0.3	614	612	0.024	0.005
Ocean transport	30.1	27.7	1,201.7	167.2	87.2	41.2	48,021	47,362	0.931	2.311
Coal combustion (High Control Efficiency)	149.4	144.5	97.0	397.1	5.0	0.7	2,128,028	2,110,845	247.2	36.0
Coal combustion (Low Control Efficiency)	293.8	228.7	3,875.0	1,985.5	62.5	8.8	2,128,028	2,110,845	247.2	36.0
Haul truck transport	1.2	0.2	0.2	0.0003	0.1	0.004	90	87	0.001	0.011
Total [b]	541	294	5,304	2,155	220	60	2,204,662	2,186,528	250	39

[a] Fugitive dust emissions of PM_{10} and $PM_{2.5}$ do not scale directly based on the mining throughput rates (see Exhibit 1)
[b] Assumes low control efficiency for coal combustion.

Table E9-2. Estimated Mine-Related Criteria Pollutant and CO2e Emissions per 7.1 Mt of Saleable Coal. (tons per year)

Segment	PM_{10} [a]	$PM_{2.5}$ [a]	NO_X	SO_2	CO	VOC	CO_2e	CO_2	CH_4	N_2O
Mine operations	302.8	44.9	73.8	16.1	52	6.1	28,294	27,788	3.188	1.505
Rail transport	41.0	41.0	1,498.5	1.7	436.9	64.9	169,856	168,324	12.971	4.198
Seaport operations	23.6	4.8	37.4	1.8	10.1	2.1	4,363	4,348	0.173	0.035
Ocean transport	213.6	196.8	8,532.1	1,186.8	619.0	292.6	340,948	336,272	6.613	16.407
Coal combustion (Low Control Efficiency)	1,060.7	1,025.7	688.7	2,819.4	35.5	5.0	15,109,001	14,987,000	1,755	255.3
Coal combustion (High Control Efficiency)	2,085.8	1,623.8	27,513	14,097	443.8	62.1	15,109,001	4,987,000	1,755	255.3
Haul truck transport	8.8	1.4	1.2	0.002	0.7	0.03	640	618	0.006	0.081
Total [b]	2,676	1,913	37,655	15,303	1,562	428	15,653,102	15,524,349	1,778	278

[a] Fugitive dust emissions of PM_{10} and $PM_{2.5}$ do not scale directly based on the mining throughput rates (see Exhibit 1)
[b] Assumes low control efficiency for coal combustion.

Table E9-3. Estimated Mine-Related Criteria Pollutant and CO2e Emissions per 10.0 Mt of Saleable Coal. (tons per year)

Segment	PM_{10} [a]	$PM_{2.5}$ [a]	NO_X	SO_2	CO	VOC	CO_2e	CO_2	CH_4	N_2O
Mine operations	348.7	51.3	104.0	22.7	73.0	8.6	39,850	39,138	4.490	2.120
Rail transport	57.7	57.7	2,110.5	2.4	615.4	91.3	239,234	237,075	18.269	5.913
Seaport operations	33.2	6.7	52.6	2.5	14.3	2.9	6,145	6,124	0.243	0.050
Ocean transport	300.9	277.1	12,017	1,671.6	871.9	412.1	480,208	473,622	9.314	23.109
Coal combustion (Low Control Efficiency)	1,494.0	1,444.6	970.0	3,971.0	50.0	7.0	21,280,283	21,108,450	2,472.1	359.6
Coal combustion (High Control Efficiency)	2,937.8	2,287.0	38,750	19,855	625.0	87.5	21,280,283	21,108,450	2,472.1	359.6
Haul truck transport	12.5	1.9	1.7	0.003	0.9	0.04	902	870.5	0.008	0.115
Total [b]	3,691	2,682	53,036	21,554	2,200	603	22,046,622	21,865,280	2,504	391

[1] Fugitive dust emissions of PM_{10} and $PM_{2.5}$ do not scale directly based on the mining throughput rates (see Exhibit 1)
[2] Assumes low control efficiency for coal combustion.

Table E9-4. Estimated Mine-Related Criteria Pollutant and CO2e Emissions for the No Action Alternative. Assumes Approximately 10.0 Mtpy of Saleable Coal Production for 1 year. (tons)

Segment	PM_{10} [a]	$PM_{2.5}$ [a]	NO_X	SO_2	CO	VOC	CO_2e	CO_2	CH_4	N_2O
Mine operations	348.7	51.3	104.0	22.7	73.0	8.6	39,850.0	39,137.6	4.490	2.120
Rail transport	57.7	57.7	2,110.5	2.4	615.4	91.3	239,234.1	237,075.4	18.269	5.913
Seaport operations	33.2	6.7	52.6	2.5	14.3	3	6,144.9	6,124.4	0.243	0.050
Ocean transport	300.9	277.1	12,017.0	1,671.6	871.9	412.1	480,208.3	473,622.1	9.314	23.109
Coal combustion (Low Control Efficiency)	1,494.0	1,444.6	970.0	3,971.0	50.0	7.0	21,280,283	21,108,450	2,472.1	359.6
Coal combustion (High Control Efficiency)	2,937.8	2,287.0	38,750.0	19,855.0	625.0	87.5	21,280,283	21,108,450	2,472.1	359.6
Haul truck transport	12.5	1.9	1.7	0.003	0.9	0.04	902.0	870.5	0.008	0.115
Total [b]	3,691	2,682	53,036	21,554	2,200	603	22,046,622	21,865,280	2,504	391

[a] Fugitive dust emissions of PM_{10} and $PM_{2.5}$ do not scale directly based on the mining throughput rates (see Exhibit 1)
[b] Assumes low control efficiency for coal combustion.

Table E9-5. Estimated Mine-Related Criteria Pollutant and CO2e Emissions for the Proposed Action Alternative. Assumes Approximately 7.11 Mtpy of Saleable Coal Production for 9 years. (tons)

Segment	PM_{10} [a]	$PM_{2.5}$ [a]	NO_X	SO_2	CO	VOC	CO_2e	CO_2	CH_4	N_2O
Mine operations	2,725.5	402.4	664.6	145.2	467	54.8	254,641.7	250,089.2	28.69	13.54
Rail transport	368.6	368.6	13,486.2	15.4	3,932.2	583.7	1,528,706.0	1,514,911.6	116.74	37.79
Seaport operations	212.4	42.8	336.4	15.9	91.3	19	39,265.7	39,134.7	1.553	0.318
Ocean transport	1,922.7	1,770.8	76,788.7	10,681.3	5,571.3	2,633.6	3,068,531.2	3,026,444.9	59.52	147.67
Coal combustion (Low Control Efficiency)	9,546.5	9,230.9	6,198.3	25,374.7	319.5	44.7	135,981,007	134,882,996	15,797	2,297.7
Coal combustion (High Control Efficiency)	18,772	14,614	247,613	126,873	3,993.8	559.1	135,981,007	134,882,996	15,797	2,297.7
Haul truck transport	79.6	12.2	10.6	0.0	6.0	0.3	5,763.9	5,562.5	0.052	0.732
Total [b]	24,081	17,211	338,899	137,731	14,061	3,850	140,877,915	139,719,138	16,003	2,498

[1] Fugitive dust emissions of PM_{10} and $PM_{2.5}$ do not scale directly based on the mining throughput rates (see Exhibit 1)
[2] Assumes low control efficiency for coal combustion.

Table E9-6. Estimated Mine-Related Criteria Pollutant and CO2e Emissions for the Partial Mining Action Alternative. Assumes Approximately 10.0 Mtpy of Saleable Coal Production for 5 years. (tons)

Segment	PM_{10} [a]	$PM_{2.5}$ [a]	NO_X	SO_2	CO	VOC	CO_2e	CO_2	CH_4	N_2O
Mine operations	1,743.3	256.5	520.1	113.6	365	42.9	199,250.2	195,687.9	22.45	10.60
Rail transport	288.5	288.5	10,552.6	12.0	3,076.8	456.7	1,196,170.6	1,185,376.9	91.34	29.57
Seaport operations	166.2	33.5	263.2	12.4	71.5	15	30,724.4	30,621.8	1.215	0.249
Ocean transport	1,504.4	1,385.6	60,085.0	8,357.9	4,359.4	2,060.7	2,401,041.6	2,368,110.3	46.57	115.54
Coal combustion (Low Control Efficiency)	7,469.9	7,222.9	4,850.0	19,855.0	250.0	35.0	106,401,414	105,542,250	12,360	1,797.9
Coal combustion (High Control Efficiency)	14,688.8	11,435.2	193,750	99,275.0	3,125.0	437.5	106,401,414	105,542,250	12,360	1,797.9
Haul truck transport	62.3	9.5	8.3	0.01	4.7	0.2	4,510.1	4,352.5	0.041	0.573
Total[2]	18,453	3,409	265,179	107,771	11,002	3,013	110,233,110	109,326,399	12,522	1,954

[a] Fugitive dust emissions of PM_{10} and $PM_{2.5}$ do not scale directly based on the mining throughput rates (see Exhibit 1)
[b] Assumes low control efficiency for coal combustion.

Table E9-7. Estimated Mine-Related Criteria Pollutant and CO2e Emissions for the One-Year Maximum Mining Scenario. Assumes Approximately 12.0 Mtpy of Saleable Coal Production for 1 year. (tons)

Segment	PM_{10} [a]	$PM_{2.5}$ [a]	NO_X	SO_2	CO	VOC	CO_2e	CO_2	CH_4	N_2O
Mine operations	380.3	55.8	124.8	27.3	87.6	10.3	47,820.0	46,965.1	5.39	2.54
Rail transport	69.2	69.2	2,532.6	2.9	738.4	109.6	287,080.9	284,490.4	21.92	7.10
Seaport operations	39.9	8.0	63.2	3.0	17.2	3.5	7,373.8	7,349.2	0.292	0.060
Ocean transport	361.1	332.5	14,420.4	2,005.9	1,046.2	494.6	576,250.0	568,346.5	11.18	27.73
Coal combustion (Low Control Efficiency)	1,792.8	1,733.5	1,164.0	4,765.2	60.0	8.4	25,536,339	25,330,140	2,966.5	431.5
Coal combustion (High Control Efficiency)	3,525.3	2,744.4	46,500.0	23,826.0	750.0	105.0	25,536,339	25,330,140	2,966.5	431.5
Haul truck transport	15.0	2.3	2.0	0.0	1.1	0.1	1,082.4	1,044.6	0.010	0.137
Total [b]	4,391	3,212	63,643	25,865	2,641	723	26,455,947	26,238,336	3,005	469

[a] Fugitive dust emissions of PM_{10} and $PM_{2.5}$ do not scale directly based on the mining throughput rates (see Exhibit 1)
[b] Assumes low control efficiency for coal combustion.

Appendix D
Wildlife Occurrence Spreadsheet

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Table D-1. Species Recorded or Potentially Occurring in Wildlife Monitoring Area 1989–2023

			Year **																								
CLASS / Common Name	**Scientific Name**	**SOC***	**BLM Sent.**	**1989-1996**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Birds																											
American Avocet	*Recurvirostra americana*																						X				
American Coot	*Fulica americana*			X										X	X	X	X	X	X	X	X		X	X			
American Crow	*Corvus brachyrhynchos*			X	X	X		X	X	X	X	X	X	X	X	X			X	X	X			X	X		
American Goldfinch	*Spinus tristis*			X								X		X	X	X	X	X			X			X	X	X	X
American Kestrel	*Falco sparverius*			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
American Pipit	*Anthus rubescens*															X											X
American Redstart	*Setophaga ruticilla*																										
American Robin	*Turdus migratorius*			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
American Tree Sparrow	*Spizelloides arborea*																									X	X
American Wigeon	*Mareca americana*			X																							
Baird's Sandpiper	*Calidris bairdii*			X																							
Baird's Sparrow	*Centronyx bairdii*	SOC	S																					X			
Bald Eagle	*Haliaeetus leucocephalus*		S	X			X			X	X				X		X	X	X	X	X	X	X	X	X	X	
Bank Swallow	*Riparia riparia*			X	X		X							X	X	X	X										
Barn Swallow	*Hirundo rustica*			X								X		X	X	X				X		X			X		
Barred Owl	*Strix varia*													X													
Belted Kingfisher	*Megaceryle alcyon*			X																							
Black-billed Cuckoo	*Coccyzus erythropthalmus*	SOC	S																								
Black-billed Magpie	*Pica hudsonia*			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Black-capped Chickadee	*Poecile atricapillus*			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Black-headed Grosbeak	*Pheucticus melanocephalus*			X								X	X	X	X	X	X	X			X	X	X			X	
Blue-winged Teal	*Spatula discors*																X		X				X			X	
Bobolink	*Dolichonyx oryzivorus*	SOC																									
Bohemian Waxwing	*Bombycilla garrulus*			X													X								X		
Brewer's Blackbird	*Euphagus cyanocephalus*			X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X
Brewer's Sparrow	*Spizella breweri*	SOC	S	X							X	X	X	X	X	X	X	X	X	X	X		X		X		
Broad-winged Hawk	*Buteo platypterus*																									X	
Brown Creeper	*Certhia americana*	SOC																									
Brown Thrasher	*Toxostoma rufum*															X	X	X	X	X	X	X		X		X	X
Brown-headed Cowbird	*Molothrus ater*			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Bullock's Oriole	*Icterus bullockii*			X					X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Burrowing Owl	*Athene cunicularia*	SOC	S																								
Canada Goose	*Branta canadensis*			X							X		X	X	X	X	X		X	X	X	X	X	X	X	X	X
Canyon Wren	*Catherpes mexicanus*															X			X	X	X		X	X			
Cassin's Kingbird	*Tyrannus vociferans*					X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Cassin's Finch	*Haemorhous cassinii*	SOC													X								X				
Cedar Waxwing	*Bombycilla cedrorum*			X										X	X	X			X					X			

			Year **																								
CLASS / Common Name	**Scientific Name**	**SOC***	**BLM Sent.**	**1989-1996**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Chestnut-collared Longspur	*Calcarius ornatus*	SOC	S	X												X											
Chipping Sparrow	*Spizella passerina*			X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X
Chimney Swift	*Chaetura pelagica*																						X				
Cinnamon Teal	*Spatula cyanoptera*																									X	
Clark's Nutcracker	*Nucifraga columbiana*	SOC		X		X								X	X	X	X		X	X	X		X	X	X	X	
Clay-colored Sparrow	*Spizella pallida*					X					X	X	X				X										
Cliff Swallow	*Petrochelidon pyrrhonota*			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Common Grackle	*Quiscalus quiscula*			X												X	X	X	X	X	X	X		X	X	X	
Common Nighthawk	*Chordeiles minor*			X	X	X	X	X	X	X	X			X	X	X	X	X		X		X	X	X		X	
Common Poorwill	*Phalaenoptilus nuttallii*			X									X	X	X	X	X										X
Common Raven	*Corvus corax*			X					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Common Redpoll	*Acanthis flammea*			X																					X	X	
Common Yellowthroat	*Geothlypis trichas*			X		X	X		X							X	X	X	X								
Cooper's Hawk	*Accipiter cooperii*			X										X			X				X			X	X	X	
Cordilleran Flycatcher	*Empidonax occidentalis*			?[j]										X	X	X											
Dark-eyed Junco	*Junco hyemalis*			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Dickcissel	*Spiza americana*																										
Downy Woodpecker	*Dryobates pubescens*			X										X	X	X	X	X	X	X	X	X		X			X
Dusky Flycatcher	*Empidonax oberholseri*													X	X	X	X	X								X	X
Eared Grebe	*Podiceps nigricollis*																										
Eastern Bluebird	*Sialia sialis*																X										
Eastern Kingbird	*Tyrannus tyrannus*			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Eastern Phoebe	*Sayornis phoebe*			X[j]																							
Eastern Screech-Owl	*Megascops asio*																										
Eastern Wood-Pewee	*Contopus virens*			?[j]																							
Eurasian Collared-Dove	*Streptopelia decaocto*																							X			
European Starling	*Sturnus vulgaris*			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Evening Grosbeak	*Coccothraustes vespertinus*	SOC		X													X	X	X								
Ferruginous Hawk	*Buteo regalis*	SOC	S	X										X										X			
Gadwall	*Mareca strepera*																X									X	
Golden Eagle	*Aquila chrysaetos*	SOC	S	X		X		X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
Grasshopper Sparrow	*Ammodramus savannarum*			X		X				X	X	X					X						X		X		X
Gray Catbird	*Dumetella carolinensis*													X	X	X	X	X	X	X	X	X	X	X	X	X	
Gray Partridge	*Perdix perdix*													X		X											
Gray-crowned Rosy-Finch	*Leucosticte tephrocotis*	SOC		X													X										
Great Blue Heron	*Ardea herodias*	SOC		X										X									X	X		X	X
Great Horned Owl	*Bubo virginianus*			X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X
Greater Sage-Grouse	*Centrocercus urophasianus*	SOC	S																								
Green-tailed Towhee	*Pipilo chlorurus*	SOC															X										
Green-winged Teal	*Anas crecca*			X									X	X	X	X	X		X	X							X

			Year **																								
CLASS / Common Name	**Scientific Name**	**SOC***	**BLM Sent.**	**1989-1996**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Hairy Woodpecker	*Dryobates villosus*			X												X	X	X	X	X	X		X	X	X	X	X
Hermit Thrush	*Catharus guttatus*																X										
Hooded Merganser	*Lophodytes cucullatus*																X										
Hoary Redpoll	*Acanthis hornemanni*																										
Horned Lark	*Eremophila alpestris*			X	X	X	X	X	X	X	X	X	X	X	X	X	X					X	X	X			X
House Finch	*Haemorhous mexicanus*																										
House Sparrow	*Passer domesticus*			X			X	X	X	X	X						X								X		
House Wren	*Troglodytes aedon*			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Indigo Bunting	*Passerina cyanea*																										X
Killdeer	*Charadrius vociferus*			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Lark Bunting	*Calamospiza melanocorys*			X			X					X				X											
Lark Sparrow	*Chondestes grammacus*			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Lazuli Bunting	*Passerina amoena*													X	X	X	X									X	
Lesser Scaup	*Aythya affinis*																X										
Least Flycatcher	*Empidonax minimus*			X	X	X	X	X	X	X				X	X									X	X		
Lewis's Woodpecker	*Melanerpes lewis*	SOC	S	X						X	X	X		X		X	X	X	X	X	X		X	X	X	X	X
Loggerhead Shrike	*Lanius ludovicianus*	SOC	S	X																			X				
Long-billed Curlew	*Numenius americanus*	SOC	S	X													X										
Mallard	*Anas platyrhynchos*			X		X	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Marbled Godwit	*Limosa fedoa*																X	X	X								
Thick-billed Longspur (McCown's)	*Rhynchophanes mccownii*	SOC	S																								
Merlin	*Falco columbarius*			X										X			X							X			
Mountain Bluebird	*Sialia currucoides*			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Mountain Chickadee	*Poecile gambeli*			X									X	X	X	X	X								X		
Mourning Dove	*Zenaida macroura*			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Northern Flicker	*Colaptes auratus*			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Northern Goshawk	*Accipiter gentilis*	SOC		X										X	X												
Northern Harrier	*Circus hudsonius*			X							X					X	X			X				X		X	X
Northern Mockingbird	*Mimus polyglottos*																										
Northern Pintail	*Anas acuta*																										
Northern Pygmy-Owl	*Glaucidium gnoma*			?[j]												X											
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*											X		X	X	X							X	X	X	X	
Northern Saw-whet Owl	*Aegolius acadicus*													X	X												
Northern Shoveler	*Spatula clypeata*																X									X	X
Northern Shrike	*Lanius borealis*														X		X								X		
Olive-sided Flycatcher	*Contopus cooperi*																										
Orchard Oriole	*Icterus spurius*																										
Ovenbird	*Seiurus aurocapilla*													X	X						X					X	

			Year **																								
CLASS / Common Name	**Scientific Name**	**SOC***	**BLM Sent.**	**1989-1996**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Peregrine Falcon	*Falco peregrinus*		S																								
Pine Grosbeak	*Pinicola enucleator*			X																							
Pine Siskin	*Spinus pinus*			X		X			X	X		X				X		X				X		X	X	X	
Pinyon Jay	*Gymnorhinus cyanocephalus*	SOC		X										X	X	X	X	X	X	X		X	X	X			
Plumbeous Vireo	*Vireo plumbeus*			X										X	X	X	X	X		X						X	X
Prairie Falcon	*Falco mexicanus*			X	X					X	X	X	X	X	X	X	X	X		X			X	X	X	X	
Pygmy Nuthatch	*Sitta pygmaea*																X									X	
Red Crossbill	*Loxia curvirostra*			X	X	X					X			X	X	X	X	X		X	X	X	X	X	X	X	X
Red Phalarope	*Phalaropus fulicarius*																										
Red-breasted Nuthatch	*Sitta canadensis*			X		X		X						X	X	X	X	X	X	X	X	X	X	X	X	X	X
Red-eyed Vireo	*Vireo olivaceus*																										
Red-headed Woodpecker	*Melanerpes erythrocephalus*	SOC	S	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X						X	X
Red-naped Sapsucker	*Sphyrapicus nuchalis*																			X							
Red-necked Phalarope	*Phalaropus lobatus*																										
Red-tailed Hawk	*Buteo jamaicensis*			X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Red-winged Blackbird	*Agelaius phoeniceus*			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Ring-necked Duck	*Aythya collaris*																										
Ring-necked Pheasant	*Phasianus colchicus*																										
Rock Pigeon	*Columba livia*			X					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Rock Wren	*Salpinctes obsoletus*			X		X		X	X	X	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X
Rose-breasted Grosbeak	*Pheucticus ludovicianus*																										
Rough-legged Hawk	*Buteo lagopus*			X			X			X	X	X			X	X	X	X				X	X				
Ruby-crowned Kinglet	*Corthylio calendula*																						X	X		X	
Ruffed Grouse	*Bonasa umbellus*																										
Rufous Hummingbird	*Selasphorus rufus*																										
Sage Thrasher	*Oreoscoptes montanus*	SOC	S													X								X			
Sandhill Crane	*Antigone canadensis*																X						X				X
Savannah Sparrow	*Passerculus sandwichensis*			X							X		X	X	X	X	X				X						
Say's Phoebe	*Sayornis saya*			X			X	X	X		X			X	X	X	X	X	X	X	X	X	X	X	X	X	X
Scissor-tailed Flycatcher	*Tyrannus forficatus*																										
Sharp-shinned Hawk	*Accipiter striatus*			X[j]					X[j]							X	X										
Sharp-tailed Grouse	*Tympanuchus phasianellus*	SOC		X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Short-eared Owl	*Asio flammeus*																										
Snow Bunting	*Plectrophenax nivalis*			X														X								X	
Snowy Owl	*Bubo scandiacus*																										
Song Sparrow	*Melospiza melodia*			X												X		X					X	X	X	X	
Sora	*Porzana carolina*			X							X		X	X	X	X		X									
Solitary Sandpiper	*Tringa solitaria*																										
Spotted Sandpiper	*Actitis macularius*								X			X	X		X		X	X	X	X		X	X	X	X	X	X
Spotted Towhee	*Pipilo maculatus*			X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X

			Year **																								
CLASS / Common Name	**Scientific Name**	**SOC***	**BLM Sent.**	**1989-1996**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Sprague's Pipit	*Anthus spragueii*	SOC	S																								
Steller's Jay	*Cyanocitta stelleri*																							X		X	
Stilt Sandpiper	*Calidris himantopus*			X																							
Swainson's Hawk	*Buteo swainsoni*			X																							
Swainson's Thrush	*Catharus ustulatus*			X																							
Townsend's Solitaire	*Myadestes townsendi*			X				X			X			X	X	X	X	X	X	X	X	X		X	X	X	X
Tree Swallow	*Tachycineta bicolor*			X	X	X	X			X	X	X	X	X	X	X	X						X	X	X	X	X
Trumpeter Swan	*Cygnus buccinator*	SOC															X										
Tundra Swan	*Cygnus columbianus*																X										
Turkey Vulture	*Cathartes aura*			X	X	X			X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Upland Sandpiper	*Bartramia longicauda*				X							X	X	X	X		X	X	X		X	X	X	X	X		X
Veery	*Catharus fuscescens*	SOC	S																								
Vesper Sparrow	*Pooecetes gramineus*			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Violet-green Swallow	*Tachycineta thalassina*			X	X	X	X	X					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Virginia Rail	*Rallus limicola*																										
Warbling Vireo	*Vireo gilvus*			X										X	X	X	X	X	X								
Western Bluebird	*Sialia mexicana*												X					X							X		
Western Kingbird	*Tyrannus verticalis*			X	X	X	X	X	X	X	X	X		X	X	X	X	X	X		X	X	X	X	X		
Western Meadowlark	*Sturnella neglecta*			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Western Tanager	*Piranga ludoviciana*			X		X				X	X	X	X	X	X	X	X	X					X	X	X	X	
Western Wood-Pewee	*Contopus sordidulus*			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Whimbrel	*Numenius phaeopus*																										
White-breasted Nuthatch	*Sitta carolinensis*			X			X		X	X	X		X				X	X	X	X	X	X	X	X	X	X	X
White-crowned Sparrow	*Zonotrichia leucophrys*																X										X
White-throated Sparrow	*Zonotrichia albicollis*																			X							
White-throated Swift	*Aeronautes saxatalis*			X								X	X	X	X	X	X	X	X		X	X	X	X	X	X	X
White-winged Crossbill	*Loxia leucoptera*			?[i]																							
Whooping Crane	*Grus americana*	SOC																									
Wild Turkey	*Meleagris gallopavo*			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Willow Flycatcher	*Empidonax traillii*																										
Willet	*Tringa semipalmata*																			X							
Wilson's Phalarope	*Phalaropus tricolor*												X														
Wilson's Snipe	*Gallinago delicata*			X			X		X	X							X	X	X	X			X	X	X	X	X
Wood Duck	*Aix sponsa*																X										
Yellow Warbler	*Setophaga petechia*			X	X	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Yellow-breasted Chat	*Icteria virens*															X											
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*			X																							
Yellow-rumped Warbler	*Setophaga coronata*			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X

			Year **																								
CLASS / Common Name	**Scientific Name**	**SOC***	**BLM Sent.**	**1989-1996**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Mammals																											
American Badger	*Taxidea taxus*			X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X		X				X
Beaver	*Castor canadensis*																										
Big Brown Bat	*Eptesicus fuscus*			X	X	X	X	X	X	X								X^n	X^n	X^n	X^n	X^n	X^n	X^n	X^n	X^n	X^n
American Black Bear	*Ursus americanus*																			X							
Black-tailed Prairie Dog	*Cynomys ludovicianus*	SOC	S																				X			X	
Bobcat	*Lynx rufus*			X			X	X				X		X		X	X	X	X	X	X	X		X	X	X	X
Bushy-tailed Woodrat	*Neotoma cinerea*			X	X	X		X	X	X		X		X	X	X							X	X		X	X
Cottontail	*Sylvilagus spp.*																X	X	X	X	X	X	X	X	X	X	X
Coyote	*Canis latrans*			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Deer Mouse	*Peromyscus maniculatus*			X				X	X			X			X	X				X			X				
Desert Cottontail	*Sylvilagus audubonii*			X	X	X	X	X	X	X	X	X	X	X	X	X											
Dwarf Shrew	*Sorex nanus*	SOC																									
Eastern Red Bat	*Lasiurus borealis*	SOC	S																		$X?^n$						
Elk	*Cervus canadensis*			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Grizzly Bear	*Ursus arctos*	SOC	T																								
Fringed Myotis	*Myotis thysanodes*	SOC	S							$X?^n$																	X^n
Hayden's Shrew	*Sorex haydeni*																										
Hoary Bat	*Lasiurus cinereus*	SOC	S	X			X			X								X^n	X^n	X^n	X^n	X^n	X^n	X^n	X^n	X^n	X
House Mouse	*Mus musculus*																										
Least Chipmunk	*Neotamias minimus*			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						
Little Brown Myotis	*Myotis lucifugus*	SOC		X			X			X								X^n	X^n	X^n	X^n	X^n	X^n	X^n	X^n	X^n	
Long-eared Myotis	*Myotis evotis*	SOC		X						X								X^n	$X?^n$		X^n	$X?^n$		X^n	$X?^n$	X^n	X^n
Long-legged Myotis	*Myotis volans*	SOC		X						X										$X?^n$	X^n		$X?^n$	X^n	$X?^n$	$X?^n$	$X?^n$
Long-tailed Vole	*Microtus longicaudus*			X																							
Long-tailed Weasel	*Neogale frenata*			X												X				X					X		
Meadow Vole	*Microtus pennsylvanicus*			X										X	X	X											
Merriam's Shrew	*Sorex merriami*	SOC																									
American Mink	*Neogale vison*																						X				
Mountain Cottontail	*Sylvilagus nuttallii*			X		X	X	X				X			X	X											
Mountain Lion	*Puma concolor*										X		X	X		X	X			X			X		X	X	
Mule Deer	*Odocoileus hemionus*			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Muskrat	*Ondatra zibethicus*			X											X	X											
Northern Grasshopper Mouse	*Onychomys leucogaster*			X											X												
Northern Pocket Gopher	*Thomomys talpoides*			X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X
Olive-backed Pocket Mouse	*Perognathus fasciatus*			X																							
Ord's Kangaroo Rat	*Dipodomys ordii*																										
Pallid Bat	*Antrozous pallidus*	SOC	S							X								$X?^n$	$X?^n$			$X?^n$					
North American Porcupine	*Erethizon dorsatum*			X	X	X	X	X	X	X	X	X		X	X	X	X	X			X	X	X	X	X	X	X

			Year **																								
CLASS / Common Name	**Scientific Name**	**SOC***	**BLM Sent.**	**1989-1996**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Prairie Vole	*Microtus ochrogaster*																										
Preble's Shrew	*Sorex preblei*	SOC																									
Pronghorn	*Antilocapra americana*			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Raccoon	*Procyon lotor*			X	X	X	X	X	X														X	X	X	X	
Red Fox	*Vulpes vulpes*			X									X			X						X	X	X		X	X
Red Squirrel	*Tamiasciurus hudsonicus*																		X	X	X	X	X	X	X	X	X
Richardson's Ground Squirrel	*Urocitellus richardsonii*			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sagebrush Vole	*Lemmiscus curtatus*																										
Silver-haired Bat	*Lasionycteris noctivagans*			X						X		X						X^n	X^n	X^n	X^n	X^n	X^n	X^n		X^n	X^n
Spotted Bat	*Euderma maculatum*	SOC	S	X						X				X	X				X^n	X^n	X^n						
Striped Skunk	*Mephitis mephitis*			X									X			X					X		X	X	X	X	X
Thirteen-lined Ground Squirrel	*Ictidomys tridecemlineatus*			X																				X			
Townsend's Big-eared Bat	*Corynorhinus townsendii*	SOC	S	X						X																	
Western Harvest Mouse	*Reithrodontomys megalotis*																										
Western Jumping Mouse	*Zapus princeps*																										
Western Small-footed Myotis	*Myotis ciliolabrum*			X						X								$X?^n$		$X?^n$	$X?^n$	$X?^n$	X^n	X^n	$X?^n$	X^n	X^n
White-footed Mouse	*Peromyscus leucopus*																										
White-tailed Deer	*Odocoileus virginianus*			X					X	X	X	X	X				X					X		X	X		
White-tailed Jackrabbit	*Lepus townsendii*			X						X	X		X	X	X	X							X	X	X		
Yellow-bellied Marmot	*Marmota flaviventris*			X		X			X				X	X	X	X	X		X		X	X	X	X			
Yellow-pine Chipmunk	*Neotamias amoenus*															X	X										
Amphibians																											
Boreal Chorus Frog	*Pseudacris maculata*			X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Great Plains Toad	*Anaxyrus cognatus*	SOC	S	X													X										
Northern Leopard Frog	*Lithobates pipiens*	SOC		X	X	X	X	X	X						X												
Plains Spadefoot	*Spea bombifrons*																										X
Western Tiger Salamander	*Ambystoma mavortium*			X	X	X	X	X	X	X		X		X	X	X	X	X					X				X
Woodhouse's Toad	*Anaxyrus woodhousii*			X		X	X				X	X		X	X	X				X	X				X	X	X
Unidentified Amphibian																						X	X	X	X		
Unidentified Frog																						X	X	X	X		
Reptiles																											
Common Gartersnake	*Thamnophis sirtalis*			X^m																X							X
Common Sagebrush Lizard	*Sceloporus graciosus*			X																							
Gophersnake	*Pituophis catenifer*			X				X			X				X		X			X	X		X		X	X	X
Greater Short-horned Lizard	*Phrynosoma hernandesi*	SOC	S																								
North American Racer	*Coluber constrictor*			X										X													
Northern Rubber Boa	*Charina bottae*																X										
Painted Turtle	*Chrysemys picta*			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

			Year **																								
CLASS / Common Name	**Scientific Name**	**SOC***	**BLM Sent.**	**1989-1996**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Plains Gartersnake	*Thamnophis radix*													X													
Plains Hog-nosed Snake	*Heterodon nasicus*	SOC	S																								
Prairie Rattlesnake	*Crotalus viridis*			X		X	X	X	X	X		X								X							
Spiny Softshell	*Apalone spinifera*	SOC	S																								
Terrestrial Gartersnake	*Thamnophis elegans*			X												X											
Western Milksnake	*Lampropeltis gentilis*	SOC	S																								

Source: Catena Consulting LLC. 2022 Study Year Wildlife Monitoring Report Bull Mountains Mine No. 1 Permit ID: C1993017. March 31, 2023 and Catena Consulting LLC Appendix 304(10)-1 AM6 Baseline Wildlife Survey (2022 & 2023) Bull Mountains Mine No. 1. AM6_20240308

Notes:

SOC – species of concern

* Species are Montana species of concern

** Species observed in a given year are noted with a "X". Species of questionable identification are identified with a "?"

j – Not reported for this latlong by Montana Bird Distribution Committee and MTNHP

n - Probable; recorded by acoustic survey only

Appendix E
Ambient Air Quality Modeling Report

Due to their large size, the following calculation spreadsheets are available by request:

- Bull Mountains Mine Fugitive Particulate Emissions and Apportionment
- Bull Mountains Mine Combustion Emissions and Apportionment
- Stockpile Particulate Emissions and Windspeeds

Please submit all requests in writing to: mcalle@osmre.gov.

Ambient Air Quality Modeling Report
Bull Mountains Mine Amendment 3 EIS

Bull Mountain, Montana

April 2025

Prepared by:

IML Air Science

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1 EXECUTIVE SUMMARY

Signal Peak Energy, LLC (SPE) has proposed extending their Bull Mountains underground coal mine in Yellowstone County and Musselshell County, Montana, approximately 15 miles southeast of the town of Roundup (Figure 1-1). Coal from the underground operation is brought to the surface, crushed, screened, washed, and stockpiled for shipment to customers by rail and by trucks. Waste material from the preparation plant is conveyed to a waste dump area (WDA) for permanent storage and reclamation. The mine is currently permitted for a maximum coal production rate of 15 million tons of raw coal per year (nominally, 12.4 million tons of clean coal). The proposed expansion will not alter this maximum production rate. An assessment of the potential air quality impacts of the revised mine plan is needed to support the Environmental Impact Statement (EIS) being prepared by the U.S. Office of Surface Mining, Reclamation, and Enforcement.

The Bull Mountains Mine site and surrounding area lie within a Class II airshed under the Clean Air Act. There is no mandatory or designated Class I area within 50 kilometers of the mine. The Northern Cheyenne Indian Reservation (designated Class I) is approximately 100 km from Bull Mountain. The mine does not qualify as a major source of any criteria pollutant or hazardous air pollutant. Therefore, this ambient air quality impact analysis does not include a Prevention of Significant Deterioration (PSD) analysis or an analysis of Air Quality Related Values (AQRV).

This air quality modeling report presents the results of an ambient air quality impact analysis at the Bull Mountains Mine for comparison with the National Ambient Air Quality Standards (NAAQS) and the Montana Ambient Air Quality Standards (MAAQS). Comparisons are made for particulate matter less than 10 microns in diameter (PM_{10}), particulate matter less than 2.5 microns in diameter ($PM_{2.5}$), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and carbon monoxide (CO).

Maximum emission rates, based on production at the permitted limit, were modeled for years 2022 through 2024 using onsite, hourly meteorological data. To establish source emission rates, an emissions inventory for the Bull Mountains Mine was developed and presented in a separate, modeling protocol document (SPE 2025).

1.1. Project Description

The SPE operations at the facility can be classified into four categories: underground mining, coal handling and storage, coal processing, and coal waste disposal. Coal is underground mined by room-and-pillar and longwall methods. A continuous miner is used to develop coal entries to establish longwall panels, and longwall equipment is used to extract coal panels. A conveyor belt is used to transfer the Run-Of-Mine (ROM) coal to a stockpile outside of the mine portal (see Figure 1-2).

Surface material storage facilities include stockpiles of ROM coal, crushed coal, cleaned coal, and stoker coal. Material is moved from inside the mine to the ROM stockpile on a high-capacity belt conveyor. Other conveyors are used to transport coal from the ROM pile to the coal cleaning facility and from there to the clean coal piles.

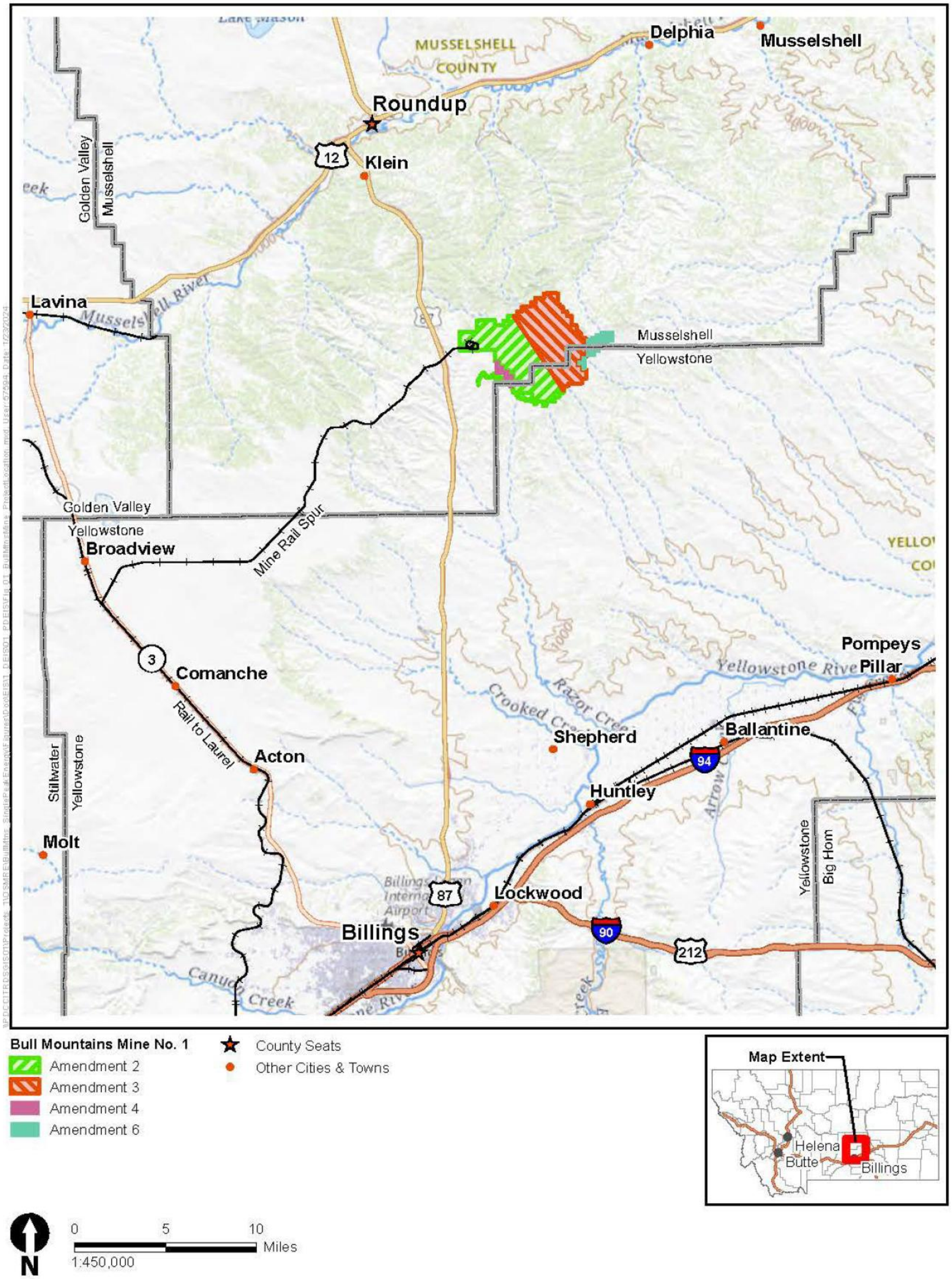
The coal preparation plant rejects approximately 18 percent of the raw coal stream. These coal processing wastes and other mine development wastes are conveyed to the Waste Disposal Area (WDA1 or WDA2) located 1.4 miles northeast of the wash plant. There they are permanently disposed. The mine plan calls for re-vegetation of this area after completion of the project and after the appropriate seed bed preparation.

During operations, coal is dumped from the mine portal onto a conveyor which dumps onto Stockpile #1. From Stockpile #1 the coal is conveyed to the crusher and the preparation plant stockpile (Stockpile #2). Coal from Stockpile #2 is conveyed to the preparation plant or blended with clean coal (Stockpile #3, a consolidation of the previous Stockpile #3 and #4). Stockpile #1A is utilized to store excess coal during longwall moves and unplanned downtime. Haul trucks are used to transport coal between Stockpile #1A and the other coal stockpile areas.

Coal sent to the prep plant is washed, dewatered, and then conveyed to the clean coal stockpile (Stockpile #3). Waste and reject material are dewatered in a plate press and transferred via conveyor belt to either WDA1 or WDA2. Loaders and haul trucks are used within the WDA perimeters to move material into desired locations for compaction.

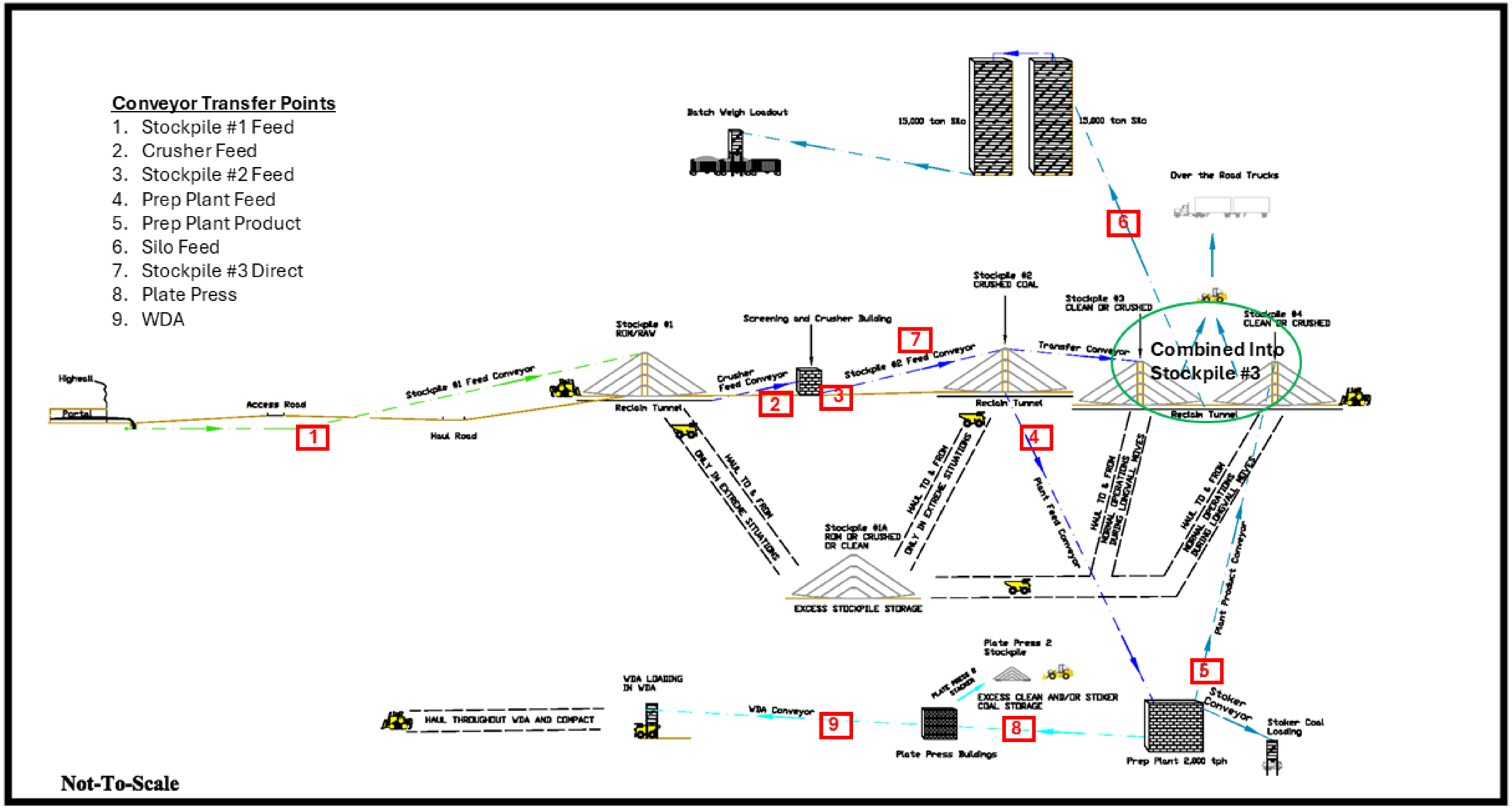
Coal from Stockpile #3 is conveyed to either the product loadout conveyor or directly to product silos. In addition to loading out to railcars, a portion of the clean coal is loaded onto over-the-road (OTR) trucks for shipment to regional customers. A smaller portion of screened, clean coal is transferred to a stoker stockpile and sold to retail customers.

Figure 1-1: Bull Mountains Mine Location Map



Source: U.S. Department of Interior, OSMRE

Figure 1-2: Bull Mountains Mine Coal Flow Schematic



1.2. Summary of Modeling Results

Table 1-1 summarizes the model predictions for maximum ambient concentrations of PM_{10}, $PM_{2.5}$, NO_x, CO, and SO_2. It demonstrates compliance with state (MDEQ 2024) and national (EPA 2024) ambient air quality standards for all pollutants and regulatory averaging periods.

Table 1-1: Model Predictions

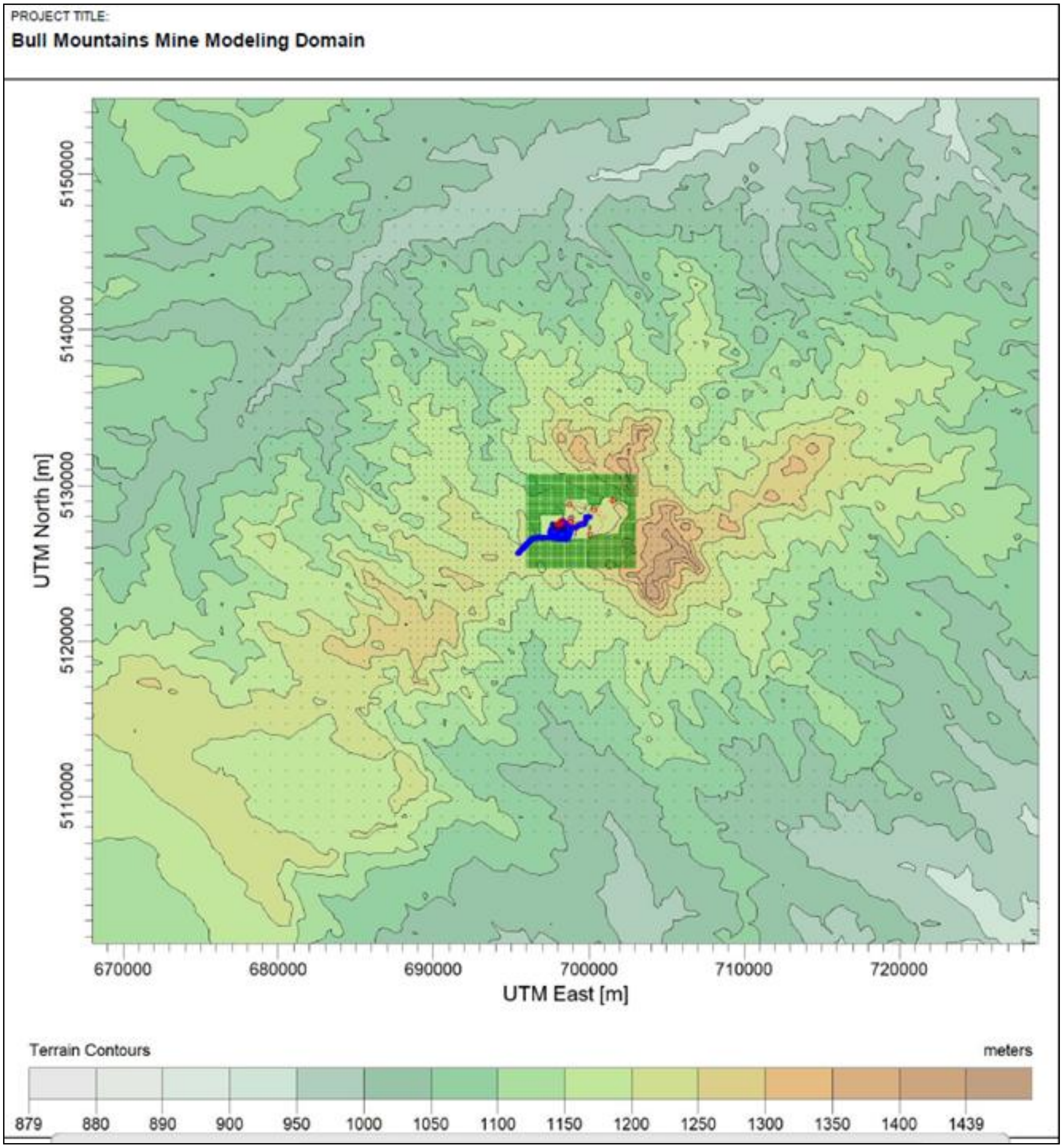
Pollutant and Design Value				Predicted Concentrations			
Pollutant	Averaging Interval	NAAQS (or MAAQS)	Units	Modeled	Background	Total	% of Standard
PM_{10}	24-HR	150	µg/m^3	80.9	25	105.9	70.6%
PM_{10}	Annual	50	µg/m^3	22.2	10	32.2	64.3%
$PM_{2.5}$	24-HR	35	µg/m^3	8.5	15	23.5	67.0%
$PM_{2.5}$	Annual	9	µg/m^3	3.2	3.6	6.8	75.0%
NO_2	1-HR	188	µg/m^3	122.8	17	139.8	74.4%
NO_2	Annual	100	µg/m^3	12.3	4	16.3	16.3%
SO_2	1-HR	196	µg/m^3	20.5	35	55.5	28.3%
SO_2	Annual	26.2	µg/m^3	1.3	3	4.3	16.5%
CO	1-HR	40,250	µg/m^3	392.7	7,213	7605.7	18.9%
CO	8-HR	10,350	µg/m^3	55.4	2,175	2230.4	21.5%

Section 2 discusses inputs to the AERMOD modeling program, including a summary of the modeling protocol. Section 3 discusses the resulting outputs from this ambient air quality impact analysis, by pollutant and averaging period, and compares them to the relevant state and national standards.

2 MODEL INPUTS

Criteria pollutant emissions were modeled with the EPA Regulatory model AERMOD, Version 24142, to evaluate emissions dispersion from multiple point, volume, and area sources. The Lakes Environmental software was used to implement the AERMOD and companion AERMET models (Lakes AERMOD View Version 13.0.0). The modeling domain extends approximately 20 km in all directions from the center of the Bull Mountains Mine (Figure 2-1).

Figure 2-1: Bull Mountains Mine Modeling Domain and Receptors



2.1. AERMOD System Settings

The AERMOD regulatory options were left in the default settings, with two exceptions justified in the modeling protocol (SPE 2025). For NO_2 modeling, AERMOD was configured to use the Tier 2 ARM method, with a minimum ambient ratio of NO_2/NO_x of 0.2. For all modeling, the ADJ_U* regulatory option was selected to adjust friction velocity calculations under conditions of low wind speeds and a stable atmosphere. All of Montana is classified as rural so the rural dispersion coefficients were selected. Building downwash was not selected since modeled sources are at or near ground level and located far enough from the nearest receptors to ignore the effects of turbulence from buildings.

For PM_{10} modeling, the Dry Deposition option was justified in the modeling protocol, to be implemented only at receptors exceeding the 24-hour NAAQS. Since AERMOD predicted concentrations well below this limit at all receptors (with background included), the Dry Deposition option was not needed.

2.2. Modeled Sources

Maximum fugitive dust and combustion emissions from the Bull Mountains Mine are summarized in Table 2-1 and Table 2-2, respectively. The appendices to the modeling protocol detail the emission calculations, emissions apportionment, and AEMROD source parameters for point, area, area-poly, volume, line-volume, and buoyant-line sources (SPE 2025). These modeled sources are listed in Table 2-3. Their locations relative to the ambient air boundary are depicted in Figure 2-2.

