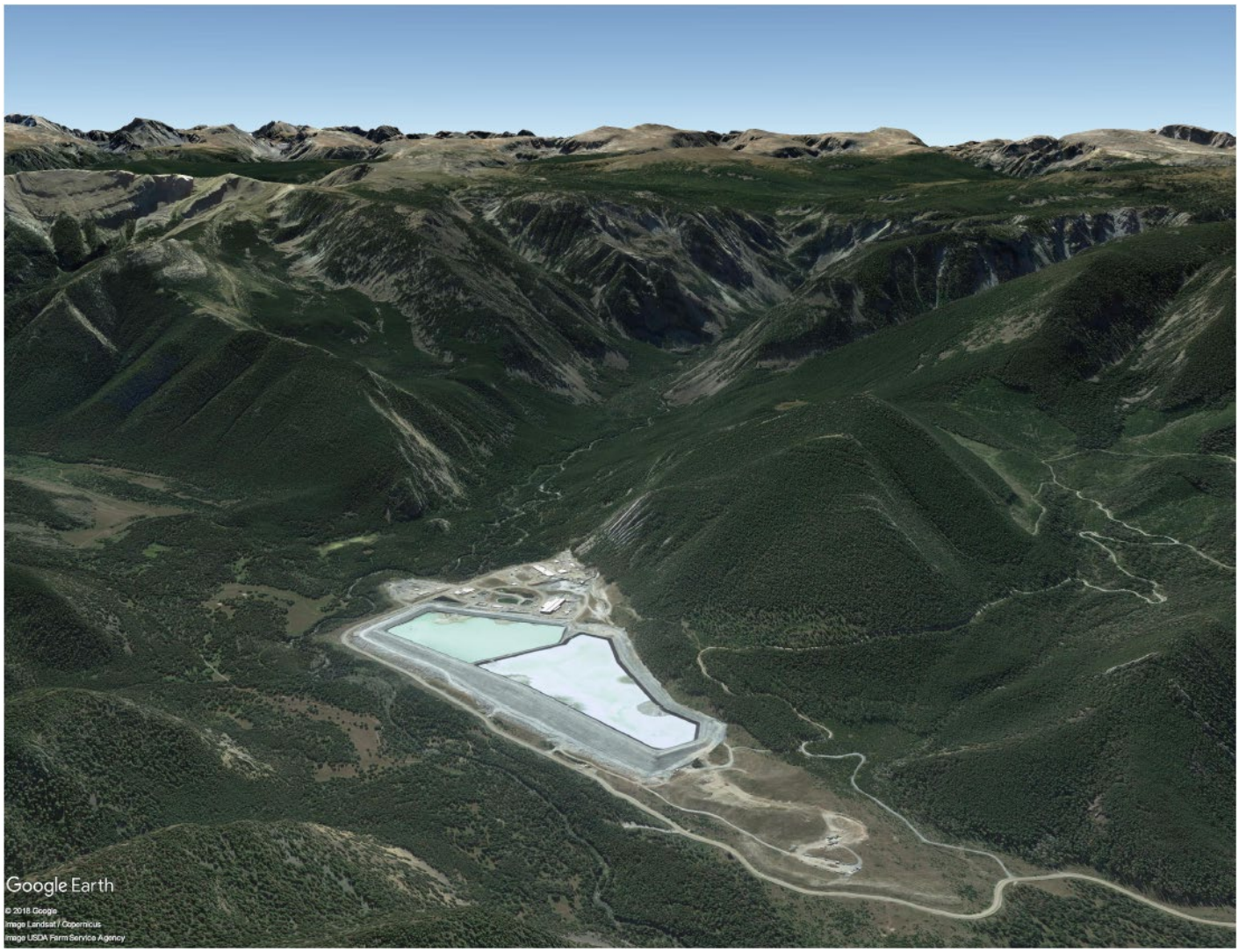



Montana Department of Environmental Quality

Yellowstone Ranger District
Custer Gallatin National Forest
Sweet Grass County, MT

# East Boulder Mine Stage 6 Tailings Storage Facility Expansion Project

Draft
Environmental Assessment

May 2020

# Draft Environmental Assessment for East Boulder Mine Stage 6 Tailings Storage Facility Expansion Project

**Lead Agencies:** USDA Forest Service and Montana Department of Environmental Quality

**Responsible Officials:**


Mary Erickson, Forest Supervisor
Custer Gallatin National Forest
PO Box 130
Bozeman, MT 59771

Dan Walsh, Chief
DEQ, Hard Rock Mining Bureau
PO Box 200901
Helena, MT 59620-0901


**For Information Contact:**


Robert Grosvenor
Custer Gallatin National Forest
805 Scott Street
Gardiner, MT 59030
406.848.7375 x28
robert.grosvenor@usda.gov

Jen Lane
DEQ, Director's Office
PO Box 200901
Helena, MT 59620-0901
406.444.4956
JLane2@mt.gov


**Public Comment Information:**

Stillwater Mining Company's application materials and supporting Project documents, such as public notices and technical memorandums, are available online at the following locations:

http://deq.mt.gov/Public/ea/hardrock

https://www.fs.usda.gov/project/?project=55061

In compliance with 36 Code of Federal Regulations (CFR) 218 Subparts A and B and the Administrative Rules of Montana 17.4.610, this Draft EA is available for public review and comment for 30 days beginning the day after publication of a legal notice in the *Bozeman Chronicle* (the newspaper of record). If the comment period ends on a Saturday, Sunday, or federal holiday, comments will be accepted until the end of the next federal working day. You are invited to submit your comments on the Draft EA. Electronic submittal of comments is preferred, but you can use either of the following methods:

1) Electronically, through the Forest Service's CARA database, which is available at the following location: https://cara.ecosystem-management.org/Public//CommentInput?Project=55061
2) Paper copies can be mailed to the CGNF, ATTN: Robert Grosvenor (address above).

Electronic comments must be submitted in a format such as an email message, plain text (.txt), rich text format (.rtf), or Word (.doc). All comments must be received or postmarked 30 days following the publication in the newspaper of record to have standing to object. In keeping with precautionary measures related to the COVID-19 pandemic, the office is not open at this time for hand-delivered submissions.

For the Forest Service objections process, only individuals or entities (as defined by 36 CFR 218.2) who submit timely and specific written comments (as defined by 36 CFR 218.2) about this proposed Project or activity during this or another public comment period established by the responsible official will be eligible to file an objection. Other eligibility requirements are defined by 36 CFR 218.25(a)(3) and include (1) name, address, email address, telephone number, and organization represented, if any; (2) postal address; (3) title of the document for which the comment is being submitted; (4) specific facts and supporting reasons for the responsible officials to consider; and (5) signature or other verification of identity upon request and the identity of the individual or entity who authored the comments. Individual members of an entity must submit their own individual comments in order to have eligibility to object as an individual. A timely submission will be determined as outlined in 36 CFR 218.25(a)(4). It is the responsibility of the sender to ensure timely receipt of any comments submitted.

Although comments submitted anonymously will be accepted and considered, anonymous comments will not provide the reviewer with standing to participate in subsequent administrative or judicial reviews. All comments received are part of the public record and will generally be posted for public viewing without change. All personal identifying information (e.g., name and address), confidential business information, or otherwise sensitive information submitted voluntarily by the sender will be publicly accessible.

## Table of Contents

## List of Figures



## List of Tables

## Appendices

## Acronyms and Abbreviations

| | |
|---|---|
| °F | degrees Fahrenheit |
| ADT | average daily total |
| agencies | DEQ and Forest Service-CGNF |
| AOC | Administrative Order on Consent |
| APE | area of potential effects |
| ARM | Administrative Rules of Montana |
| BA | Biological Assessment |
| BAU | Bear Analysis Unit |
| BE | Biological Evaluation |
| BMP | best management practice |
| CEQ | Council on Environmental Quality |
| CFR | Code of Federal Regulations |
| CGNF | Custer Gallatin National Forest |
| CORP | Consolidated Operations and Reclamation Plan |
| DEQ | Montana Department of Environmental Quality |
| DNRC | Montana Department of Natural Resources and Conservation |
| DPS | Distinct Population Segment |
| DSL | Montana Division of State Lands |
| EA | Environmental Assessment |
| EAU | Elk Analysis Unit |
| EBMW | East Boulder Mine monitoring well |
| EBR | East Boulder River monitoring stations |
| EIS | Environmental Impact Statement |
| EO | Executive Order |
| EPP | Emergency Preparedness Plan |
| EQC | Environmental Quality Council |
| ERM | Environmental Resources Management, Inc. |
| ERO | ERO Resources Corporation |
| ESA | Endangered Species Act |
| FEIS | Final Environmental Impact Statement |
| FEMA | Federal Emergency Management Agency |
| FMEA | Failure Modes and Effects Assessment |
| FOIA | Freedom of Information Act |
| FoS | Factor of Safety |
| FSM | Forest Service Manual |
| FWP | Montana Fish, Wildlife, and Parks |
| FY | fiscal year |
| HDPE | high-density polyethylene |
| IDF | Inflow Design Flood |
| IRP | Independent Review Panel |
| KV | Kilo Volt |
| LAD | land application disposal |
| LAU | Lynx Analysis Unit |
| MA | Management Area |
| MAQP | Montana Air Quality Permit |
| MCA | Montana Code Annotated |