Table 2-1: Fugitive Particulate Emissions (tons/year)

Emission Category	**PM_{10} Tons/Yr**	**$PM_{2.5}$ Tons/Yr**
Coal Stockpiles	102.59	15.39
Disturbed Areas	72.00	10.80
Soil Stockpiles	16.04	2.41
Paved Road Fugitive Dust	1.29	0.32
Grader	3.16	0.32
Compactor	0.00	0.00
Haul Truck Komatsu	87.60	8.76
Water Truck	7.90	0.79
Front End Loader - Large	2.10	0.31
Front End Loader - Small	0.52	0.08
Bulldozer	9.34	1.40
Medium Excavator	0.06	0.01
Large Excavator	0.26	0.04
Shop Backhoe	0.02	0.00
Maintenance Truck	1.40	0.14
OTR Truck on Unpaved Road	9.39	0.94
Crew Cab	1.97	0.20
Pickup Truck - Diesel	0.98	0.10
Pickup/Utility Vehicle - Gasoline	10.56	1.06
Farm Tractor	0.90	0.09
Conveyor Transfers	7.10	1.06
Train and Truck Loadout	2.14	0.22
Baghouses	4.88	0.73
PARTICULATE TOTALS	342.20	45.16

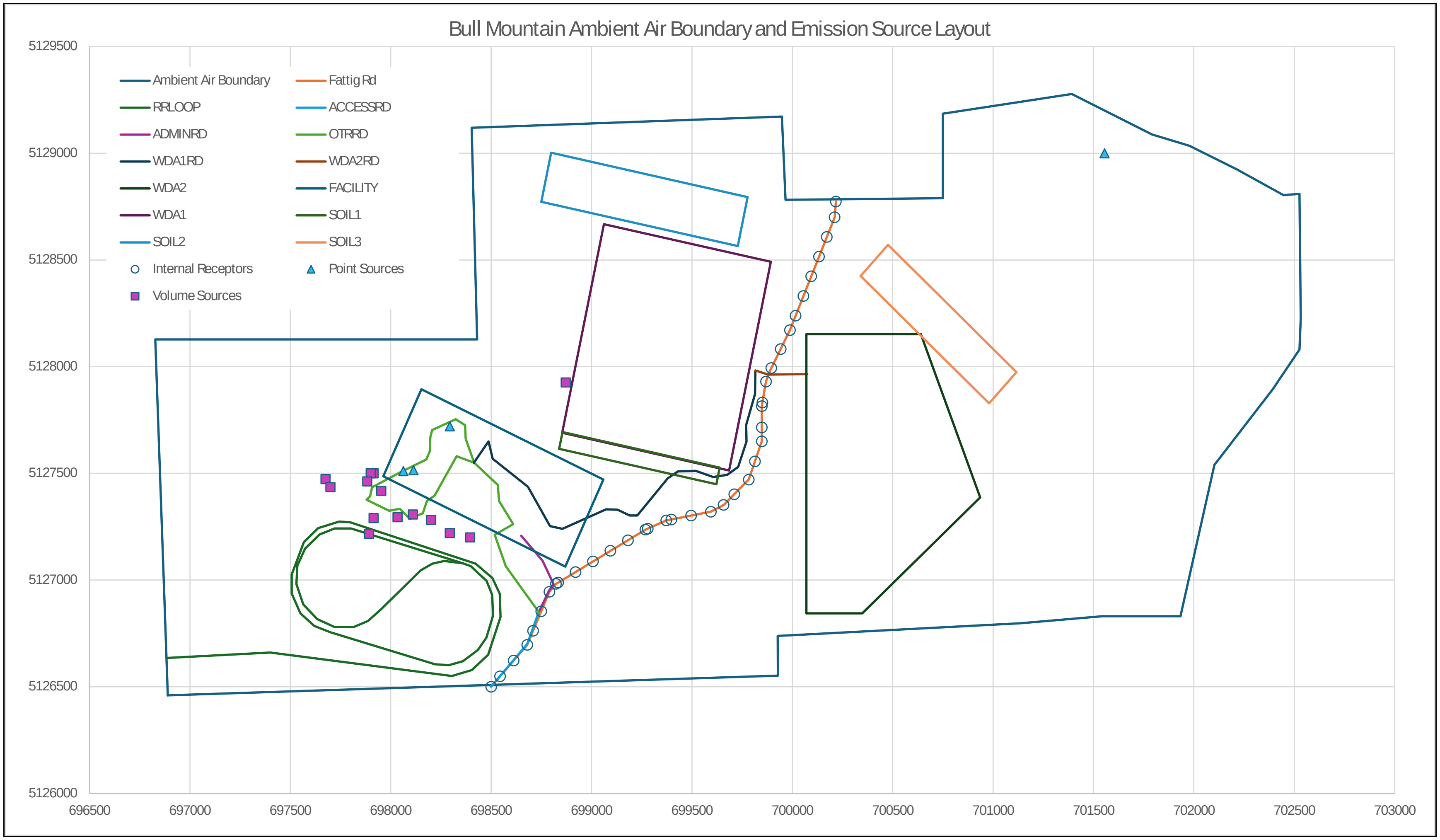
Table 2-2: Combustion Emissions (tons/year)

Source Type	NO_x	CO	SO_2	PM_{10}	$PM_{2.5}$
Locomotive	49.76	11.62	3.57	3.83	3.83
Stationary Engines	20.29	4.81	1.45	1.43	1.43
Grader	0.15	0.17	0.06	0.01	0.01
Compactor	0.72	0.80	0.29	0.03	0.03
Haul Truck	8.04	15.22	5.44	0.10	0.10
Water Truck	0.87	0.60	0.21	0.02	0.02
Loader	0.38	0.97	0.34	0.01	0.01
Bulldozer	7.60	13.89	4.97	0.29	0.29
Excavator	3.70	4.18	1.48	0.14	0.14
Miscellaneous Support Equipment	0.38	0.46	0.14	0.02	0.02
Skid Steer	0.55	0.74	0.19	0.02	0.02
OTR Truck on Unpaved Road	0.30	0.17	0.00	0.02	0.02
Crew Cab	0.00	0.07	0.00	0.00	0.00
Pickup Truck	0.48	2.20	0.00	0.09	0.09
Delivery Trucks	0.30	0.17	0.00	0.02	0.02
Passenger Vehicles	0.01	0.36	0.00	0.01	0.01
Underground Mine Vent	15.28	18.60	4.76	0.86	0.43
Coal Fires	0.22	6.60	0.96	0.00	0.00
COMBUSTION TOTALS (TONS/YR)	109.04	81.61	23.87	6.90	6.47

Table 2-3: AERMOD Modeled Sources

Source ID	Source Type	Description
BHCRUSH	POINT	Crusher Baghouse
BHASH	POINT	Ash Baghouse
BHROCK	POINT	Rock Waste Baghouse
UGVENT	POINT	Underground Mine Vent
STKPILE1	VOLUME	Run-of-Mine Coal Stockpile
STKPILE2	VOLUME	Crushed Coal Stockpile
STKPILE3	VOLUME	Clean Coal Stockpile
STKPILE1A	VOLUME	Temporary Coal Storage
STOKERA	VOLUME	Stoker Coal Stockpile A
STOKERB	VOLUME	Stoker Coal Stockpile B
TLOADOUT	VOLUME	Train Loadout
XFERCRUSH	VOLUME	Crusher Conveyor Transfer
XFERPROD	VOLUME	Prep Plant Product Conveyor Transfer
XFERSILO	VOLUME	Silo Conveyor Transfer
XFERFEED	VOLUME	Prep Plant Feed Conveyor Transfer
XFERPRESS	VOLUME	Plate Press Bldg 2 Conveyor Transfer
XFERSTOKER	VOLUME	Stoker Coal Conveyor Transfer
XFERWDA	VOLUME	WDA Conveyor Transfer
FACILITY	AREA	Main Mine Facility Area
WDA1	AREA	Waste Disposal Area 1
WDA2	AREA_POLY	Waste Disposal Area 2
SOIL1	AREA	Soil Stockpile Area 1
SOIL2	AREA	Soil Stockpile Area 2
SOIL3	AREA	Soil Stockpile Area 3
RRLOOP	LINE_VOLUME	Rail Loop
WDA1ROAD	LINE_VOLUME	WDA1 Access Road
WDA2ROAD	LINE_VOLUME	WDA2 Access Road
OTRRD	LINE_VOLUME	OTR Truck Haul Road
ACCESSRD	LINE_VOLUME	Mine Access Road
ADMINRD	LINE_VOLUME	Administrative Area Access Road
RR_EXTEND	LINE_VOLUME	Extension of Railroad Beyond Boundary
SMOKER	BUOYLINE	Spontaneous Combustion at Coal Pile

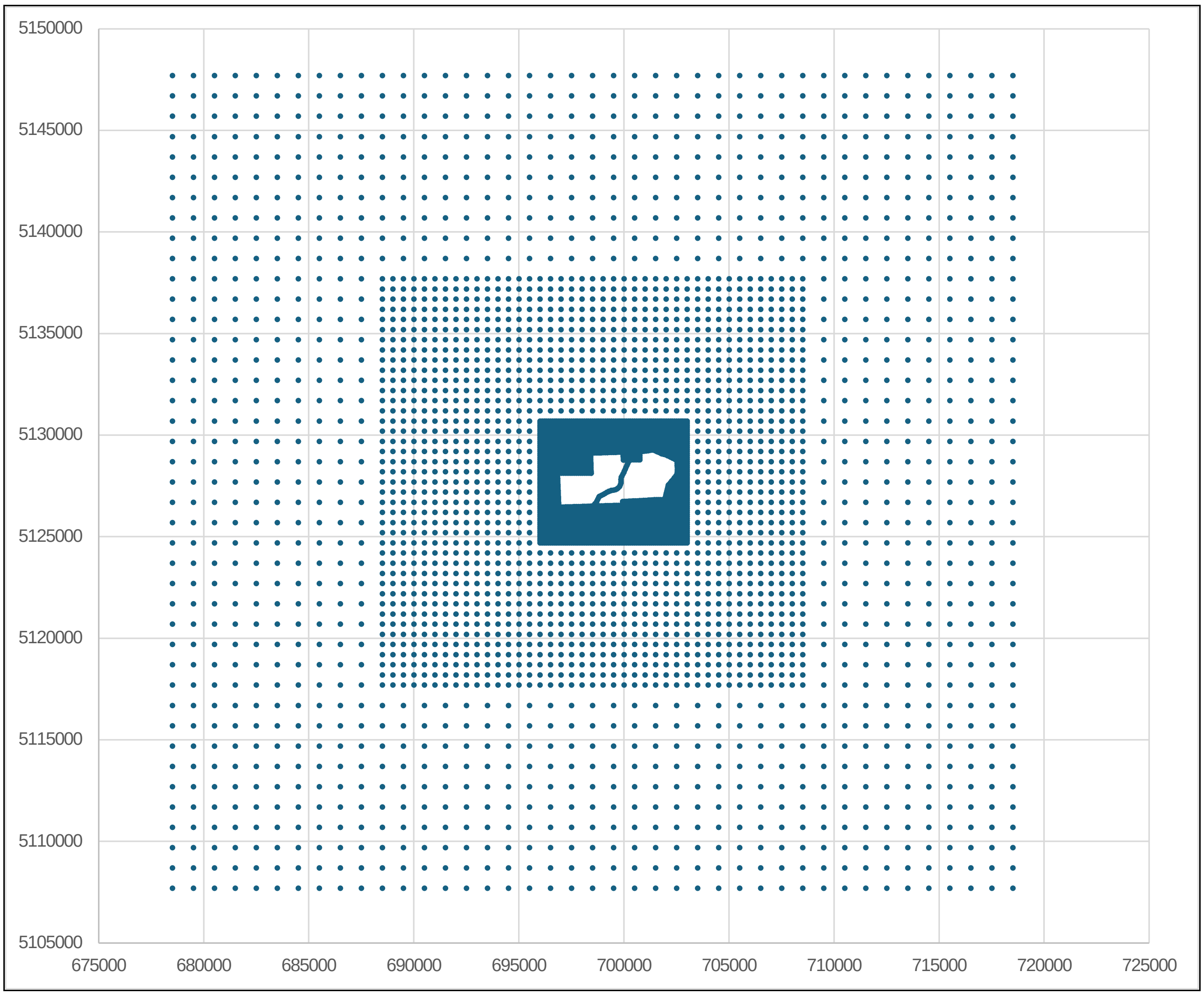
Figure 2-2: Bull Mountains Mine Modeled Sources



2.3. Model Receptors

Figures 2-3 displays the AERMOD receptor placement. The model domain includes a total of 6,092 receptors. The fence line receptors follow the ambient air boundary and the public road bisecting the Bull Mountains Mine area. Fence line and fine grid receptors are spaced at 100-meter intervals, intermediate grid receptors are spaced 500 meters apart, and coarse grid receptors are spaced 1,000 meters apart. The receptor grid extends in all directions to 20 km from the center of the Bull Mountains Mine.

Figure 2-3: Bull Mountains Mine AERMOD Receptor Layout



2.4. Meteorology

AERMOD requires both surface and upper air data to characterize atmospheric conditions. Upper air data were obtained for years 2022-2024 from the National Weather Service station at Great Falls, Montana. The surface meteorological data were obtained for the same 3-year period from the Bull Mountains Mine meteorological station. Located along the southern ambient air boundary, this onsite meteorological station meets EPA’s Meteorological Monitoring Guidance for Regulatory Modeling Applications (EPA 2000). Hourly data recovery at this site for the last three years has averaged 99.4%. Onsite data were supplemented by hourly meteorological data from the Billings airport weather station, approximately 33 miles south of the mine.

2.5. Background Concentrations

For this ambient air quality impact analysis, only sources at the Bull Mountains Mine were modeled. Background concentrations for each pollutant were assumed to account for regional sources. Table 1-1 includes background concentrations for each pollutant and averaging interval. The modeling protocol (SPE 2025) describes and justifies the sources of background information used in this modeling analysis.

3 MODEL OUTPUTS

This section presents the results from modeling pollutant dispersion from the Bull Mountains Mine using hourly meteorology from the most recent 3-year period.

3.1. PM_{10} Results

3.1.1. Annual Average Concentrations

Table 3-1 lists receptors with the 20 highest predicted annual average PM_{10} concentrations. After adding background concentrations, these receptors demonstrate compliance with the Montana Ambient Air Quality Standard (MAAQS). The national standards (NASQS) no longer regulate the annual average PM_{10}. Figure 3-1 shows the near-field portion of the receptor array most susceptible to impacts from mine sources. It highlights the top 10 receptors (red diamonds) as well as the receptor with the maximum predicted concentration (light blue diamond), all positioned along Fattig Road. Figure 3-2 is a contour map of modeled impacts only, over a larger area.

Table 3-1: Top 20 Annual PM_{10} Receptors

UTM Coordinates		Concentrations (µg/m³)			
Easting	Northing	Modeled	Background	Total	MAAQS
699869	5127930	22.2	10.0	32.2	50.0
699848	5127815	21.7	10.0	31.7	50.0
699851	5127832	21.2	10.0	31.2	50.0
699848	5127715	20.4	10.0	30.4	50.0
699896	5127994	20.3	10.0	30.3	50.0
699848	5127650	19.2	10.0	29.2	50.0
699942	5128082	18.8	10.0	28.8	50.0
699814	5127556	18.8	10.0	28.8	50.0
698790	5126945	18.7	10.0	28.7	50.0
698823	5126982	18.4	10.0	28.4	50.0
698834	5126988	18.2	10.0	28.2	50.0
698750	5126854	17.0	10.0	27.0	50.0
699783	5127471	16.8	10.0	26.8	50.0
698709	5126762	16.4	10.0	26.4	50.0
698921	5127038	16.4	10.0	26.4	50.0
699988	5128171	15.4	10.0	25.4	50.0
699007	5127087	15.3	10.0	25.3	50.0
699711	5127402	15.0	10.0	25.0	50.0
698680	5126696	14.7	10.0	24.7	50.0
699094	5127137	14.5	10.0	24.5	50.0

Figure 3-1: Bull Mountains Mine Top 10 Annual PM_{10} Receptors

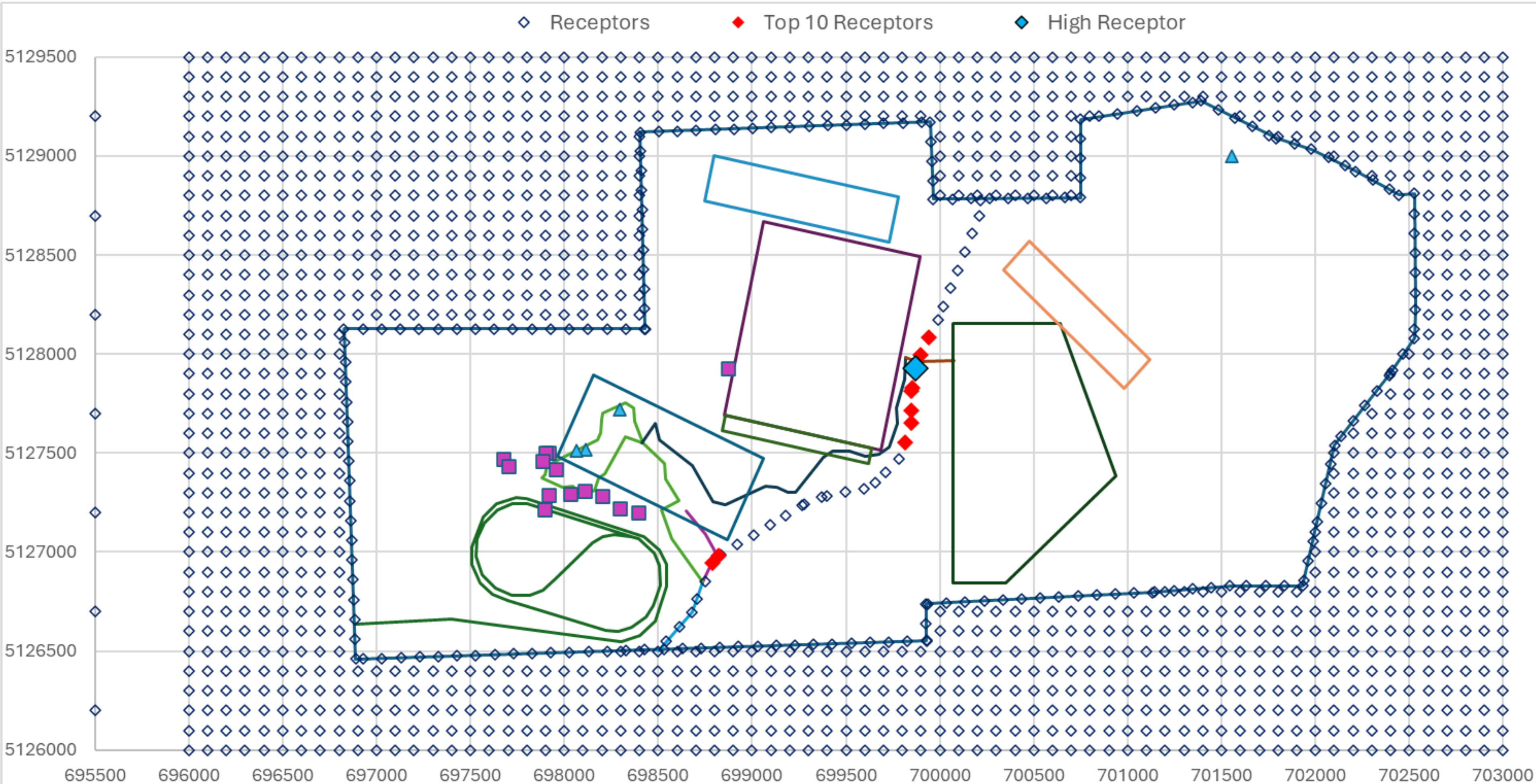
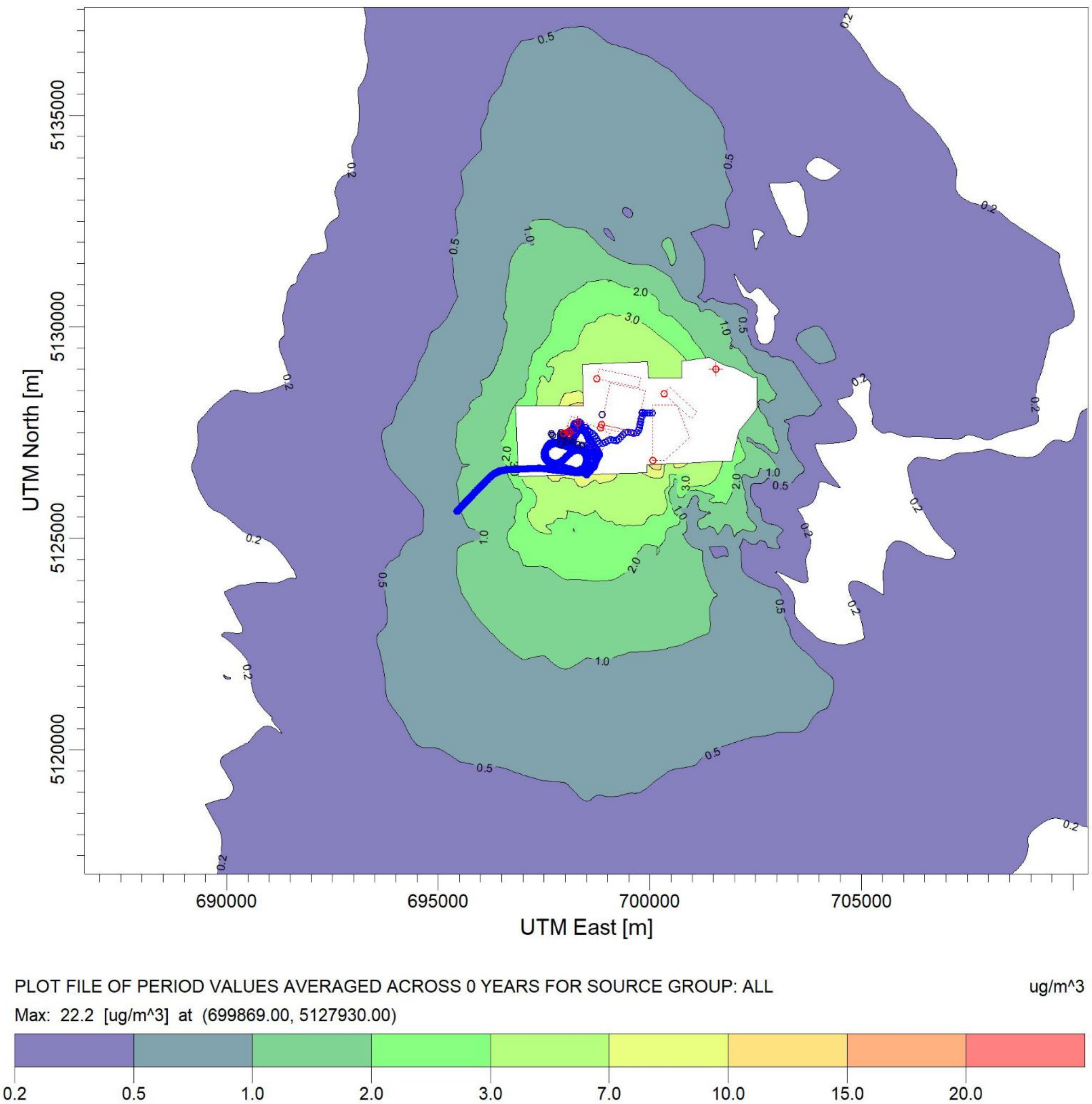


Figure 3-2: Bull Mountains Mine Annual PM_{10} Isopleth Map

PROJECT TITLE:

Bull Mountains Mine Annual PM10
Maximum Modeled Impacts



COMMENTS: 3 Years ADJ_U*	SOURCES: **33**	COMPANY NAME: **Signal Peak Energy, LLC**	
	RECEPTORS: **6092**	MODELER: **Ronn Smith**	Pace Analytical® ENVIRONMENTAL SCIENCES
	OUTPUT TYPE: **Concentration**	SCALE: 1:149,042 0 — 5 km	
	MAX: **22.2 ug/m^3**	DATE: **4/3/2025**	PROJECT NO.: **SPE-250328**

AERMOD View - Lakes Environmental Software

3.1.2. 24-Hour Concentrations

Table 3-2 lists receptors with the 20 highest predicted 24-hour average PM_{10} concentrations. The 24-hour design value is the fourth highest concentration over the 3-year modeling period (one exceedance is allowed per year). After adding background concentrations, these receptors demonstrate compliance with the NASQS. Figure 3-3 shows the near-field portion of the receptor array most susceptible to impacts from mine sources. It highlights the top 10 receptors (red diamonds) as well as the receptor with the maximum predicted concentration (light blue diamond), all positioned along Fattig Road. Figure 3-4 is a contour map of modeled impacts only, over a larger area.

Table 3-2: Top 20 24-Hr PM_{10} Receptors

UTM Coordinates		Concentrations (µg/m^3)			
Easting	Northing	Modeled	Background	Total	NAAQS
699869	5127930	80.9	25	105.9	150
699848	5127815	78.4	25	103.4	150
699851	5127832	78.1	25	103.1	150
699848	5127715	76.9	25	101.9	150
699896	5127994	74.7	25	99.7	150
699848	5127650	74.3	25	99.3	150
699814	5127556	74.2	25	99.2	150
700135	5126748	72.1	25	97.1	150
699007	5127087	68.8	25	93.8	150
699942	5128082	66.7	25	91.7	150
698921	5127038	66.3	25	91.3	150
698834	5126988	65.4	25	90.4	150
698823	5126982	64.3	25	89.3	150
698790	5126945	63.8	25	88.8	150
698750	5126854	63.5	25	88.5	150
700200	5126700	63.0	25	88.0	150
699783	5127471	62.3	25	87.3	150
699988	5128171	61.0	25	86.0	150
700100	5126700	60.2	25	85.2	150
699094	5127137	60.0	25	85.0	150

Figure 3-3: Bull Mountains Mine Top 10 24-Hr PM_{10} Receptors

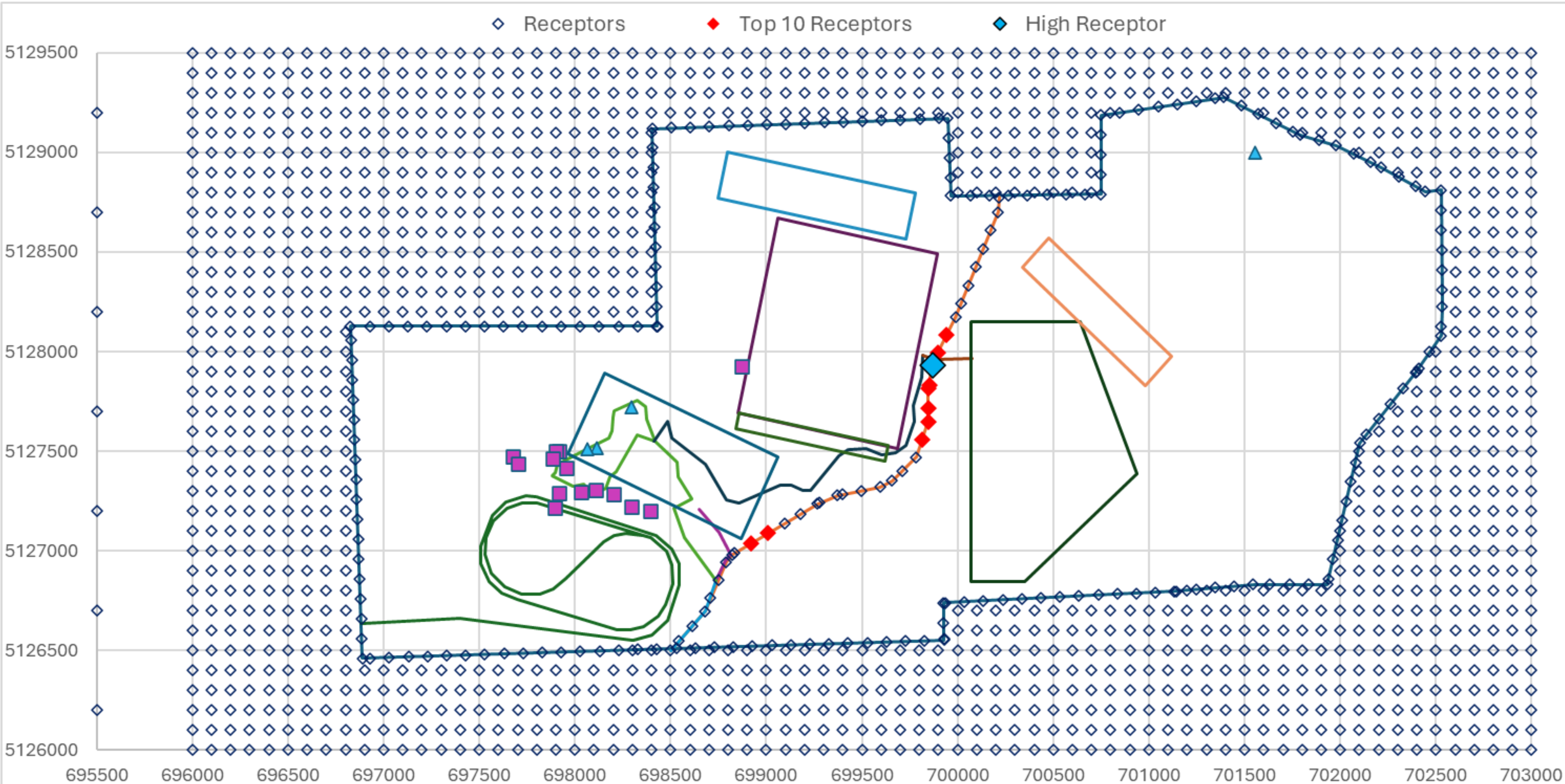
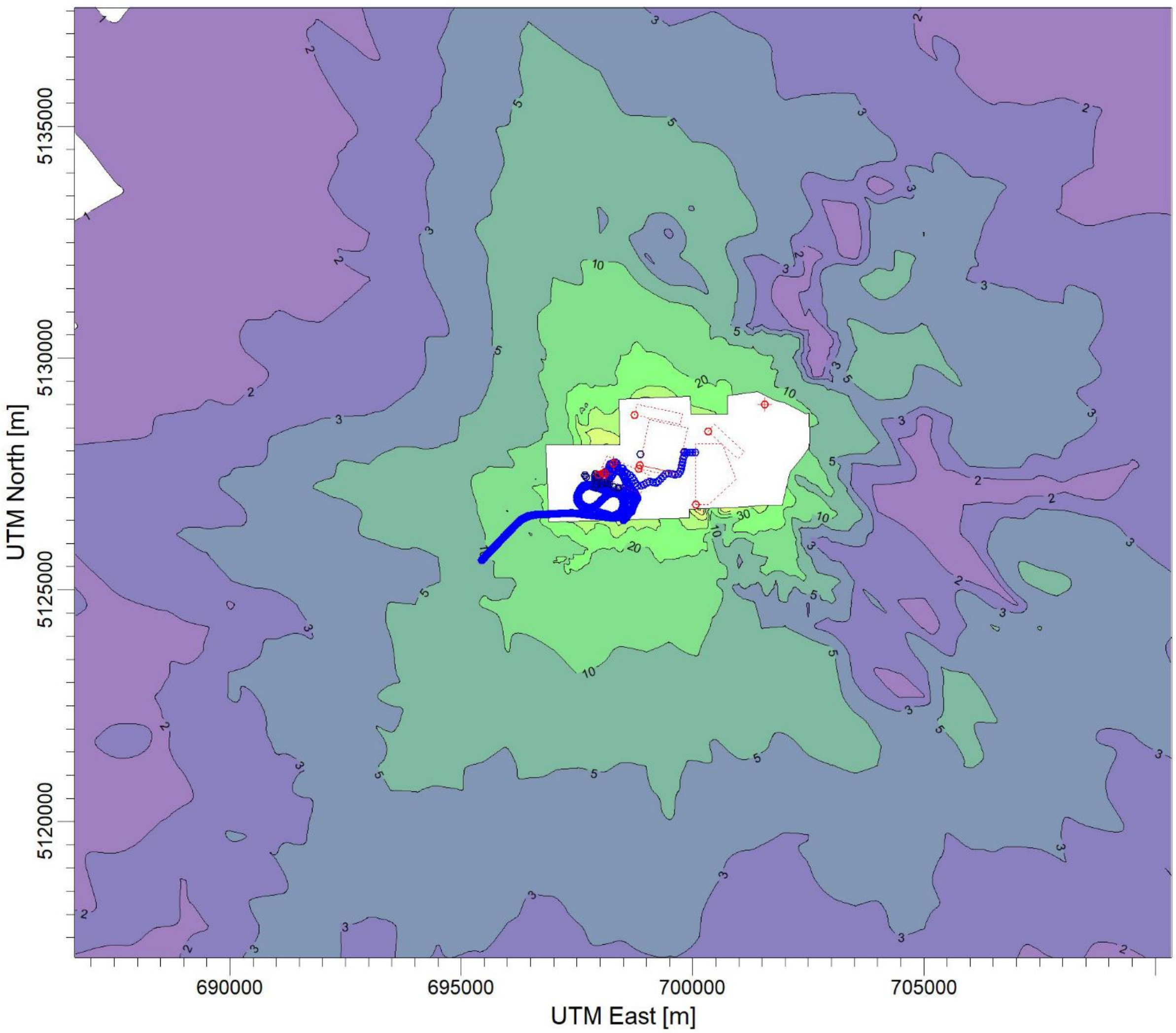


Figure 3-4: Bull Mountains Mine 24-Hr PM_{10} Isopleth Map

PROJECT TITLE:

Bull Mountains Mine 24-HR PM10
Modeled 3-Year 4th High Impacts



PLOT FILE OF HIGH 4TH HIGH 24-HR VALUES FOR SOURCE GROUP: ALL — ug/m^3

Max: 81 [ug/m^3] at (699869.00, 5127930.00)

1 2 3 5 10 20 30 40 50 60 70 80

COMMENTS:	SOURCES:	COMPANY NAME:	
3 Years ADJ_U*	**33**	**Signal Peak Energy, LLC**	
	RECEPTORS: **6092**	MODELER: **Ronn Smith**	Pace Analytical® ENVIRONMENTAL SCIENCES
	OUTPUT TYPE: **Concentration**	SCALE: 1:149,065 0 — 5 km	
	MAX: **81 ug/m^3**	DATE: **4/3/2025**	PROJECT NO.: **SPE-250328**

AERMOD View - Lakes Environmental Software

3.2. $PM_{2.5}$ Results

3.2.1. Annual Average Concentrations

Table 3-3 lists receptors with the 20 highest predicted annual average $PM_{2.5}$ concentrations. After adding background concentrations, these receptors demonstrate compliance with the NAAQS. Figure 3-5 shows the near-field portion of the receptor array most susceptible to impacts from mine sources. It highlights the top 10 receptors (red diamonds) as well as the receptor with the maximum predicted concentration (light blue diamond), all positioned along Fattig Road. Figure 3-6 is a contour map of modeled impacts only, over a larger area.

Table 3-3: Top 20 Annual $PM_{2.5}$ Receptors

UTM Coordinates		Concentrations ($\mu g/m^3$)			
Easting	Northing	Modeled	Background	Total	MAAQS
698790	5126945	3.2	3.6	6.8	9.0
698823	5126982	3.1	3.6	6.7	9.0
698834	5126988	3.1	3.6	6.7	9.0
698709	5126762	2.9	3.6	6.5	9.0
698750	5126854	2.9	3.6	6.5	9.0
698680	5126696	2.7	3.6	6.3	9.0
699869	5127930	2.7	3.6	6.3	9.0
698612	5126622	2.7	3.6	6.3	9.0
698921	5127038	2.7	3.6	6.3	9.0
699848	5127815	2.7	3.6	6.3	9.0
699851	5127832	2.6	3.6	6.2	9.0
698545	5126549	2.6	3.6	6.2	9.0
699848	5127715	2.5	3.6	6.1	9.0
699896	5127994	2.5	3.6	6.1	9.0
698529	5126510	2.5	3.6	6.1	9.0
699007	5127087	2.4	3.6	6.0	9.0
699848	5127650	2.4	3.6	6.0	9.0
699814	5127556	2.3	3.6	5.9	9.0
699942	5128082	2.3	3.6	5.9	9.0
698500	5126500	2.3	3.6	5.9	9.0

Figure 3-5: Bull Mountains Mine Top 10 Annual $PM_{2.5}$ Receptors

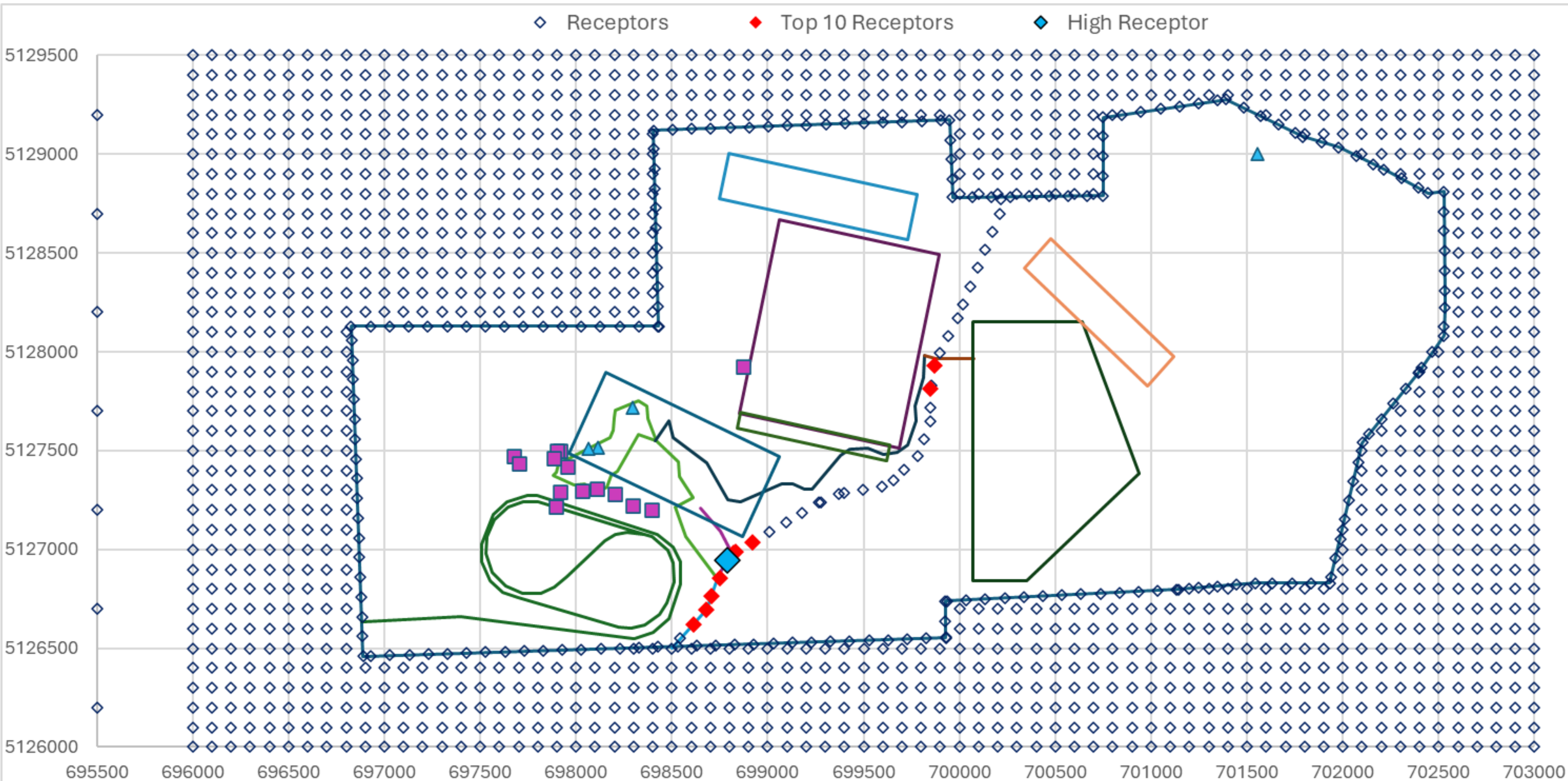
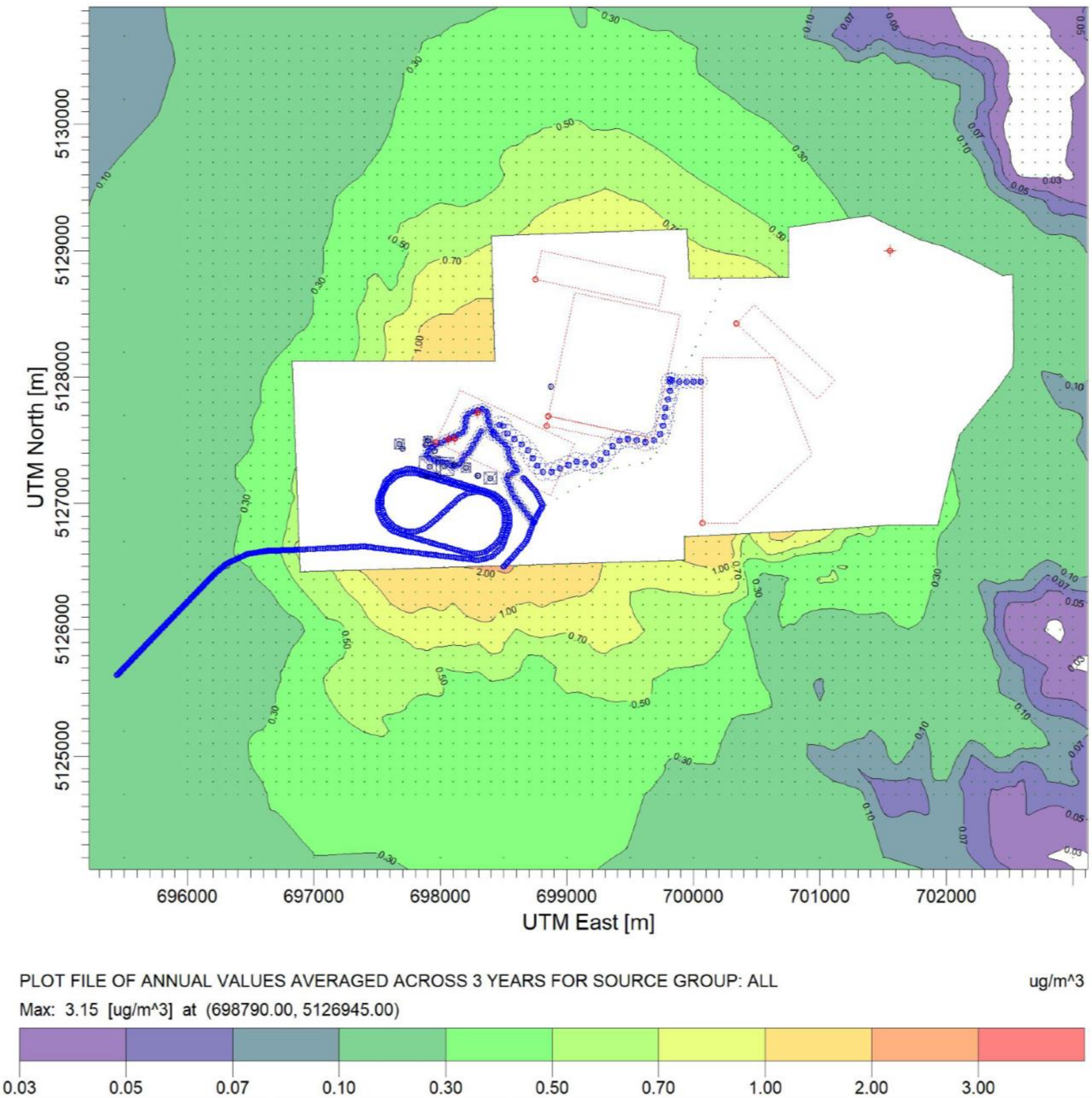


Figure 3-6: Bull Mountains Mine Annual $PM_{2.5}$ Isopleth Map

PROJECT TITLE:

Bull Mountains Mine Annual Average PM2.5 Modeled Impacts



COMMENTS:	SOURCES:	COMPANY NAME:	
3-year met ADJ_U*	**33**	**Pace Analytical**	
	RECEPTORS: **6092**	MODELER: **Ronn Smith**	Pace Analytical® DELIVERING SCIENCE BETTER
	OUTPUT TYPE: **Concentration**	SCALE: 1:49,627 0 1 km	
	MAX: **3.15 ug/m^3**	DATE: **3/31/2025**	PROJECT NO.: **SPE-250328**

3.2.2. 24-Hour Concentrations

Table 3-4 lists receptors with the 20 highest predicted 24-hour average $PM_{2.5}$ concentrations. The design value is the 3-year average of the 8th high concentrations (98th percentile). After adding background concentrations, these receptors demonstrate compliance with the NAAQS. Figure 3-7 shows the near-field portion of the receptor array most susceptible to impacts from mine sources. It highlights the top 10 receptors (red diamonds) as well as the receptor with the maximum predicted concentration (light blue diamond), all positioned along Fattig Road. Figure 3-8 is a contour map of modeled impacts only, over a larger area.

Table 3-4: Top 20 24-Hr $PM_{2.5}$ Receptors

UTM Coordinates		Concentrations (µg/m³)			
Easting	Northing	Modeled	Background	Total	NAAQS
698834	5126988	8.5	15.0	23.5	35.0
698823	5126982	8.4	15.0	23.4	35.0
698790	5126945	8.1	15.0	23.1	35.0
698709	5126762	7.8	15.0	22.8	35.0
698921	5127038	7.7	15.0	22.7	35.0
698750	5126854	7.7	15.0	22.7	35.0
699848	5127815	7.4	15.0	22.4	35.0
699869	5127930	7.4	15.0	22.4	35.0
699007	5127087	7.4	15.0	22.4	35.0
698680	5126696	7.3	15.0	22.3	35.0
699851	5127832	7.3	15.0	22.3	35.0
698612	5126622	7.2	15.0	22.2	35.0
699848	5127715	7.1	15.0	22.1	35.0
698545	5126549	7.0	15.0	22.0	35.0
699896	5127994	7.0	15.0	22.0	35.0
698529	5126510	6.9	15.0	21.9	35.0
699814	5127556	6.7	15.0	21.7	35.0
699848	5127650	6.7	15.0	21.7	35.0
699094	5127137	6.6	15.0	21.6	35.0
698227	5128128	6.6	15.0	21.6	35.0

Figure 3-7: Bull Mountains Mine Top 10 24-Hr $PM_{2.5}$ Receptors

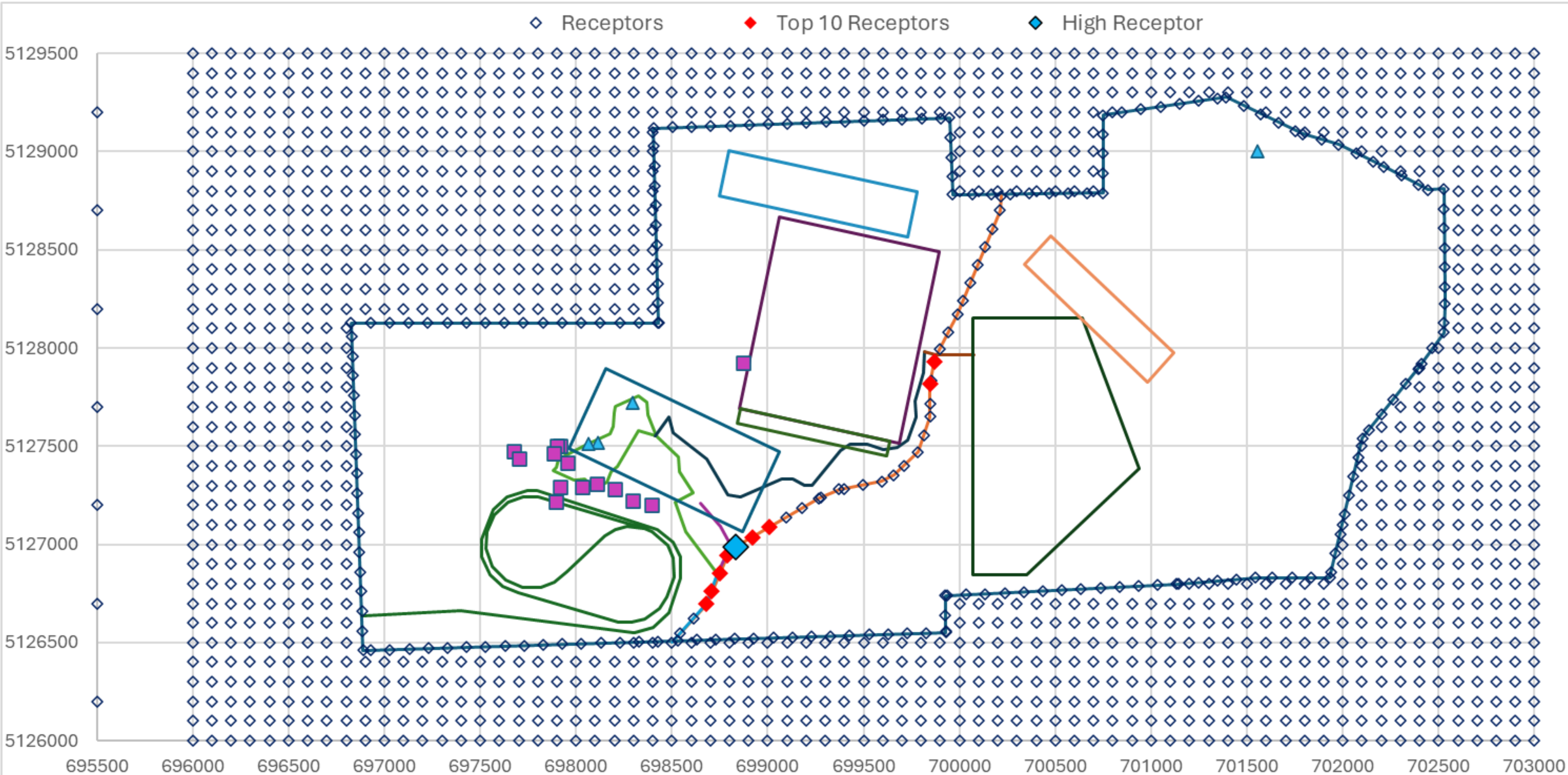
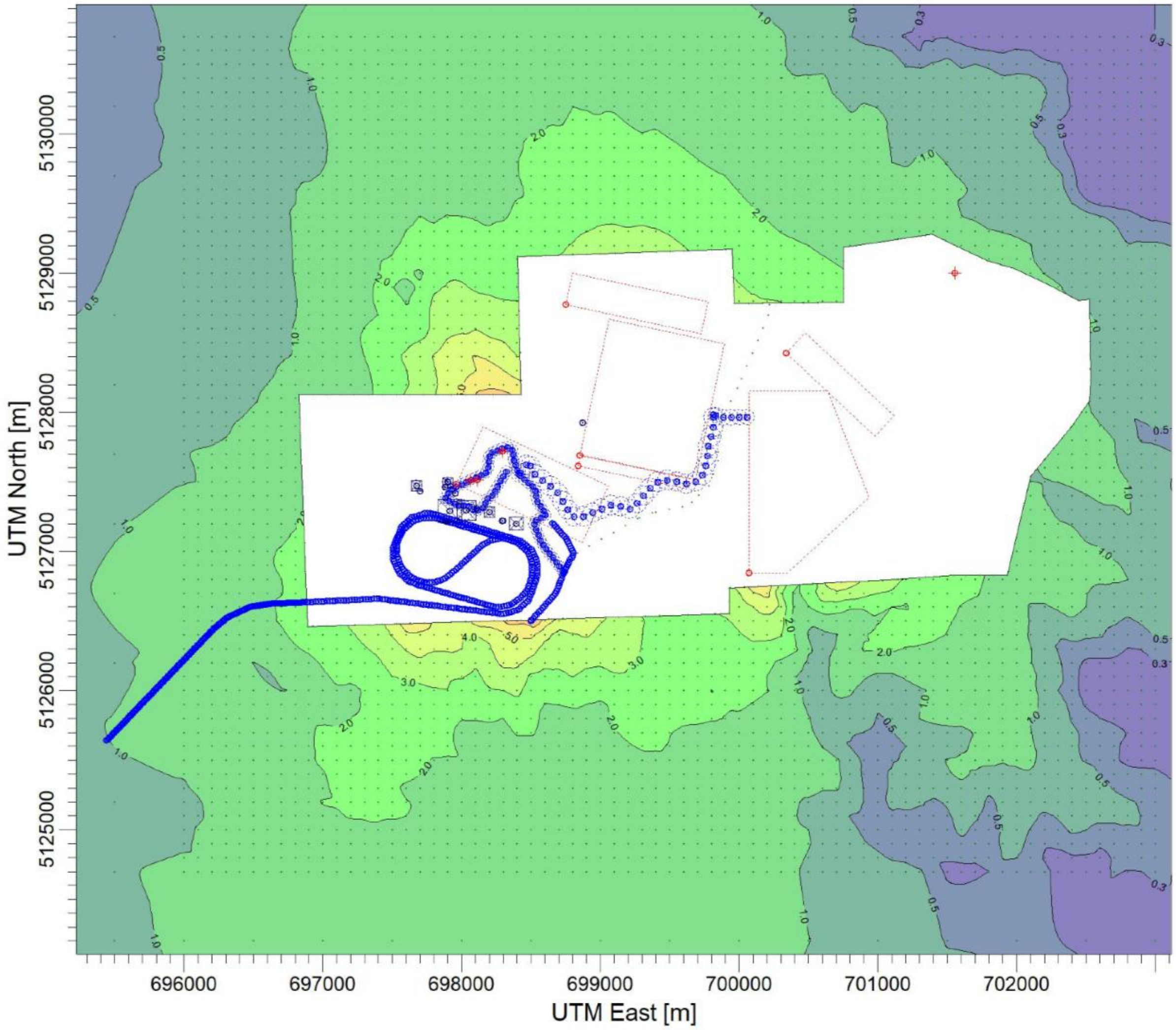


Figure 3-8: Bull Mountains Mine 24-Hr $PM_{2.5}$ Isopleth Map

PROJECT TITLE:

Bull Mountains Mine 24HR PM2.5
98th Percentile of Modeled Impacts



PLOT FILE OF 8TH-HIGHEST MAX DAILY 24-HR VALUES AVERAGED OVER 3 YEARS FOR SOURCE GROUP: ALL ug/m^3

Max: 8.5 [ug/m^3] at (698833.76, 5126988.14)

0.1 0.3 0.5 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0

COMMENTS:	SOURCES:	COMPANY NAME:	
3-year met ADJ_U*	**33**	**Pace Analytical**	
	RECEPTORS: **6092**	MODELER: **Ronn Smith**	Pace Analytical DELIVERING SCIENCE BETTER
	OUTPUT TYPE: **Concentration**	SCALE: 1:49,631 0 1 km	
	MAX: **8.5 ug/m^3**	DATE: **3/31/2025**	PROJECT NO.: **SPE-250328**

3.3. NO_2 Results

3.3.1. Annual Average Concentrations

Table 3-5 lists receptors with the 20 highest predicted annual average NO_2 concentrations. After adding background concentrations, these receptors demonstrate compliance with the NAAQS. Figure 3-9 shows the near-field portion of the receptor array most susceptible to impacts from mine sources. It highlights the top 10 receptors (red diamonds) as well as the receptor with the maximum predicted concentration (light blue diamond), all positioned along the ambient air boundary immediately south of the rail loop. Figure 3-10 is a contour map of modeled impacts only, over a larger area.

Table 3-5: Top 20 Annual NO_2 Receptors

UTM Coordinates		Concentrations (µg/m^3)			
Easting	Northing	Modeled	Background	Total	MAAQS
698329	5126504	12.3	4.0	16.3	100.0
698300	5126500	11.8	4.0	15.8	100.0
698229	5126501	11.5	4.0	15.5	100.0
698129	5126498	10.6	4.0	14.6	100.0
698400	5126500	10.2	4.0	14.2	100.0
698429	5126507	9.4	4.0	13.4	100.0
698029	5126494	8.9	4.0	12.9	100.0
697929	5126491	8.4	4.0	12.4	100.0
697829	5126488	8.2	4.0	12.2	100.0
697729	5126485	7.6	4.0	11.6	100.0
698545	5126549	7.4	4.0	11.4	100.0
698612	5126622	7.2	4.0	11.2	100.0
698823	5126982	7.1	4.0	11.1	100.0
698500	5126500	7.1	4.0	11.1	100.0
698834	5126988	7.1	4.0	11.1	100.0
698529	5126510	6.9	4.0	10.9	100.0
698790	5126945	6.9	4.0	10.9	100.0
698921	5127038	6.8	4.0	10.8	100.0
697629	5126482	6.8	4.0	10.8	100.0
698300	5126400	6.6	4.0	10.6	100.0

Figure 3-9: Bull Mountains Mine Top 10 Annual NO_2 Receptors

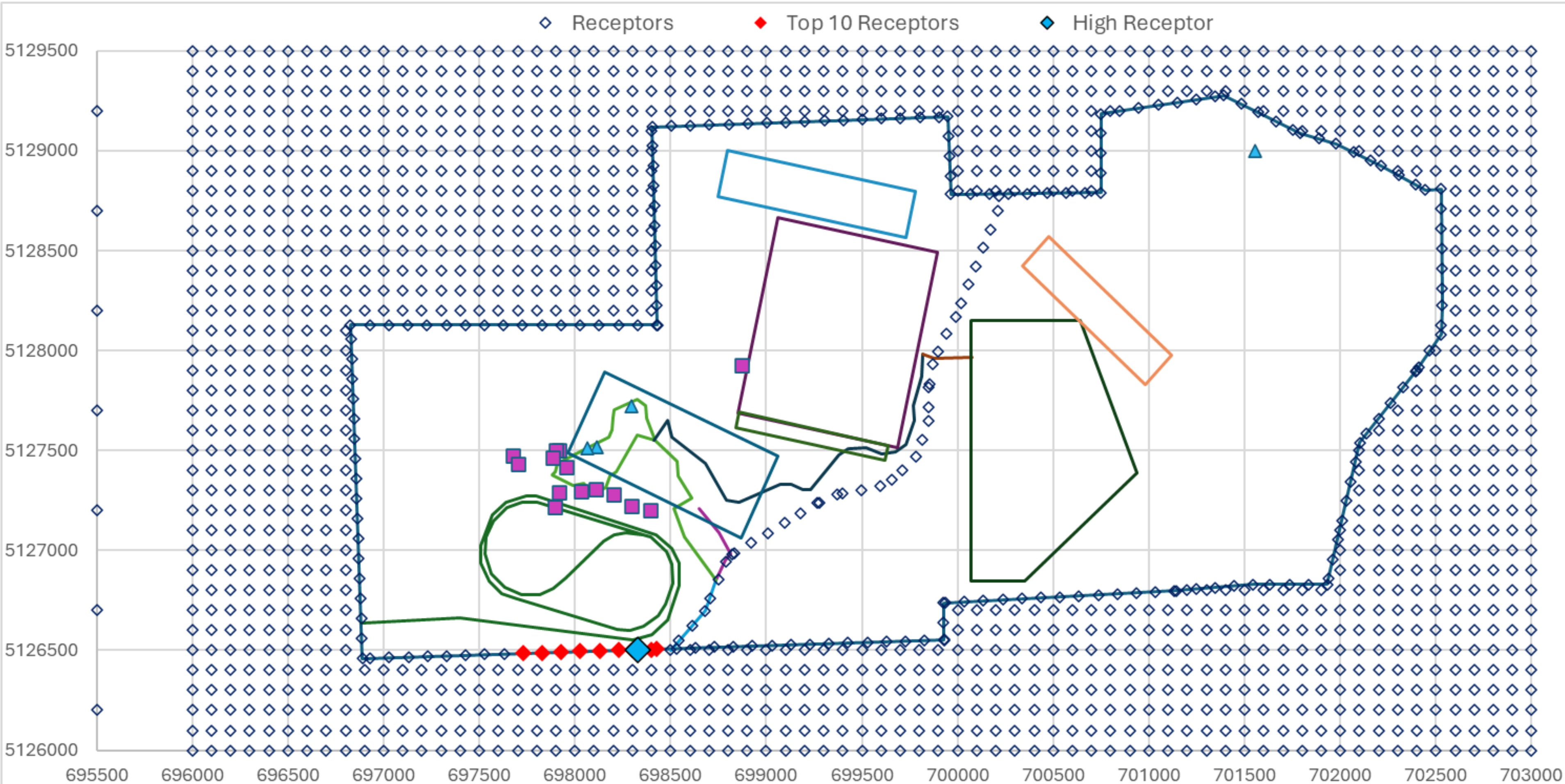
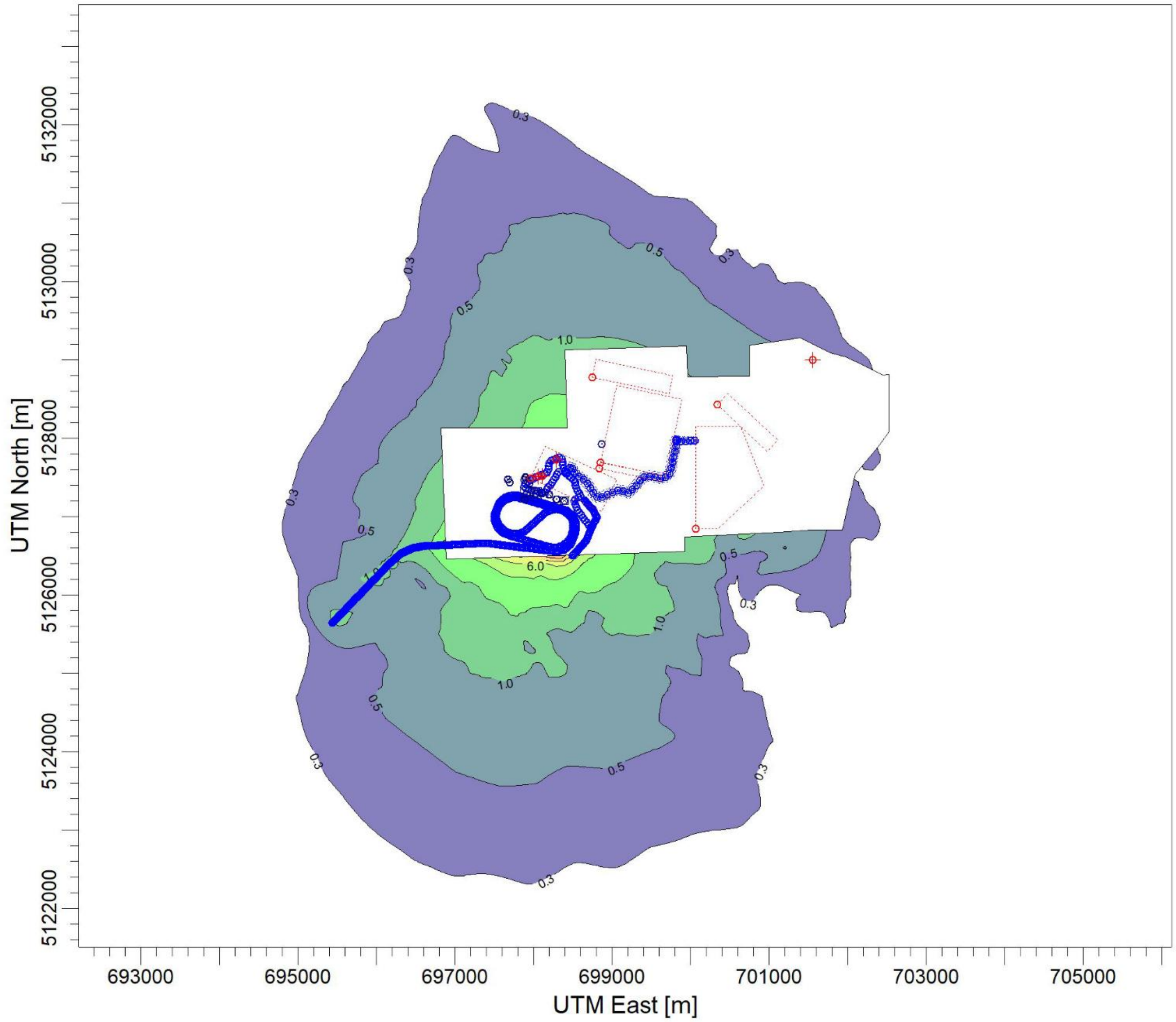


Figure 3-10: Bull Mountains Mine Annual NO_2 Isopleth Map

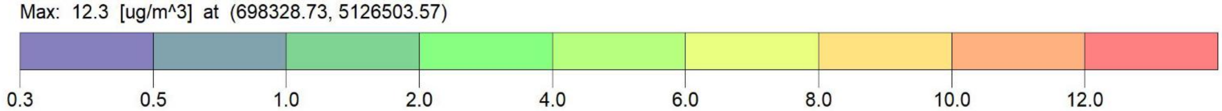
PROJECT TITLE:

Bull Mountains Mine Annual NO2
Maximum Modeled Impacts



PLOT FILE OF ANNUAL VALUES AVERAGED ACROSS 3 YEARS FOR SOURCE GROUP: ALL ug/m^3

Max: 12.3 [ug/m^3] at (698328.73, 5126503.57)



COMMENTS:	SOURCES:	COMPANY NAME:	
ARM2 minimum ambient ratio 0.20 3 years ADJ_U* Includes maximum emissions from coal smokers	**33**	**Signal Peak Energy, LLC**	
	RECEPTORS:	MODELER:	
	6092	**Ronn Smith**	Pace Analytical® ENVIRONMENTAL SCIENCES
	OUTPUT TYPE:	SCALE: 1:87,487	
	Concentration	0 — 3 km	
	MAX:	DATE:	PROJECT NO.:
	12.3 ug/m^3	**4/3/2025**	**SPE-250328**

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3.3.2. 1-Hour Concentrations

Table 3-6 lists receptors with the 20 highest predicted 1-hour average NO_2 concentrations. The design value is the 3-year average of the 8th high concentrations (98th percentile). After adding background concentrations, these receptors demonstrate compliance with the NAAQS. Figure 3-11 shows the near-field portion of the receptor array most susceptible to impacts from mine sources. It highlights the top 10 receptors (red diamonds) as well as the receptor with the maximum predicted concentration (light blue diamond), all positioned either along Fattig Road or along the ambient air boundary immediately south of the rail loop. Figure 3-12 is a contour map of modeled impacts only, over a larger area.

Table 3-6: Top 20 1-Hr NO_2 Receptors

UTM Coordinates		Concentrations (µg/m^3)			
Easting	Northing	Modeled	Background	Total	NAAQS
698921	5127038	122.8	17.0	139.8	188.0
698329	5126504	120.5	17.0	137.5	188.0
698300	5126500	118.8	17.0	135.8	188.0
699007	5127087	118.5	17.0	135.5	188.0
698229	5126501	114.3	17.0	131.3	188.0
699094	5127137	111.3	17.0	128.3	188.0
698834	5126988	108.6	17.0	125.6	188.0
698400	5126500	107.8	17.0	124.8	188.0
698823	5126982	107.0	17.0	124.0	188.0
698129	5126498	106.4	17.0	123.4	188.0
698429	5126507	104.9	17.0	121.9	188.0
699181	5127186	103.3	17.0	120.3	188.0
698790	5126945	98.7	17.0	115.7	188.0
698300	5126400	96.3	17.0	113.3	188.0
698029	5126494	96.0	17.0	113.0	188.0
697729	5126485	94.2	17.0	111.2	188.0
698545	5126549	88.8	17.0	105.8	188.0
698500	5126500	88.7	17.0	105.7	188.0
698529	5126510	88.6	17.0	105.6	188.0
697829	5126488	88.3	17.0	105.3	188.0

Figure 3-11: Bull Mountains Mine Top 10 1-Hr NO_2 Receptors

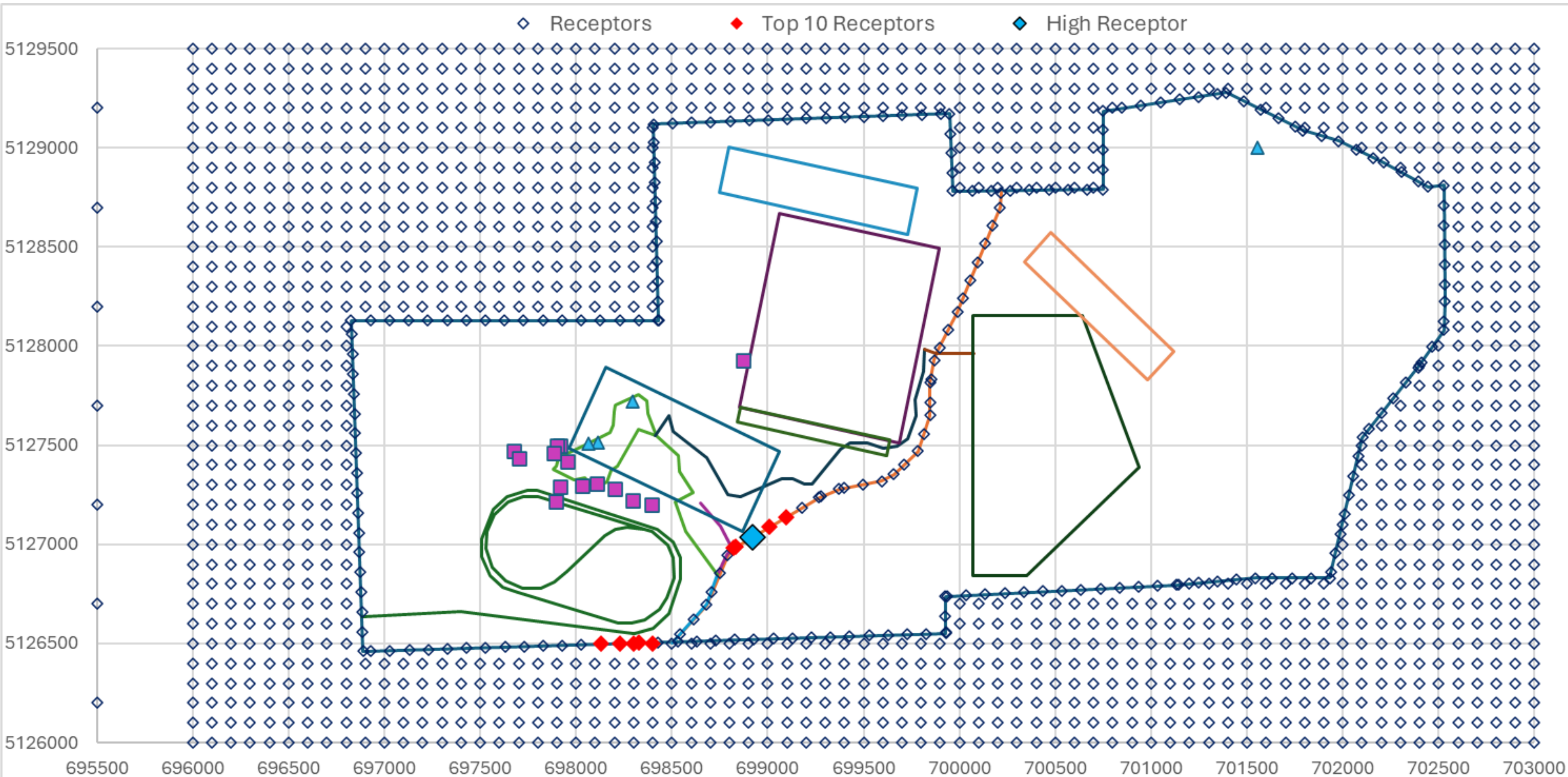
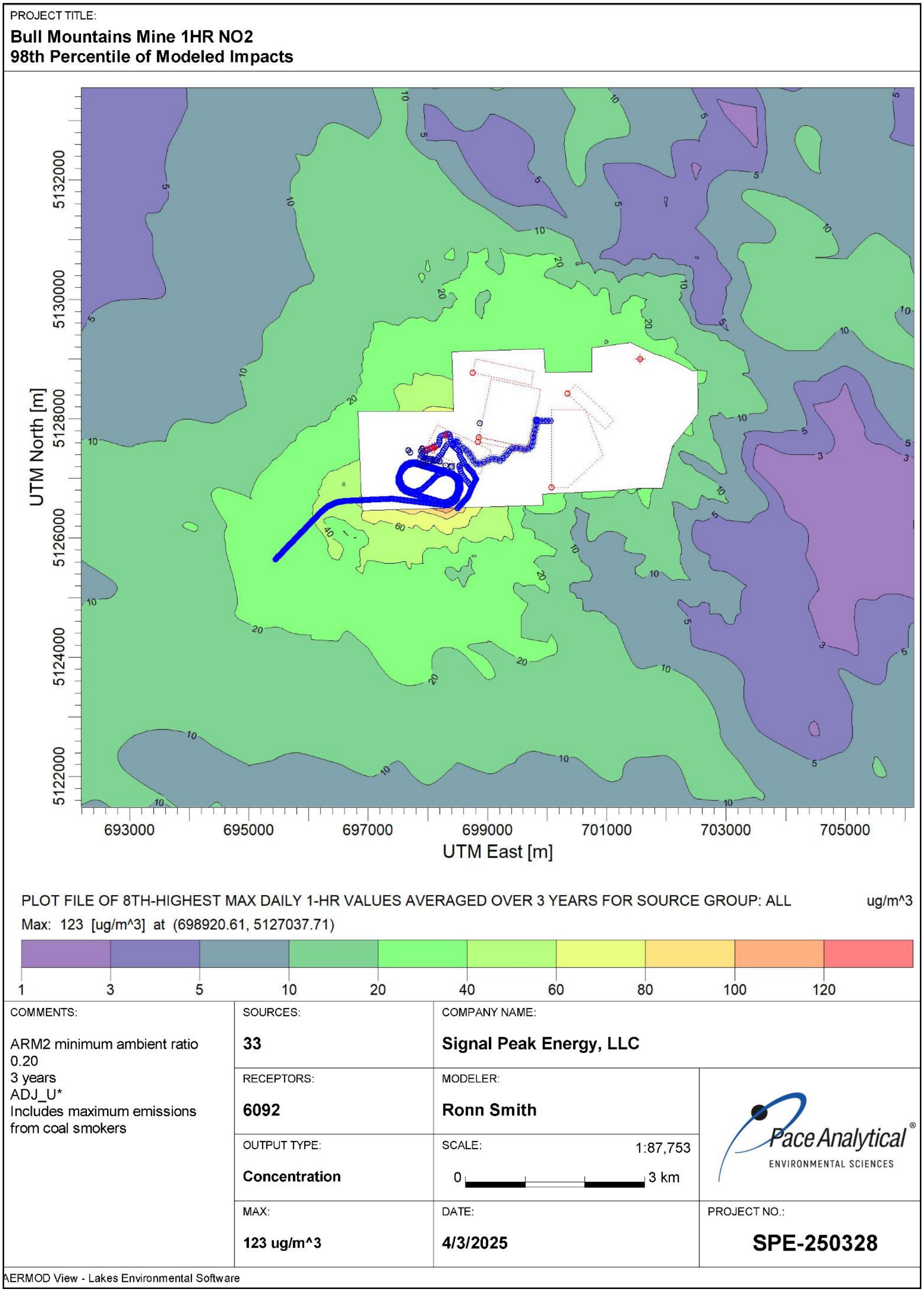


Figure 3-12: Bull Mountains Mine 1-Hr NO_2 Isopleth Map



3.4. SO_2 Results

3.4.1. Annual Average Concentrations

Table 3-7 lists receptors with the 20 highest predicted annual average SO_2 concentrations. After adding background concentrations, these receptors demonstrate compliance with the NAAQS. Figure 3-13 shows the near-field portion of the receptor array most susceptible to impacts from mine sources. It highlights the top 10 receptors (red diamonds) as well as the receptor with the maximum predicted concentration (light blue diamond), all positioned along Fattig Road or along the ambient air boundary immediately south of the rail loop. Figure 3-14 is a contour map of modeled impacts only, over a larger area.

Table 3-7: Top 20 Annual SO_2 Receptors

UTM Coordinates		Concentrations (μg/m^3)			
Easting	Northing	Modeled	Background	Total	NAAQS
699848	5127815	1.3	3.0	4.3	26.2
699869	5127930	1.3	3.0	4.3	26.2
699851	5127832	1.3	3.0	4.3	26.2
699848	5127715	1.3	3.0	4.3	26.2
699896	5127994	1.2	3.0	4.2	26.2
699848	5127650	1.2	3.0	4.2	26.2
698329	5126504	1.2	3.0	4.2	26.2
699814	5127556	1.2	3.0	4.2	26.2
698300	5126500	1.1	3.0	4.1	26.2
699942	5128082	1.1	3.0	4.1	26.2
698229	5126501	1.1	3.0	4.1	26.2
699783	5127471	1.0	3.0	4.0	26.2
698921	5127038	1.0	3.0	4.0	26.2
698129	5126498	1.0	3.0	4.0	26.2
698400	5126500	1.0	3.0	4.0	26.2
698834	5126988	1.0	3.0	4.0	26.2
698823	5126982	1.0	3.0	4.0	26.2
699007	5127087	1.0	3.0	4.0	26.2
699988	5128171	1.0	3.0	4.0	26.2
700135	5126748	1.0	3.0	4.0	26.2

Figure 3-13: Bull Mountains Mine Top 10 Annual SO_2 Receptors

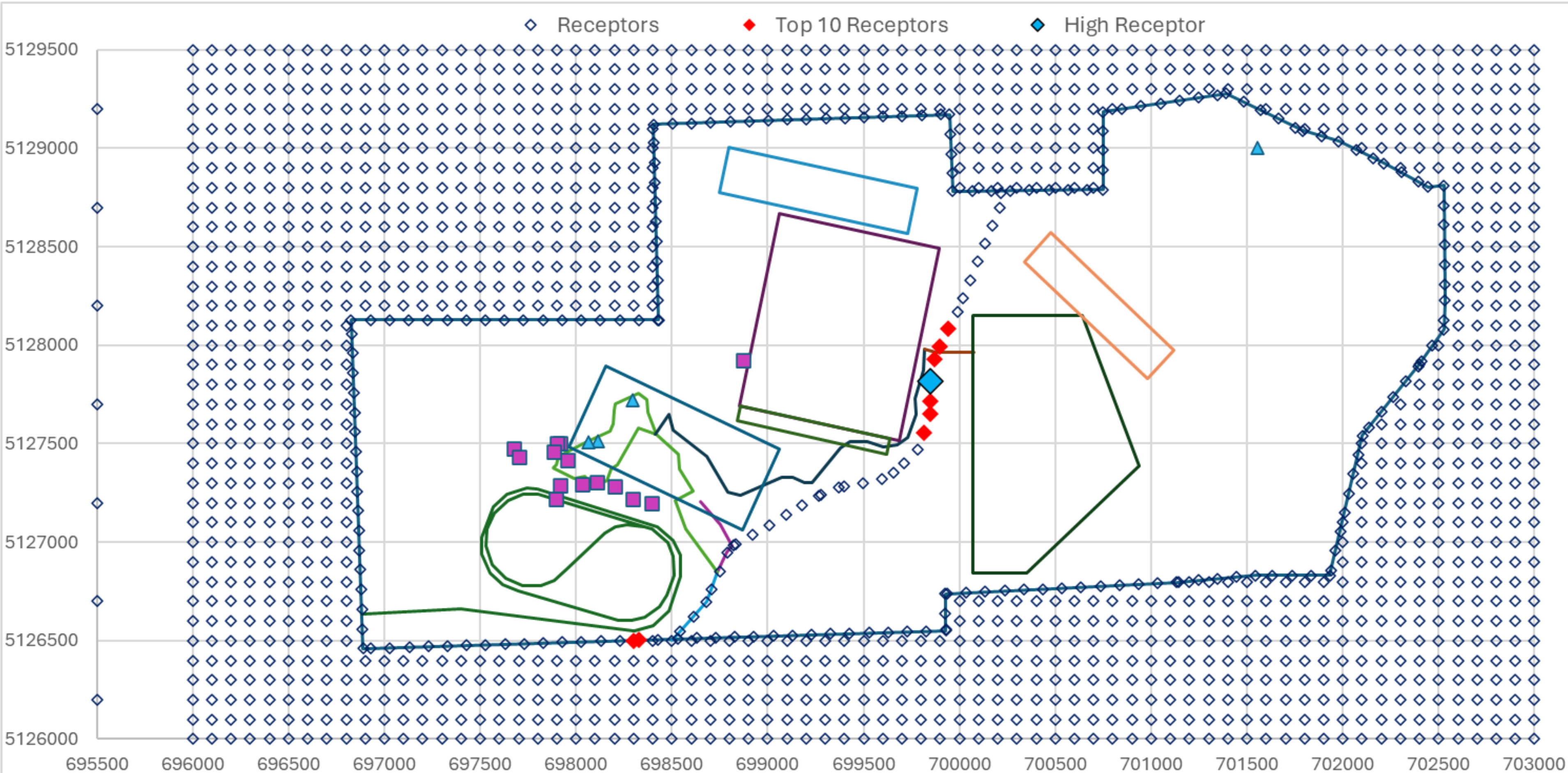
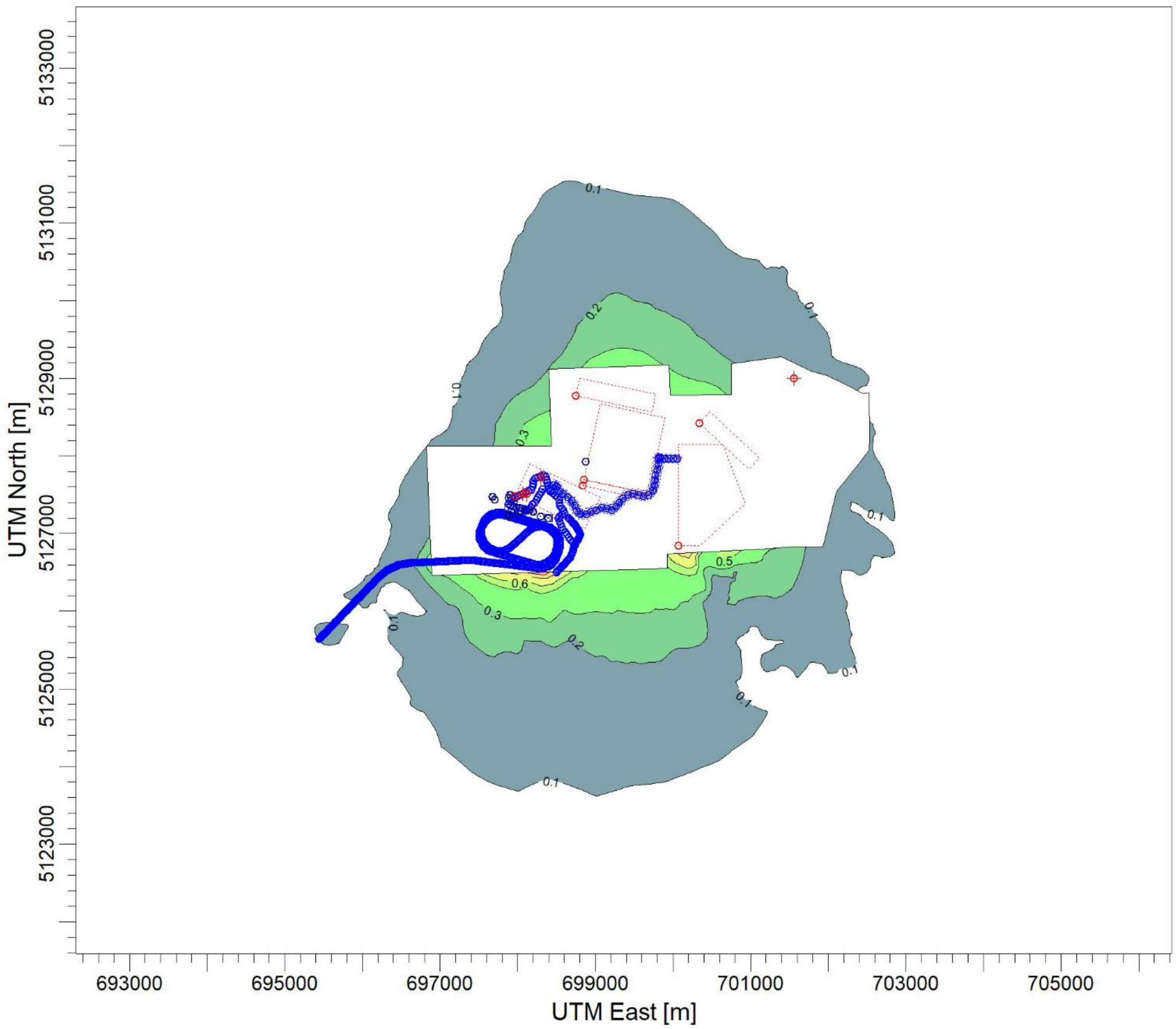


Figure 3-14: Bull Mountains Mine Annual SO_2 Isopleth Map

PROJECT TITLE:

Bull Mountains Mine Annual SO2
Maximum Modeled Impacts



PLOT FILE OF PERIOD VALUES AVERAGED ACROSS 3 YEARS FOR SOURCE GROUP: ALL ug/m^3

Max: 1.3 [ug/m^3] at (699848.00, 5127815.00)

0.1 0.2 0.3 0.5 0.6 0.8 1.0 1.2

COMMENTS: Includes maximum SO2 emission rate from coal smokers 3 years ADJ_U*.	SOURCES: **33**	COMPANY NAME: **Signal Peak Energy, LLC**	
	RECEPTORS: **6092**	MODELER: **Ronn Smith**	Pace Analytical® ENVIRONMENTAL SCIENCES
	OUTPUT TYPE: **Concentration**	SCALE: 1:88,717 0 — 3 km	
	MAX: **1.3 ug/m^3**	DATE: **4/3/2025**	PROJECT NO.: **SPE-250328**

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3.4.2. 1-Hour Concentrations

Table 3-8 lists receptors with the 20 highest predicted 1-hour average SO_2 concentrations. The design value is the 3-year average of the 4th high concentrations (99th percentile). After adding background concentrations, these receptors demonstrate compliance with the NAAQS. Figure 3-15 shows the near-field portion of the receptor array most susceptible to impacts from mine sources. It highlights the top 10 receptors (red diamonds) as well as the receptor with the maximum predicted concentration (light blue diamond), all positioned along Fattig Road or the southern ambient air boundary. Figure 3-16 is a contour map of modeled impacts only, over a larger area. The extended 1-hour impacts northeast and southeast of the mine represent a worst-case condition. The impacts reflect the buoyant-line source used to model spontaneous coal smokers. Although some of the coal sulfur remains in the ash, for conservatism it is assumed that all sulfur in the coal volatilizes during combustion, and that a smoker occurs on every meteorological day. Typically, the mine experiences less than two of these per month.

Table 3-8: Top 20 1-Hr SO_2 Receptors

UTM Coordinates		Concentrations (µg/m³)			
Easting	Northing	Modeled	Background	Total	NAAQS
700135	5126748	20.5	35.0	55.5	196.0
699783	5127471	20.1	35.0	55.1	196.0
699814	5127556	20.0	35.0	55.0	196.0
699848	5127815	19.9	35.0	54.9	196.0
699848	5127715	19.8	35.0	54.8	196.0
699869	5127930	19.7	35.0	54.7	196.0
699851	5127832	19.5	35.0	54.5	196.0
699848	5127650	19.2	35.0	54.2	196.0
699896	5127994	19.0	35.0	54.0	196.0
698300	5126500	19.0	35.0	54.0	196.0
698329	5126504	18.7	35.0	53.7	196.0
700600	5126300	18.6	35.0	53.6	196.0
698921	5127038	18.5	35.0	53.5	196.0
700200	5126700	18.4	35.0	53.4	196.0
699942	5128082	18.1	35.0	53.1	196.0
699711	5127402	18.1	35.0	53.1	196.0
700035	5126743	17.9	35.0	52.9	196.0
700100	5126700	17.9	35.0	52.9	196.0
700734	5126777	17.9	35.0	52.9	196.0
700235	5126753	17.5	35.0	52.5	196.0

Figure 3-15: Bull Mountains Mine Top 10 1-Hr SO_2 Receptors

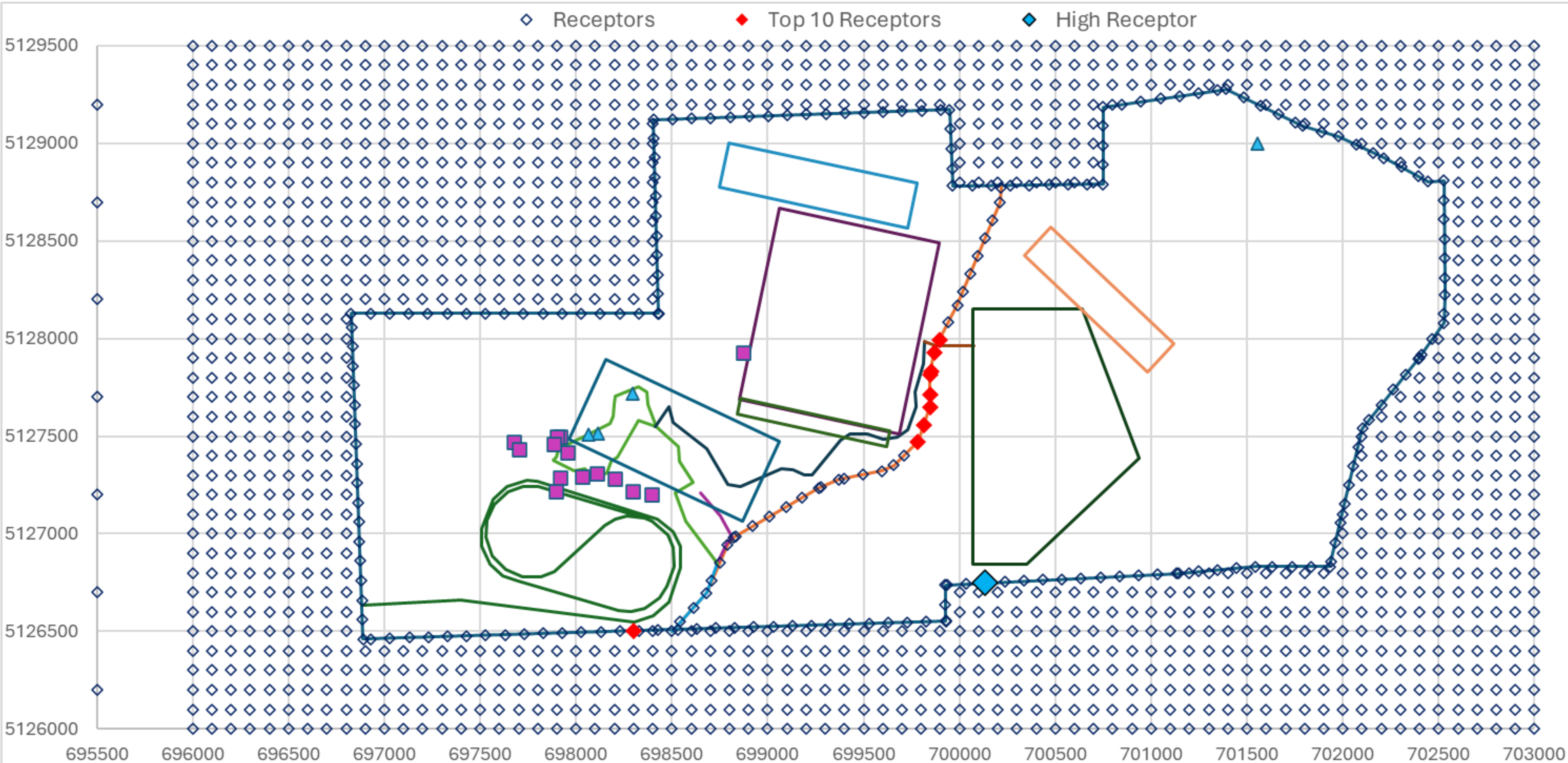
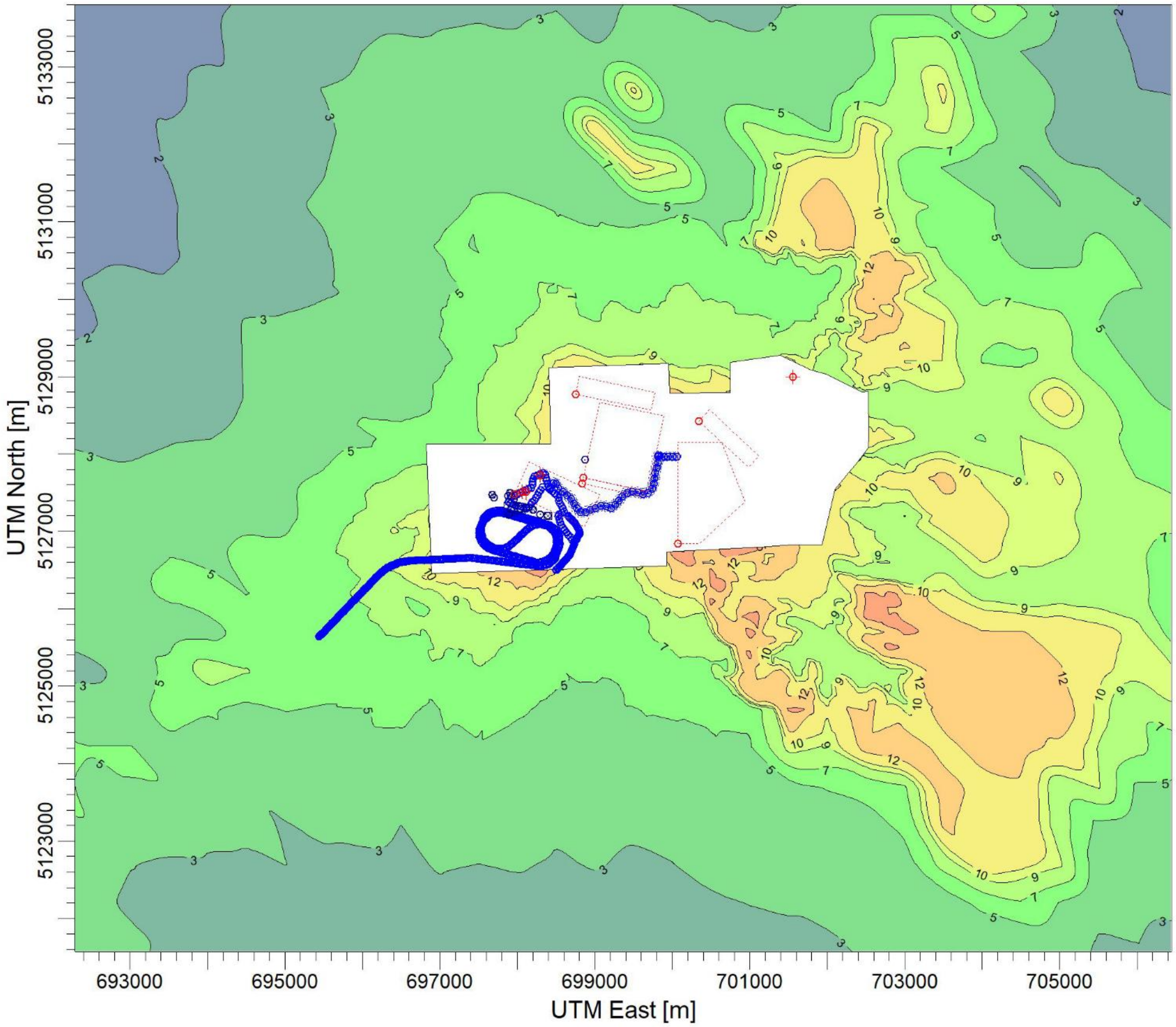


Figure 3-16: Bull Mountains Mine 1-Hr SO_2 Isopleth Map

PROJECT TITLE:

Bull Mountains Mine 1HR SO2
99th Percentile of Modeled Impacts



PLOT FILE OF 4TH-HIGHEST MAX DAILY 1-HR VALUES AVERAGED OVER 3 YEARS FOR SOURCE GROUP: ALL ug/m^3

Max: 21 [ug/m^3] at (700135.19, 5126748.18)

1 2 3 5 7 9 10 12 15 20

COMMENTS:	SOURCES:	COMPANY NAME:	
Includes maximum SO2 emission rate from coal smokers 3 years ADJ_U*.	**33**	**Signal Peak Energy, LLC**	
	RECEPTORS: **6092**	MODELER: **Ronn Smith**	Pace Analytical® ENVIRONMENTAL SCIENCES
	OUTPUT TYPE: **Concentration**	SCALE: 1:88,984 0 3 km	
	MAX: **21 ug/m^3**	DATE: **4/3/2025**	PROJECT NO.: **SPE-250328**

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3.5. CO Results

3.5.1. 8-Hour Average Concentrations

Table 3-9 lists receptors with the 20 highest predicted 8-hour average CO concentrations. After adding background concentrations, these receptors demonstrate compliance with the NAAQS. Figure 3-17 shows the near-field portion of the receptor array most susceptible to impacts from mine sources. It highlights the top 10 receptors (red diamonds) as well as the receptor with the maximum predicted concentration (light blue diamond), all positioned along Fattig Road, the southern ambient air boundary, or the northeastern ambient air boundary near the underground mine vent. Figure 3-18 is a contour map of modeled impacts only, over a larger area. The extended impacts northeast and southeast of the mine represent a worst-case condition. The impacts reflect the buoyant-line source used to model spontaneous coal smokers. The model assumes that a smoker occurs on every meteorological day. Typically, the mine experiences less than two of these per month.

Table 3-9: Top 20 8-Hr CO Receptors

UTM Coordinates		Concentrations ($\mu g/m^3$)			
Easting	Northing	Modeled	Background	Total	MAAQS
701573	5129192	55.4	2175	2230	10350
701600	5129200	53.3	2175	2228	10350
700135	5126748	47.2	2175	2222	10350
699848	5127715	44.0	2175	2219	10350
699848	5127815	43.5	2175	2219	10350
699814	5127556	42.8	2175	2218	10350
702900	5125600	42.7	2175	2218	10350
699851	5127832	42.7	2175	2218	10350
699869	5127930	42.4	2175	2217	10350
699848	5127650	42.2	2175	2217	10350
700200	5126700	41.4	2175	2216	10350
702800	5125600	41.3	2175	2216	10350
701482	5129235	40.8	2175	2216	10350
700100	5126700	40.7	2175	2216	10350
698834	5126988	40.6	2175	2216	10350
698823	5126982	40.4	2175	2215	10350
703000	5125600	40.2	2175	2215	10350
703000	5125500	39.3	2175	2214	10350
698790	5126945	39.1	2175	2214	10350
698300	5126500	39.1	2175	2214	10350

Figure 3-17: Bull Mountains Mine Top 10 8-Hr CO Receptors

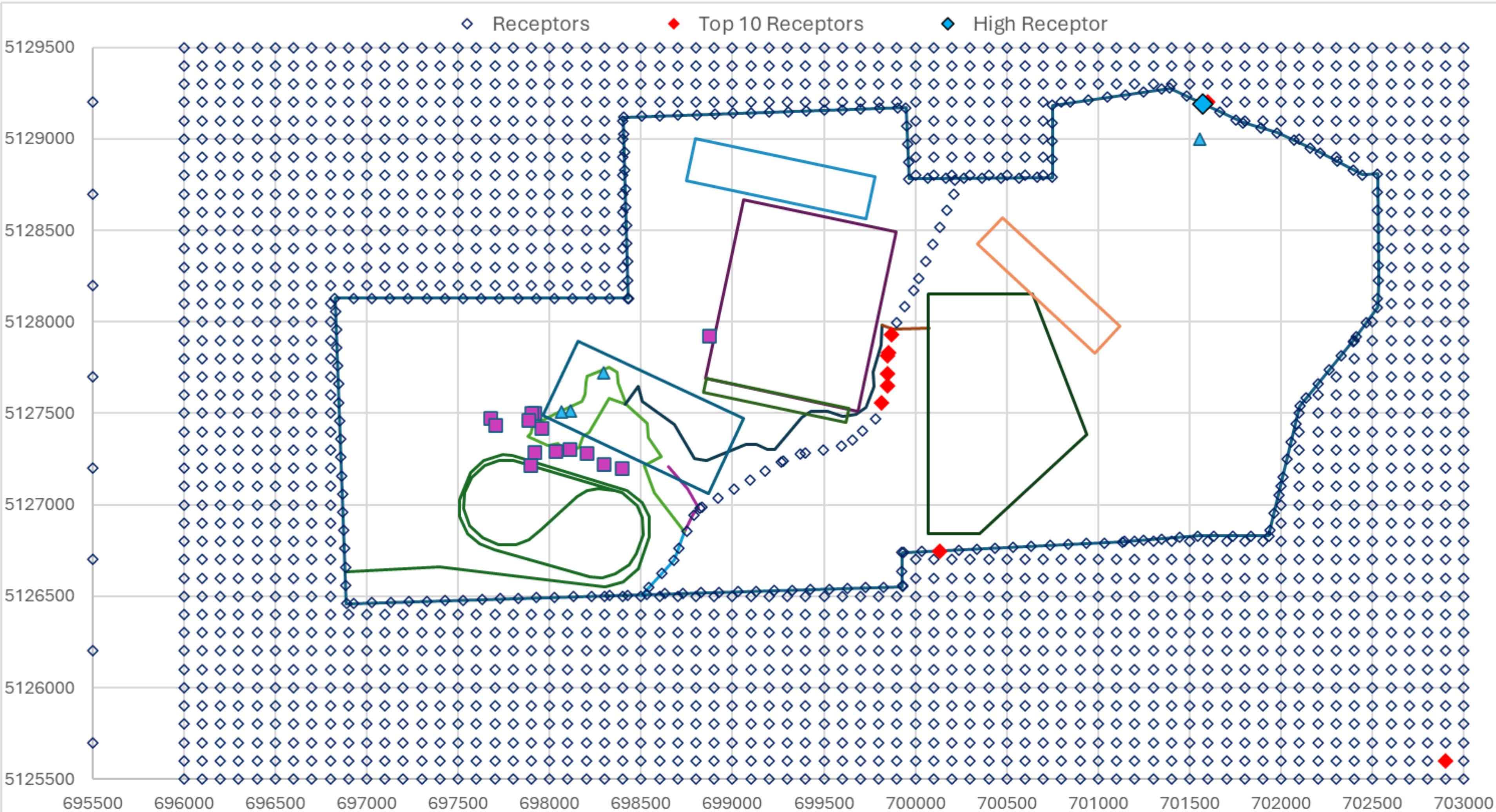
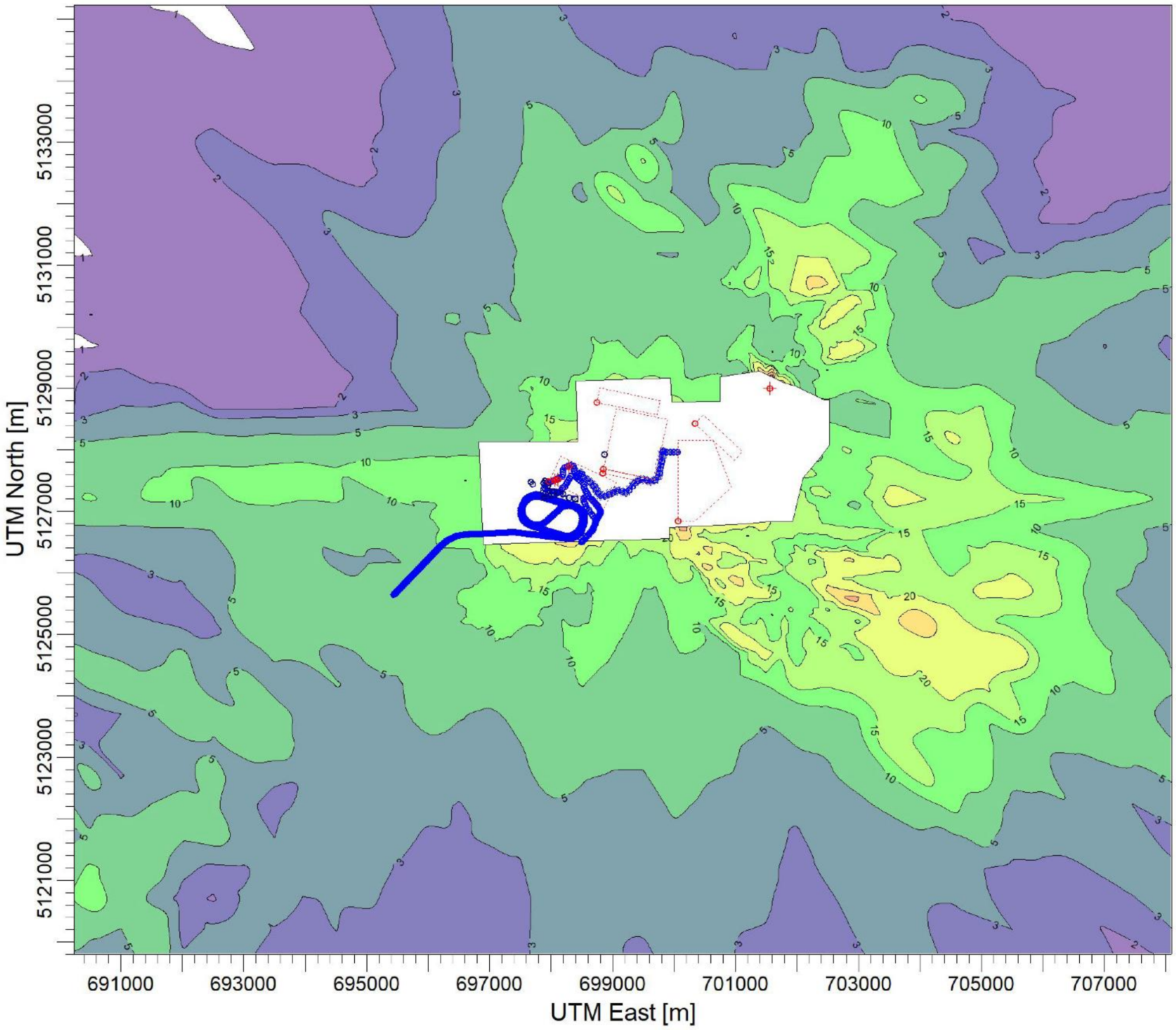


Figure 3-18: Bull Mountains Mine 8-Hr CO Isopleth Map

PROJECT TITLE:

Bull Mountains Mine 8HR CO
Maximum Modeled Impacts



PLOT FILE OF HIGH 1ST HIGH 8-HR VALUES FOR SOURCE GROUP: ALL ug/m^3

Max: 55 [ug/m^3] at (701572.57, 5129192.01)

1 2 3 5 10 15 20 30 40 50

COMMENTS: 3 years ADJ_U* Assumes maximum emissions from coal smokers	SOURCES: **33**	COMPANY NAME: **Pace Analytical**
	RECEPTORS: **6092**	MODELER: **Ronn Smith**
	OUTPUT TYPE: **Concentration**	SCALE: 1:112,243 0 4 km
	MAX: **55 ug/m^3**	DATE: **4/3/2025**
		PROJECT NO.: **SPE-250328**

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DELIVERING SCIENCE BETTER

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3.5.2. 1-Hour Concentrations

Table 3-10 lists receptors with the 20 highest predicted 1-hour average CO concentrations. After adding background concentrations, these receptors demonstrate compliance with the NAAQS. Figure 3-19 shows the near-field portion of the receptor array most susceptible to impacts from mine sources. It highlights the top 10 receptors (red diamonds) as well as the receptor with the maximum predicted concentration (light blue diamond), positioned downwind from the mine facilities or on the ambient air boundary near the underground mine vent. Figure 3-20 is a contour map of modeled impacts only, over a larger area. The more distant impacts reflect the buoyant-line source used to model spontaneous coal smokers. The model assumes that a smoker occurs on every meteorological day. Typically, the mine experiences less than two of these per month.

Table 3-10: Top 20 1-Hr CO Receptors

UTM Coordinates		Concentrations (μg/m^3)			
Easting	Northing	Modeled	Background	Total	NAAQS
701573	5129192	392.7	7213	7606	40250
701600	5129200	389.2	7213	7602	40250
701600	5129300	263.5	7213	7476	40250
700600	5126300	167.9	7213	7381	40250
701663	5129149	165.5	7213	7379	40250
701482	5129235	158.7	7213	7372	40250
702600	5126100	153.3	7213	7366	40250
702600	5126000	151.5	7213	7365	40250
702500	5126100	151.4	7213	7364	40250
700500	5126400	149.9	7213	7363	40250
702700	5126000	149.5	7213	7362	40250
702900	5126100	147.8	7213	7361	40250
702900	5126000	147.2	7213	7360	40250
702500	5126000	147.1	7213	7360	40250
702800	5126100	147.0	7213	7360	40250
701000	5126000	146.9	7213	7360	40250
700600	5126400	146.5	7213	7359	40250
701000	5125800	146.3	7213	7359	40250
702800	5126000	146.1	7213	7359	40250
702500	5126200	146.1	7213	7359	40250

Figure 3-19: Bull Mountains Mine Top 10 1-Hr CO Receptors

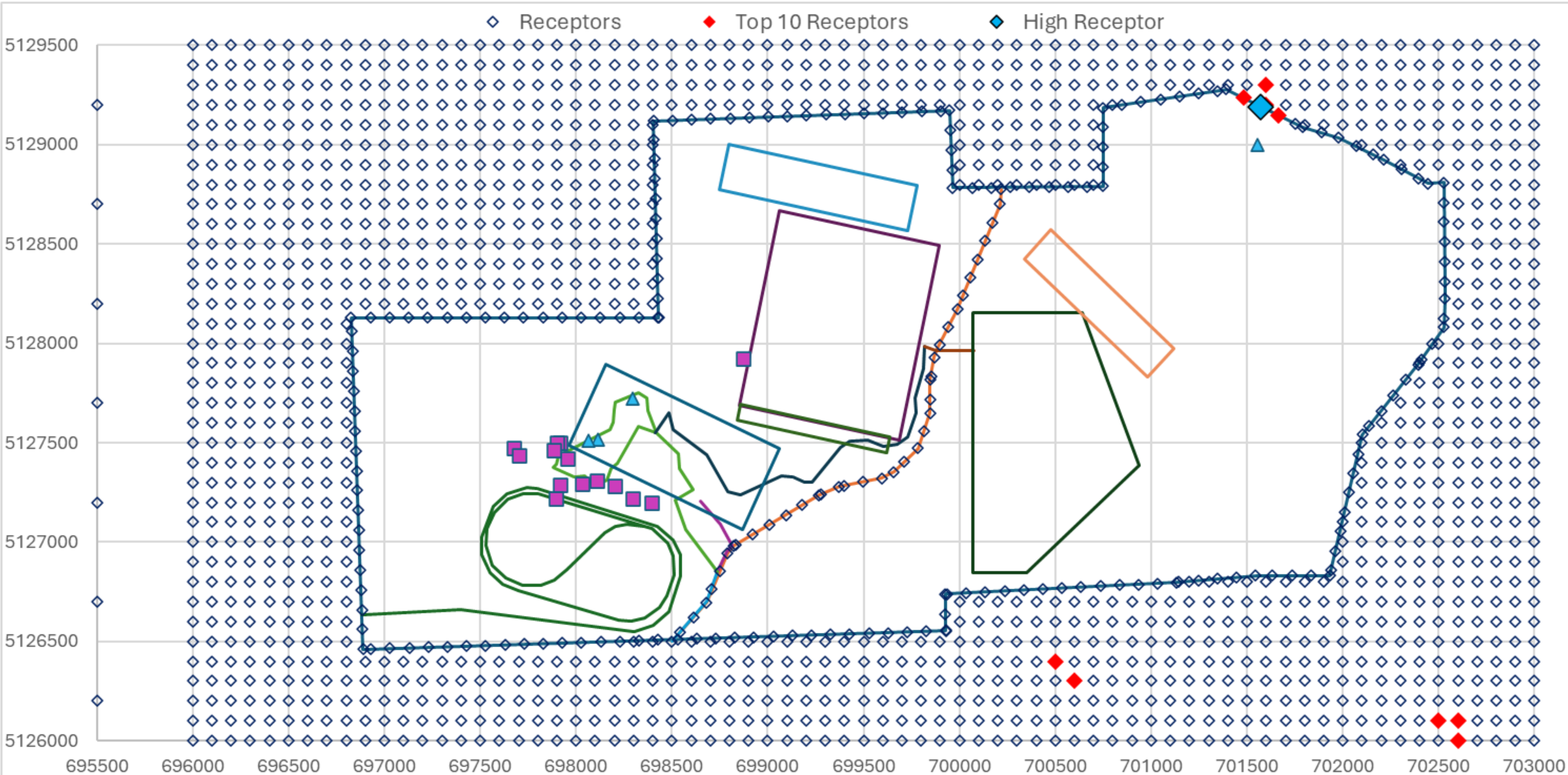
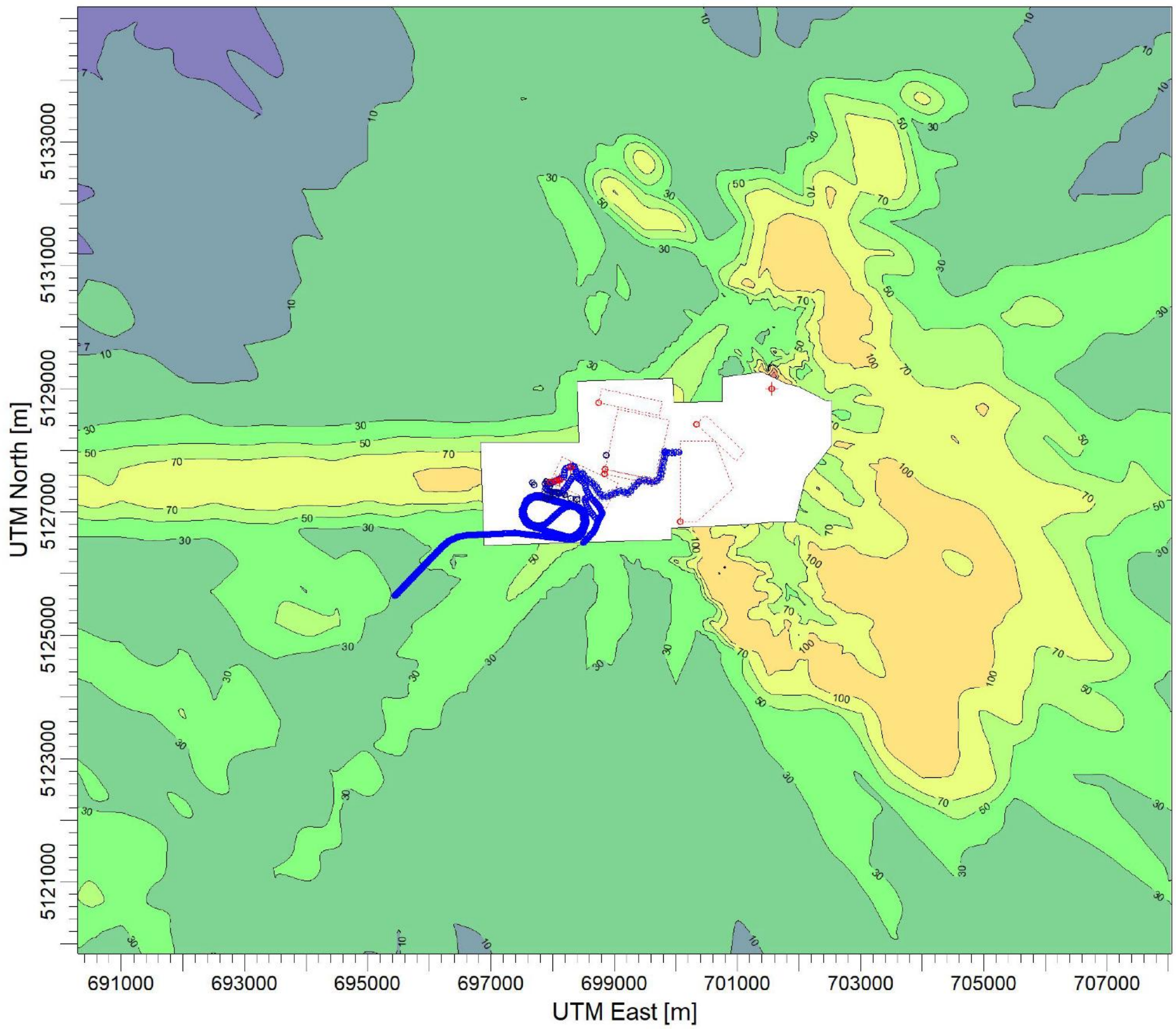


Figure 3-20: Bull Mountains Mine 1-Hr CO Isopleth Map

PROJECT TITLE:

Bull Mountains Mine 1HR CO
Maximum Modeled Impacts



PLOT FILE OF HIGH 1ST HIGH 1-HR VALUES FOR SOURCE GROUP: ALL ug/m^3

Max: 393 [ug/m^3] at (701572.57, 5129192.01)

3 5 7 10 30 50 70 100 200 300

COMMENTS:	SOURCES:	COMPANY NAME:	
3 years ADJ_U* Assumes maximum emissions from coal smokers	**33**	**Pace Analytical**	
	RECEPTORS: **6092**	MODELER: **Ronn Smith**	Pace Analytical® DELIVERING SCIENCE BETTER
	OUTPUT TYPE: **Concentration**	SCALE: 1:111,666 0 4 km	
	MAX: **393 ug/m^3**	DATE: **4/3/2025**	PROJECT NO.: **SPE-250328**

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4 CONCLUSION

The dispersion modeling results presented in this report predict future ambient air quality impacts from the maximum potential emissions at the Bull Mountains Mine. These predictions were compared to the relevant state and national standards. The results demonstrate compliance with the MAAQS and NAAQS for all modeled pollutants and averaging intervals.

5 REFERENCES

1. EPA 2024, *National Ambient Air Quality Standards*, December 16, 2024. NAAQS Table | US EPA
2. EPA 2000, EPA, *Meteorological Monitoring Guidance for Regulatory Modeling Applications*, February 2000. MMG09 FEB 2000
3. MDEQ 2024, *Montana Ambient Air Quality Standards*, June 25, 2024. MTDEQ 2024 Network Plan
4. SPE 2025, *Bull Mountains Mine Modeling Protocol*, March 31, 2017.

Appendix F
Transport Analysis for Waste Disposal Areas

Due to their large size, the following Attachments are available by request:

- Attachment 1: Meteoric Water Mobility Procedure Analytical Summary Report
- Attachment 2: Acid-Base Accounting Results Summary
- Attachment 3: Hydrologic Evaluation of Landfill Performance
- Attachment 4: Laboratory Report for Signal Peak Energy WDA Investigation
- Attachment 5: Soil Characteristic Curve Results

Please submit all requests in writing to: mcalle@osmre.gov.

MEMORANDUM

To: Dusty Weber

From: Brad Rutherford, Michael Nicklin, PhD, PE

Date: 2/27/2025

Re: Numerical Groundwater Model Analysis of Chemical Loading to the Rehder Creek Alluvial Aquifer from Solid Waste Disposal and Mine Production Water Discharge

1.0 INTRODUCTION

The focus of this memorandum is to summarize the sampling and analysis completed by Water and Environmental Technologies (WET) and Signal Peak Energy (SPE) in response to a request for information (RFI) from Knight Piésold. The purpose of the RFI was to assess potential chemical loading in the Rehder Creek alluvial groundwater aquifer from potential mine related sources including seepage through and runoff from coal refuse materials deposited in one actively operating Waste Disposal Area (WDA) and one planned WDA (Figure 1). Another potential source of mine related chemical loading is excess water produced from strata during mining, not used for coal processing, that has been and will continue to be stored within ponds and occasionally discharged via MPDES outfalls through Life Of Mine (LOM). Following construction of the second WDA (WDA-2), the first WDA (WDA-1) will be capped with native soils that were excavated and stockpiled from the WDA-1 footprint prior to placement of coal refuse. The native soil cap will then be vegetated prior to LOM. After LOM, WDA-2 will undergo an analogous closing process. The focus of the analysis was on loading (concentration and flow rate) of each potential source component. To forecast mine related water quality impacts, natural water concentrations and flow rates are required to simulate mixing and dilution downgradient of potential sources.

2.0 BACKGROUND AND POTENTIAL SOURCE WATER QUALITY

2.1 Background and Natural Changes to Site Groundwater Quality

The focus of the water quality impact analysis to the Rehder Creek alluvial aquifer was on total dissolved solids (TDS) because no individual analyte has exceeded DEQ-7 human health standards in Rehder Creek alluvial groundwater wells. One nitrogen exceedance occurred in BMP026 in 2011 (10 mg/L) within the PM Draw alluvial aquifer, however an upgradient well within the same watershed, far from possible mine related sources (BMP027) exhibited a nitrate concentration of 23.8 mg/L suggesting that neither of these exceedances were related to mining activity. TDS concentration median values prior to 2010 for springs (measurable flow only) and alluvial wells are shown in Figure 2 – Sheet 1 and summarized in Table 1. The watershed area that extends from Rehder Creek toward the mine office and portal area (PM Draw) shows elevated TDS concentration (~1,700 mg/L) in Figure 2 -Sheet 1. PM-88-2A (1,650 mg/L) is a baseline well that was sampled once in July 1991 prior to and upgradient from current mine facilities in PM Draw. The Rehder Creek alluvial aquifer shows TDS concentration near 1,200 mg/L. One notable exception is downgradient from the confluence with PM Draw where the concentrations appear to increase by more than 100 mg/L. This subtle increase in baseline samples likely indicates mixing with the naturally occurring, relatively high TDS concentrations observed in PM Draw groundwater. In May 2011 there was a major precipitation event at the site that caused groundwater levels to increase substantially in alluvial aquifers and likely in colluvial deposits. This water level increase has been correlated to water quality degradation in alluvial aquifers at the site (Appendix 314-5). To substantiate that assertion, Figure 2 – Sheet 2 shows 2011 and 2012 median TDS concentration values in flowing springs and alluvial groundwater wells and these data are also summarized in Table 1. Most notably, PM Draw watershed areas show two very high TDS groundwater samples (BMP027 - 5,260 mg/L and BMP028 – 4,280 mg/L), upgradient of any known mine related sources. Although longwall mining activity preceded the 2011 rain event, only a very small portion, 6.6 acres of 1,647 acres in Watershed 23 of PM Draw, had been longwall undermined prior to 2013. The high TDS groundwater concentrations in PM Draw must have been related to the 2011 precipitation event and likely contributed to elevated TDS concentrations observed in the downgradient Rehder Creek alluvial aquifer.

2.2 Potential Source Water Quality

Three potential mine related sources were identified and assessed for contributions to chemical loading in the Rehder Creek and PM Draw alluvial aquifer system. Runoff from active WDA's, infiltration and seepage of meteoric water through the WDA coal refuse material, and diversion of excess mine production water into site ponds. Analytical data for all potential source waters are compiled in Table 2.

2.2.1 WDA Leachate Water Quality

Coal refuse material from three widely spaced test pits (Figure 1) were collected at multiple depths from the surface down to approximately 11.5 feet and homogenized. One sample (WDA1-1) was duplicated, and all samples were sent to Energy Labs for Meteoric Water Mobility Procedure (MWMP) (Attachment 1) and Acid-Base Accounting (ABA) (Attachment 2). No exceedances of DEQ-7 human health standards occurred for the MWMP extraction results

(Table 2). Additionally, these data suggest that the leachate will mirror natural site background TDS concentrations (~1,200 mg/L). MWMP results indicate that WDA leachate is not a likely source for groundwater quality impacts to the Rehder Creek alluvial aquifer. ABA results indicate that the material has a median acid-base potential from the three samples of -42 t/kt (Attachment 2). Although these results suggest that WDA material has acid forming potential, ABA considers total sulfur content within the sample which tends to overestimate the true acid forming potential of waste under interaction with meteoric water. The industry standard threshold ratio of acid-to-neutralization potential for likely acid formation (3:1) was not exceeded in any sample. The median ratio value of 2.1:1 diminishes the likelihood of acid formation in the waste. Multiple lines of evidence including: median groundwater pH (7.6 s.u.) for all samples following WDA-1 construction in immediately downgradient alluvial monitoring well BMP033, the median pH results of the MWMP (8.2 s.u.), and the median pH of WDA runoff samples (8.0 s.u.) indicate that the acid forming potential under natural field conditions is likely less than the neutralizing potential in the waste material (Table 2).

2.2.2 WDA Runoff Water Quality

SPE queried water quality sample data from WDA Pond 1 and MPDES Outfall 008 that were representative of runoff water without other commingled sources (i.e. excess mine production water) (Table 2). Several exceedances of DEQ-7 human health standards have occurred over the sample set including nitrogen, lead, arsenic, and nickel. The sample with the most exceedances and highest TDS concentration occurred in August 2014. This sample followed a precipitation event that was preceded by a relatively dry spring and summer, suggesting that an anomalous amount of freshly deposited waste was exposed within WDA-1 that had not yet been exposed to a major precipitation event. The relatively high concentrations of analytes in WDA runoff water in comparison to the result of the MWMP indicates that most of the available ions within the coal refuse material are dissolved and transported downslope to WDA ponds via runoff during precipitation events. No median concentration values of the WDA runoff sample set exceeded DEQ-7 human health standards. The median TDS produced by runoff from the WDA was above observed background concentrations at 1,940 mg/L.

2.2.3 Excess Strata Produced Flow Water Quality

Seepage into the mine from surrounding strata is collected by sumps and diverted to the surface where some of the volume (~400 gpm) is utilized for coal processing. A portion of the volume required for coal processing is evaporated from the coal stockpile, sent to the WDA with the waste, and some is shipped offsite with the coal because the coal moisture content increases slightly during processing. Excess mine production water (gob water) is diverted to site ponds where infiltration into groundwater and occasional discharge via MPDES outfalls occurs. Two samples of strata produced water were collected in 2015 and 7 samples were collected in 2023 and 2024. Two samples produced nickel concentrations above DEQ-7 human health standards for groundwater in 2015 and again in 2023 (Table 2). No exceedances from the 2024 sampling set occurred. Median nickel concentration is below DEQ-7 human health standard and no nickel exceedances have been found in Rehder Creek alluvial site groundwater wells. TDS concentrations for gob water samples averaged 3,270 mg/L for the 2015 samples, whereas the 2023 and 2024 median TDS concentration was 2,150 mg/L. These data indicate that the TDS concentration in strata produced groundwater has decreased by more than 1,000 mg/L over the 8-year timeframe. Median TDS concentration for all samples is 2,180 mg/L.

3.0 BACKGROUND AND POTENTIAL SOURCE WATER QUANTITY

3.1 WDA Water Budget Modeling

To determine the portions of precipitation that runoff and seep through WDA waste material, the EPA Hydrologic Evaluation of Landfill Performance (HELP) model was utilized. The HELP model is a quasi-two-dimensional model that predicts the water budget of landfill designs. Four separate HELP models were completed to represent active and closed conditions for both WDA's. The model parameters for the 100-year simulations are summarized in Attachment 3 and discussed below. Average water budget results over the 100-year simulations are summarized in Table 3.

3.1.1 Soil Hydraulic Parameter Assumptions

Soil samples of WDA waste and stockpile cover materials were collected from the same three test pits (Figure 1) and sent to Daniel B. Stephens and Associates Inc. (DBS&A) for hydraulic properties testing (Attachment 4). Specific soil properties required for the HELP modelling include total porosity, field capacity, wilting point, and saturated hydraulic conductivity. To determine field capacity and wilting point of each material, the oversize corrected soil characteristic curves, provided by DBS&A, were utilized (Attachment 5). The moisture content of the given sample was determined at soil moisture potentials of -33 kPa and -1500 kPa for field capacity and wilting point respectively. Values of these parameters and the other soil property inputs required to run the HELP model are summarized in Table 4. Soil classification and soil percentages of gravel, sand, silt, and clay were used qualitatively to estimate the evaporative zone depth. For both the active and capped WDA's it was assumed that the evaporative zone depth was 6 inches. According to Schroder et al. (1994) the evaporative zone depth for unvegetated soil should be 4 to 8 inches for sand, 8 to 18 inches for silt, and 12 to 60 inches in clay. An evaporative depth within the range of sand was selected although WDA waste is comprised of slightly more than 50% clay and silt (Attachment 4). This assumption is conservative because it will result in less evaporation in the model which results in more runoff and/or infiltration through waste materials.

3.1.2 Soil and Design Assumptions

For the active WDA, waste material was defined as the uppermost layer (Layer 1), followed by a vertical infiltration layer of waste material (Layer 2), a lateral drainage layer of waste material (Layer 3), and the bottom (Layer 4) was a soil barrier layer assigned a very low saturated hydraulic conductivity (1×10^{-20} cm/s) to ensure that all water simulated to infiltrate the waste flowed laterally out of the waste. This assumption that little vertical infiltration occurs into bedrock underlying the base of the WDA waste is justified by the structural bedrock dip in the vicinity of both WDA's being to the northeast, toward Rehder Creek. The structural dip of low permeability mudstones interbedded with sandstone will ultimately result in lateral flow toward the Rehder Creek alluvial aquifer. No subsurface flow was assumed to enter the waste from the underlying bedrock. The thickness of the waste (Layers 1, 2, and 3) were assumed to be half the average thickness of the final waste (80 feet - half thickness of 40 feet for WDA-1 and 60 feet - half thickness of 30 feet for WDA-2). The thickness of layer 1 was assigned as the evaporative zone depth (6 in) and given an initial moisture content equal to the material field capacity. The thickness of layer 3 was dependent upon the HELP simulation results. Since Layer 3 was assumed to be fully saturated at initial conditions, this thickness was determined by running multiple models to determine the steady state saturated thickness of the lateral flow layer. Once the average change in landfill water storage over the 100-year simulation period was less than 0.1%, it was assumed that the model was near steady state conditions and the thickness of the saturated lateral flow layer was determined. Layer 2 was assigned the remaining thickness of the waste and was assigned an initial saturation at the field capacity of the waste material. The slope on the bottom of the lateral drainage layer (Layer 3) was assigned as the average slope of the base surface, provided by SPE, prior to deposition of waste (25% for WDA-1 and 30% for WDA-2).

For the closed WDA, two layers were added to the top of the model. Layer 1 was 18 inches of topsoil and Layer 2 was 24 inches thick comprised of subsoil. The waste material was thickened to the final waste thickness and the fully saturated lateral flow layer was redetermined for the new steady state conditions. Water content of the two WDA cap layers was initiated at the field capacity of the respective material (Table 4).

3.1.3 Weather Simulation and Assumptions

The built-in weather simulator included with HELP V4 was utilized to simulate 100 years of weather. The same simulated weather was used for all four HELP model applications. Wind speed and relative humidity data were downloaded from the National Solar Radiation Data Base (NSRDB), which resulted in an average wind speed of 11 mph and average relative humidity of 60%, 55%, 46%, and 54% for the four quarters respectively.

3.1.4 Additional Model Parameters and Assumptions

An estimated 95% of the WDA areas were assumed to be subject to runoff. For the runoff curve number, the HELP computed value was utilized with inputs of slope and surface cover. For operating WDA's the slope was assumed to be the average of the base slope and the final cap slope (15% and 20% for WDA-1 and WDA-2 respectively) and for closed WDA's the slope was the average slope of the final surface (8.5% and 9.0% for WDA-1 and WDA-2 respectively). The landfill cover was assumed to be bare ground for operating conditions and fair grass following closure. The growing season was assigned a length of zero days (no vegetation) for the operating WDA scenario and a growing season from Julian day 142 to 212 (May 2 to July 31) was assumed for the closed WDA's. Although the growing season in the area is longer than the days selected, many of the grasses that will cover the WDA's will likely not grow after July.

3.2 Numerical Groundwater Flow Modeling

To determine approximate lateral groundwater quantity contributions from watershed areas and areal recharge to the Rehder Creek and PM Draw alluvial aquifer system, a MODFLOW-USG numerical groundwater model was implemented and calibrated to observed transient heads. MODFLOW–USG is an unstructured grid version of MODFLOW for simulating groundwater flow and tightly coupled processes using a control volume finite-difference (CVFD) framework (Panday et al., 2013). The model was also used to simulate fate and transport of TDS within the system to assess mine related water quality changes to the Rehder Creek alluvial aquifer.

3.2.1 Model Construction and Boundary Conditions

A single layer unconfined aquifer model was developed to represent the Rehder Creek alluvial aquifer. The model domain was discretized using an irregular quadtree grid refinement scheme. Parent cells of 160 feet were divided twice to achieve 40-foot cells over the entire active domain.

The following MODFLOW-USG boundary packages used for the simulation and the package application are listed below (See Figure 3 for the spatial location of the boundary cells):

• Recharge Package (RCH) – This package was used to represent vertical infiltration of precipitation and/or runoff water into the alluvial aquifer and was a transient boundary condition.

• Drain Package (DRN) – This package was utilized to represent the Rehder Creek channel. Since the channel rarely exhibits flow, the channel was assumed to be a steady state groundwater sink.

• Well Package (WEL) – 10 boundary cells per watershed area (Figure 3) were assigned as WEL nodes to represent subsurface groundwater flow into the model along the edge of the active model domain. The flow quantity inputs were proportional to the respective area of the watershed they represented. The same WEL nodes were used to represent input quantities determined for potential mine related sources. All WEL nodes in the model were transient boundary conditions used to present variable flow inputs from watersheds during drought and wet conditions and variable flows from mine related sources.

• General Head Boundary Package (GHB) – To allow subsurface flow to exit the active model domain, a line of GHB nodes were assigned at the most downgradient end of the Rehder Creek alluvium.

• Block-Centered Transport Process (BCT) – This process was utilized to simulate transport of TDS in the unstructured -grid CVFD framework (Panday, 2018).

The thickness of the alluvial aquifer is a large unknown between boring locations along the simulated reaches of the Rehder Creek and PM Draw alluvial aquifers. Interpretation of the bedrock surface between borings was completed and used for the bottom elevation of the model. The transmissivity of the aquifer is dependent on the thickness of the aquifer. Both the computed groundwater elevation and the bedrock surface are used to compute the transmissivity of each model node. Under transient conditions, the transmissivity of the aquifer can vary both temporally and spatially. Under wet conditions, the aquifer thickness and width will increase as previously unsaturated material becomes saturated resulting in greater flow through the aquifer under the same gradient. For numerical simulations, steeply sloped edges of the aquifer result in thinly saturated cells. An infinitesimally thin saturation at a model node results in near zero transmissivity which is numerically problematic. To avoid thinly saturated cells on the edge of the aquifer, the width of the active model domain was placed approximately between the high groundwater width and the low groundwater width of the aquifer. Model nodes determined to have aquifer bottom elevations above the low simulated groundwater elevation were thickened to ensure full width saturation at low water levels. Model convergence was achieved without this structural simplification, however, the BCT process produced erroneous concentrations within the thin zone of saturation along the edges of the model.

3.2.2 Model Transient Head Calibration

A transient head calibration was performed to better define aquifer parameters (hydraulic conductivity and specific yield) and model responses to variable flux inputs into the model during drought and wet time periods. The simulation was initiated with a steady state simulation to match the low groundwater conditions from 2000 to 2005. Time was discretized into 11 stress periods (1 month time steps) to represent various precipitation events and construction/closing of WDA’s (Figure 4). The transient calibration was a critical step to understand how much groundwater from adjacent watersheds and vertical infiltration from recharge (precipitation and/or runoff) enters the Rehder and PM Draw alluvial aquifer system (Figure 3). The calibrated results show an exponential relationship between observed precipitation and sources of recharge to the alluvial aquifer system. Stress period 4 represents the high precipitation event during 2011 and illustrates that a significant increase in groundwater recharge must have occurred to produce the observed high groundwater levels in monitoring wells. Stress period 10 was added on to the period of record to represent closure of WDA-1 and activation of WDA-2 through LOM. Stress period 11 was included to represent post-mine average conditions, where potential TDS loading from WDA waste runoff and excess mine production water were assumed to no longer occur.

A mass balance and loading calculation, shown in Figure 4, assumes mine production flow and TDS concentrations shown in Figure 5. The excess production flow was assumed to be the total of the Madison well production and strata produced flow minus 400 gpm for coal processing. Strata produced flow quantities were calculated based on the average simulated (Appendix 314-6) flow over the stress period and/or the average observed flow where data were available. Little has been documented regarding the discharge rates of excess strata produced flow to site ponds. The excess flow was divided amongst available receiving ponds based on communication with mine staff and an attempt to approximate head and TDS concentrations in nearby monitoring wells. The WDA (HELP model results) and pond water budgets are included in the water balance. Source water injection rates (WEL) were not used as a calibration parameter.

Transient targets were defined within each stress period based on observed groundwater elevations. Stress periods with predominately dry status or few records were not included as targets. BMP026 and BMP122 were considered as the same well (BMP026&BMP122), because BMP122 replaced BMP026 in 2013. The transient head calibration residuals and statistics are shown in Table 5, and plotted calibration results are shown in Figure 6. Additionally, hydrographs in Figure 7 show the calibration targets along with simulated heads and observed heads.

Model-Independent Parameter Estimation and Uncertainty Analysis (PEST) (Doherty, 2003) was utilized to minimize the differences between observed and simulated heads. Watershed fluxes for each stress period (proportional to the given watershed area) were simultaneously calibrated with a single recharge zone, specific yield, and a spatial distribution of horizontal hydraulic conductivity (via pilot points). Pilot points were employed to create a spatial interpolation (Kriging) of hydraulic conductivities with a maximum of 200 ft/day and a minimum of 10 ft/day. Figure 8 shows the calibrated distribution of hydraulic conductivity within the active model domain along with alluvial aquifer test results from Appendix 314-6. Variable hydraulic conductivities may be a function of aquifer sediment characteristics and/or a representation of aquifer thickness. For example, relatively low hydraulic conductivity zones could represent relatively fine aquifer materials and/or a region of shallow bedrock (thin alluvial aquifer) that was not included in the structural bottom of the model.

3.2.3 Model Transient Head Sensitivity Analysis

Sensitivity analysis was completed for the transient head calibration using the absolute residual mean (ARM) as the reference statistic (Table 6). The model is the most sensitive to hydraulic conductivity (transmissivity). Lateral flow from watersheds is the second most sensitive parameter. The calibration could be improved slightly by decreasing the flow from mine related sources which indicates the simulation is a conservative representation of mine impacts. For other parameters, the sensitivity analysis shows little room for calibration improvement.

4.0 FATE AND TARNSPORT SIMULATIONS

A calibration to TDS concentration could not be reliably completed because naturally occurring changes to groundwater TDS concentrations are unpredictable at the site. Instead, the relatively consistent concentrations observed prior to the 2011 precipitation event were assumed to persist throughout the entire simulation, and potential mine related loading sources were introduced into the model. Underprediction of TDS concentrations at monitoring locations can be attributed to naturally occurring TDS loading to the alluvial aquifer system. TDS transport was assumed to be fully conservative and isotropic dispersion was used. The distance used to estimate dispersivity, based on Xu and Eckstein (1995), was approximated from the length of the flow path to the nearest upgradient potential mine related source. A porosity of 20% was assumed for the entire alluvial aquifer.

4.1 Naturally Occurring TDS Loading Assumptions

The transient model head calibration results were utilized to define the quantity of natural water (watershed influx and recharge) entering the model. The background concentrations for each watershed were assumed from Figure 2 -Sheet 1 and Table 1. A minimum concentration of 1,000 mg/L was inferred for Watershed 13 based on background TDS concentration observations in BMP001, although median concentrations of upgradient groundwater were only 762 mg/L within Watershed 13. All watersheds that contributed flow to the PM Draw alluvial aquifer were assumed to have background concentrations of 1,700 mg/L to improve the baseline simulated concentration match to BMP053. All other watersheds, without available background water quality information, and recharge were assumed to have concentrations of 1,200 mg/L. These background concentrations were held constant for the duration of the transient simulation for the purpose of isolating mine related TDS changes to alluvial groundwater.

4.2 Potential Source TDS Concentration Assumptions

Figure 4 summarizes the water budget and TDS loading for the three potential sources. All potential source water was assumed to infiltrate into groundwater, although occasional discharges to surface water via MPDES outfalls are known to occur during large precipitation events and/or during times of significant strata produced flow from mining activity. Flow rates of these generally short duration surface water discharge events are not available and therefore are assumed to be a small percentage of the total water that enters the alluvial aquifer system. Model transient calibration results were used to calculate the amount of water that mixes with source water prior to being injected into the model via the WEL package. Approximate surface areas of ponds were used to calculate evaporation based on evaporation rates from Potts (1988) and direct precipitation was added to the pond for a simple pond water budget.

Excess strata produced water diverted from the mine was accounted for in the water budget. Figure 5 shows a plot of forecasted strata produced flow from Appendix 314-6 along with observed strata produced flow, and assumed strata produced flow for each stress period of the Rehder and PM Draw alluvial groundwater flow model. Madison production flow rates show an inverse relationship with strata produced flow, because water required for coal processing was accommodated by water produced by mining activity and ultimately replaced the need for pumping Madison wells. Gob water TDS concentration samples are plotted in Figure 5 along with the assumed decreasing TDS concentration trend used for the numerical simulation.

5.0 DISCUSSION OF RESULTS

Figure 7 shows the simulated TDS concentration time series comparison to alluvial monitoring wells. Monitoring wells nearest to the sources (BMP026&BMP122, BMP033, and BMP049) suggest that the assumptions in the simulation are conservatively overpredicting TDS concentrations immediately downgradient from existing sources. Although apparent matches to concentration have been achieved in further downgradient wells (i.e. BMP016, BMP087) no additional natural loading from the 2011 precipitation event was added into the simulation so the apparent matches likely represent an overprediction of mine related TDS increases. The hydrologic lag for transport of potential mine related source water flowing within the PM Draw alluvial aquifer is on display in Figure 7 (BMP053, BMP054, BMP088, and BMP105). These wells demonstrate that the changes to water quality preceded any known mine related source and are very likely naturally occurring. BMP053 shows that the TDS concentration increasing trend started before the 2011 precipitation event and is correlated to rising water levels that also began prior to the 2011 precipitation event. One potential flow path for excess mine production water, that could have accelerated the timing of TDS increase observed in BMP053, is via channelized flow down PM Draw and infiltration into the alluvial aquifer system. Flow has been monitored monthly at stream station 12456 (Figure 1) since 2003 and has been predominantly dry even during and following the 2011 precipitation event where no channelized flow was observed until a brief (3-month) flowing (1 gpm) period was observed in 2014. This 1 gpm of channelized flow is very small compared to the simulated flow through the alluvial aquifer at the position of BMP053 (29 gpm) even at lowest simulated groundwater levels. This eliminates the channelized flow of excess mine production water as the possible source for TDS increases observed in BMP053 prior to occasional larger surface water discharges from Pond A in August 2018 through present. Some of the more recent discharges could be correlated with a TDS decreasing trend in BMP053.

WDA-1 construction began in 2009, so channelized flow in the Rehder Creek channel is another potential source for relatively rapid changes to TDS concentration in BMP053. The Rehder Creek channel exhibited flow following the 2011 precipitation event (based on July 2011 NAIP imagery), however, the TDS concentrations near the potential source (BMP033) are much lower than those observed in BMP053, so this eliminates WDA-1 runoff as the primary potential source for TDS increases in BMP053.

Based on the above, groundwater in BMP053, BMP054, BMP088 and BMP105 degraded to Class III groundwater via natural loading from 2014 through at least 2018. Following 2018 the Class III status may be partially related to mine sources. BMP016 and BM087 likely have exhibited occasional Class III groundwater as a result of combined natural and mine related TDS loading. Wells near sources, BMP033, BMP049, and BMP026&BMP122, are more likely to reflect source concentrations, however, BMP033 only shows one sample of Class III groundwater. BMP026&BMP122 show more frequent Class III groundwater from 2011 through present that could be attributed to both natural and mine related loading. BMP049 has exhibited recent Class III groundwater likely in response to construction of WDA Pond 2 and discharge of strata produced flow to this pond. BMP049 has been predominantly dry prior to Pond 2 construction. The TDS concentration in BMP049 is overpredicted in the simulation suggesting a potential natural component.

Figure 9 shows simulated TDS plume snapshots at the end of each stress period during active mining and 5-year increments for 20 years beyond LOM. The simulated plume evolves with the addition of multiple sources and clearly shows the transport lag for the PM draw loading to reach downgradient Rehder Creek alluvial wells. The primary source of simulated TDS concentration changes is clearly related to excess strata produced flow in early stages of discharge when the TDS concentration from the underground mining activity was highest. It is also apparent that the WDA's are a relatively minor source of TDS loading, especially following LOM as the TDS concentrations are predicted to return to pre-mine conditions.

6.0 CONCLUSIONS

Mine related chemical loading sources to the Rehder Creek alluvial aquifer were considered and fate and transport of TDS was simulated via a numerical groundwater flow model. Although evidence of an increase in natural TDS loading has been observed, the simulation did not account for changes observed above natural background concentrations. Multiple wells within the alluvial system have degraded from Class II to Class III groundwater, however mine related sources could not be tied to the initial degradation for wells in the Rehder Creek Alluvial aquifer downgradient of the PM Draw confluence. It is difficult to parse out the mine related and natural components of the loading, especially following the loading caused by the 2011 precipitation event. Mine related loading is likely overpredicted for both concentration and flow volumes based on monitoring wells near the sources and sensitivity analysis of mine related source flow rates. Elevated TDS concentrations should return to background levels, assuming natural loading returns to pre-mine conditions following LOM. WDA's will not likely contribute much chemical loading to downgradient receptors, especially following unit closure.

7.0 REFERENCES

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TABLES

Table 1: Watershed Water Quality Summary

Watershed ID	Station ID	Sample Type	Pre-2010 TDS Concentration Data (Figure 2 - Sheet 1)				2011 & 2012 TDS Concentation Data (Figure 2 - Sheet 2)			
			Sample Date Range	Number of Samples	Median TDS (mg/L)	Median Watershed Groundwater TDS Concentration (mg/L)	Sample Date Range	Number of Samples	Median TDS Concentration (mg/L)	Median Watershed Groundwater TDS Concentration (mg/L)
10	11115	Measurable Flow from Spring	Apr - 1989 to Oct - 2009	21	1490	1490	Oct - 2011 to Oct - 2012	3	1770	2045
	11185		-	-	-		Oct - 2011 to Apr - 2012	2	2320	
11	14785	Measurable Flow from Spring	Apr - 1989 to Oct - 1994	18	1435	1435	-	-	-	-
13	27-1	Alluvial Groundwater Well	Jun - 1989 to May - 1994	12	805	762	-	-	-	1030
	BMP017		-	-	-		Oct - 2011 to Apr - 2012	2	1159	
	14255	Measurable Flow from Spring	Oct - 1993 to Oct - 2009	4	645		Apr - 2012 to Oct - 2012	2	794	
	14325		Apr - 1989 to Jul - 2009	22	762		Oct - 2011 to Oct - 2012	5	1030	
14	62717-14	Alluvial Groundwater Well	Oct - 1993 to Oct - 1994	3	1310	1080	-	-	-	1249.5
	62717-16		Oct - 1993 to May - 1994	2	1545		-	-	-	
	62718-20		Sep - 1991 to May - 1994	6	1705		-	-	-	
	62718-23		Oct - 1993	1	1080		-	-	-	
	BMP032		-	-	-		Oct - 2011	1	2250	
	BMP035		-	-	-		Oct - 2011	1	1710	
	BMP045		-	-	-		Oct - 2011 to Apr - 2012	2	2390	
	BMP061		-	-	-		Apr - 2012	1	2040	
	BMP062		-	-	-		Apr - 2011 to Apr - 2012	3	506	
	BMP072		Oct - 2007	1	1650		Oct - 2011 to Apr - 2012	2	1655	
	16135	Measurable Flow from Spring	Sep - 1989 to Oct - 2009	23	283		Apr - 2011 to Oct - 2012	4	294	
	16255		Oct - 1993 to Oct - 2009	9	449		Oct - 2012	1	525	
	16355		Apr - 1989 to Oct - 2009	25	504		Apr - 2012	1	508	
	16365		Nov - 1989 to Oct - 2009	28	544		Oct - 2012	1	673	
	16625		May - 1991 to Sep - 1994	10	1295		Apr - 2012 to Oct - 2012	3	1520	
	16655		Apr - 1989 to Oct - 2009	29	781		Jan - 2011 to Oct - 2012	6	870	
	16755		Jan - 1990 to Oct - 2009	36	1010		Jul - 2011 to Oct - 2012	5	1010	
	16855		Oct - 1993 to Sep - 1994	4	2635		-	-	-	
	16955		Oct - 1989 to Jul - 1994	9	1010		Apr - 2012	1	1230	
	17145		Jul - 1989 to Oct - 2009	22	605		Oct - 2011 to Oct - 2012	3	602	
	17185		Apr - 1989 to Oct - 2009	22	1080		Oct - 2011 to Oct - 2012	3	1270	
	17315		Apr - 1989 to Jul - 1991	2	975		Oct - 2011 to Oct - 2012	2	1269	
	17415		Apr - 1989 to Oct - 2009	17	1400		Apr - 2011 to Jan - 2012	2	1455	
	17515		Apr - 1989 to Jul - 1994	4	1515		-	-	-	
	17655		Oct - 1993 to Apr - 2009	4	1230		Oct - 2011 to Apr - 2012	2	1145	
	17685		May - 1991 to Jul - 2009	17	1370		Jan - 2012 to Jul - 2012	3	1530	
23	BMP027	Alluvial Groundwater Well	-	-	-	1700	Oct - 2011	1	5260	5260
	PM-88-1A		Jul - 1991	1	1750		-	-	-	
	PM-88-2A		Jul - 1991	1	1650		-	-	-	
24	BMP028	Alluvial Groundwater Well	-	-	-	-	Apr - 2012	1	4280	4280
PM Draw Alluvial Aquifer	BMP026	Alluvial Groundwater Well	-	-	-	-	Oct - 2011	1	3140	3140
Rehder Creek Alluvial Aquifer	01-1	Alluvial Groundwater Well	Jun - 1989 to Oct - 1994	17	1080	1205	-	-	-	1540
	20-1		Jun - 1989 to Sep - 1994	19	1260		-	-	-	
	21-1		Jun - 1989 to Oct - 1994	17	1320		-	-	-	
	50-1		Jul - 1991	1	493		-	-	-	
	6262-2		Oct - 1993 to Sep - 1994	3	1230		-	-	-	
	6264-1		Oct - 1993 to Sep - 1994	3	1340		-	-	-	
	BMP001		Oct - 2007 to Oct - 2009	2	962		Oct - 2011 to Oct - 2012	3	1540	
	BMP016		Oct - 2003 to Jul - 2009	20	1205		Jan - 2011 to Jul - 2012	4	1265	
	BMP033		Oct - 2003 to Oct - 2009	13	1200		Apr - 2011 to Oct - 2012	3	1600	
	BMP053		Oct - 2003 to Apr - 2009	13	1330		Apr - 2011 to Oct - 2012	4	1775	
	BMP087		Oct - 2003 to Apr - 2009	13	1200		Apr - 2011 to Oct - 2012	4	1350	

Table 2: Summary of Potential Source Water Quality

Sample ID	Date	Source Description	Physical Properties			Inorganics								Nutrients				Metals																	
			pH	Conductivity @ 25C	Solids, Total Dissolved TDS @ 180 C	Alkalinity (total) as CaCO3	Bicarbonate	Carbonate as CaCO3	Chloride	Fluoride	Hydroxide	Hydroxide as CaCO3	Sulfate	Nitrogen, Nitrate + Nitrite as N	Kjeldahl Nitrogen	Nitrogen (Total)	Phosphorus	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Zinc
			s.u.	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
WDA1-1	8/29/2024	WDA Leachate (Meteroic Water Mobility Procedure)	8.2	1,710	1,180	173	207	ND	24	0.2	ND	ND	650	0.10	ND	ND	ND	ND	0.002	ND	ND	60	ND	ND	ND	ND	25	0.064	ND	ND	9	0.0250	ND	285	ND
WDA1-2	8/29/2024		8.1	417	389	105	128	ND	9	0.2	ND	ND	175	ND	ND	ND	0.015	0.22	0.002	0.11	ND	15	ND	ND	0.07	ND	5	0.034	ND	ND	4	0.0090	ND	108	ND
WDA1-3	8/29/2024		8.4	1,860	1,410	221	257	6	27	0.2	ND	ND	765	ND	ND	ND	0.005	0.03	0.002	0.06	0.001	45	ND	ND	0.04	ND	11	0.042	ND	ND	7	0.0170	ND	402	ND
WDA1-1-DUP	8/29/2024		8.4	1,790	1,370	229	265	7	27	0.2	ND	ND	728	ND	ND	ND	ND	ND	0.002	0.06	ND	39	ND	ND	ND	ND	9	0.036	ND	ND	7	0.0190	ND	400	ND
Median Values (WDA1-1-DUP not included)			**8.2**	**1,710**	**1,180**	**173**	**207**	**ND**	**24**	**0.2**	**ND**	**0**	**ND**	**0.00**	**ND**	**ND**	**0.005**	**0.03**	**0.002**	**0.06**	**0.000**	**45**	**ND**	**0.0000**	**0.04**	**0.0000**	**11**	**0.042**	**ND**	**0.0000**	**7**	**0.0170**	**ND**	**285**	**ND**
2RT Gob	7/1/2015	Strata Produced Flow	7.4	4,730	3,320	983	983	-	17	ND	-	-	1,470	2.30	-	-	-	ND	ND	-	0.00015	110	-	0.0073	ND	0.0097	36.4	0.646	-	0.0909	15.1	0.0011	-	921	0.010
4RT Gob	7/1/2015		7.1	4,450	3,220	1,080	1,080	-	18.3	ND	-	-	1,430	0.02	-	-	-	ND	ND	-	ND	175	-	ND	0.0731	0.0006	93.8	0.252	-	0.1600	17.5	ND	-	818	ND
8 RT XC2 GOB	10/31/2023		7.5	3,150	2,150	925	1,130	ND	33.2	0.27	-	-	836	0.04	-	ND	-	ND	0.001	-	ND	63.6	-	ND	0.123	ND	37.4	0.097	-	0.1190	11.6	ND	-	613	ND
8RT XC8 1 Entry	06/05/2024		7.6	3,300	2,310	1,160	1,410	ND	7	0.2	-	-	751	0.17	ND	-	-	ND	0.001	-	ND	65	-	ND	ND	0.0049	23	-	ND	0.0500	11	ND	-	713	0.010
8RT XC9	06/10/2024		7.6	3,350	2,310	1,170	1,430	ND	8	ND	-	-	767	0.17	-	-	-	ND	0.002	-	ND	61	-	0.0050	ND	0.0051		ND	-	0.0550	11	ND	-	734	0.009
9RT XC16	06/10/2024		7.5	2,860	1,950	950	1,160	ND	5	0.2	-	-	700	1.32	-	-	-	ND	ND	-	ND	71	-	0.0060	ND	0.0031	37	0.013	-	0.0400	10	ND	-	576	0.009
9RT XC16 2 Entry	06/05/2024		7.5	2,860	1,970	956	1,170	ND	5	ND	-	-	685	1.34	-	-	-	ND	ND	-	ND	65	-	ND	ND	0.0030	39	0.011	-	0.0370	10	ND	-	561	0.011
9RT XC21	06/10/2024		7.3	3,100	2,180	975	1,190	ND	5	ND	-	-	836	1.64	-	-	-	ND	ND	-	0.00009	88	-	0.0050	ND	0.0035	49	ND	-	0.0540	10	ND	-	614	0.012
9RT XC21 1 Entry	06/05/2024		7.3	3,080	2,110	989	1,210	ND	5	ND	-	-	810	1.74	-	-	-	ND	ND	-	ND	92	-	0.0030	ND	0.0035	48	ND	-	0.0520	11	ND	-	578	0.014
Median Values			**7.5**	**3,150**	**2,180**	**983**	**1,170**	**ND**	**7**	**ND**	**-**	**-**	**810**	**1.32**	**ND**	**ND**	**-**	**ND**	**ND**	**-**	**ND**	**71**	**-**	**0.0030**	**ND**	**0.0035**	**38.2**	**0.012**	**ND**	**0.0540**	**11**	**0.0000**	**-**	**614**	**0.010**
WDA POND 1	5/19/2013	WDA Runoff	8.6	2,510	2,150	-	-	-	79.7	ND	-	-	1,390	0.21	1.8	1.9	0.05	ND	0.005	-	0.00009	452	-	0.0093	5.7	0.0058	56.8	-	ND	0.0140	-	0.0120	ND	94.1	0.026
MPDES008	5/28/2013		7.6	2,820	2,530	-	-	-	-	-	-	-	1,610	0.24	0.76	1	0.67	0.1	0.0028	-	ND	578	-	ND	0.16	0.0002	62.3	-	ND	ND	-	0.0160	ND	105	ND
MPDES008	6/1/2013		8.1	1,860	1,580	-	-	-	-	-	-	-	1,030	0.18	0.54	0.72	0.016	0.06	0.002	-	ND	324	-	0.0010	0.43	0.0006	32.4	-	ND	0.0029	-	0.0067	ND	63.6	0.005
MPDES008 WDA POND 1	6/20/2013		7.8	2,470	2,270	-	-	-	-	-	-	-	1,430	0.21	0.73	0.94	0.0089	0.0063	0.0033	-	ND	445	-	ND	0.11	0.0002	72.1	-	ND	0.0035	-	0.0120	ND	93.4	0.006
MPDES008	8/12/2013		7.9	3,290	3,180	-	-	-	-	-	-	-	1,990	0.32	0.51	0.51	0.0087	0.0312	0.0031	-	0.00012	632	-	0.0013	0.059	0.0001	97.3	-	ND	0.0009	-	0.0130	ND	131	0.006
008	8/23/2014		8.6	2,190	2,650	-	-	-	-	-	-	-	1,320	0.07	90.2	90.3	1.4	0.02	0.052	-	0.00250	832	-	0.1300	80.5	0.0810	127	-	ND	0.3800	-	0.0170	ND	86.1	0.420
MPDES-008	10/19/2016		8.3	2,130	1,440	-	-	-	-	-	-	-	812	0.78	0.78	1.6	0.03	ND	0.0016	-	0.00011	115	-	0.0035	0.179	0.0028	31.6	-	ND	0.0253	-	0.0126	ND	300	0.017
MPDES-008	11/7/2016		8.1	3,420	2,130	-	-	-	-	-	-	-	1,080	2.10	1.1	3.2	0.0083	ND	0.001	-	0.00014	90.3	-	0.0076	0.0843	0.0105	56.3	-	ND	0.0833	-	0.0039	ND	647	0.022
008	3/22/2018		7.5	2,420	1,920	-	-	-	-	-	-	-	975	0.42	1.4	1.8	0.043	ND	0.0022	-	0.00120	134	-	0.0057	0.25	0.0187	34.6	-	ND	0.0321	-	0.0163	ND	432	0.039
008	4/10/2018		7.8	2,860	1,940	-	-	-	-	-	-	-	974	0.98	1.7	2.7	0.021	ND	0.0021	-	0.00039	114	-	0.0082	0.647	0.0209	34.1	-	ND	0.0453	-	0.0114	ND	491	0.041
008	5/1/2018		8.0	3,340	2,210	-	-	-	-	-	-	-	1,070	1.20	2.2	3.3	0.012	ND	0.0025	-	0.00032	80	-	0.0128	0.544	0.0228	31.4	-	ND	0.0563	-	0.0077	ND	592	0.041
008	6/1/2018		7.5	525	1,900	-	-	-	-	-	-	-	1,010	1.10	1.4	2.4	0.052	ND	0.0024	-	0.00034	84.4	-	0.0094	1.74	0.0125	30.5	-	ND	0.0444	-	0.0093	ND	544	0.037
008	7/2/2018		7.9	3,000	1,980	-	-	-	-	-	-	-	935	1.20	1.4	2.6	0.094	ND	0.0018	-	0.00031	65.7	-	0.0081	0.273	0.0115	30.9	-	ND	0.0432	-	0.0058	ND	647	0.041
MPDES-008	5/27/2019		8.0	1,310	960	-	-	-	-	-	-	-	446	0.70	0.59	1.3	0.1	ND	0.0027	-	0.00013	56.4	-	0.0073	3.49	0.0042	16.4	-	ND	0.0167	-	0.0124	ND	203	0.020
MPDES-008	6/5/2019		7.6	1,550	1,040	-	-	-	-	-	-	-	545	0.52	0.47	0.99	0.012	ND	0.0017	-	0.00012	64.5	-	0.0018	0.218	0.0015	17.7	-	ND	0.0171	-	0.0133	ND	220	0.013
MPDES-008	6/3/2023		8.3	1,750	1,100	-	-	-	-	-	-	-	691	0.75	3.4	-	0.57	1.99	0.009	-	0.00020	81.5	-	0.0280	16.4	ND	23	-	0.000072	0.0320	-	0.0170	ND	311	0.063
MPDES-008	6/6/2023		-	1,920	-	205	237	6	-	-	-	-	-	-	-	-	-	-	-	-	-	91	-	-	-	-	23	-	-	-	-	-	-	-	-
MPDES-008	6/24/2023		8.2	1,220	828	-	-	-	-	-	-	-	547	0.40	1.4	-	0.17	0.01	0.003	-	0.00011	75.1	-	0.0090	4.74	ND	18.3	-	0.000027	0.0100	-	0.0140	ND	176	0.022
Median Values			**8.0**	**2,305**	**1,940**	**205**	**237**	**6**	**79.7**	**ND**	**-**	**-**	**1,010**	**0.52**	**1.4**	**1.6**	**0.043**	**ND**	**0.0025**	**-**	**0.00013**	**102.5**	**-**	**0.0076**	**0.43**	**0.0042**	**32**	**-**	**0.000000**	**0.0253**	**-**	**0.0124**	**ND**	**220**	**0.022**

Red Value Indicates DEQ-7 Groundwater HHS Exceedance

Table 3- WDA Water Budget Results

		Average Annual Totals for Years 1 - 100			
		(inches)	[std dev]	(cubic feet)	(percent)
WDA-1	Precipitation	14.07	[2.16]	15,326,026.0	100.00
	Runoff	1.985	[0.722]	2,161,691.4	14.10
	Evapotranspiration	11.463	[1.398]	12,482,889.4	81.45
	Subprofile1				
	Lateral drainage collected from Layer 3	0.6201	[0.0455]	675,259.0	4.41
	Percolation/leakage through Layer 4	0.000000	[0]	0.0000	0.00
	Average Head on Top of Layer 4	237.4402	[17.4192]	---	---
	Water storage				
	Change in water storage	0.0057	[0.6228]	6,186.2	0.04
WDA-1 Closed	Precipitation	14.07	[2.16]	15,326,026.0	100.00
	Runoff	0.234	[0.221]	254,539.4	1.66
	Evapotranspiration	13.165	[2.029]	14,337,029.6	93.55
	Subprofile1				
	Lateral drainage collected from Layer 4	0.6804	[0.0173]	740,955.9	4.83
	Percolation/leakage through Layer 5	0.000000	[0]	0.0000	0.00
	Average Head on Top of Layer 5	260.5413	[6.6192]	---	---
	Water storage				
	Change in water storage	-0.0060	[0.6043]	-6,498.9	-0.04
WDA-2	Precipitation	14.07	[2.16]	12,005,387.0	100.00
	Runoff	1.985	[0.722]	1,693,324.9	14.10
	Evapotranspiration	11.463	[1.398]	9,778,263.3	81.45
	Subprofile1				
	Lateral drainage collected from Layer 3	0.6144	[0.0554]	524,106.0	4.37
	Percolation/leakage through Layer 4	0.000000	[0]	0.0000	0.00
	Average Head on Top of Layer 4	201.1278	[18.131]	---	---
	Water storage				
	Change in water storage	0.0114	[0.6228]	9,692.8	0.08
WDA-2 Closed	Precipitation	14.07	[2.16]	12,005,387.0	100.00
	Runoff	0.236	[0.224]	201,253.2	1.68
	Evapotranspiration	13.137	[2.013]	11,206,511.6	93.35
	Subprofile1				
	Lateral drainage collected from Layer 4	0.7010	[0.0318]	598,021.8	4.98
	Percolation/leakage through Layer 5	0.000000	[0]	0.0000	0.00
	Average Head on Top of Layer 5	229.4936	[10.3996]	---	---
	Water storage				
	Change in water storage	-0.0005	[0.6465]	-399.7	0.00

Table 4: Soil Parameter Inputs for HELP Model

SampleID	Field Capacity (33 kPa)		Wilting Point (1,500 kPa)		Total Porosity		Saturated Hydraulic Conductivity (cm/s)	
	Sample Results	Median Value for HELP Soil and Design Layer	Sample Results	Median Value for HELP Soil and Design Layer	Sample Results	Median Value for HELP Soil and Design Layer	Sample Results	Median Value for HELP Soil and Design Layer
Topsoil	0.28	0.28	0.11	0.11	0.53	0.53	3.60E-04	3.60E-04
Subsoil	0.31	0.29	0.10	0.10	0.50	0.50	3.20E-05	3.96E-04
Suitable Soil	0.28		0.10		0.50		7.61E-04	
WDA1-1(4.5-8 ft)	0.29	0.28	0.12	0.13	0.44	0.43	1.28E-05	1.34E-05
WDA1-1(8-11.5 ft)	0.26		0.12		0.44		1.66E-06	
WDA1-2(4.5-8 ft)	0.29		0.14		0.43		1.20E-05	
WDA1-2(8-11.5 ft)	0.28		0.13		0.42		1.40E-05	
WDA1-3(4.5-8 ft)	0.28		0.14		0.42		8.33E-05	
WDA1-3(8-11.5 ft)	0.29		0.14		0.41		4.09E-05	
WDA1-1-DUP(4.5-8 ft)	0.28	-	0.15	-	0.44	-	2.20E-04	-
WDA1-1-DUP(8-11.5 ft)	0.28		0.14		0.43		1.50E-05	

Table 5 - Transient Model Calibration Results and Statistics

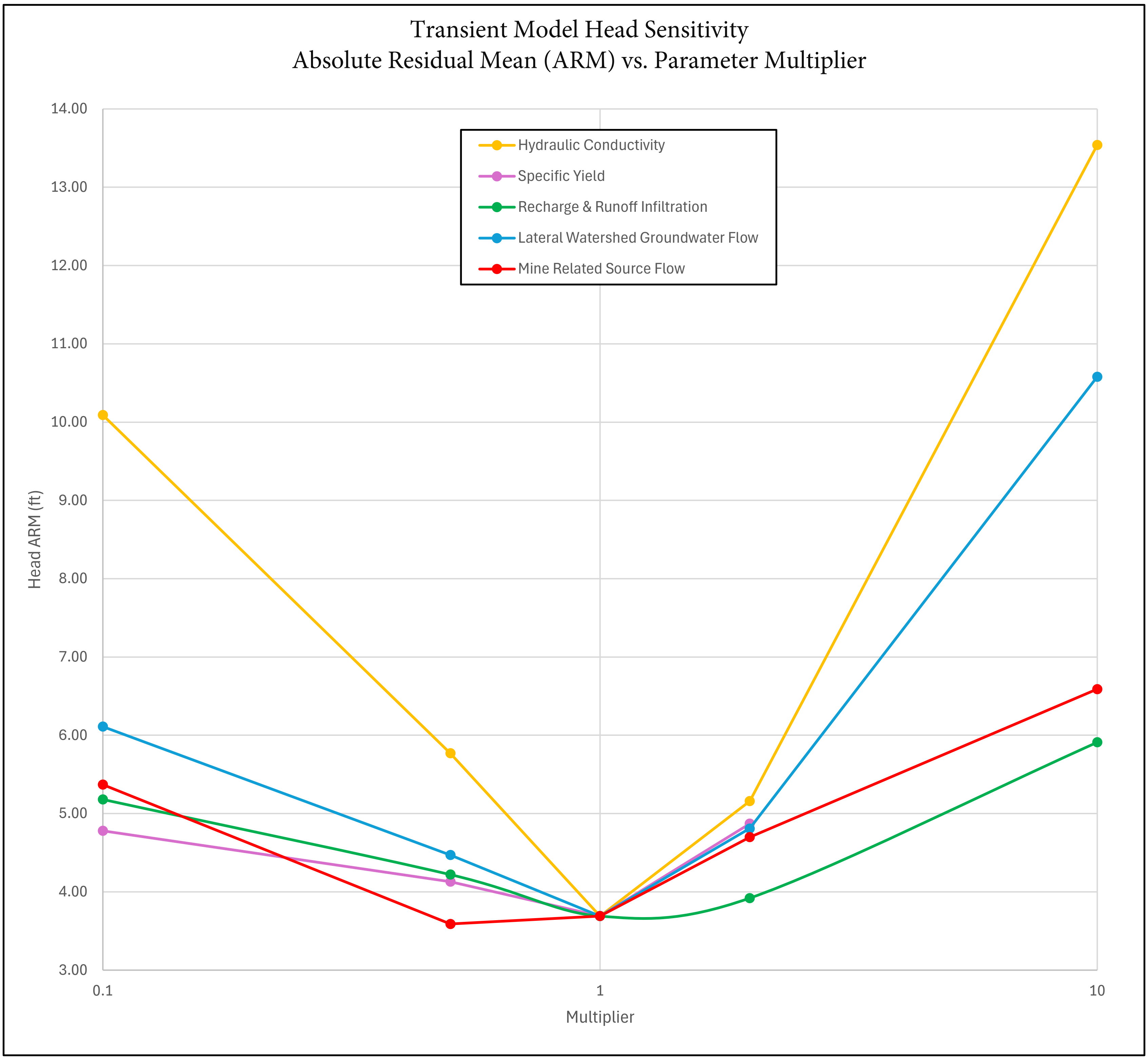
Target ID	Model Stress Period ID	Easting NAD83 MT	Northing NAD83 MT	Target Groundwater Elevation	Simulated Groundwater Elevation	Residual Groundwater Elevation
		ift	ift	ft	ft	ft
BMP001	1	2248041	744632	3871.1	3871.0	+0.04
	2			3872.9	3876.4	-3.51
	3			3876.3	3878.1	-1.77
	4			3888.0	3897.6	-9.60
	5			3883.2	3877.2	+6.06
	6			3877.3	3873.2	+4.16
	7			3884.3	3881.7	+2.54
	8			3877.8	3872.7	+5.06
	9			3872.7	3874.0	-1.23
BMP016	1	2242406	745436	3784.8	3776.7	+8.10
	2			3784.7	3780.3	+4.43
	3			3788.3	3785.2	+3.15
	4			3800.0	3805.9	-5.89
	5			3794.3	3796.0	-1.68
	6			3790.4	3790.4	+0.03
	7			3793.6	3800.1	-6.52
	8			3792.0	3800.9	-8.88
	9			3794.1	3803.5	-9.31
BMP018	4	2233526	747133	3700.0	3698.4	+1.59
	5			3695.9	3693.8	+2.17
	7			3693.6	3691.4	+2.21
	8			3693.3	3691.0	+2.34
	9			3696.0	3691.1	+4.91
BMP033	1	2243983	744108	3810.7	3800.9	+9.82
	2			3810.9	3803.7	+7.20
	3			3813.0	3809.4	+3.56
	4			3830.0	3830.6	-0.59
	5			3817.0	3813.2	+3.80
	6			3813.5	3809.4	+4.09
	7			3815.8	3821.5	-5.65
	8			3813.2	3821.7	-8.45
	9			3820.0	3826.7	-6.74
BMP053	1	2229679	750479	3615.4	3620.1	-4.72
	2			3614.5	3621.7	-7.17
	3			3617.6	3625.6	-7.91
	4			3640.0	3640.2	-0.19
	5			3636.9	3639.0	-2.09
	6			3627.9	3636.4	-8.53
	7			3631.5	3636.9	-5.39
	8			3635.4	3636.7	-1.23
	9			3635.4	3636.6	-1.27
BMP054	4	2229680	750270	3640.0	3640.5	-0.54
	5			3638.1	3639.2	-1.14
	8			3634.0	3636.9	-2.88
	9			3638.0	3636.9	+1.13
BMP087	1	2235022	747155	3690.6	3685.3	+5.3
	2			3690.1	3687.7	+2.47
	3			3691.9	3692.6	-0.67
	4			3714.0	3712.5	+1.51
	5			3707.0	3705.8	+1.12
	6			3696.1	3703.6	-7.43
	7			3702.9	3704.3	-1.37
	8			3701.1	3703.8	-2.64
	9			3704.3	3703.9	+0.31
BMP088	3	2233654	746246	3675.3	3678.7	-3.34
	4			3700.0	3700.0	+0.03
	5			3687.1	3694.4	-7.28
	6			3683.6	3691.4	-7.8
	7			3691.8	3692.1	-0.25
	8			3693.4	3691.6	+1.81
	9			3695.5	3691.7	+3.83
BMP103	4	2245550	744264	3851.5	3849.0	+2.49
	5			3829.6	3826.5	+3.18
	6			3825.8	3821.5	+4.28
	7			3828.7	3829.7	-1.05
	8			3825.6	3826.2	-0.54
	9			3834.3	3838.0	-3.77
BMP105	4	2229682	749961	3645.0	3640.8	+4.22
	5			3640.1	3639.3	+0.78
	8			3638.0	3637.0	+1.00
	9			3641.0	3637.0	+4.01
BMP026 & BMP122	4	2238120	741020	3795.0	3796.7	-1.70
	5			3787.0	3796.6	-9.56
	6			3783.8	3786.3	-2.52
	7			3792.0	3796.5	-4.53
	8			3792.0	3796.5	-4.52
	9			3792.0	3796.5	-4.52
BMP049	4	2246803	742636	3880.0	3879.3	+0.71
	9			3868.0	3869.3	-1.33

Statistical Summary	
Residual Mean	-0.81
Absolute Residual Mean	3.69
Residual Std. Deviation	4.53
Sum of Squares	1671
RMS Error	4.60
Min Residual	-9.60
Max Residual	9.82
Number of Observations	79
Range in Observations	273
Scaled Residual Std. Deviation	0.017
Scaled Absolute Residual Mean	0.013
Scaled RMS Error	0.017
Scaled Residual Mean	-0.003

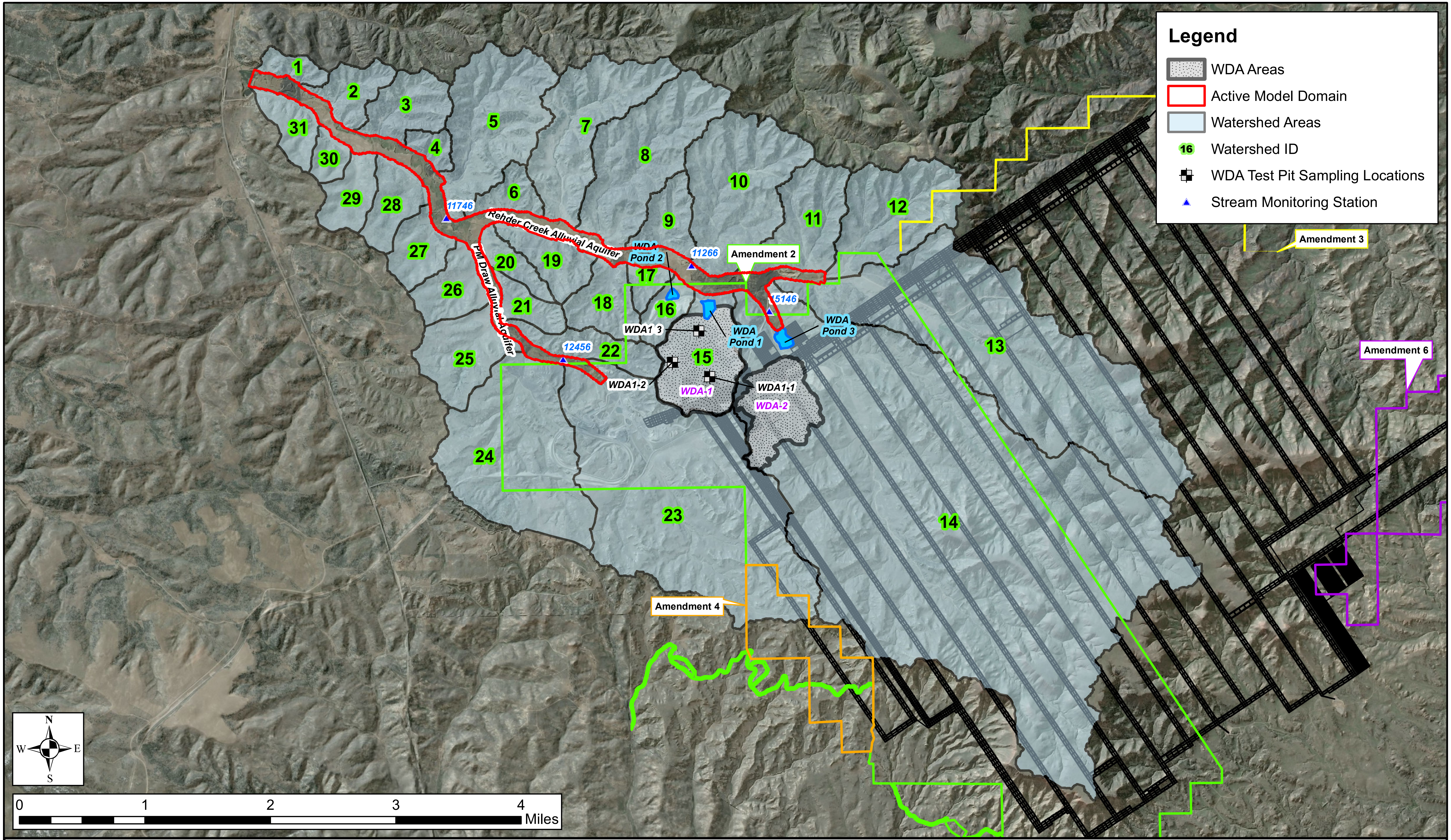
Positive Residual = Underprediction
Negative Residual = Overprediction

Table 6: Transient Model Head Sensitivity

	Parameter				
Multiplier	**Hydraulic Conductivity**	**Specific Yield**	**Recharge & Runoff Infiltration**	**Lateral Watershed Groundwater Flow**	**Mine Related Source Flow**
0.1	10.09	4.78	5.18	6.11	5.37
0.5	5.77	4.13	4.22	4.47	3.59
1	**3.69**	**3.69**	**3.69**	**3.69**	**3.69**
2	5.16	4.87	3.92	4.81	4.70
10	13.54	Invalid Parameter	5.91	10.58	6.59



FIGURES



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SIGNAL PEAK ENERGY

Figure 1
Site Location Map
Rehder Creek and PM Draw Alluvial Aquifer Model
Bull Mountains Mine No. 1

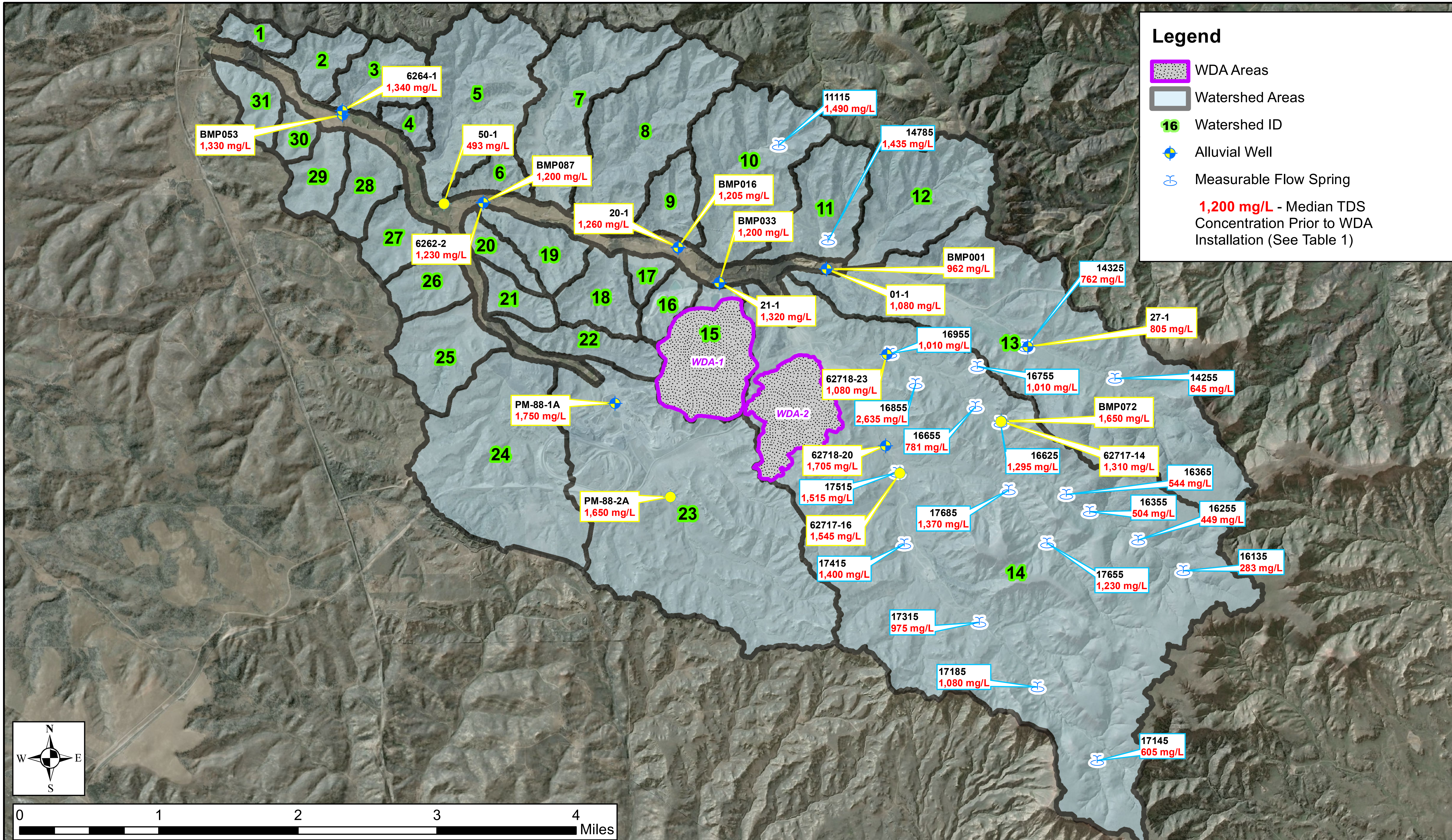

Figure 2 - Sheet 1
Baseline Median Alluvial TDS Concentration Map
Rehder Creek Alluvial Catchment Area
Bull Mountains Mine No. 1

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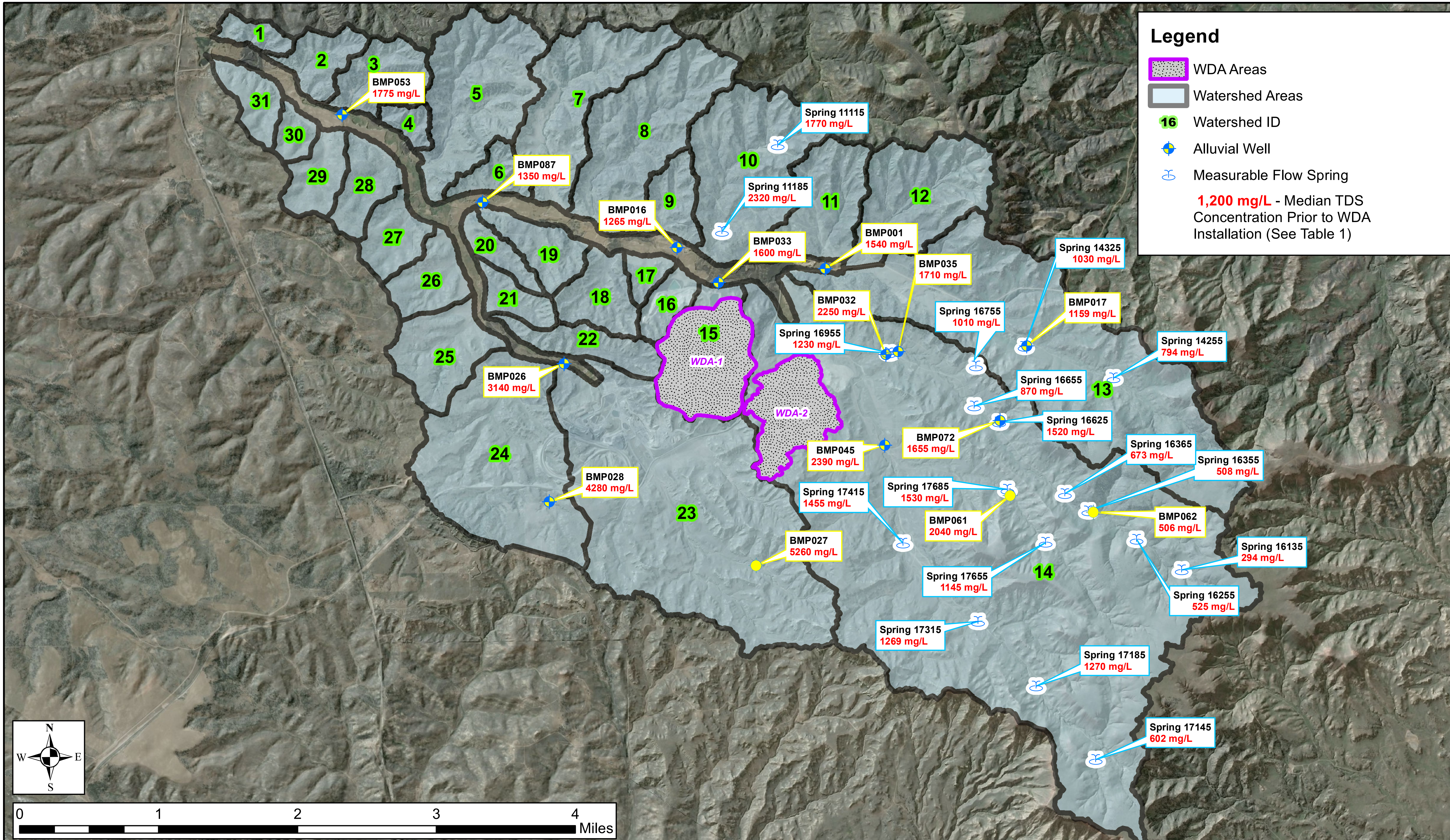

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Figure 2 - Sheet 2
2011 & 2012 Median TDS Concentration Map
Rehder Creek Alluvial Catchment Area
Bull Mountains Mine No. 1

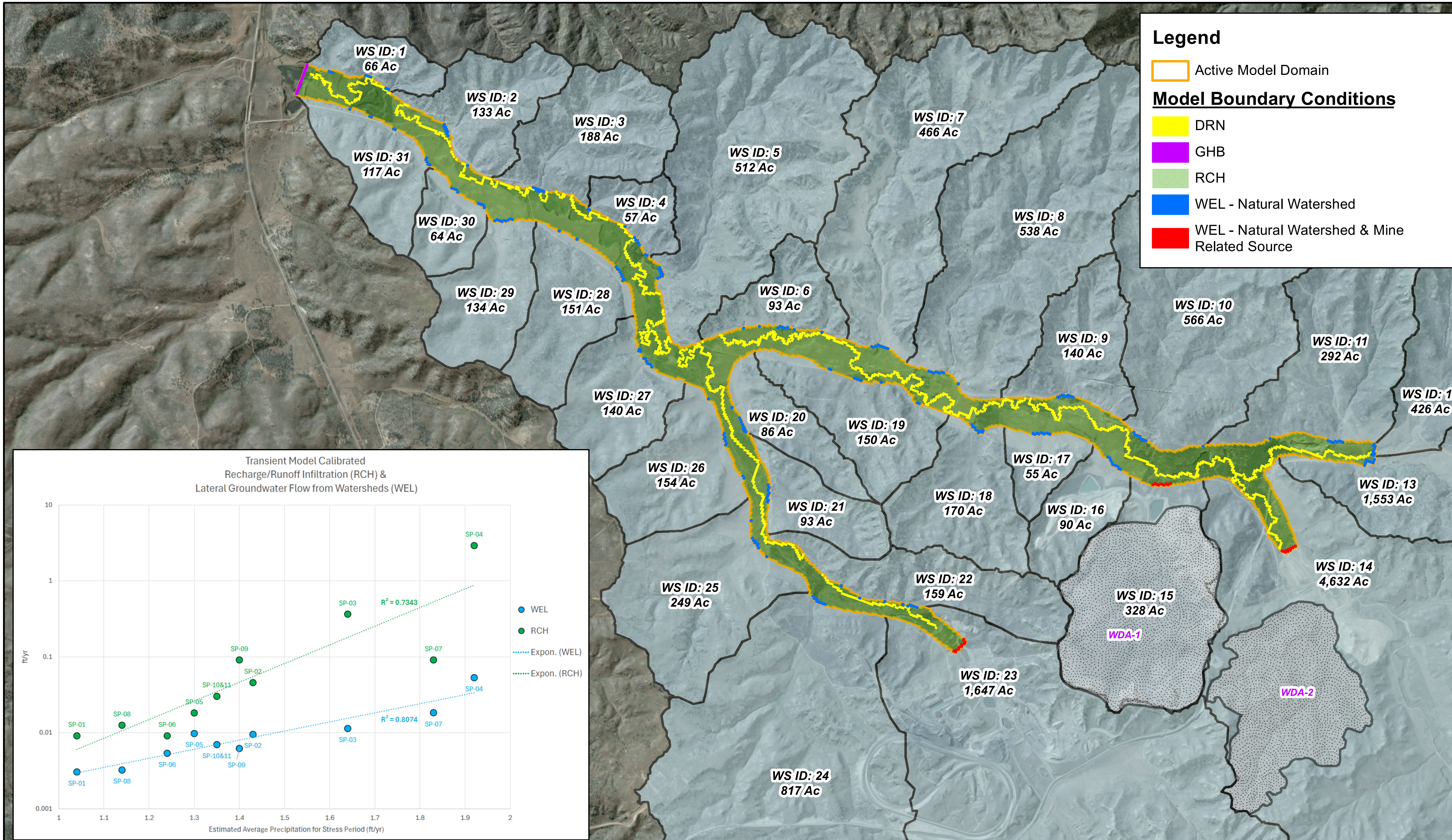

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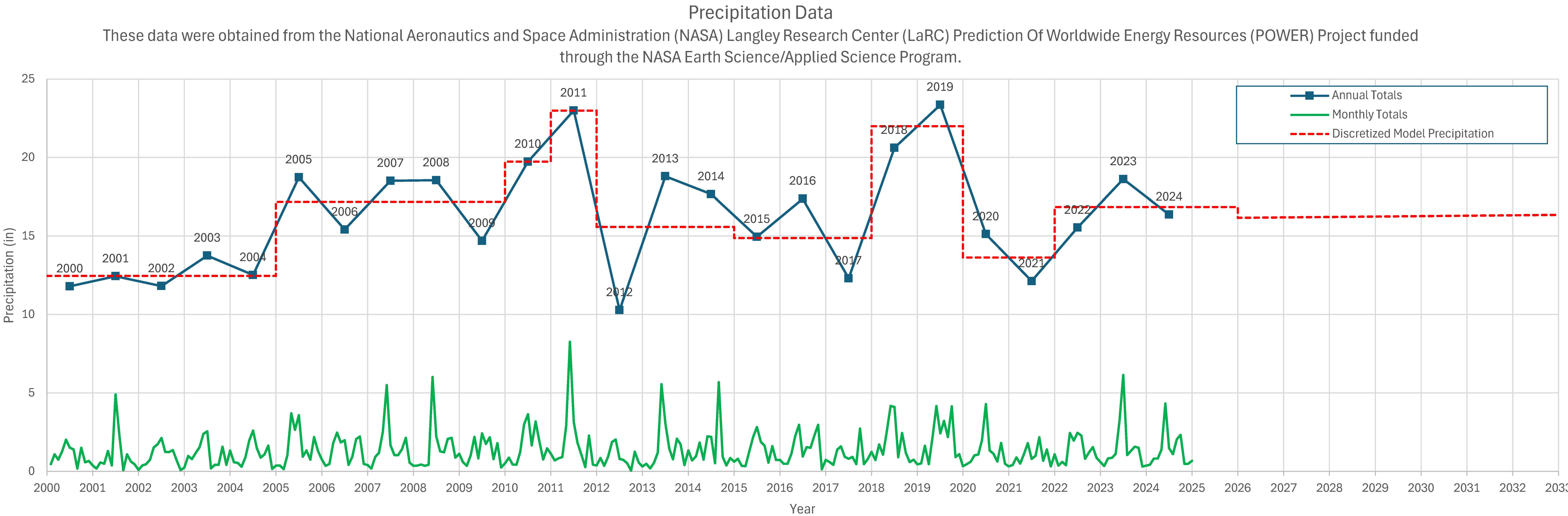
Figure 3
Model Boundary Conditions
Rehder Creek and PM Draw Alluvial Aquifer Model
Bull Mountains Mine No. 1



Mine Related Source Water Budget and TDS Loading Summary

Source	Watershed ID	Status	Model Stress Period				Precipitation		Natural Watershed					Pond			
			ID	Start Date	End Date	Length	Average Precipitation During Stress Period	Average Precipitation (2000 - 2024)	Watershed Area not Including WDA or Ponds	Watershed Area not Including WDA or Ponds Flow		Watershed Background TDS Concentration	Watershed Area not Including WDA or Ponds TDS Load	Appoximate Pond Water Area	Pond Evaporation (Potts (1988) - Billings)	Pond Evaporation	Pond Direct Precipitation
						yr	ft/yr	ft/yr	ft^2	Transient Model Calibrated Watershed Groundwater (ft/yr)	ft^3/yr	kg/ft^3	kg/yr	ft^2	ft/yr	ft^3/yr	ft^3/yr
WDA-1	15	Natural Watershed	1	1/1/2000	1/1/2005	5	1.04	1.35	14,266,310	3.05E-03	43,503	0.0340	1,478	0	4.4	0	0
			2	1/1/2005	1/1/2010	5	1.43	1.35	14,266,310	9.55E-03	136,233	0.0340	4,629	0	4.4	0	0
		Active	3	1/1/2010	1/1/2011	1	1.64	1.35	2,088,310	1.14E-02	23,792	0.0340	808	120,000	4.4	-528,000	196,800
			4	1/1/2011	1/1/2012	1	1.92	1.35	2,088,310	5.32E-02	111,010	0.0340	3,772	120,000	4.4	-528,000	230,400
			5	1/1/2012	1/1/2015	3	1.30	1.35	2,088,310	9.81E-03	20,482	0.0340	696	120,000	4.4	-528,000	156,000
			6	1/1/2015	1/1/2018	3	1.24	1.35	2,088,310	5.37E-03	11,218	0.0340	381	120,000	4.4	-528,000	148,800
			7	1/1/2018	1/1/2020	2	1.83	1.35	2,088,310	1.84E-02	38,370	0.0340	1,304	120,000	4.4	-528,000	219,600
			8	1/1/2020	1/1/2022	2	1.14	1.35	2,088,310	3.24E-03	6,764	0.0340	230	120,000	4.4	-528,000	136,800
			9	1/1/2022	1/1/2026	4	1.40	1.35	2,088,310	6.23E-03	13,009	0.0340	442	120,000	4.4	-528,000	168,000
		Closed	10	1/1/2026	1/1/2033	7	1.35	1.35	2,088,310	7.00E-03	14,612	0.0340	497	120,000	4.4	-528,000	162,000
			11	1/1/2033	1/1/2083	50	1.35	1.35	2,208,310	7.00E-03	15,451	0.0340	525	0	4.4	0	0
WDA-2	14	Natural Watershed	1	1/1/2000	1/1/2005	5	1.04	1.35	201,786,368	3.05E-03	615,316	0.0306	18,818	0	4.4	0	0
			2	1/1/2005	1/1/2010	5	1.43	1.35	201,786,368	9.55E-03	1,926,918	0.0306	58,929	0	4.4	0	0
			3	1/1/2010	1/1/2011	1	1.64	1.35	201,786,368	1.14E-02	2,298,895	0.0306	70,305	0	4.4	0	0
			4	1/1/2011	1/1/2012	1	1.92	1.35	201,786,368	5.32E-02	10,726,482	0.0306	328,039	0	4.4	0	0
			5	1/1/2012	1/1/2015	3	1.30	1.35	201,786,368	9.81E-03	1,979,059	0.0306	60,524	0	4.4	0	0
			6	1/1/2015	1/1/2018	3	1.24	1.35	201,786,368	5.37E-03	1,083,984	0.0306	33,151	0	4.4	0	0
			7	1/1/2018	1/1/2020	2	1.83	1.35	201,786,368	1.84E-02	3,707,530	0.0306	113,384	0	4.4	0	0
			8	1/1/2020	1/1/2022	2	1.14	1.35	201,786,368	3.24E-03	653,574	0.0306	19,988	0	4.4	0	0
		Pond Active	9	1/1/2022	1/1/2026	4	1.40	1.35	201,641,368	6.23E-03	1,256,085	0.0306	38,414	145,000	4.4	-638,000	203,000
		Active	10	1/1/2026	1/1/2033	7	1.35	1.35	192,427,368	7.00E-03	1,346,383	0.0306	41,175	145,000	4.4	-638,000	195,750
		Closed	11	1/1/2033	1/1/2083	50	1.35	1.35	192,572,368	7.00E-03	1,347,398	0.0306	41,206	0	4.4	0	0
PM Draw Ponds	23	Natural Watershed	1	1/1/2000	1/1/2005	5	1.04	1.35	71,734,309	3.05E-03	218,743	0.0481	10,530	0	4.4	0	0
			2	1/1/2005	1/1/2010	5	1.43	1.35	71,734,309	9.55E-03	685,012	0.0481	32,976	0	4.4	0	0
		Active	3	1/1/2010	1/1/2011	1	1.64	1.35	71,672,309	1.14E-02	816,542	0.0481	39,307	62,000	4.4	-272,800	101,680
			4	1/1/2011	1/1/2012	1	1.92	1.35	71,672,309	5.32E-02	3,809,929	0.0481	183,404	62,000	4.4	-272,800	119,040
			5	1/1/2012	1/1/2015	3	1.3	1.35	71,620,309	9.81E-03	702,430	0.0481	33,814	114,000	4.4	-501,600	148,200
			6	1/1/2015	1/1/2018	3	1.24	1.35	71,620,309	5.37E-03	384,740	0.0481	18,521	114,000	4.4	-501,600	141,360
			7	1/1/2018	1/1/2020	2	1.83	1.35	71,620,309	1.84E-02	1,315,918	0.0481	63,346	114,000	4.4	-501,600	208,620
			8	1/1/2020	1/1/2022	2	1.14	1.35	71,620,309	3.24E-03	231,974	0.0481	11,167	114,000	4.4	-501,600	129,960
			9	1/1/2022	1/1/2026	4	1.4	1.35	71,620,309	6.23E-03	446,145	0.0481	21,477	114,000	4.4	-501,600	159,600
			10	1/1/2026	1/1/2033	7	1.35	1.35	71,620,309	7.00E-03	501,116	0.0481	24,123	114,000	4.4	-501,600	153,900
		Inactive	11	1/1/2033	1/1/2083	50	1.35	1.35	71,734,309	7.00E-03	501,913	0.0481	24,161	0	4.4	0	0

Source	ID	WDA									Excess Strata Produced Flow							Totals					
		WDA Area	WDA Runoff - HELP	WDA Runoff	WDA Runnoff TDS Concentration	Total WDA Runnoff TDS Load	Lateral Flow Through WDA Waste - HELP	Lateral Flow Through WDA Waste	Lateral Flow Through WDA Waste TDS Concentration	Total Lateral Flow Through WDA Waste TDS Load	Average Madison Well Production	Average Strata Produced Flow	Estimated Total Excess Strata Produced Flow Assumed Diverted to Ponds	Estimated Portion of Excess Strata Produced Flow		Strata Produced Flow TDS Concetration	Portion of Strata Produced Flow TDS Load	Total Flow to Alluvial Aquifer Model			Total TDS Load to Alluvial Aquifer Model	Total Flow TDS Concetration to Alluvial Aquifer Model	
		ft^2	% of Precipitation During Stress Period	ft^3/yr	kg/ft^3	kg/yr	% of Average Precipitation (2000-2024)	ft^3/yr	kg/ft^3	kg/yr	ft^3/yr	ft^3/yr	ft^3/yr	%	ft^3/yr	kg/ft^3	kg/yr	ft^3/yr	ft^3/day	gal/min	kg/yr	kg/ft^3	mg/L
WDA-1	1	0	0%	0	0	0	0%	0	0	0	0	252,767	0	0%	0	0	0	43,503	119	0.6	1,478	0.0340	1,200
	2	0	0%	0	0	0	0%	0	0	0	0	1,593,014	0	0%	0	0	0	136,233	373	1.9	4,629	0.0340	1,200
	3	12,058,000	14.1%	2,788,292	0.0549	153,174	4.10%	667,410	0.0334	22,301	25,142,714	9,062,316	6,128,107	0%	0	0.0926	0	3,148,294	8,625	44.9	176,283	0.0560	1,977
	4	12,058,000	14.1%	3,264,342	0.0549	179,325	4.10%	667,410	0.0334	22,301	22,267,397	12,153,087	6,343,561	0%	0	0.0926	0	3,745,162	10,261	53.4	205,398	0.0548	1,937
	5	12,058,000	14.1%	2,210,231	0.0549	121,418	4.10%	667,410	0.0334	22,301	25,428,361	19,607,062	16,958,500	0%	0	0.0926	0	2,526,123	6,921	36.0	144,415	0.0572	2,019
	6	12,058,000	14.1%	2,108,221	0.0549	115,814	4.10%	667,410	0.0334	22,301	4,191,902	27,169,553	3,284,532	50%	1,642,266	0.0926	152,067	4,049,915	11,096	57.7	290,563	0.0717	2,534
	7	12,058,000	14.1%	3,111,326	0.0549	170,919	4.10%	667,410	0.0334	22,301	2,107,551	38,840,120	12,870,748	50%	6,435,374	0.0835	537,576	9,944,080	27,244	141.7	732,100	0.0736	2,600
	8	12,058,000	14.1%	1,938,203	0.0549	106,474	4.10%	667,410	0.0334	22,301	0	44,396,659	16,319,736	50%	8,159,868	0.0765	623,866	10,381,045	28,441	147.9	752,871	0.0725	2,561
	9	12,058,000	14.1%	2,380,249	0.0549	130,758	4.10%	667,410	0.0334	22,301	0	49,561,318	21,484,395	33%	7,154,303	0.0603	431,510	9,854,972	27,000	140.4	585,011	0.0594	2,096
	10	12,058,000	1.7%	270,220	0.0340	9,182	4.84%	787,870	0.0334	26,326	0	73,565,281	45,488,358	33%	15,147,623	0.0603	913,626	15,854,324	43,437	225.9	949,630	0.0599	2,115
	11	12,058,000	1.7%	270,220	0.0340	9,182	4.84%	787,870	0.0334	26,326	0	0	0	0%	0	0	0	1,073,541	2,941	15.3	36,033	0.0336	1,185
WDA-2	1	0	0%	0	0	0	0%	0	0	0	-	252,767	0	0%	0	0	0	615,316	1,686	8.8	18,818	0.0306	1,080
	2	0	0%	0	0	0	0%	0	0	0	-	1,593,014	0	0%	0	0	0	1,926,918	5,279	27.5	58,929	0.0306	1,080
	3	0	0%	0	0	0	0%	0	0	0	25,142,714	9,062,316	6,128,107	0%	0	0.0926	0	2,298,895	6,298	32.8	70,305	0.0306	1,080
	4	0	0%	0	0	0	0%	0	0	0	22,267,397	12,153,087	6,343,561	0%	0	0.0926	0	10,726,482	29,388	152.8	328,039	0.0306	1,080
	5	0	0%	0	0	0	0%	0	0	0	25,428,361	19,607,062	16,958,500	0%	0	0.0926	0	1,979,059	5,422	28.2	60,524	0.0306	1,080
	6	0	0%	0	0	0	0%	0	0	0	4,191,902	27,169,553	3,284,532	0%	0	0.0926	0	1,083,984	2,970	15.4	33,151	0.0306	1,080
	7	0	0%	0	0	0	0%	0	0	0	2,107,551	38,840,120	12,870,748	0%	0	0.0835	0	3,707,530	10,158	52.8	113,384	0.0306	1,080
	8	0	0%	0	0	0	0%	0	0	0	0	44,396,659	16,319,736	0%	0	0.0765	0	653,574	1,791	9.3	19,988	0.0306	1,080
	9	0	0%	0	0	0	0%	0	0	0	0	49,561,318	21,484,395	33%	7,154,303	0.0603	431,510	7,975,389	21,850	113.6	469,924	0.0589	2,081
	10	9,214,000	14.1%	1,753,885	0.0549	96,349	4.37%	543,580	0.0334	18,163	0	73,565,281	45,488,358	33%	15,147,623	0.0603	913,626	18,349,221	50,272	261.4	1,069,313	0.0583	2,058
	11	9,214,000	1.7%	208,974	0.0340	7,101	4.98%	619,457	0.0334	20,698	0	0	0	0%	0	0	0	2,175,829	5,961	31.0	69,006	0.0317	1,120
PM Draw Ponds	1	0	0%	0	0	0	0%	0	0	0	0	252,767	0	0%	0	0	0	218,743	599	3.1	10,530	0.0481	1,700
	2	0	0%	0	0	0	0%	0	0	0	0	1,593,014	0	0%	0	0	0	685,012	1,877	9.8	32,976	0.0481	1,700
	3	0	0%	0	0	0	0%	0	0	0	25,142,714	9,062,316	6,128,107	100%	6,128,107	0.0926	567,438	6,773,529	18,558	96.5	606,745	0.0896	3,163
	4	0	0%	0	0	0	0%	0	0	0	22,267,397	12,153,087	6,343,561	100%	6,343,561	0.0926	587,388	9,999,730	27,397	142.5	770,792	0.0771	2,722
	5	0	0%	0	0	0	0%	0	0	0	25,428,361	19,607,062	16,958,500	100%	16,958,500	0.0926	1,570,288	17,307,530	47,418	246.6	1,604,102	0.0927	3,273
	6	0	0%	0	0	0	0%	0	0	0	4,191,902	27,169,553	3,284,532	50%	1,642,266	0.0926	152,067	1,666,766	4,566	23.7	170,588	0.1023	3,614
	7	0	0%	0	0	0	0%	0	0	0	2,107,551	38,840,120	12,870,748	50%	6,435,374	0.0835	537,576	7,458,313	20,434	106.3	600,923	0.0806	2,845
	8	0	0%	0	0	0	0%	0	0	0	0	44,396,659	16,319,736	50%	8,159,868	0.0765	623,866	8,020,202	21,973	114.3	635,033	0.0792	2,796
	9	0	0%	0	0	0	0%	0	0	0	0	49,561,318	21,484,395	33%	7,154,303	0.0603	431,510	7,258,448	19,886	103.4	452,987	0.0624	2,204
	10	0	0%	0	0	0	0%	0	0	0	0	73,565,281	45,488,358	33%	15,147,623	0.0603	913,626	15,301,039	41,921	218.0	937,749	0.0613	2,164
	11	0	0%	0	0	0	0%	0	0	0	0	0	0	0%	0	0	0	501,913	1,375	7.2	24,161	0.0481	1,700

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Figure 4
Precipitation Data & Mine Related Source Loading Calculations
Rehder Creek and PM Draw Alluvial Aquifer Model
Bull Mountains Mine No. 1

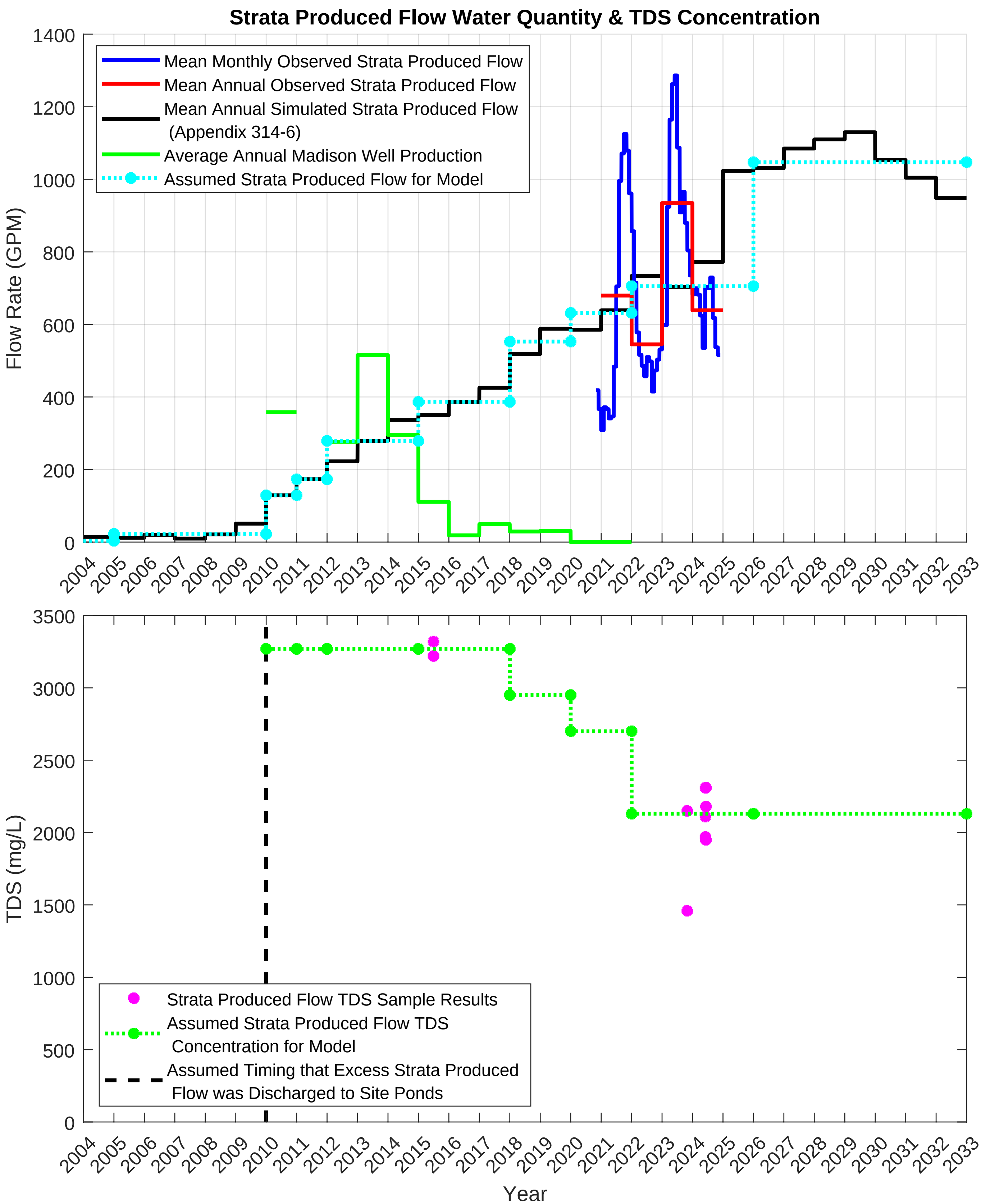

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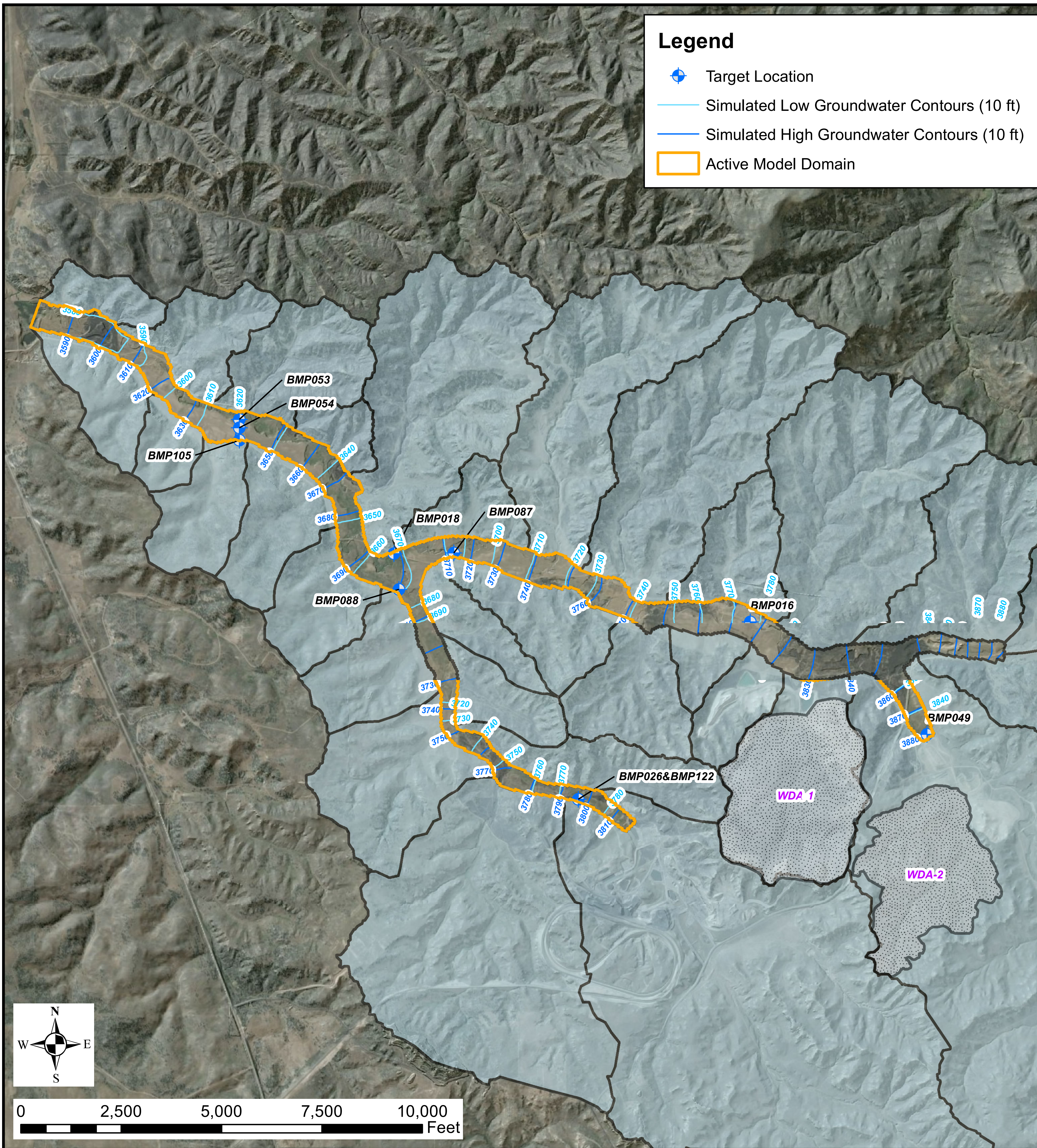
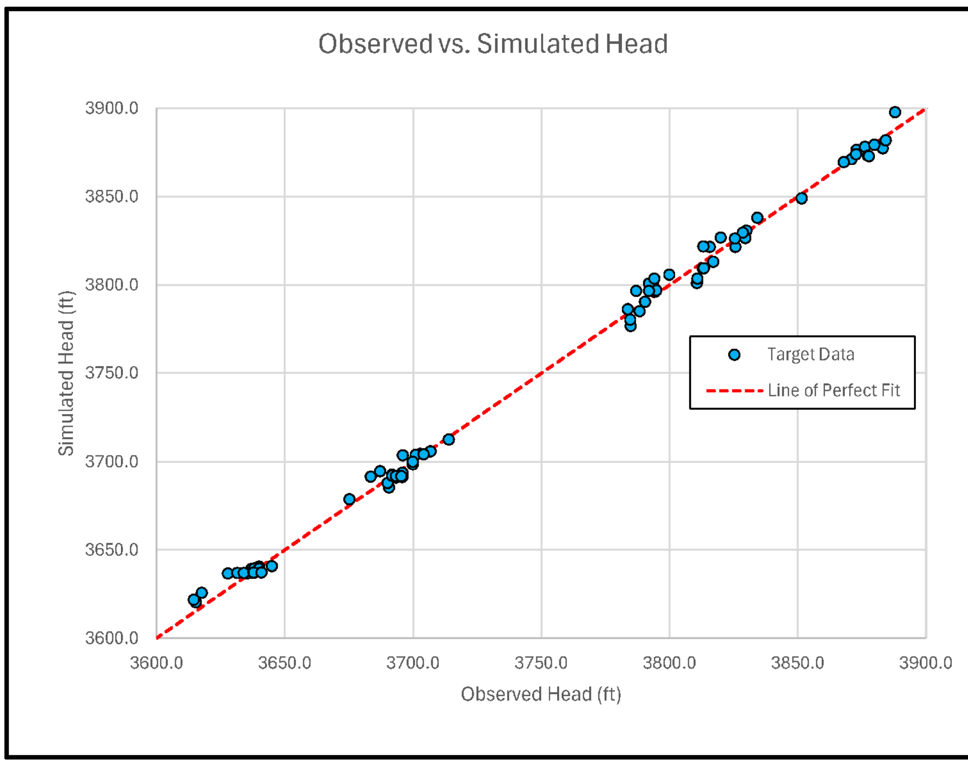
Figure 5
Strata Produced Flow Quantity & TDS Concentration
Rehder Creek and PM Draw Alluvial Aquifer Model
Bull Mountains Mine No. 1





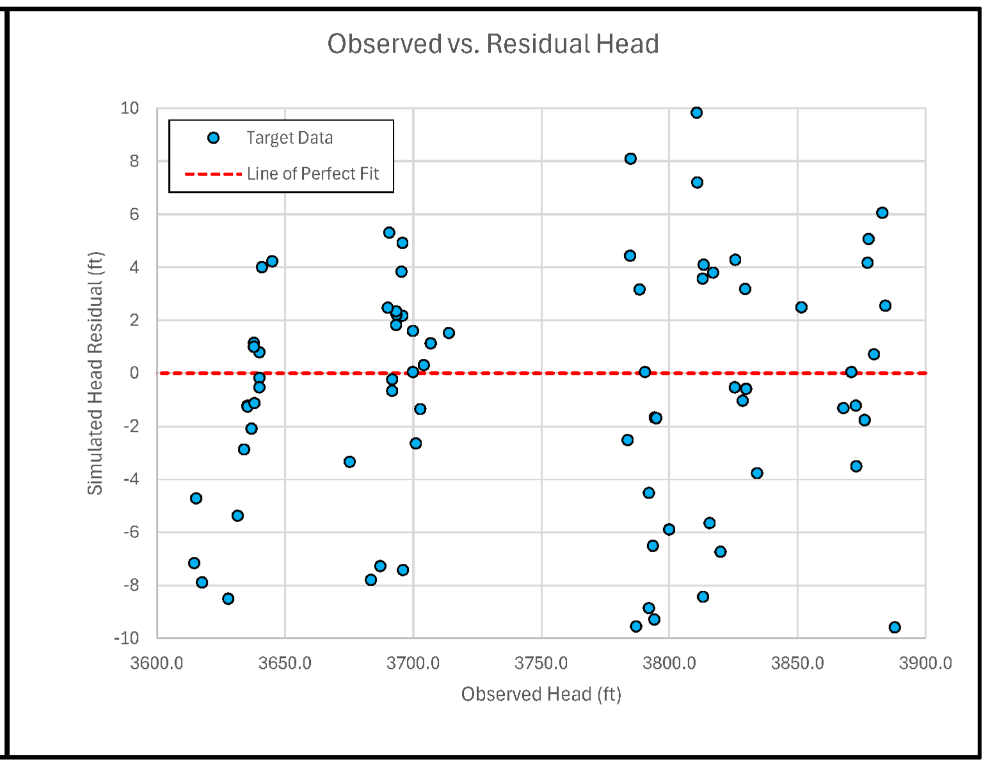


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Figure 6
Model Calibration Target Locations and Plotted Calbration Results
Rehder Creek and PM Draw Alluvial Aquifer Model
Bull Mountains Mine No. 1

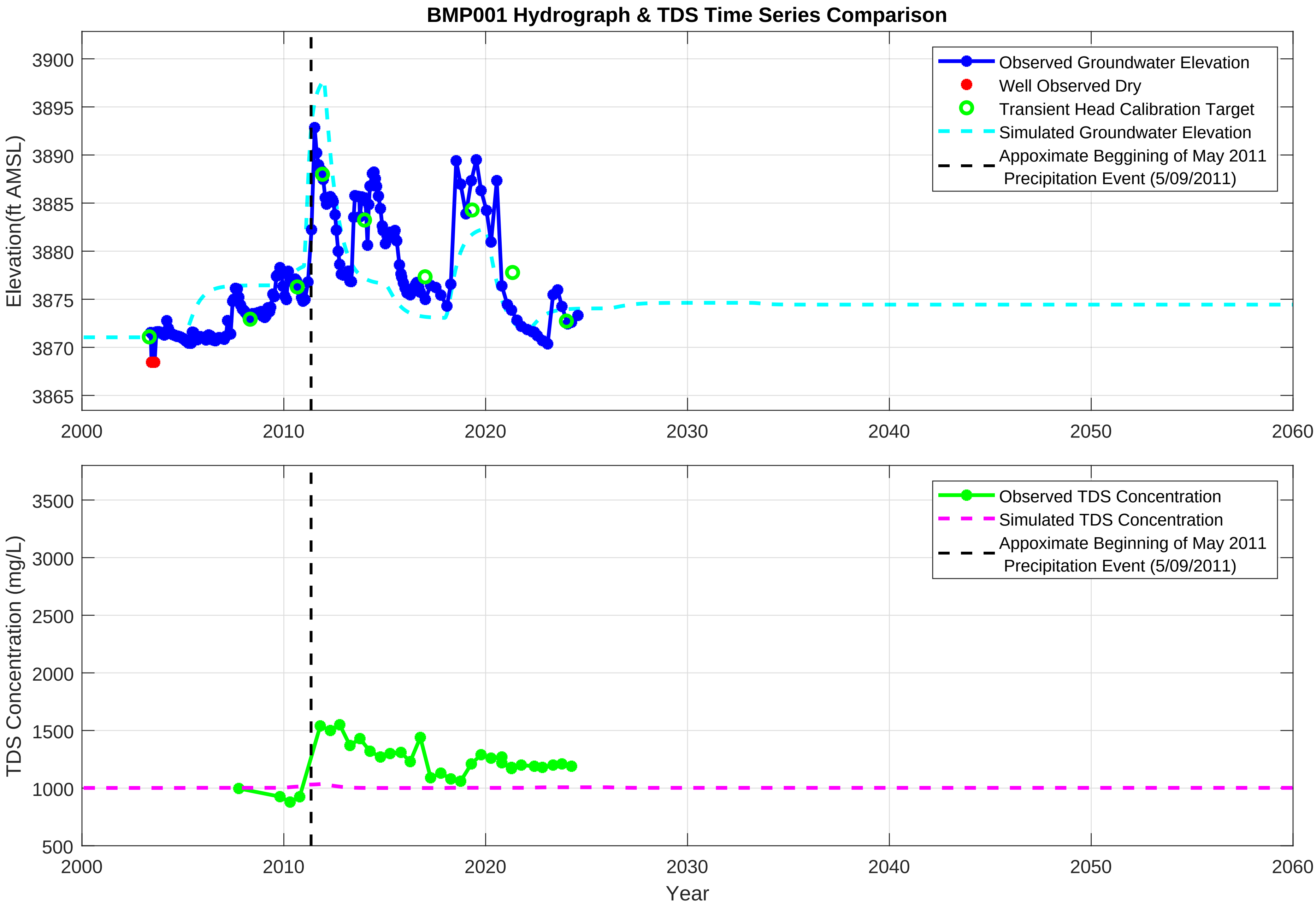

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Figure 7 - Sheet 1
BMP001 Hydrograph & TDS Time Series Comparison
Rehder Creek and PM Draw Alluvial Aquifer Model
Bull Mountains Mine No. 1

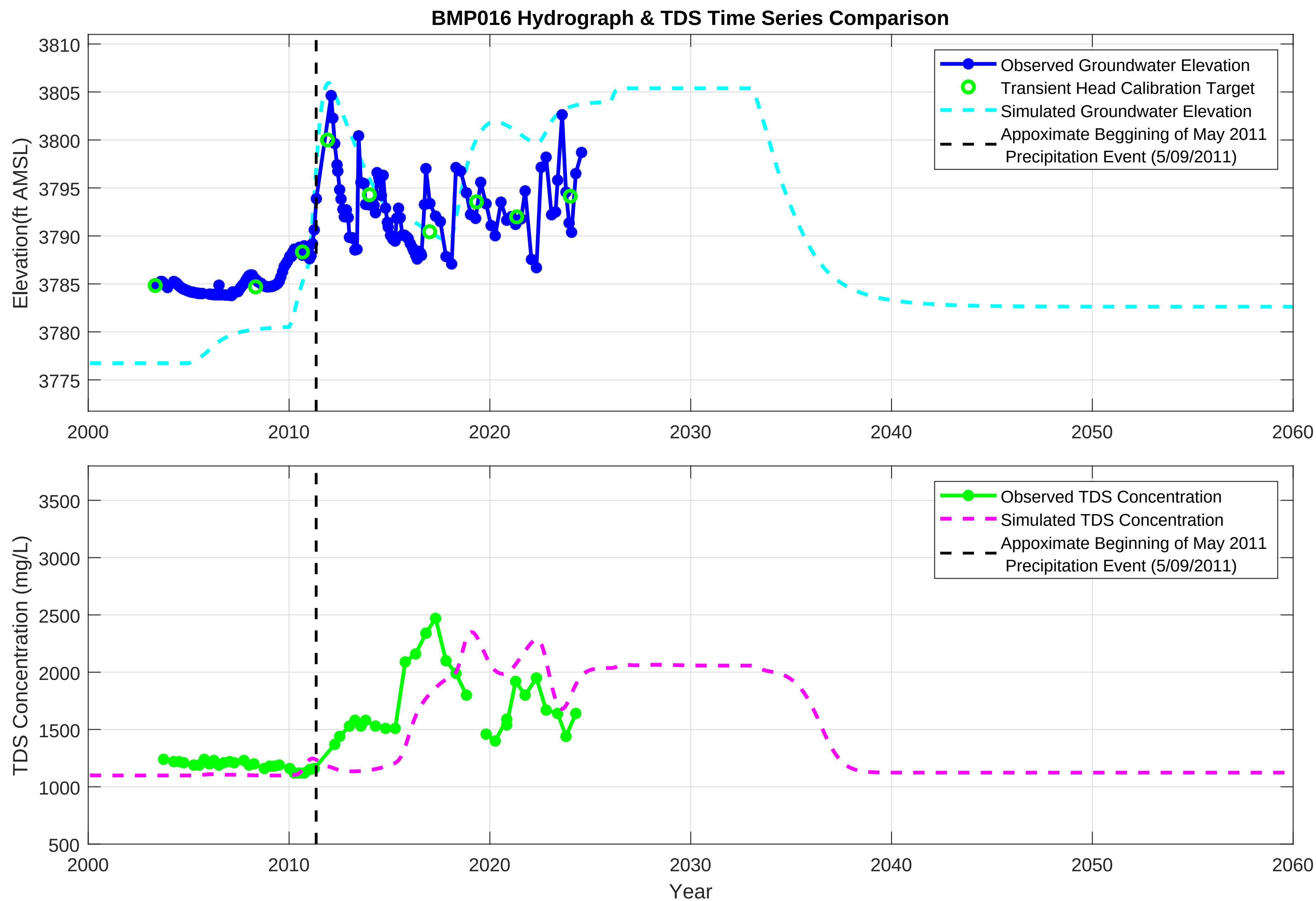
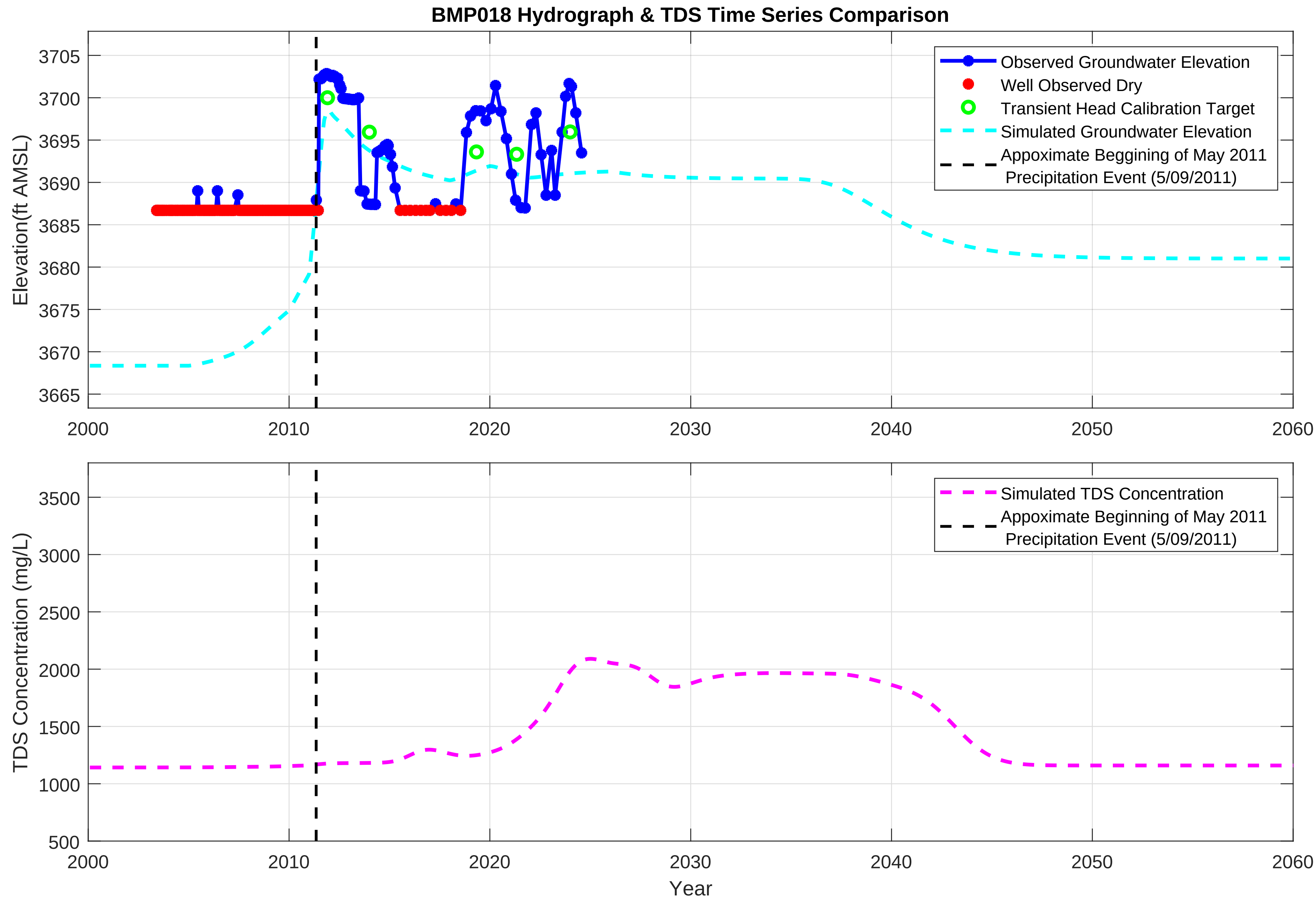


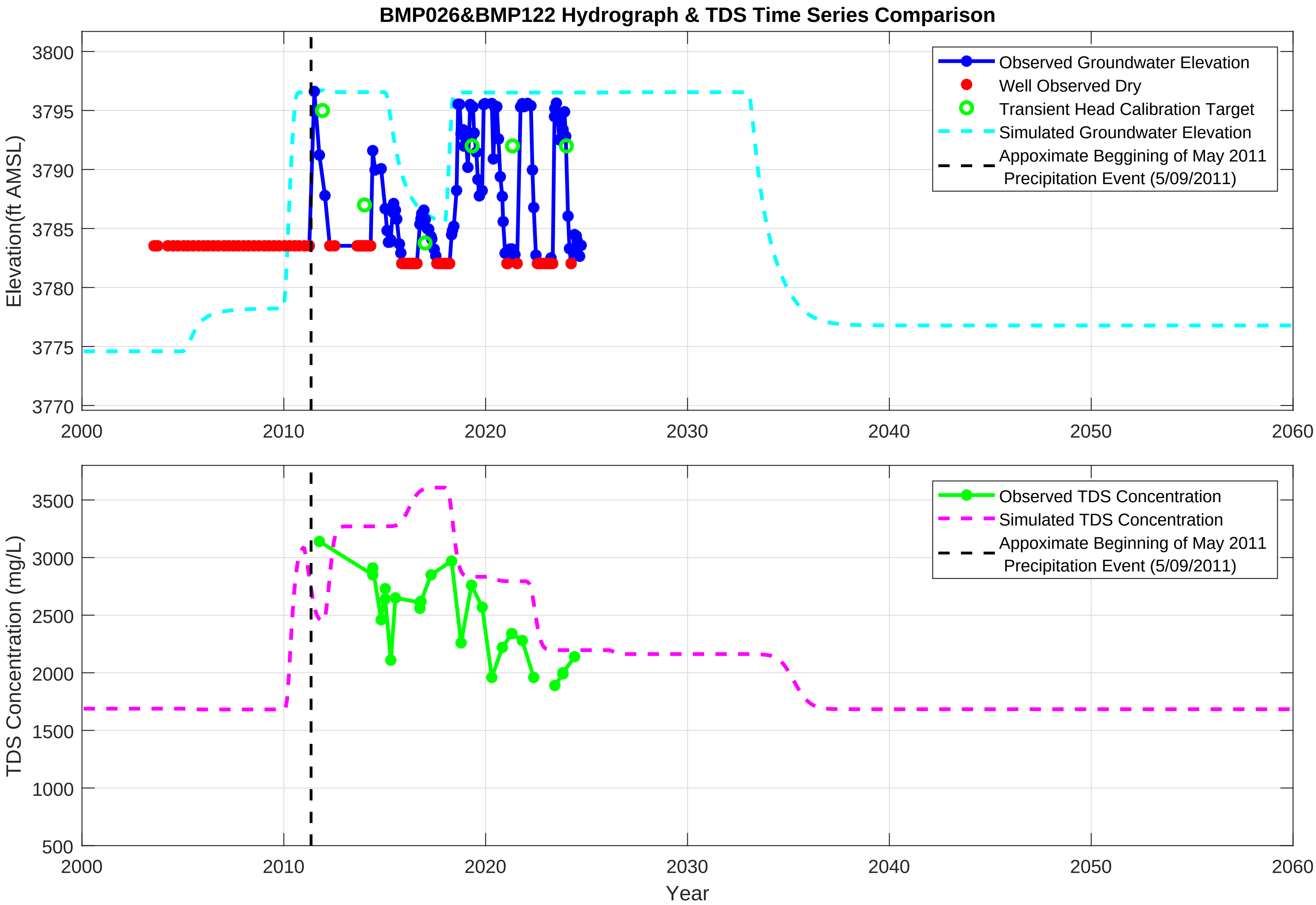
Figure 7 - Sheet 2
BMP016 Hydrograph & TDS Time Series Comparison
Rehder Creek and PM Draw Alluvial Aquifer Model
Bull Mountains Mine No. 1



Water & Environmental TECHNOLOGIES

SIGNAL PEAK ENERGY

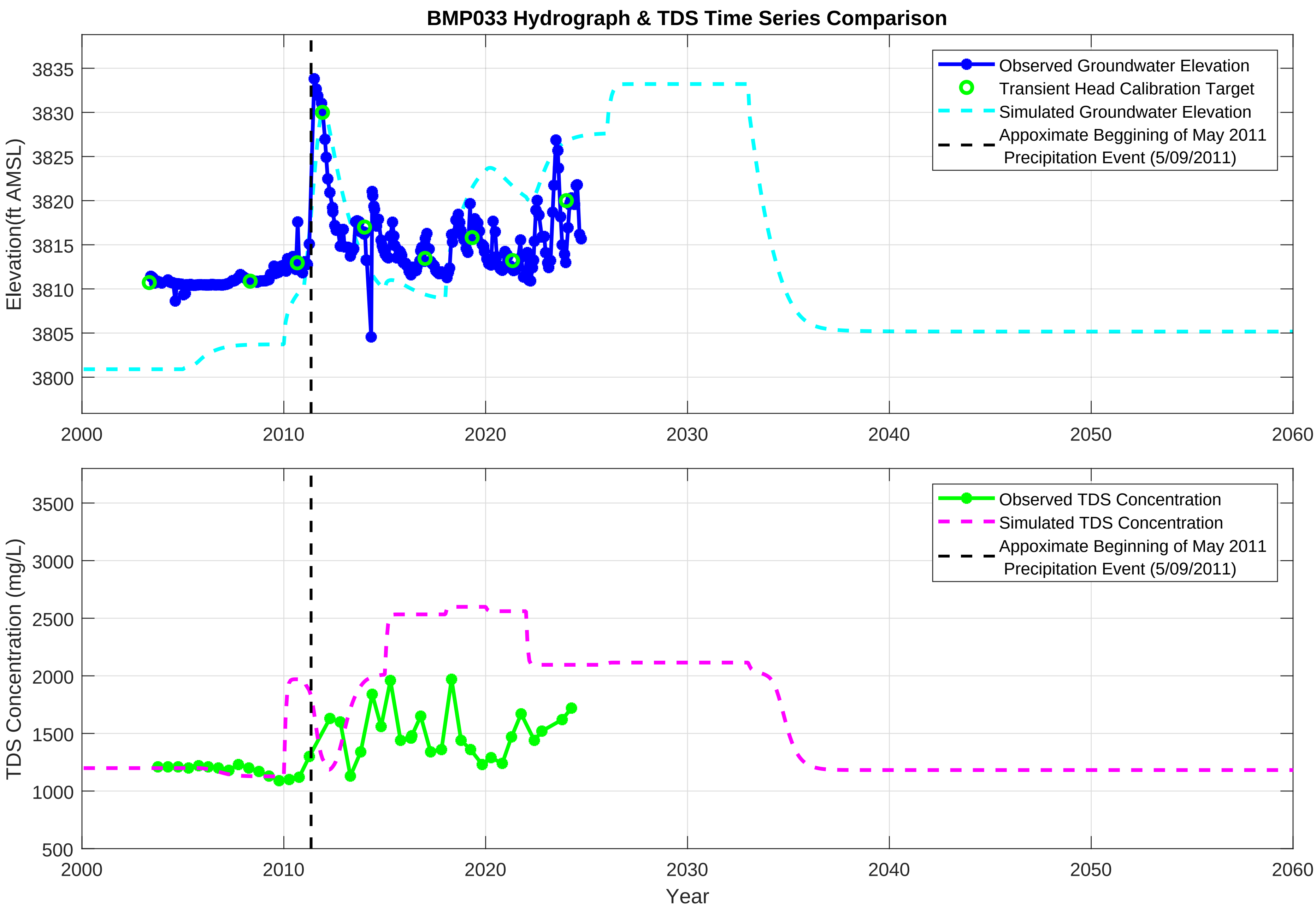
Figure 7 - Sheet 3
BMP018 Hydrograph & TDS Time Series Comparison
Rehder Creek and PM Draw Alluvial Aquifer Model
Bull Mountains Mine No. 1



Water & Environmental Technologies

SIGNAL PEAK ENERGY

Figure 7 - Sheet 4
BMP026&BMP122 Hydrograph & TDS Time Series Comparison
Rehder Creek and PM Draw Alluvial Aquifer Model
Bull Mountains Mine No. 1



Water & Environmental TECHNOLOGIES

SIGNAL PEAK ENERGY

Figure 7 - Sheet 5
BMP033 Hydrograph & TDS Time Series Comparison
Rehder Creek and PM Draw Alluvial Aquifer Model
Bull Mountains Mine No. 1

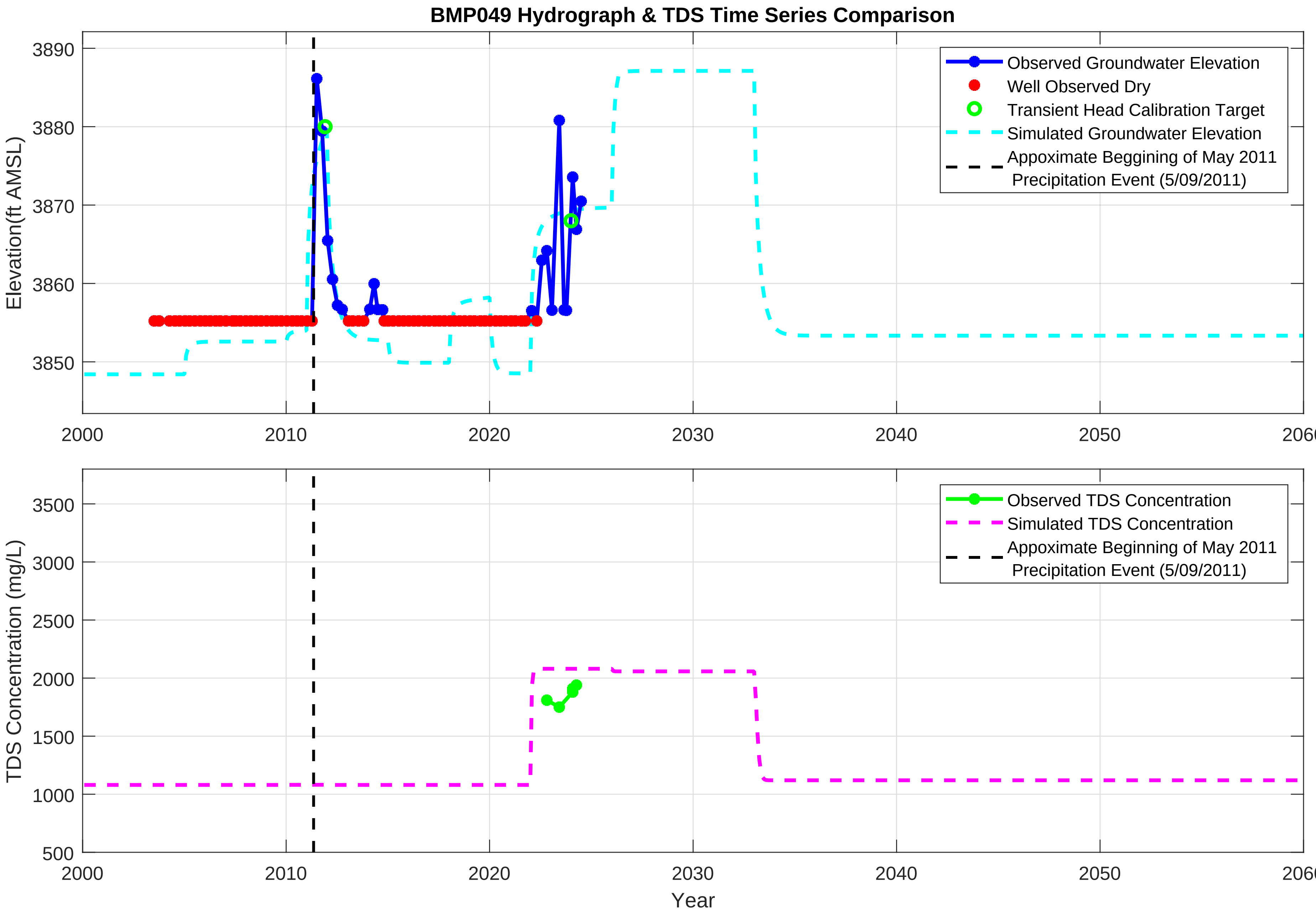


Figure 7 - Sheet 6
BMP049 Hydrograph & TDS Time Series Comparison
Rehder Creek and PM Draw Alluvial Aquifer Model
Bull Mountains Mine No. 1

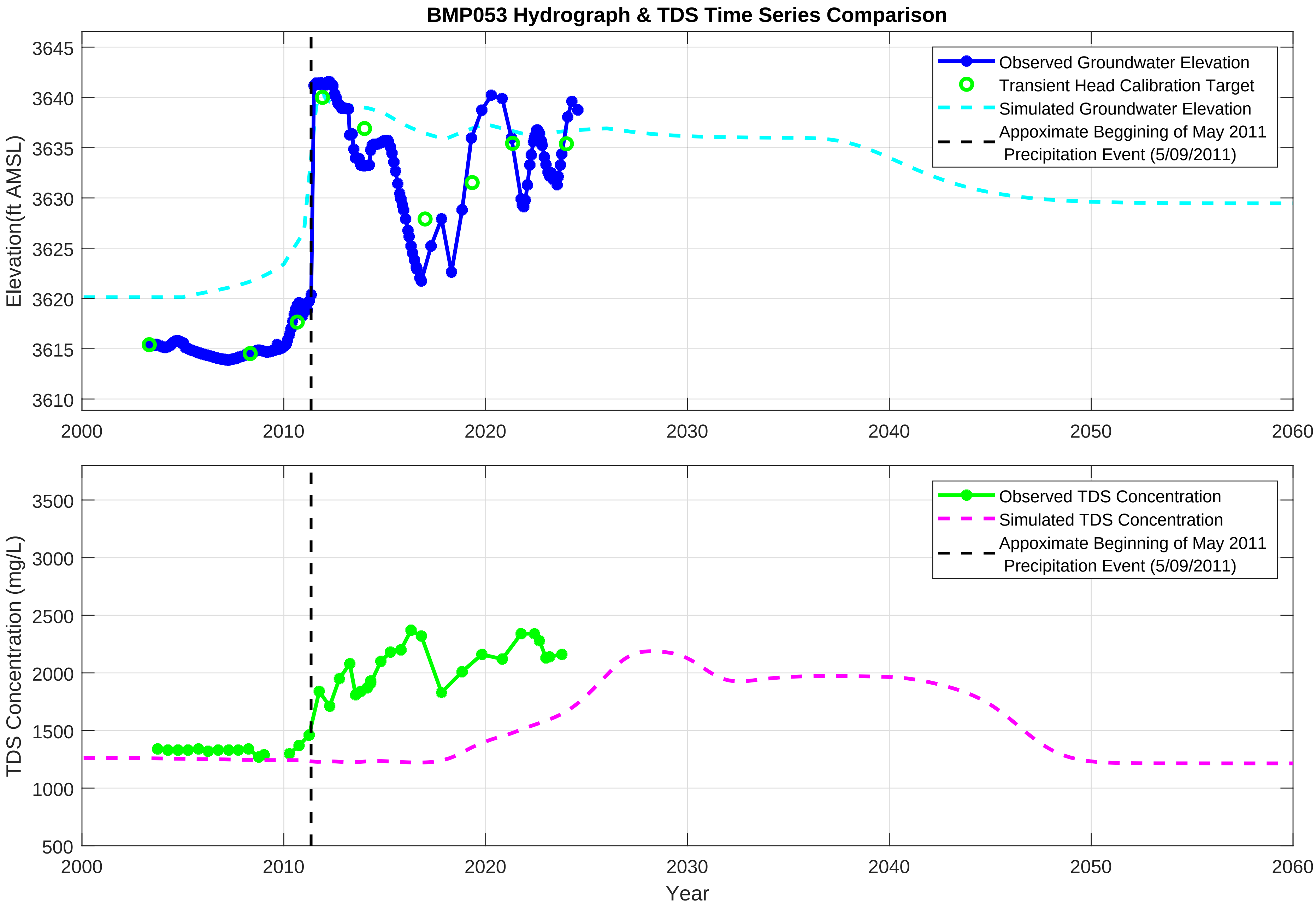
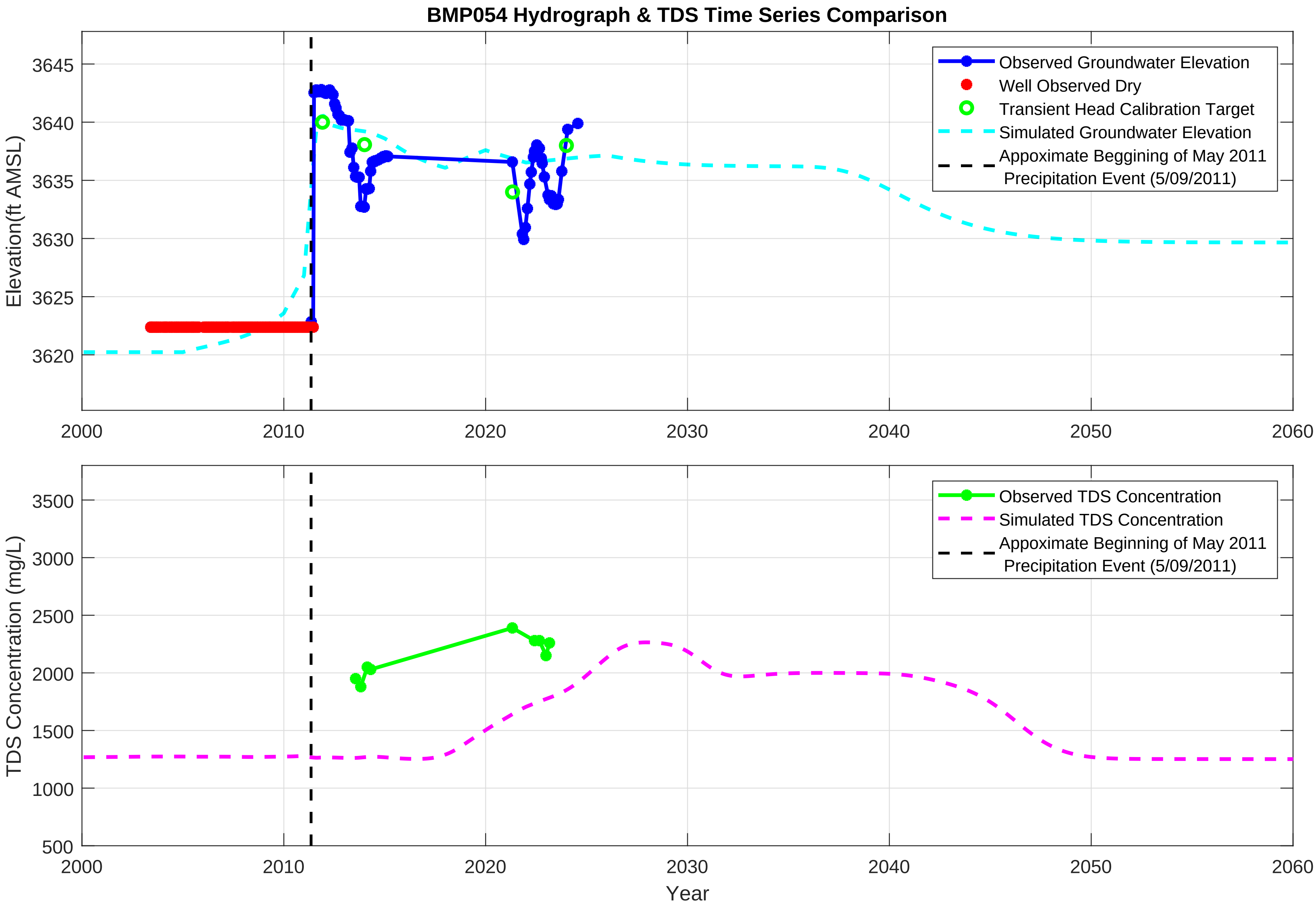


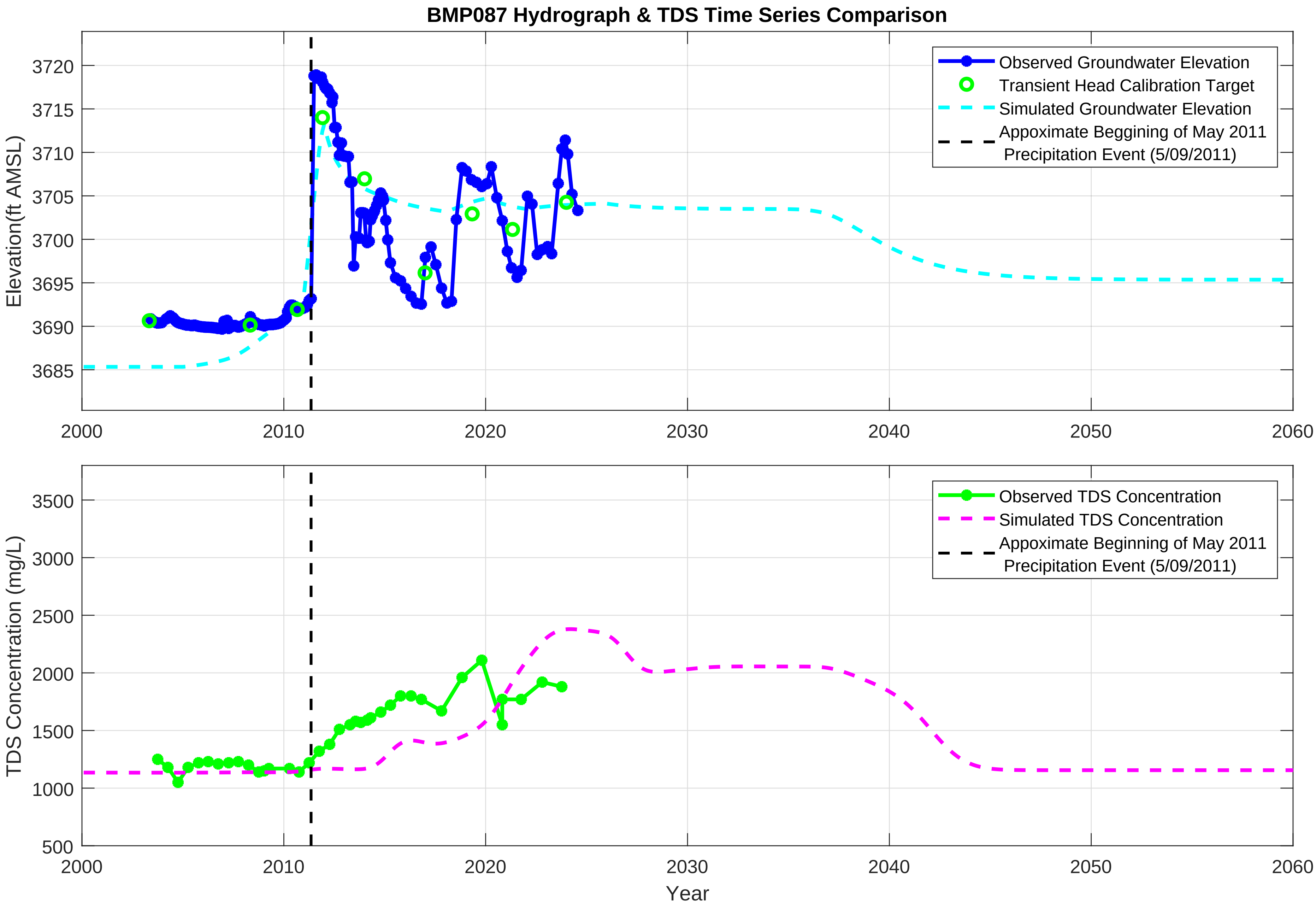
Figure 7 - Sheet 7
BMP053 Hydrograph & TDS Time Series Comparison
Rehder Creek and PM Draw Alluvial Aquifer Model
Bull Mountains Mine No. 1



Water & Environmental TECHNOLOGIES

SIGNAL PEAK ENERGY

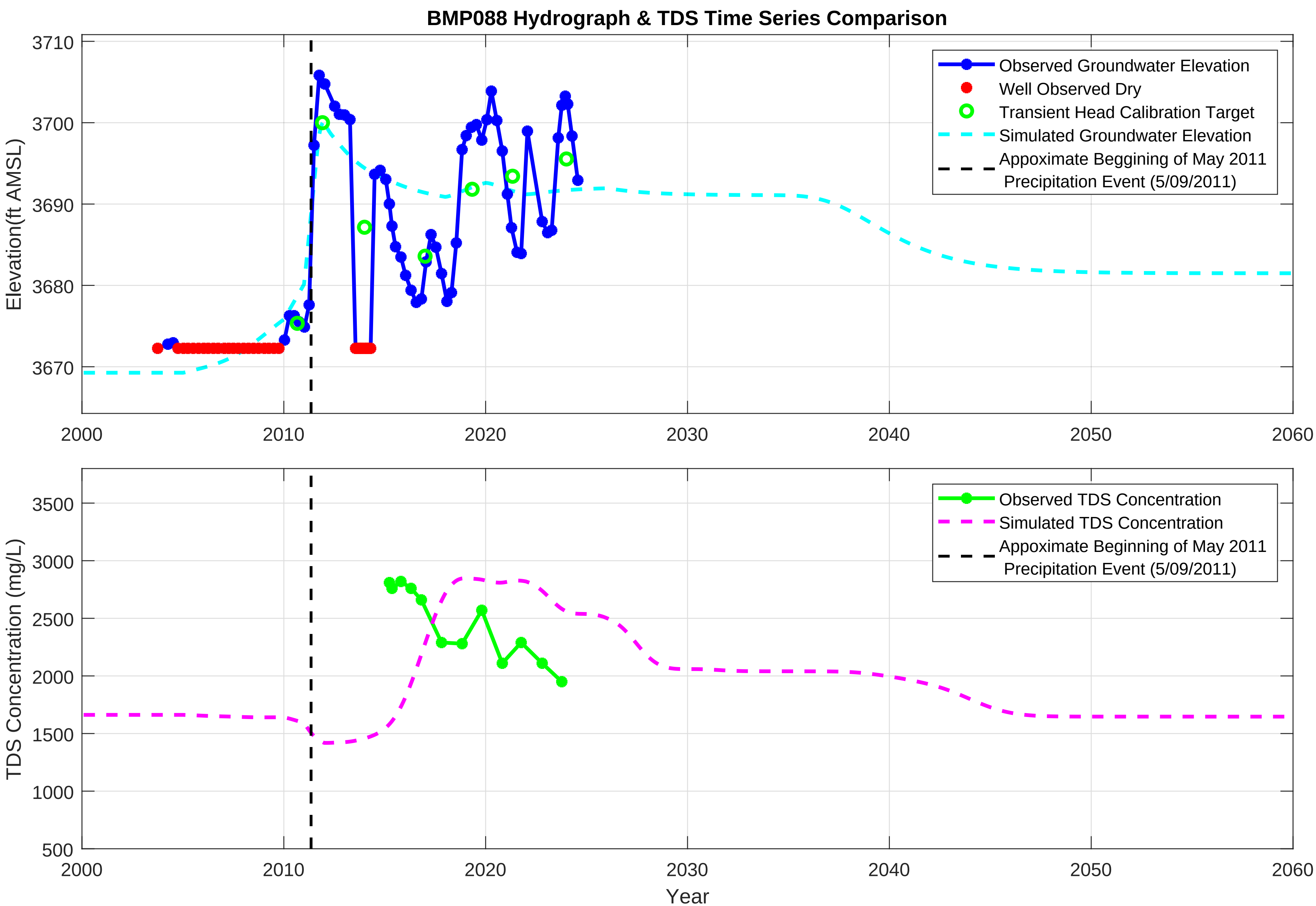
Figure 7 - Sheet 8
BMP054 Hydrograph & TDS Time Series Comparison
Rehder Creek and PM Draw Alluvial Aquifer Model
Bull Mountains Mine No. 1



Water & Environmental TECHNOLOGIES

SIGNAL PEAK ENERGY

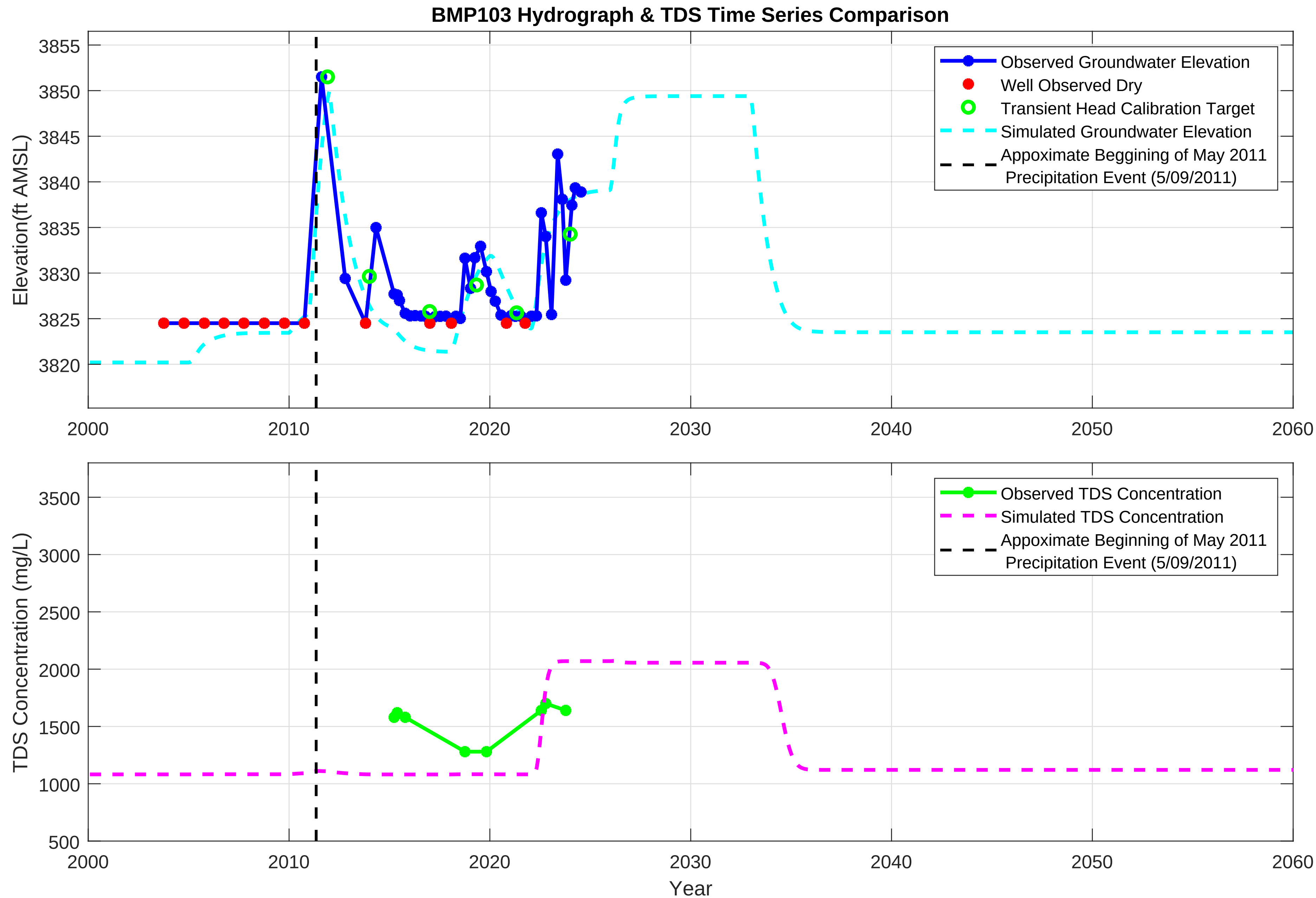
Figure 7 - Sheet 9
BMP087 Hydrograph & TDS Time Series Comparison
Rehder Creek and PM Draw Alluvial Aquifer Model
Bull Mountains Mine No. 1



Water & Environmental TECHNOLOGIES

SIGNAL PEAK ENERGY

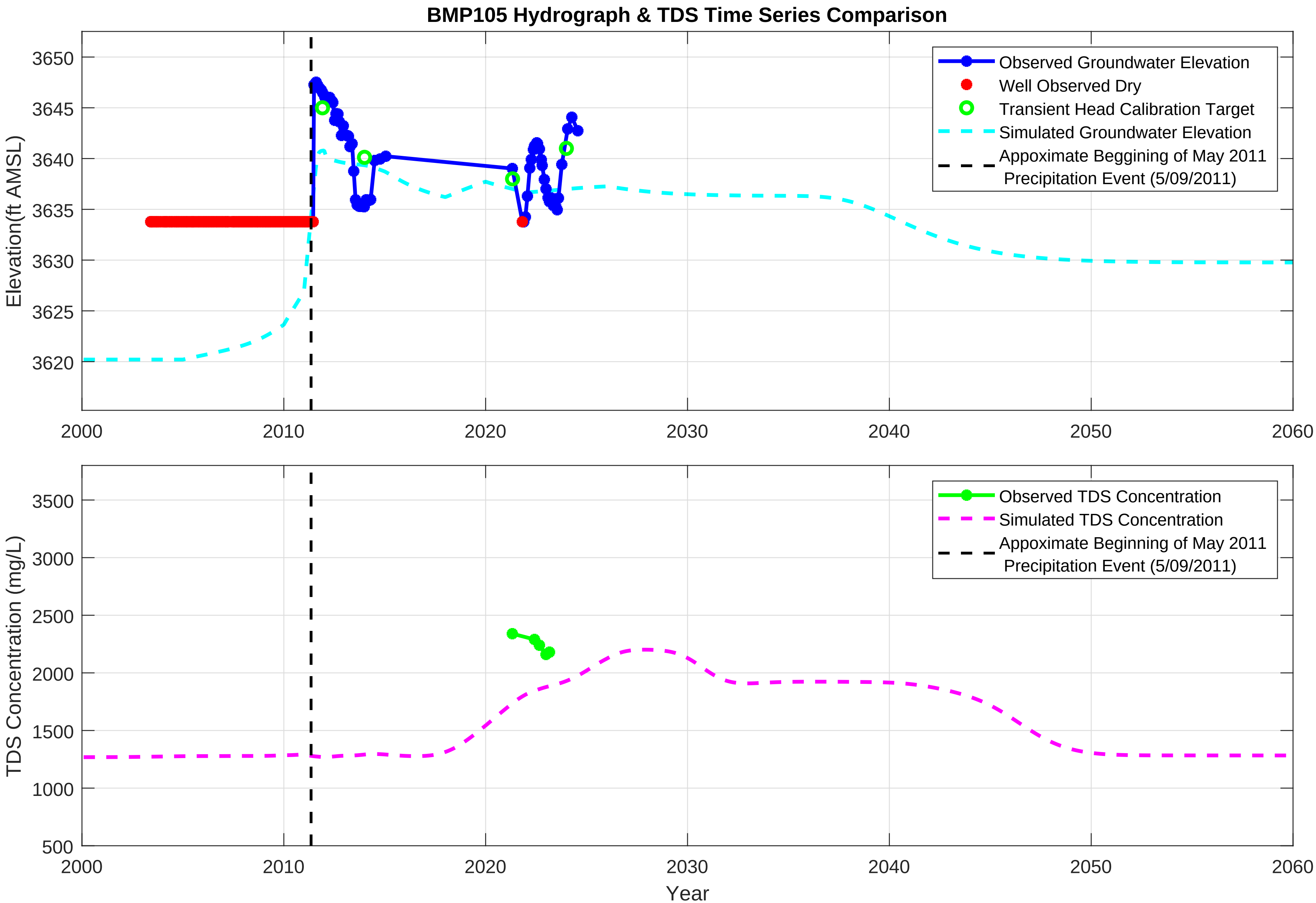
Figure 7 - Sheet 10
BMP088 Hydrograph & TDS Time Series Comparison
Rehder Creek and PM Draw Alluvial Aquifer Model
Bull Mountains Mine No. 1



Water & Environmental Technologies

SIGNAL PEAK ENERGY

Figure 7 - Sheet 11
BMP103 Hydrograph & TDS Time Series Comparison
Rehder Creek and PM Draw Alluvial Aquifer Model
Bull Mountains Mine No. 1



Water & Environmental TECHNOLOGIES

SIGNAL PEAK ENERGY

Figure 7 - Sheet 12
BMP105 Hydrograph & TDS Time Series Comparison
Rehder Creek and PM Draw Alluvial Aquifer Model
Bull Mountains Mine No. 1

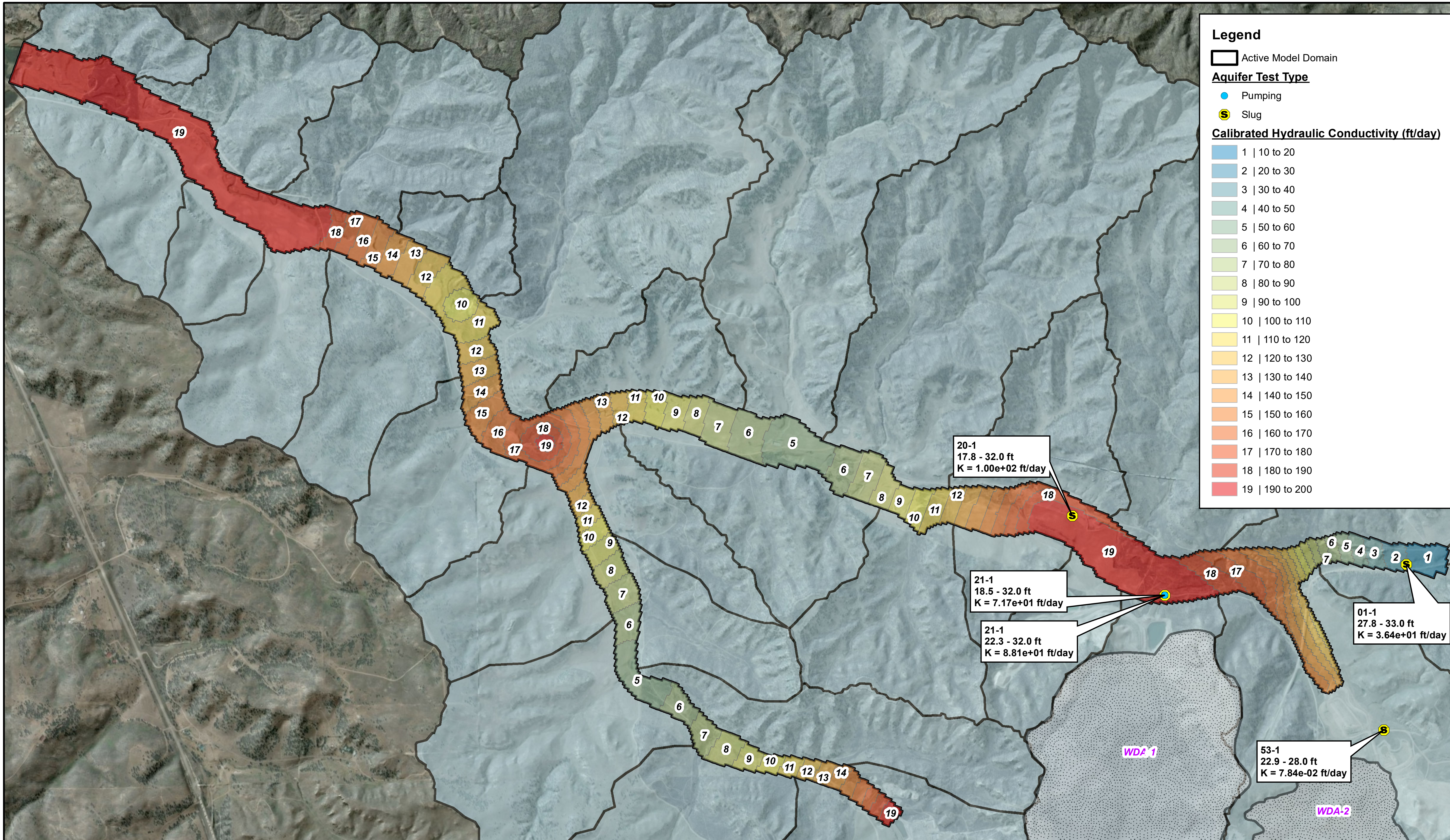
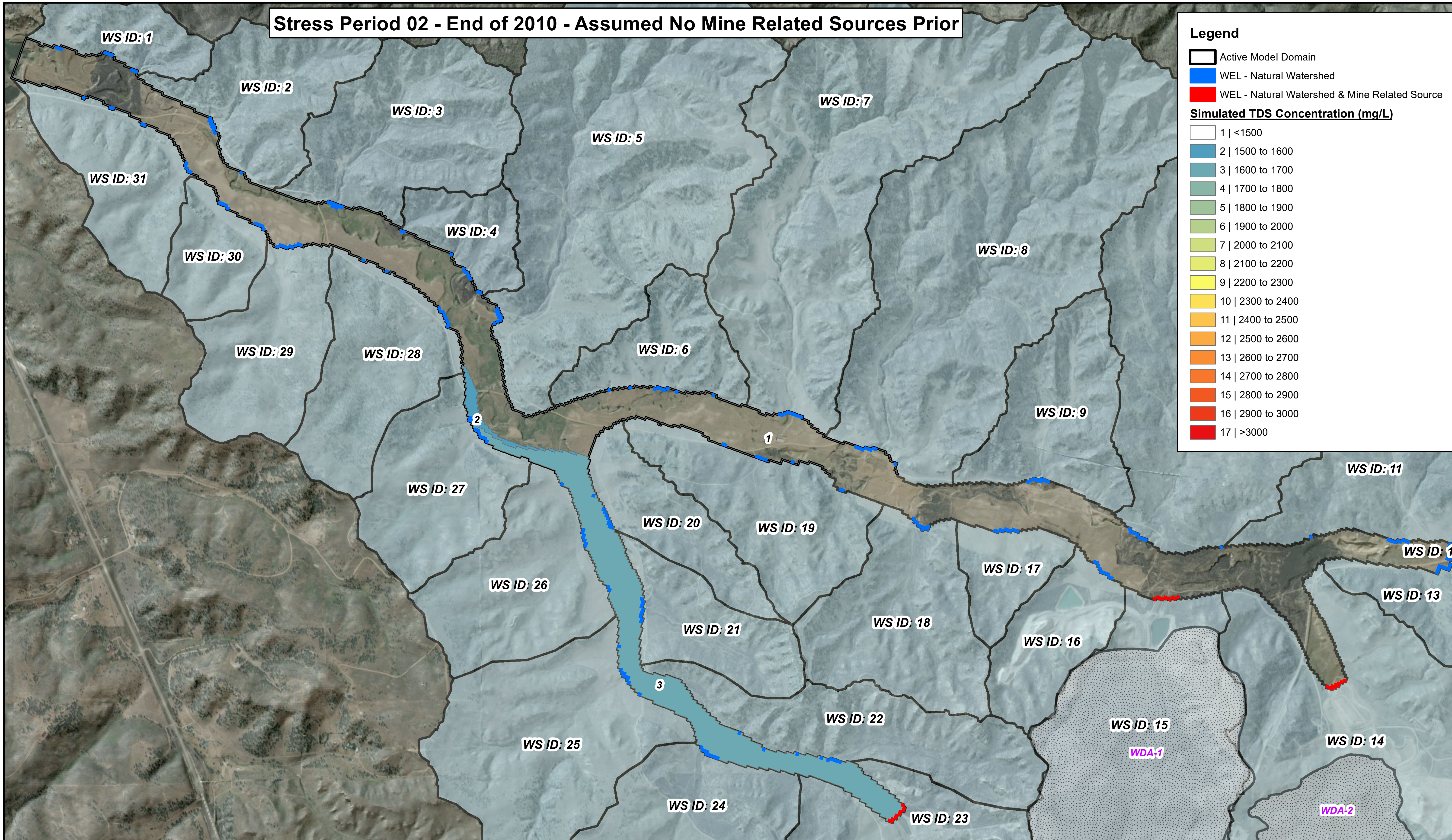


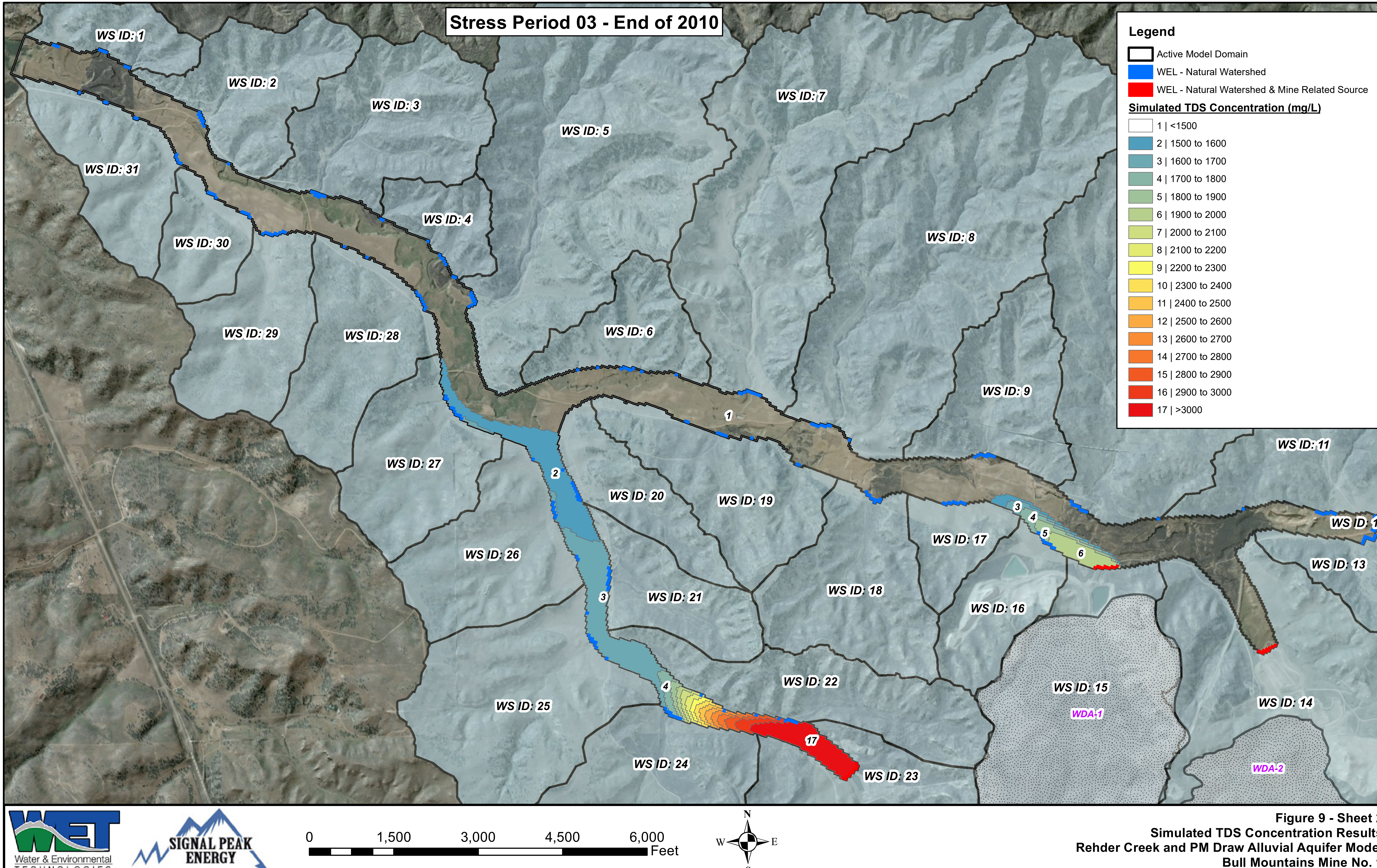
Figure 8
Calibrated Hydraulic Conductivity Spatial Distribution
Rehder Creek and PM Draw Alluvial Aquifer Model
Bull Mountains Mine No. 1



WET Water & Environmental Technologies

SIGNAL PEAK ENERGY

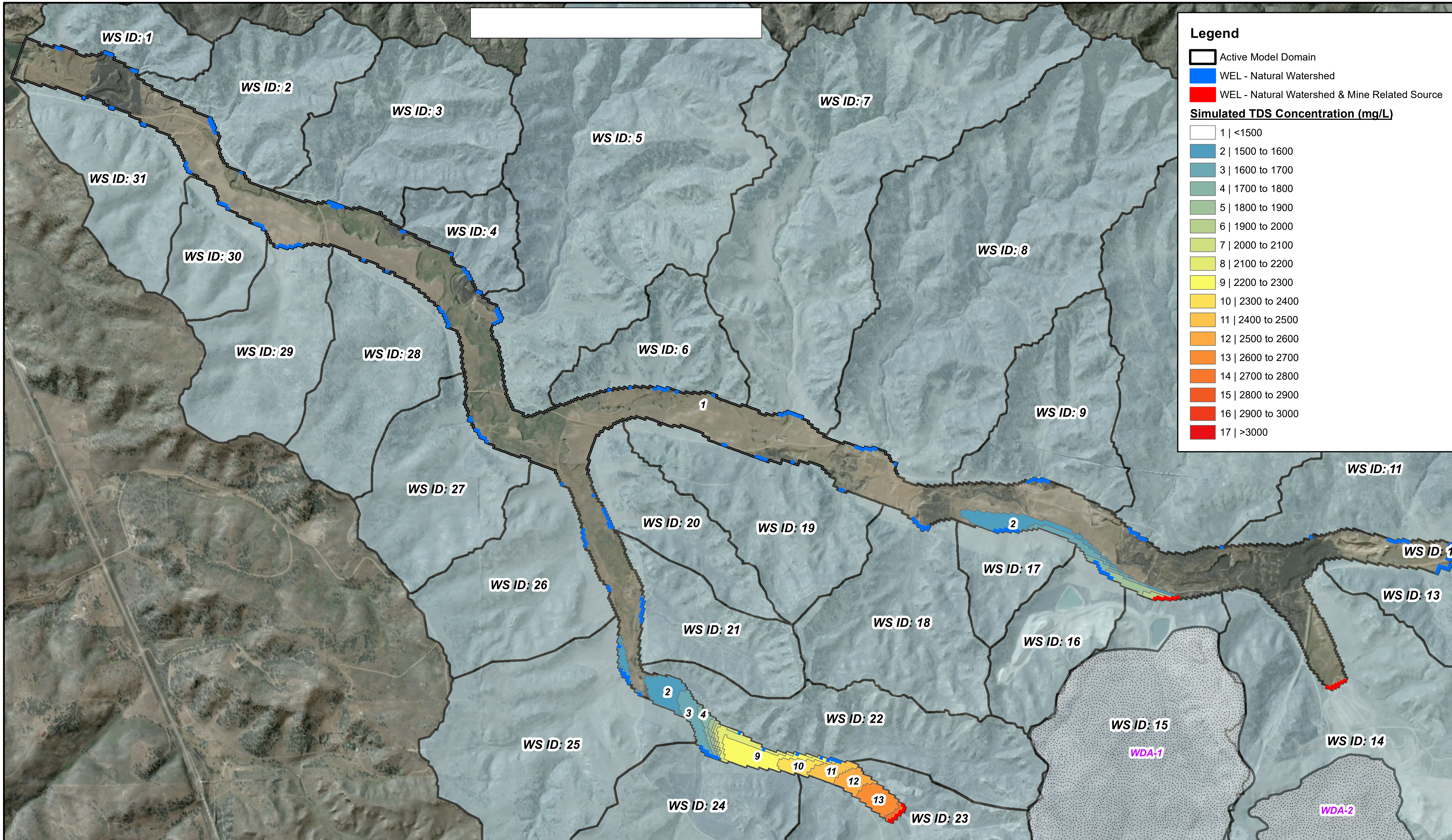
Figure 9 - Sheet 1
Simulated TDS Concentration Results
Rehder Creek and PM Draw Alluvial Aquifer Model
Bull Mountains Mine No. 1



Water & Environmental Technologies

Signal Peak Energy

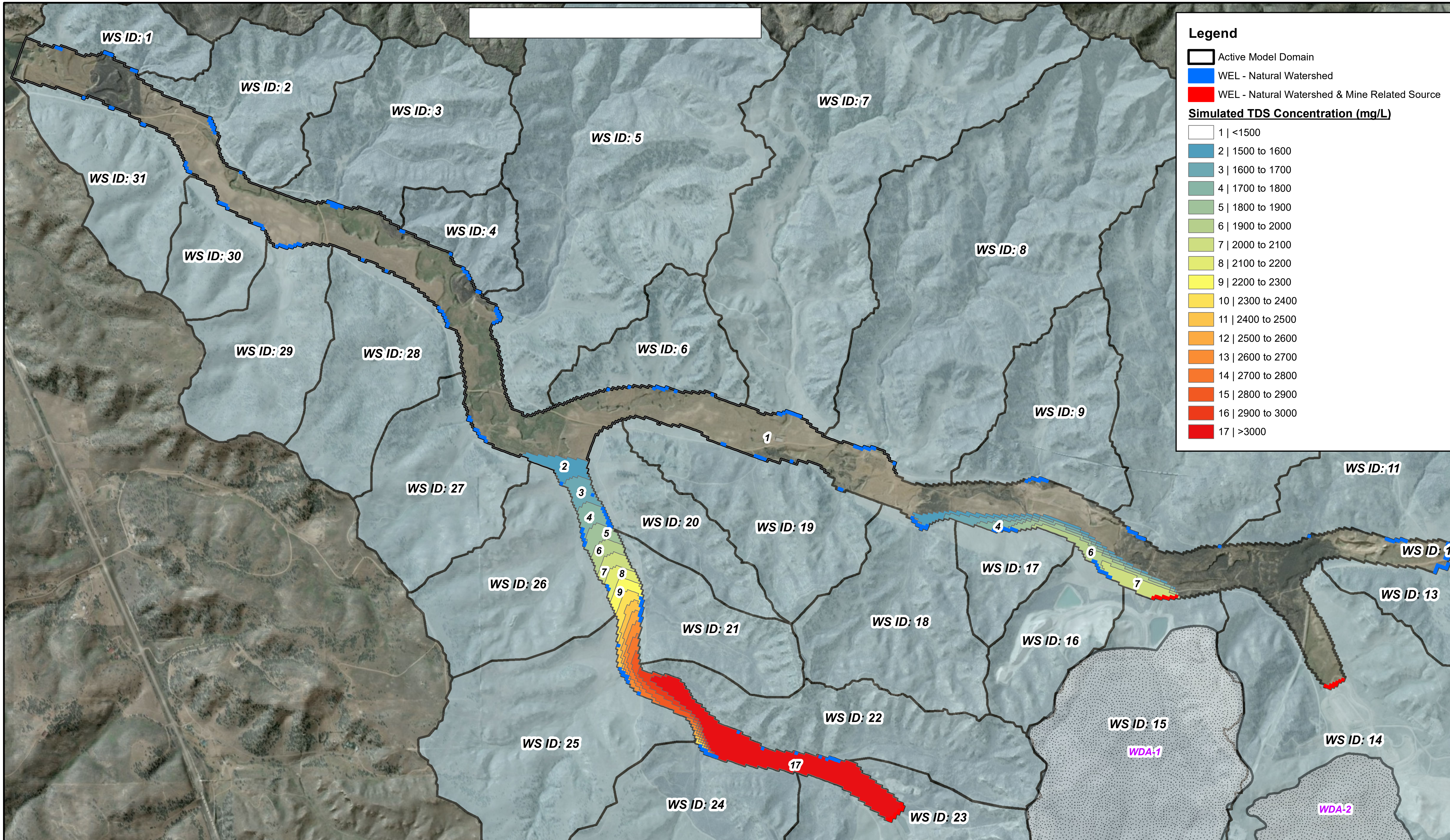
Figure 9 - Sheet 2
Simulated TDS Concentration Results
Rehder Creek and PM Draw Alluvial Aquifer Model
Bull Mountains Mine No. 1



Water & Environmental TECHNOLOGIES

SIGNAL PEAK ENERGY

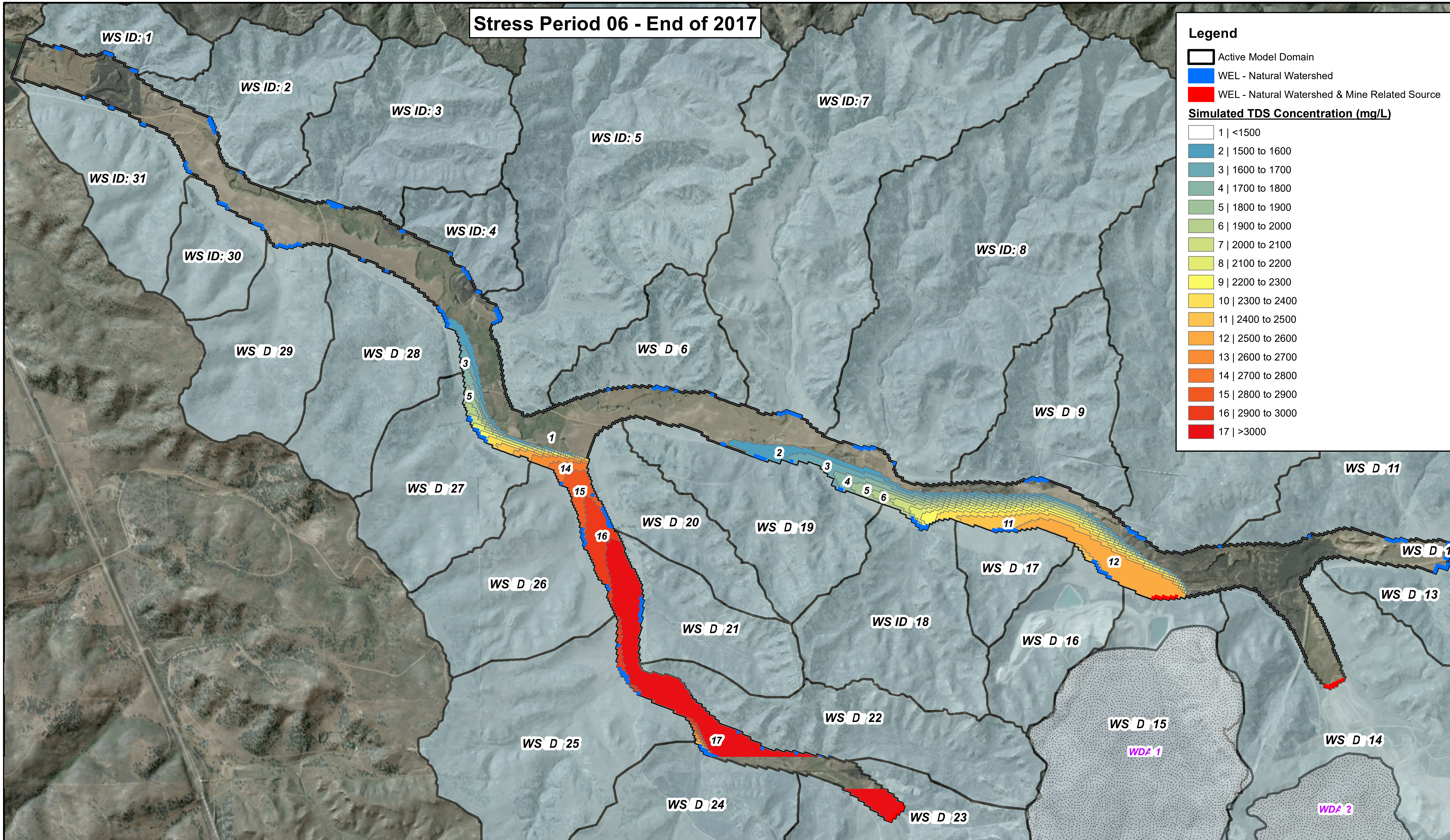
Figure 9 - Sheet 3
Simulated TDS Concentration Results
Rehder Creek and PM Draw Alluvial Aquifer Model
Bull Mountains Mine No. 1



Water & Environmental TECHNOLOGIES

SIGNAL PEAK ENERGY

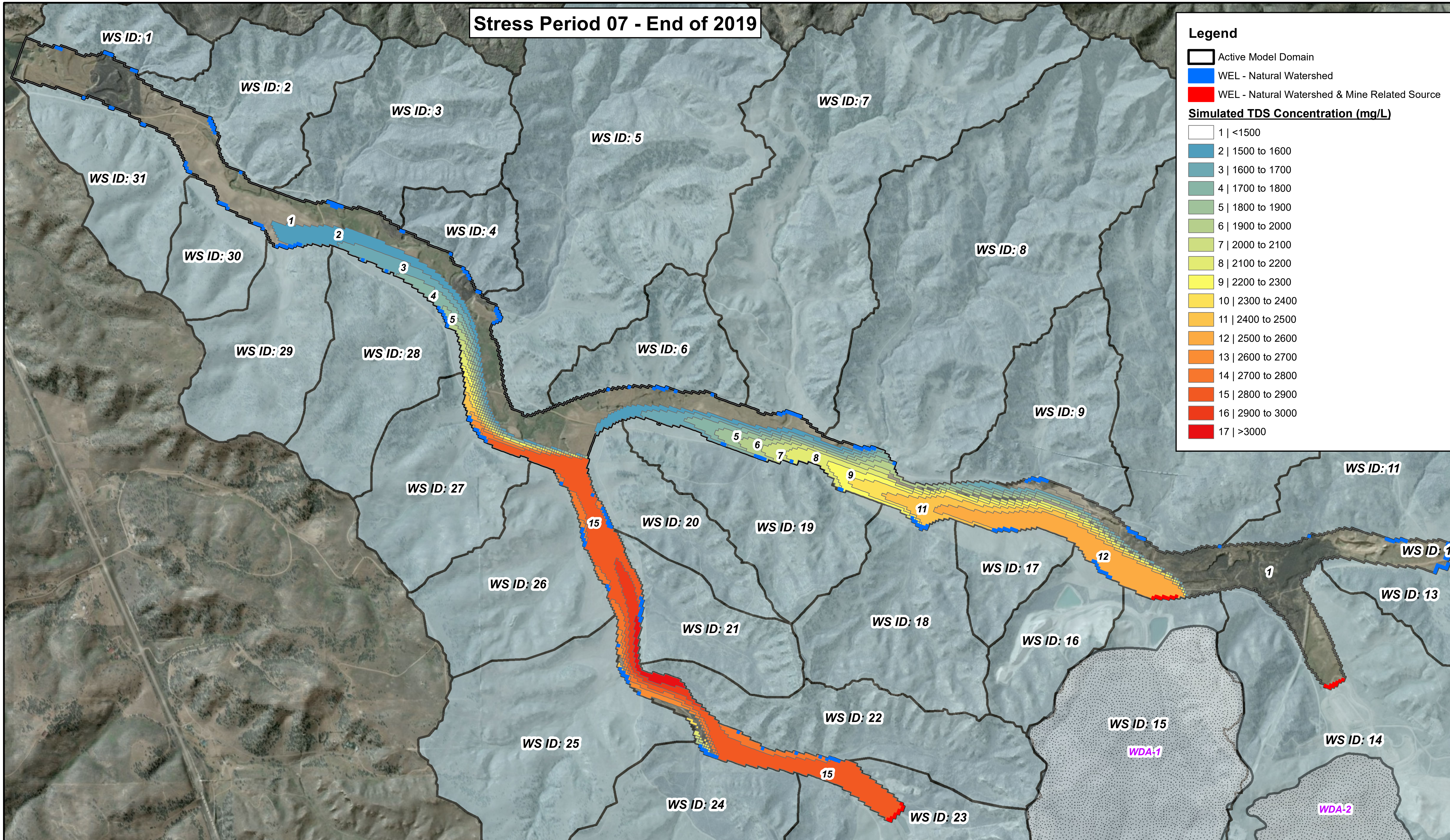
Figure 9 - Sheet 4
Simulated TDS Concentration Results
Rehder Creek and PM Draw Alluvial Aquifer Model
Bull Mountains Mine No. 1



WET Water & Environmental Technologies

SIGNAL PEAK ENERGY

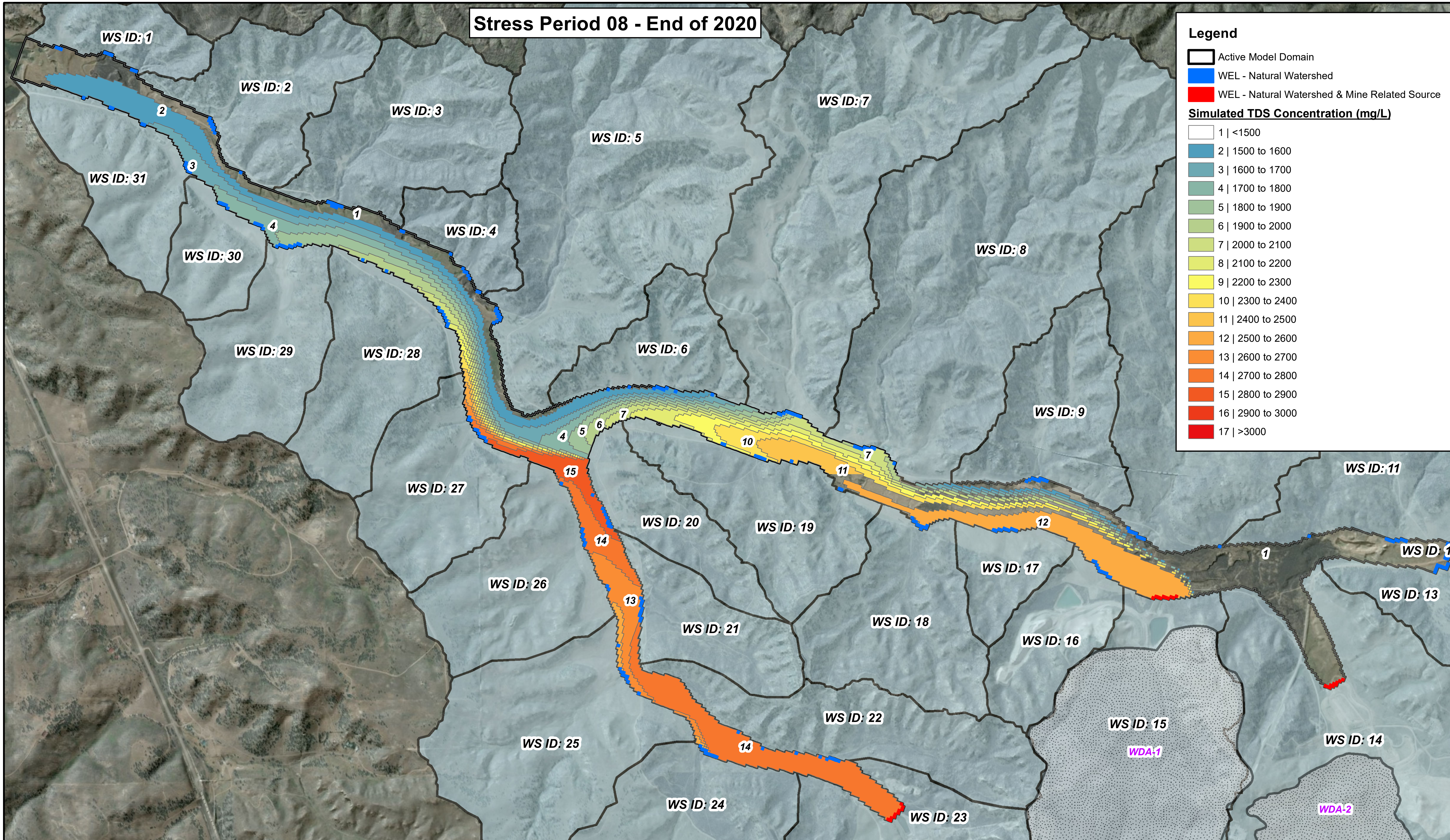
Figure 9 - Sheet 5
Simulated TDS Concentration Results
Rehder Creek and PM Draw Alluvial Aquifer Model
Bull Mountains Mine No. 1



Water & Environmental TECHNOLOGIES

SIGNAL PEAK ENERGY

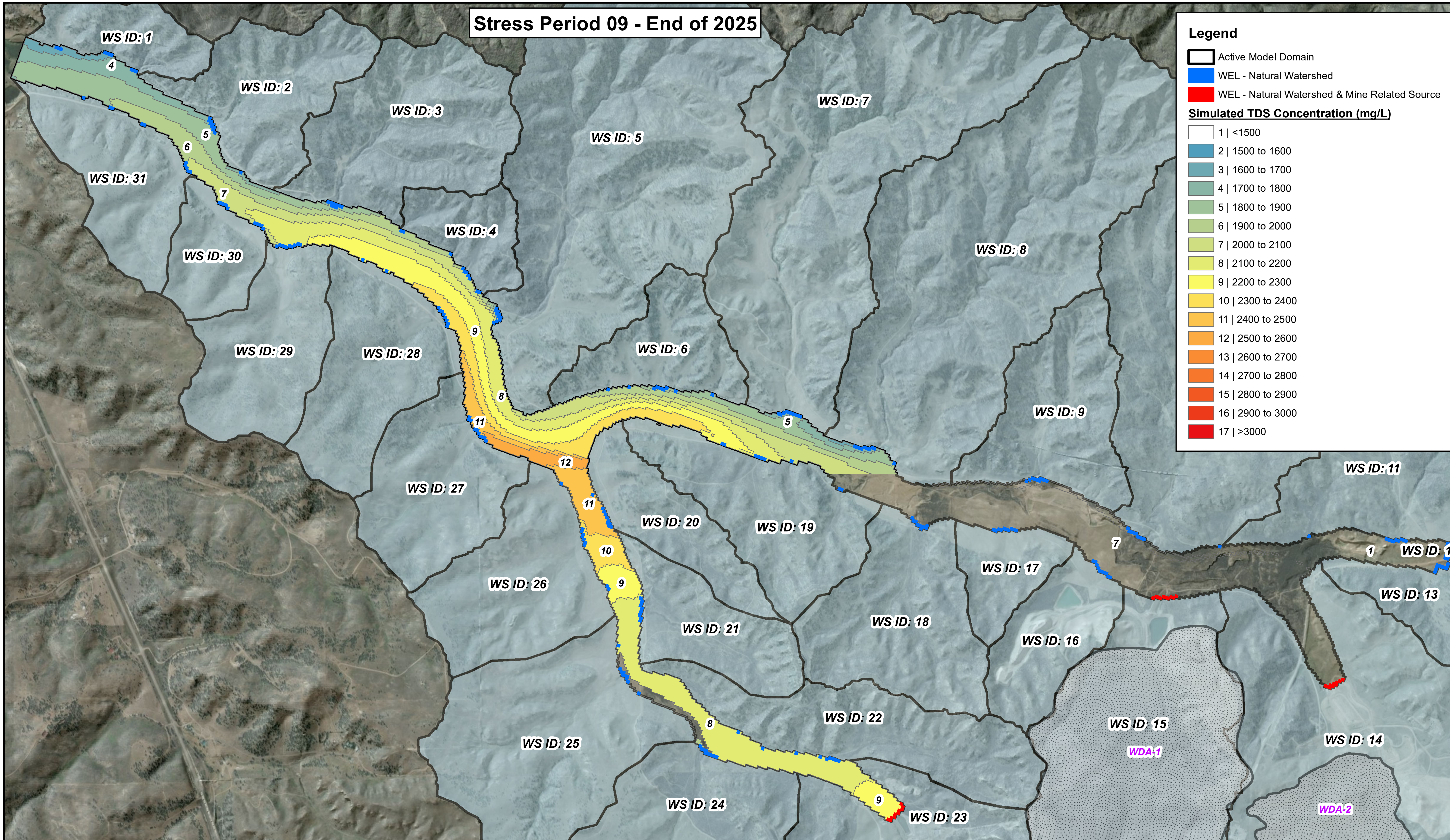
Figure 9 - Sheet 6
Simulated TDS Concentration Results
Rehder Creek and PM Draw Alluvial Aquifer Model
Bull Mountains Mine No. 1



Water & Environmental Technologies

SIGNAL PEAK ENERGY

Figure 9 - Sheet 7
Simulated TDS Concentration Results
Rehder Creek and PM Draw Alluvial Aquifer Model
Bull Mountains Mine No. 1



Water & Environmental TECHNOLOGIES

SIGNAL PEAK ENERGY

Figure 9 - Sheet 8
Simulated TDS Concentration Results
Rehder Creek and PM Draw Alluvial Aquifer Model
Bull Mountains Mine No. 1

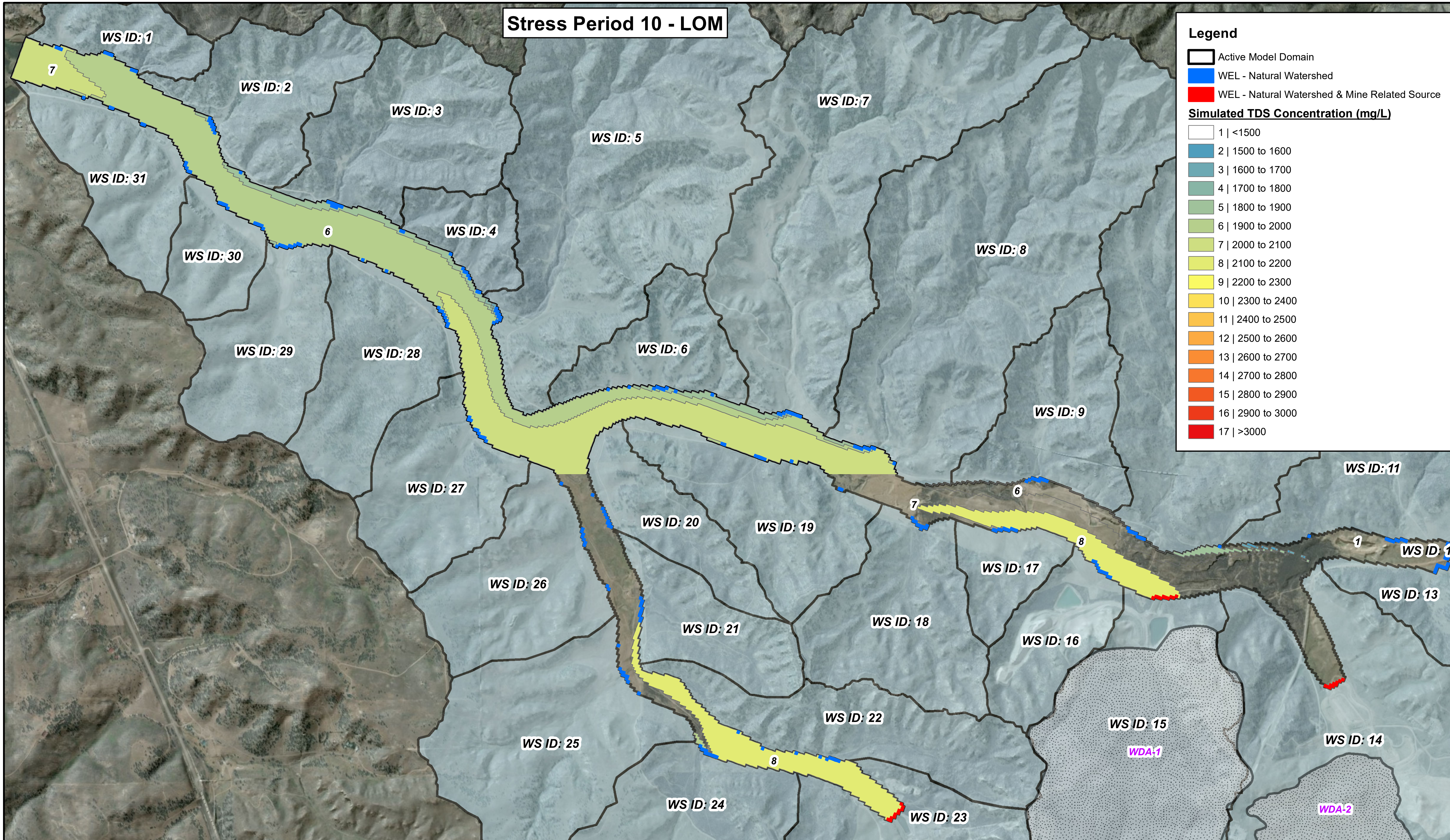
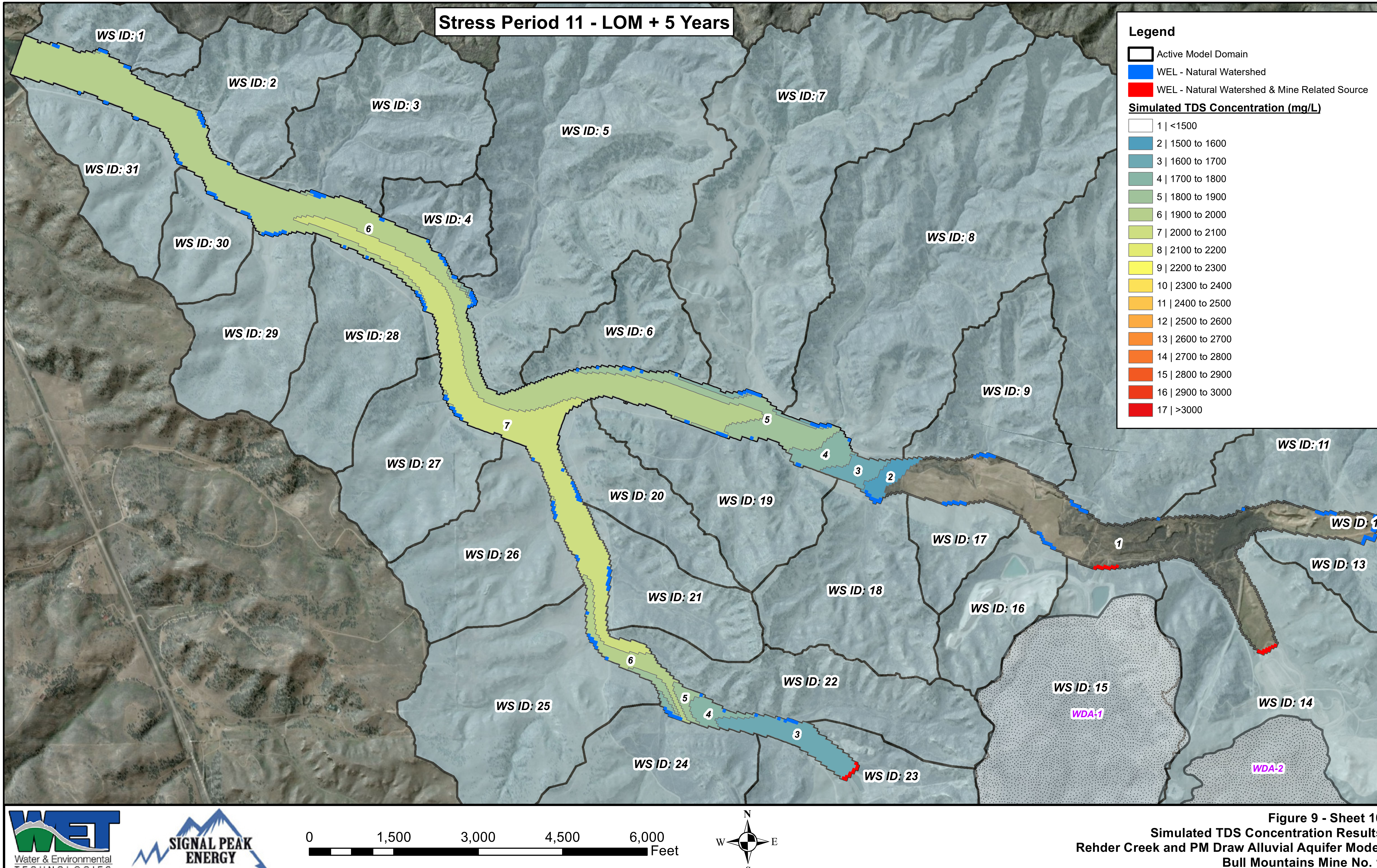


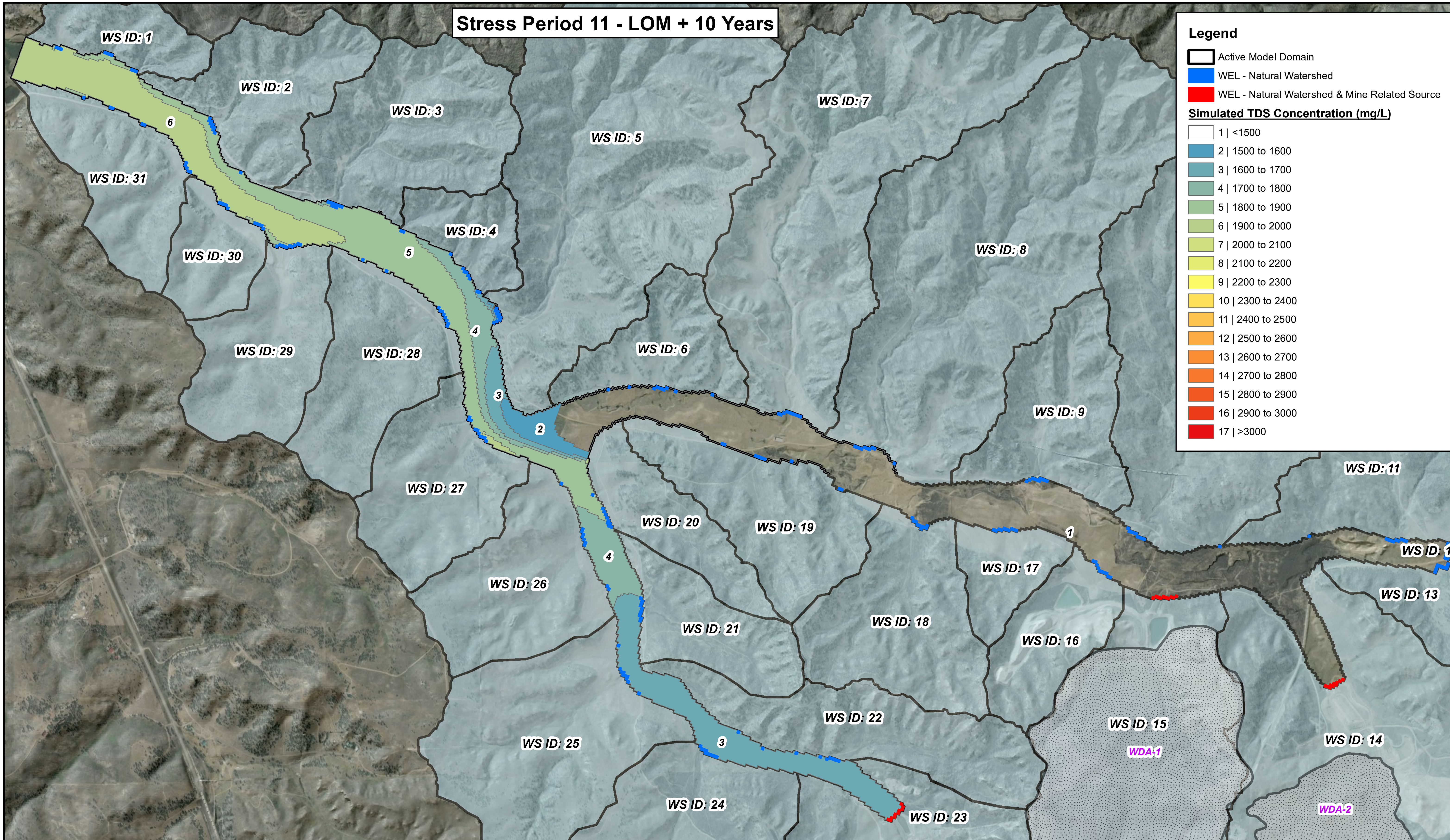
Figure 9 - Sheet 9
Simulated TDS Concentration Results
Rehder Creek and PM Draw Alluvial Aquifer Model
Bull Mountains Mine No. 1



Water & Environmental Technologies

Signal Peak Energy

Figure 9 - Sheet 10
Simulated TDS Concentration Results
Rehder Creek and PM Draw Alluvial Aquifer Model
Bull Mountains Mine No. 1



Water & Environmental TECHNOLOGIES

SIGNAL PEAK ENERGY

Figure 9 - Sheet 11
Simulated TDS Concentration Results
Rehder Creek and PM Draw Alluvial Aquifer Model
Bull Mountains Mine No. 1

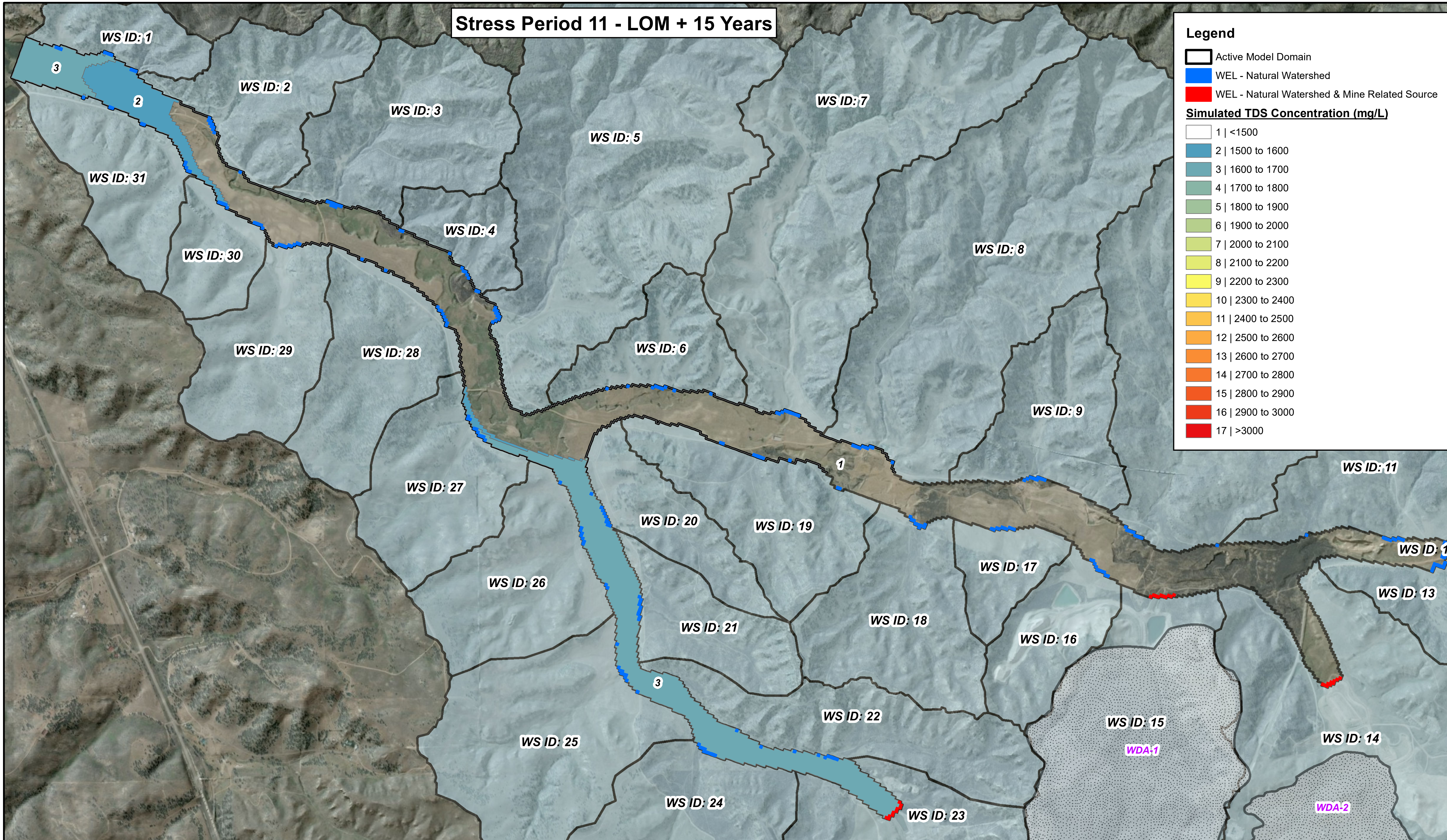
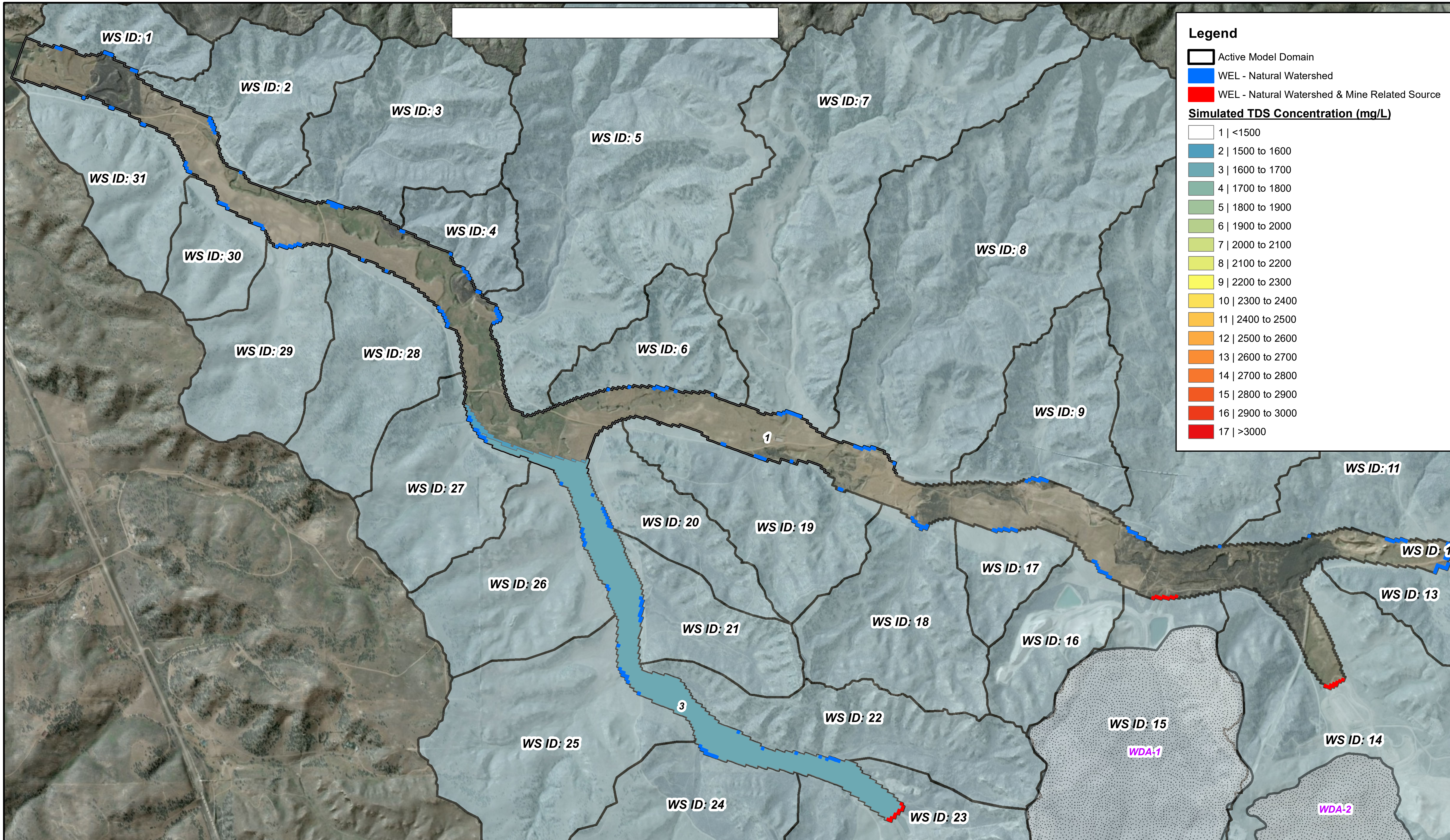


Figure 9 - Sheet 12
Simulated TDS Concentration Results
Rehder Creek and PM Draw Alluvial Aquifer Model
Bull Mountains Mine No. 1



Water & Environmental Technologies

Signal Peak Energy

Figure 9 - Sheet 13
Simulated TDS Concentration Results
Rehder Creek and PM Draw Alluvial Aquifer Model
Bull Mountains Mine No. 1

Due to their large size, the following Attachments are available by request:

- Attachment 1: Meteoric Water Mobility Procedure Analytical Summary Report
- Attachment 2: Acid-Base Accounting Results Summary
- Attachment 3: Hydrologic Evaluation of Landfill Performance
- Attachment 4: Laboratory Report for Signal Peak Energy WDA Investigation
- Attachment 5: Soil Characteristic Curve Results

Please submit all requests in writing to: bullmtns_amd3_eis@icf.com.

Appendix G
Water Resources Figures

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Figure 4.4-1. Mammoth Coal Simulated Drawdown End of Mining

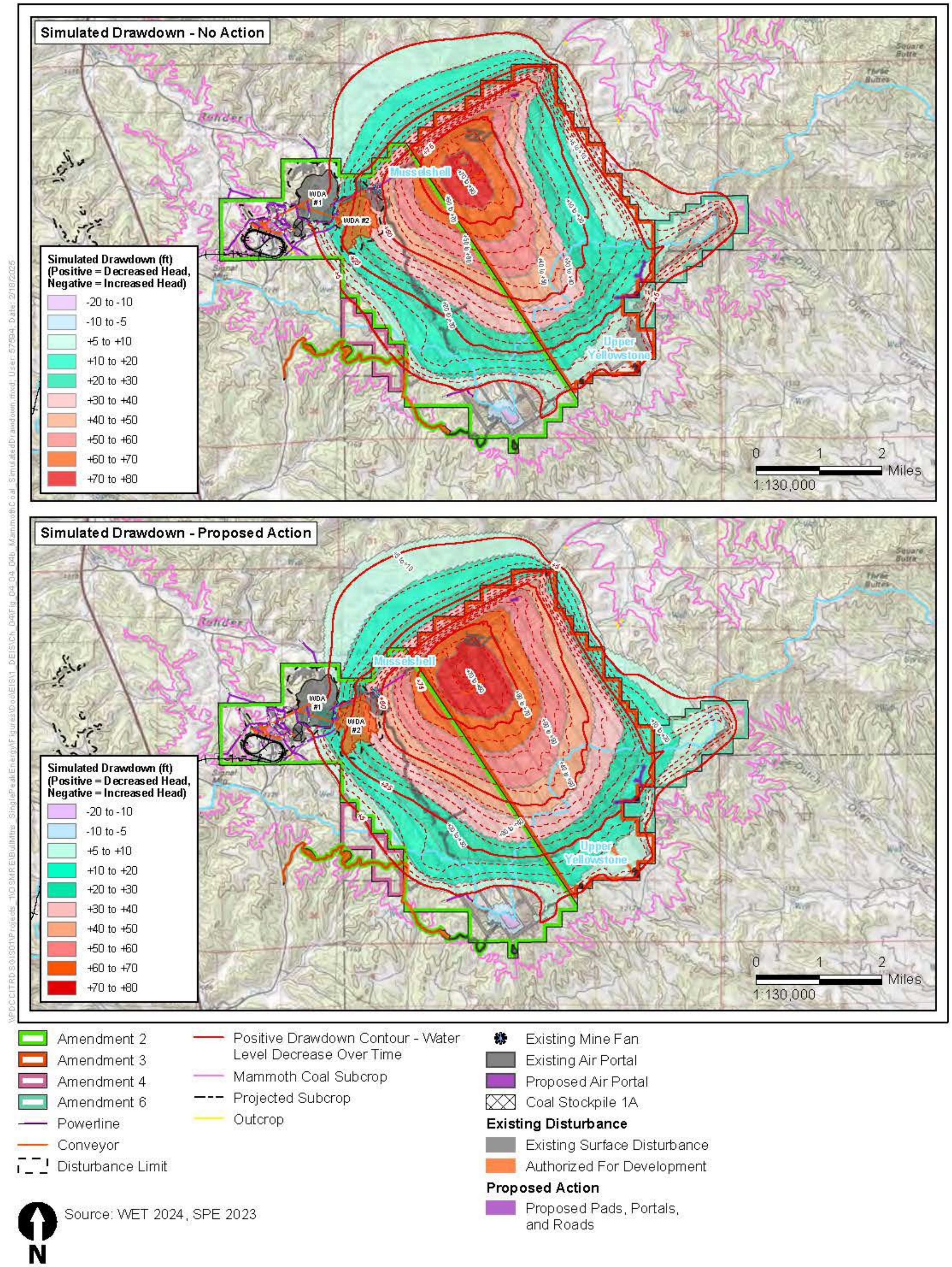


Figure 4.4-2. Life of Mine UB-1A Simulated Drawdown End of Mining

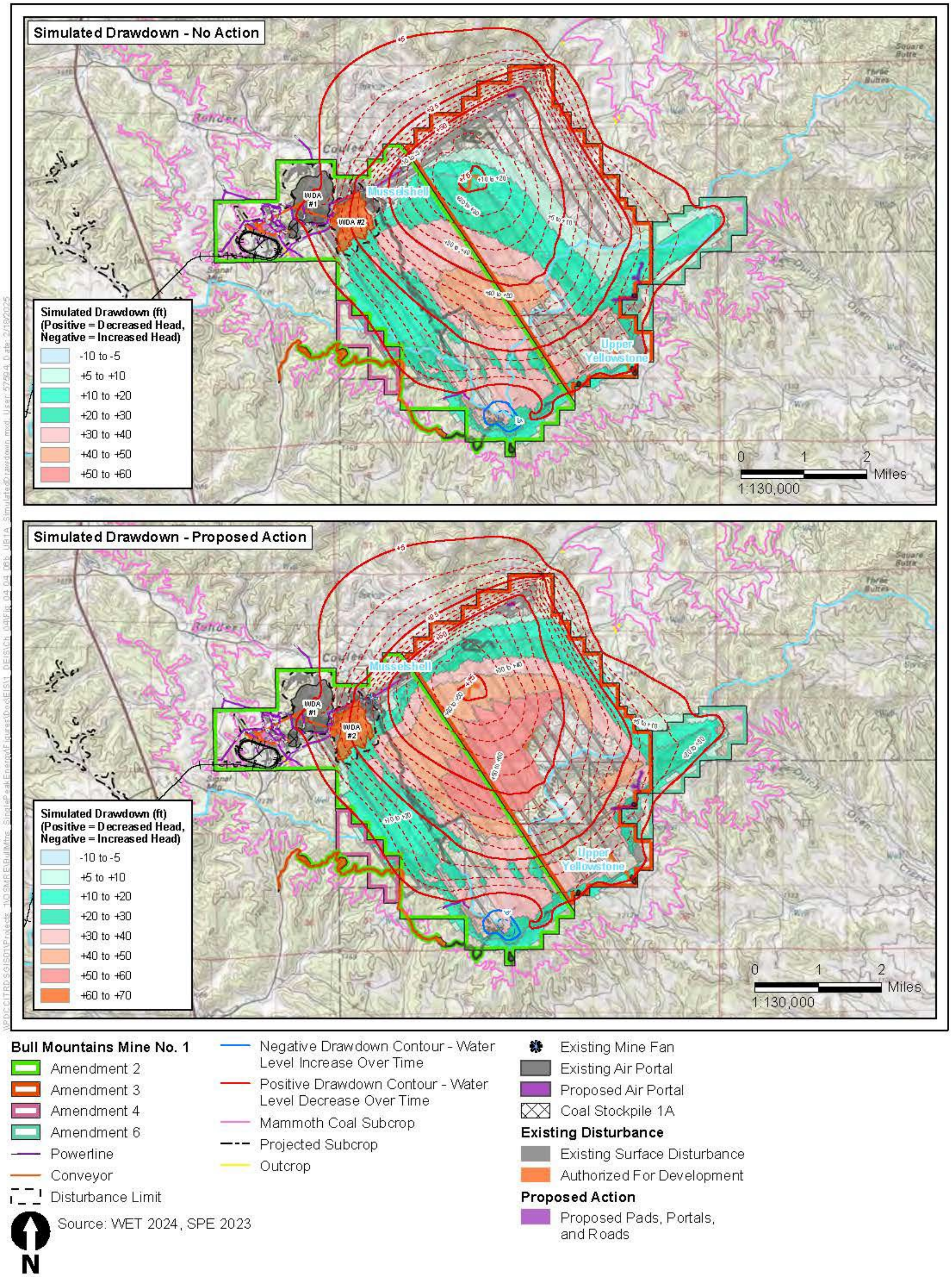


Figure 4.4-3. UB-2A Simulated Drawdown End of Mining

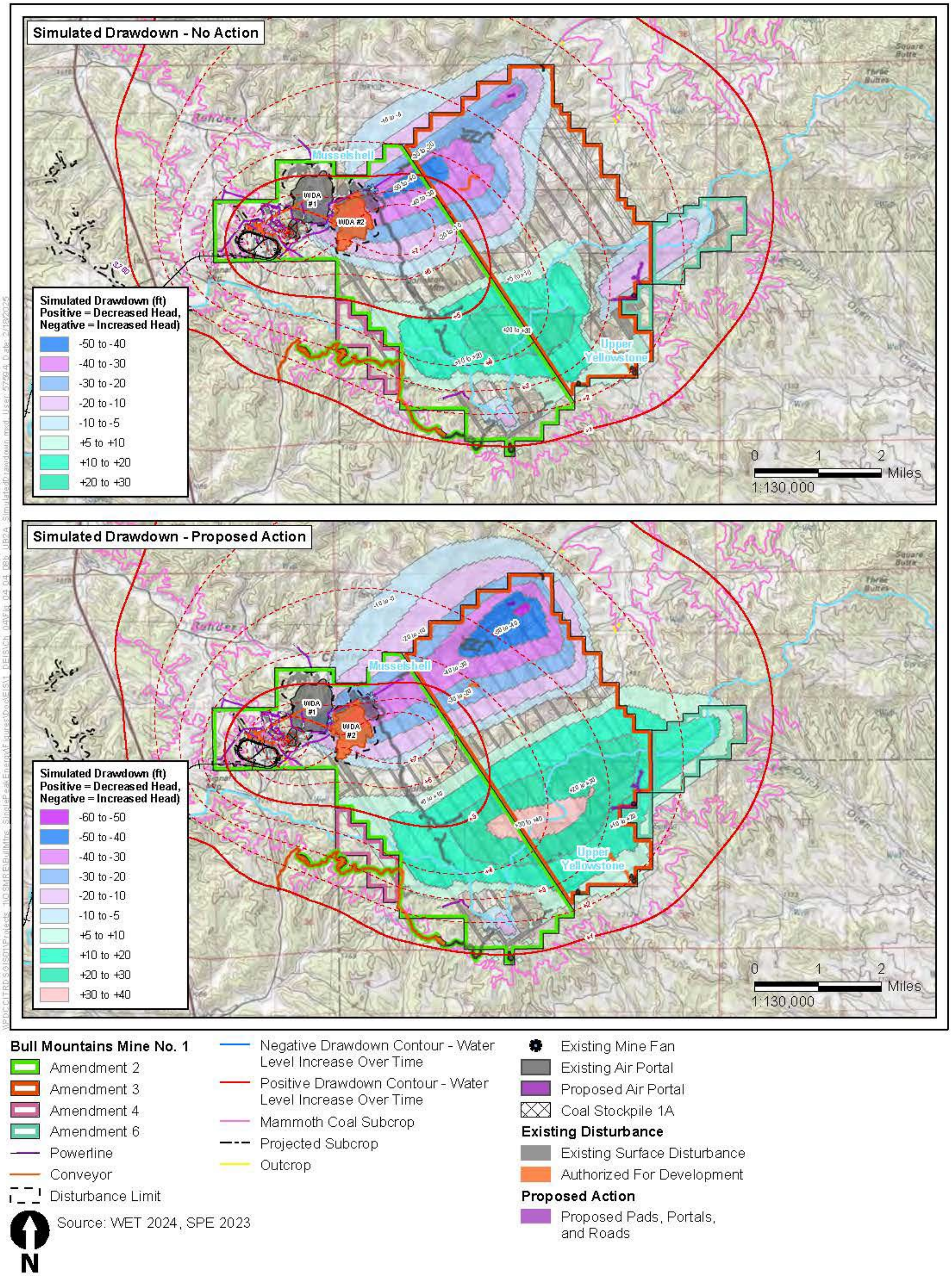


Figure 4.4-4. OB-5 Simulated Drawdown 50 years after mining

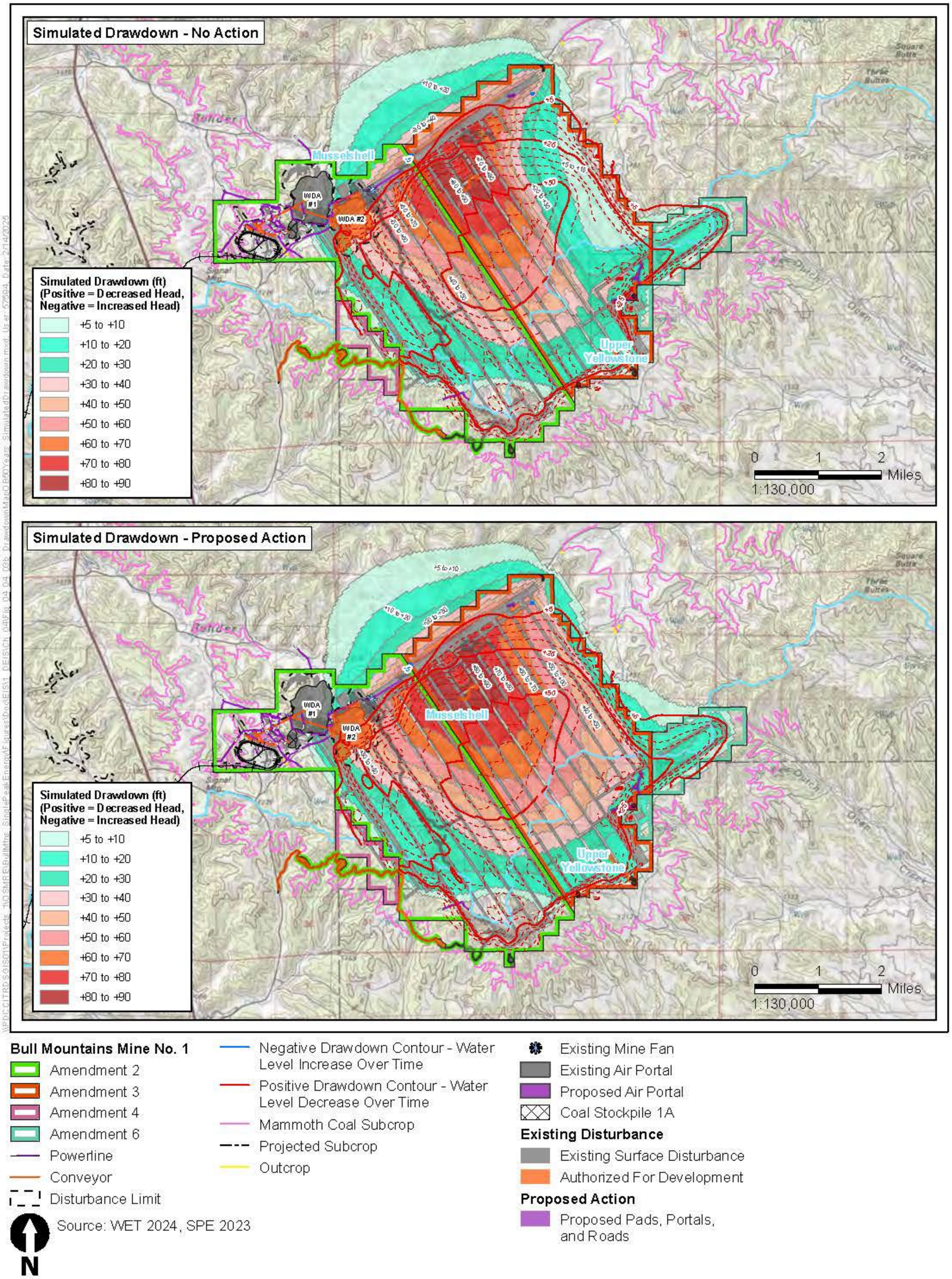


Figure 4.4-5. Mammoth Coal Simulated Drawdown 50 Years After Mining

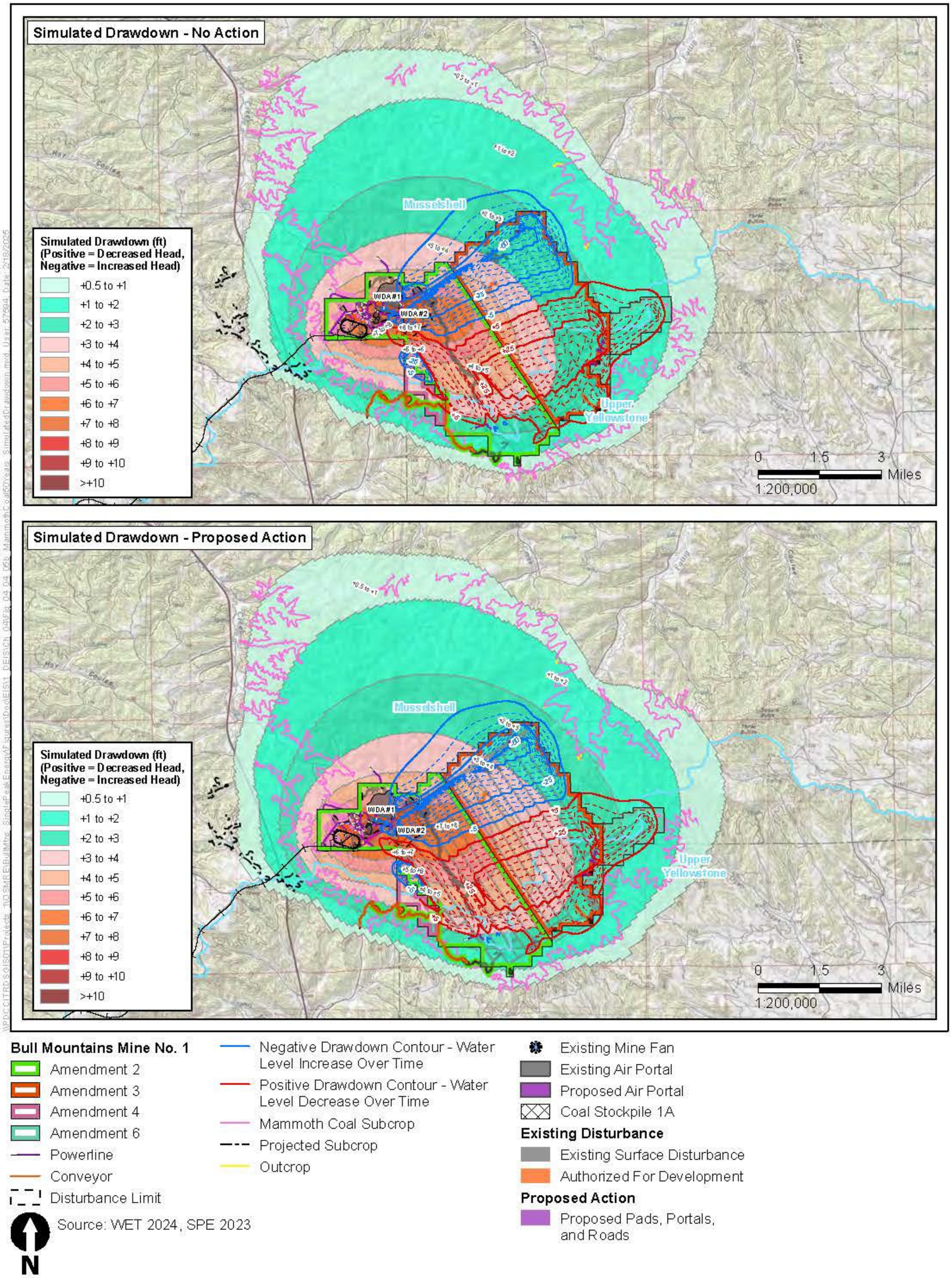


Figure 4.4-6. UB-1A Simulated Drawdown 50 Years After Mining

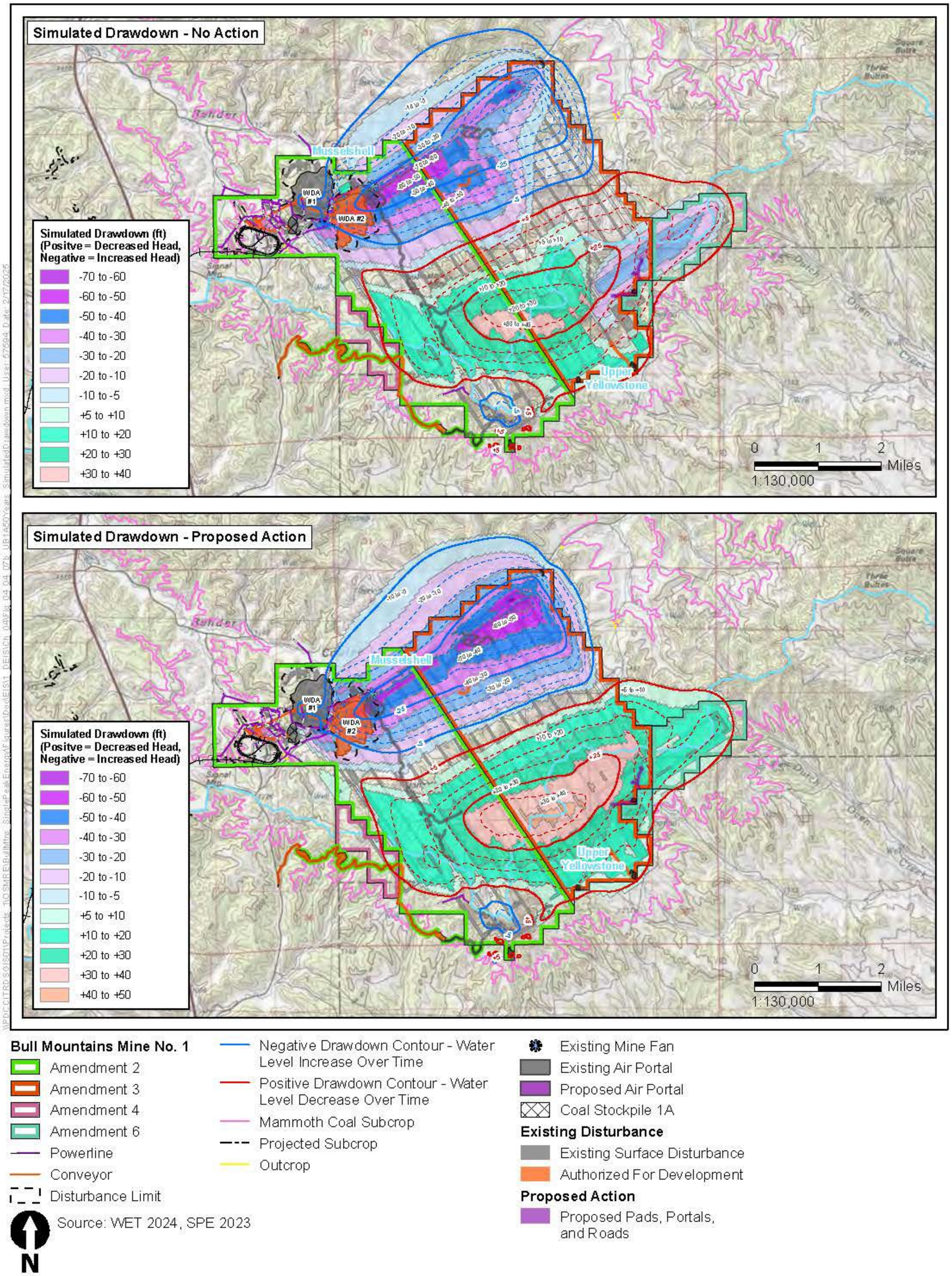


Figure 4.4-7. Mammoth Coal Transport Simulation 100 Years After Mining

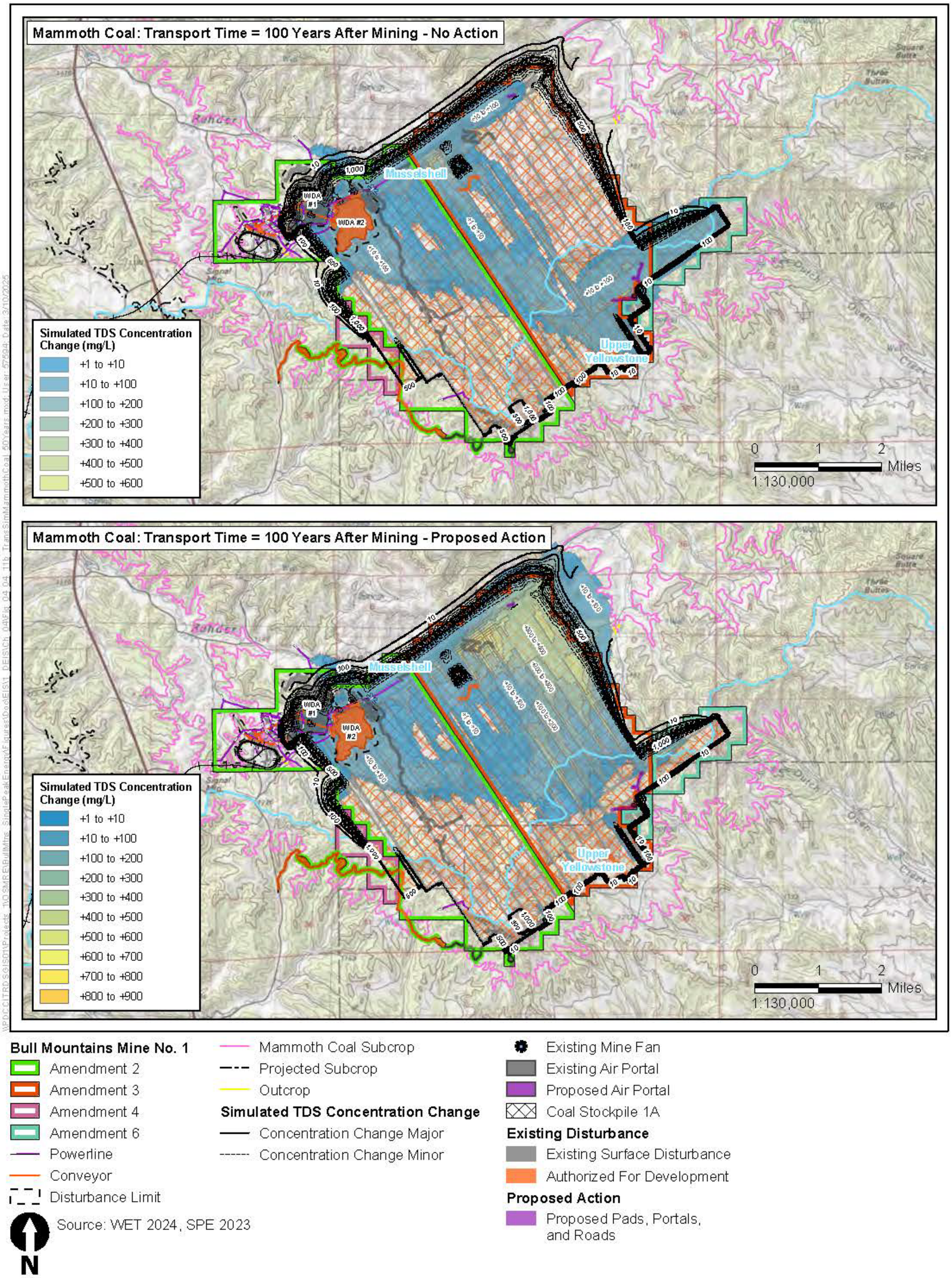


Figure 4.4-8. UB-1A Transport Simulation 100 Years After Mining

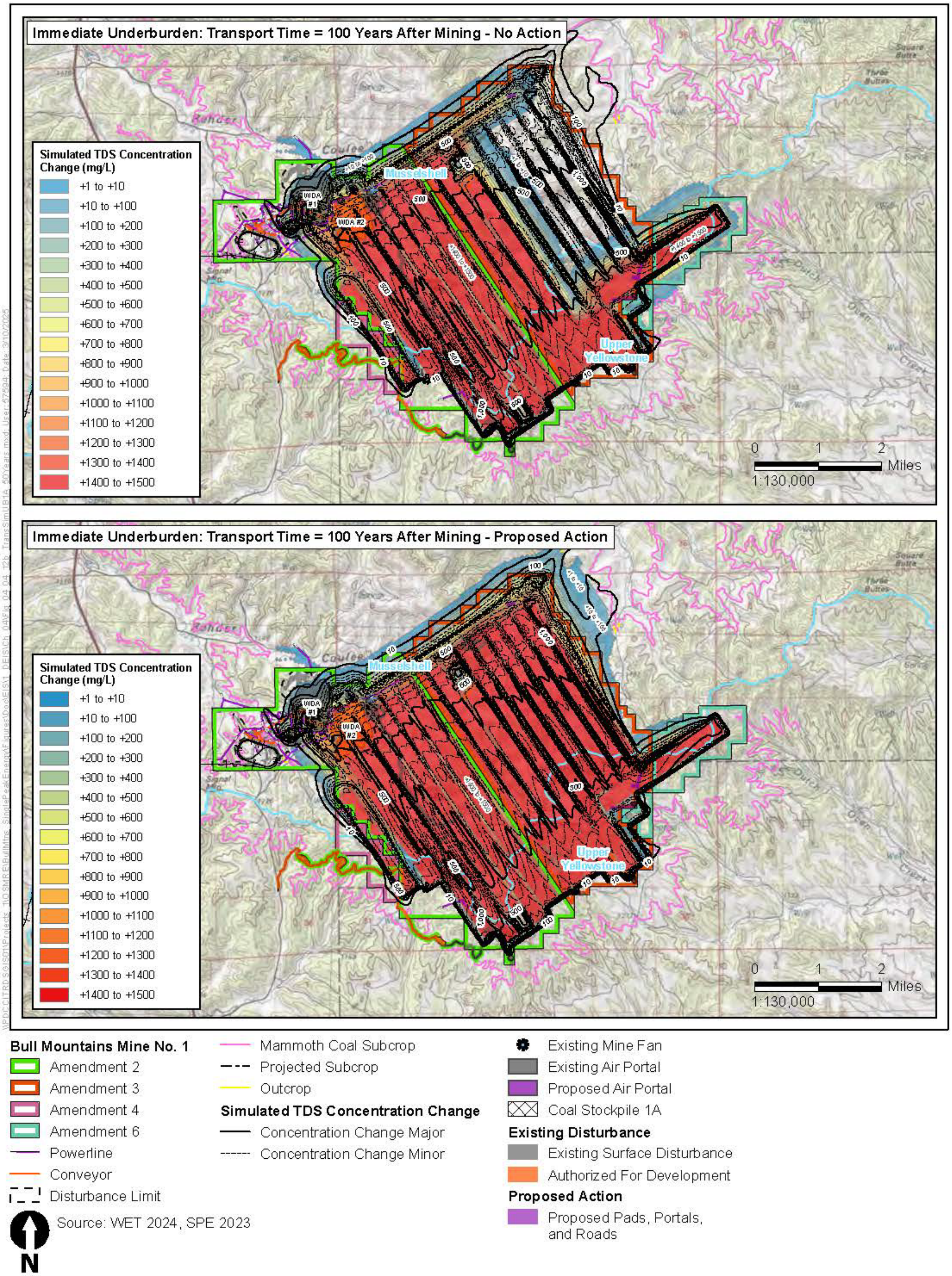


Figure 4.4-9. OB-5 Simulated Drawdown End of Mining

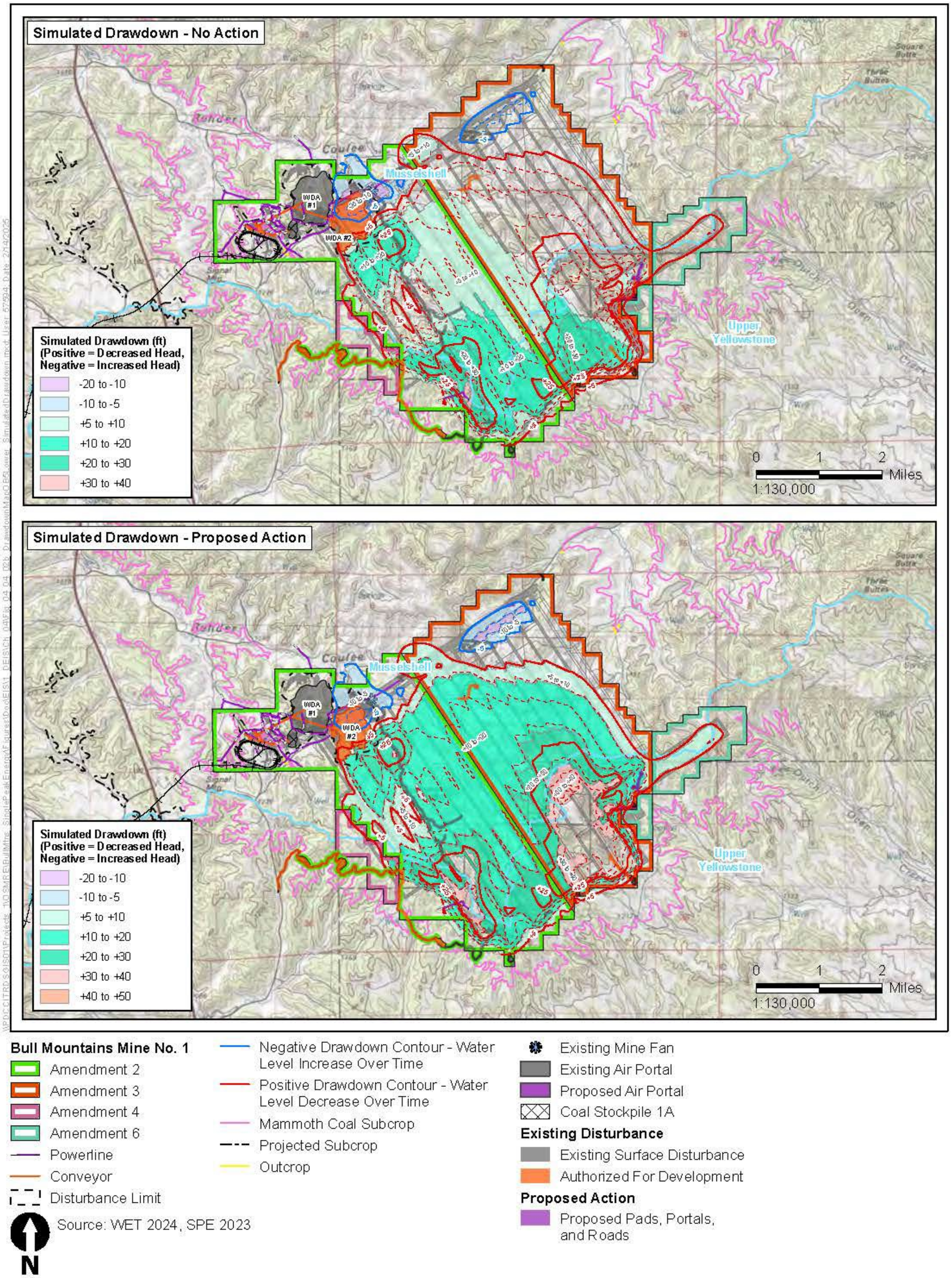
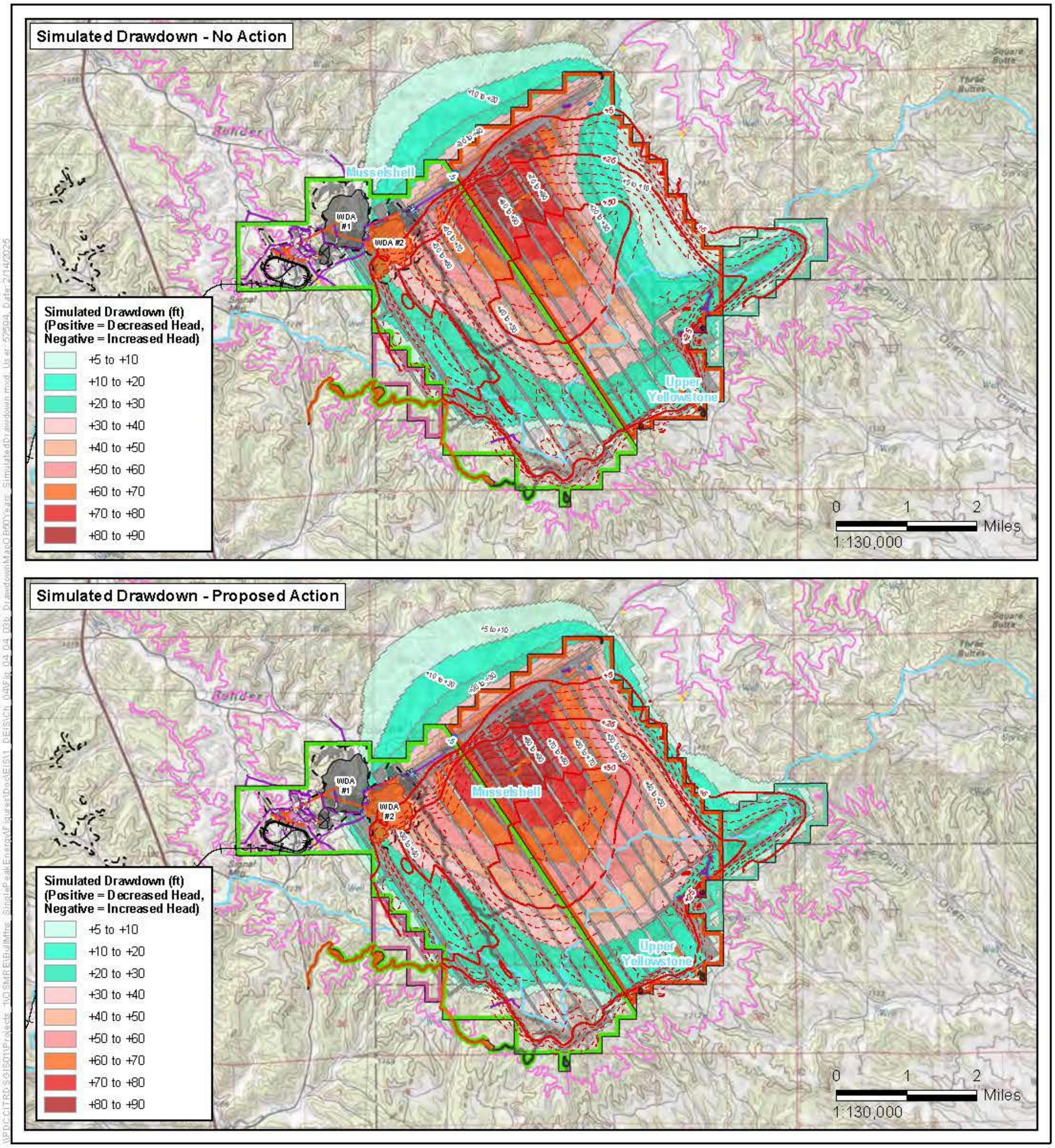


Figure 4.4-10. OB-5 Simulated Drawdown 50 Years After Mining



Bull Mountains Mine No. 1
- Amendment 2
- Amendment 3
- Amendment 4
- Amendment 6
- Powerline
- Conveyor
- Disturbance Limit

- Negative Drawdown Contour - Water Level Increase Over Time
- Positive Drawdown Contour - Water Level Decrease Over Time
- Mammoth Coal Subcrop
- Projected Subcrop
- Outcrop

- Existing Mine Fan
- Existing Air Portal
- Proposed Air Portal
- Coal Stockpile 1A

Existing Disturbance
- Existing Surface Disturbance
- Authorized For Development

Proposed Action
- Proposed Pads, Portals, and Roads

N

Source: WET 2024, SPE 2023

Figure 4.4-11. Mammoth Coal Simulated Drawdown 50 Years After Mining

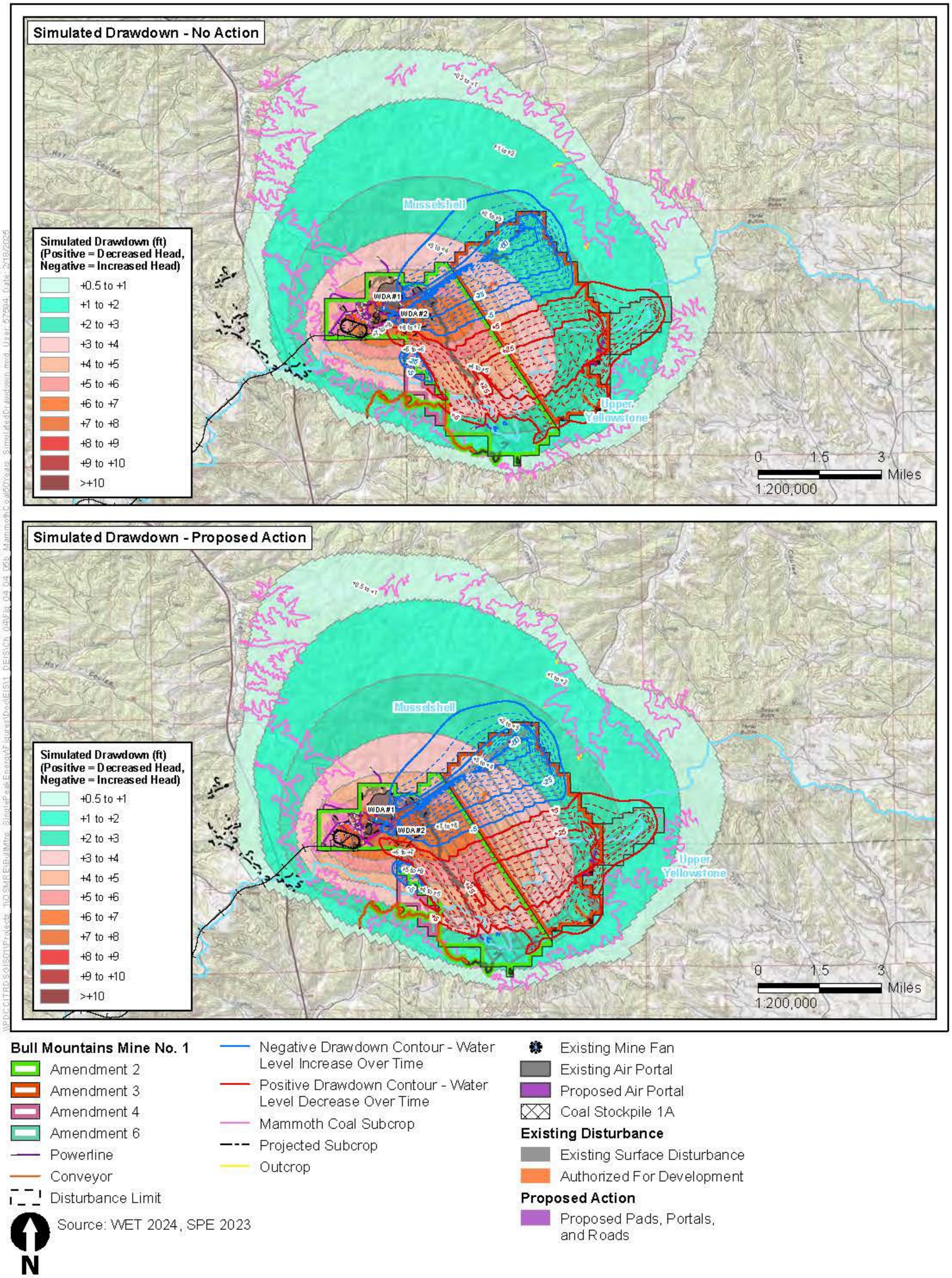


Figure 4.4-12. UB-1A Simulated Drawdown 50 Years After Mining

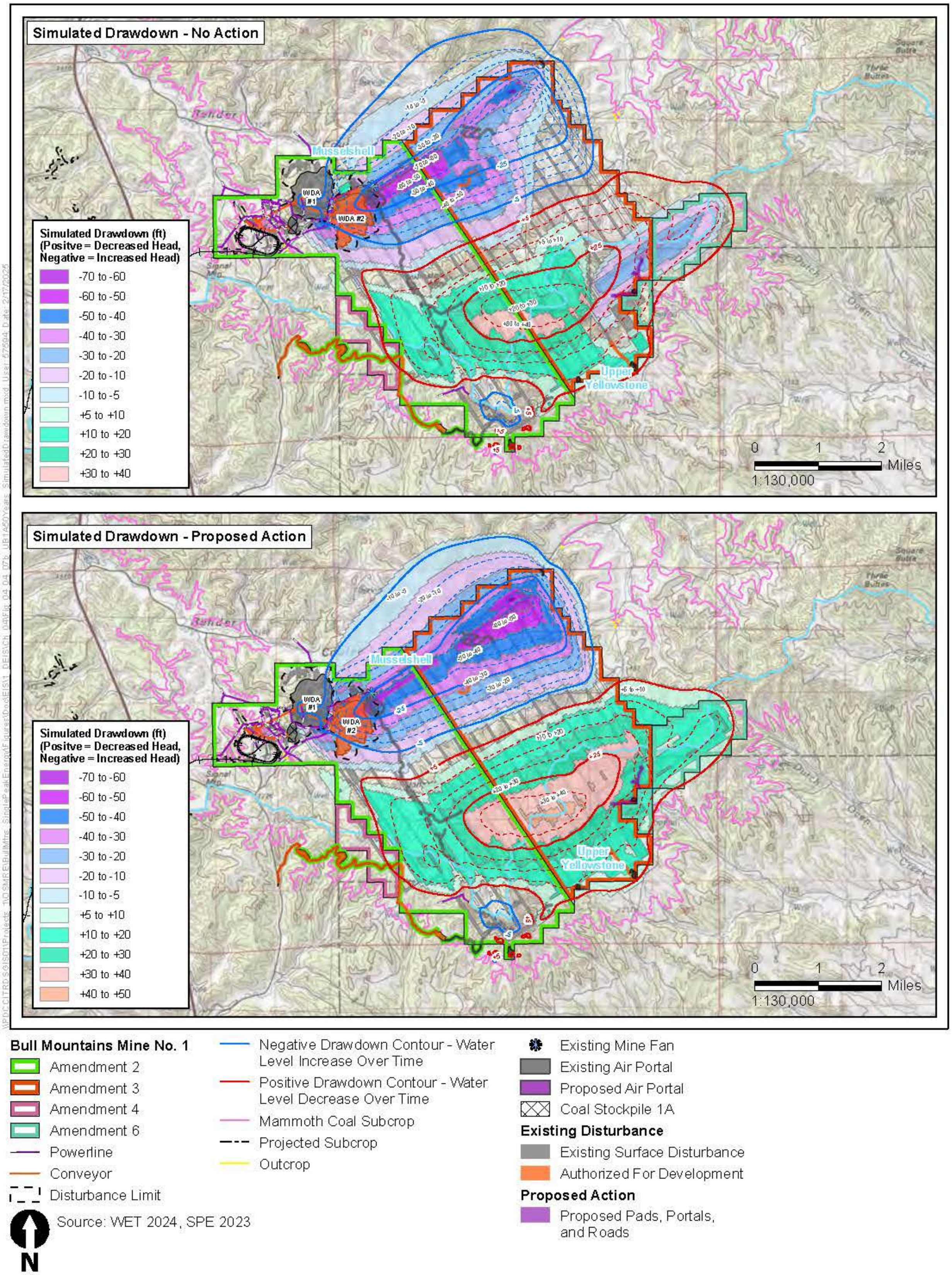


Figure 4.4-13. UB-2A Simulated Drawdown 50 Years After Mining