| | |
|---|---|
| MEPA | Montana Environmental Policy Act |
| MIS | Management Indicator Species |
| MMRA | Montana Metal Mine Reclamation Act |
| MNHP | Montana Natural Heritage Program |
| MPDES | Montana Pollutant Discharge Elimination System |
| MSGP | Multi-Sector General Permit |
| MT | Montana |
| MT DOA | Montana Department of Agriculture |
| NAICS | North American Industry Classification System |
| NDSP | National Dam Safety Program |
| NEPA | National Environmental Policy Act |
| NFMA | National Forest Management Act |
| NFS | National Forest System |
| NHPA | National Historic Preservation Act |
| NRHP | National Register of Historic Places |
| OHV | off-road vehicle |
| PCE | Primary Constituent Element |
| PMF | Probable Maximum Flood |
| ROD | Record of Decision |
| ROM | run-of-mine |
| SHPO | State Historic Preservation Office |
| SMC | Stillwater Mining Company |
| SPA | Montana Streamside Protection Act |
| SWPPP | Storm Water Pollution Prevention Plan |
| TDS | total dissolved solids |
| TMDL | Total Maximum Daily Loads |
| TOMS | Tailings, Operations, Maintenance and Surveillance Manuals |
| TSF | Tailings Storage Facility |
| USC | United States Code |
| USDA | U.S. Department of Agriculture |
| USFWS | U.S. Fish and Wildlife Service |
| WT | western toad |
| WTP | water treatment plant |
| YCT | Yellowstone cutthroat trout |

# 1. PURPOSE AND NEED

## 1.1. INTRODUCTION

On November 30, 2017, Stillwater Mining Company (SMC), the Project Proponent, applied to the Montana Department of Environmental Quality (DEQ) for Amendment 003 (amendment) to Operating Permit No. 00149 and to the U.S. Forest Service Custer Gallatin National Forest (CGNF or Forest Service) for a revision to the East Boulder Mine Plan of Operations. If approved, Amendment 003 and the revised plan of operations would allow SMC to construct Stage 6 of the East Boulder Mine Tailings Storage Facility (TSF).

The East Boulder Mine is approximately 23 miles south of Big Timber, Montana, in Sweet Grass County and is accessed from National Forest System (NFS) Road 205 (East Boulder Road) (**Figure 1.1-1**). The forested landscape surrounding the mine is mountainous, set at an elevation of 6,265 feet above sea level. The Absaroka-Beartooth Wilderness Area is located several miles to the south. The East Boulder River is adjacent to the mine on the north and east sides and flows to the west (**Figure 1.4-1**).

The current authorized mine permit boundary for the mill site and TSF (Project area) encompasses approximately 396.58 acres. Of that area, surface disturbance currently is authorized and bonded for approximately 238 acres. The proposed amendment and the plan of operations revision would expand the disturbance area to 286.85 acres and would authorize SMC to expand the TSF to Stage 6, raising the height 14 feet in elevation above what was previously authorized. All Project activities would occur within the existing 396.58-acre permit boundary and would disturb 66.11 acres within the proposed 286.85-acre disturbance boundary; in terms of the existing 238-acre bonded disturbance area, 44.62 acres within and 21.49 acres outside the existing 238-acre bonded disturbance area would be disturbed. The amendment would not result in a change to the permit area boundary.

A December 11, 1989 Memorandum of Understanding (MOU) between the State of Montana and the Forest Service provided for preparation of joint environmental analyses, approval and sharing of information, personnel, and funds for mining projects on National Forest System lands in Montana. DEQ and the Forest Service have jointly prepared this Environmental Assessment (EA) to meet the requirements of the Montana Environmental Policy Act (MEPA) and the National Environmental Policy Act (NEPA). Under MEPA, an EA may serve a number of purposes, one of which is to assist an agency in determining whether impacts of a Proposed Action could result in significant impacts requiring an Environmental Impact Statement (EIS) (Administrative Rules of Montana [ARM] 17.4.607(2)). Similarly, under NEPA, the purpose of an EA is to briefly provide sufficient evidence and analysis for determining whether to prepare an Environmental Impact Statement or a Finding of No Significant Impact (40 Code of Federal Regulations [CFR] 1508.9(a)).

This EA evaluates the environmental impacts of the No Action Alternative and the Proposed Action. The DEQ Hard Rock Mining Bureau Chief and the CGNF Forest Supervisor will determine

if the Proposed Action would have a significant effect on the quality of the human environment (see **Chapter 7**). If so, an EIS will be prepared.

All values provided throughout this EA (i.e., size, length, weight, locations and volumes) are approximations, unless otherwise noted. Additional documentation, including more detailed analyses of Project area resources, may be found in the Project's administrative record, which is available on request (see the contact information provided at the beginning of this EA).

Terms used in this EA are defined in **Chapter 8**. For definitions related to impacts analysis and a discussion of the key differences between NEPA and MEPA terminology, see **Section 8.1, Definitions Used in Impact Analyses**.

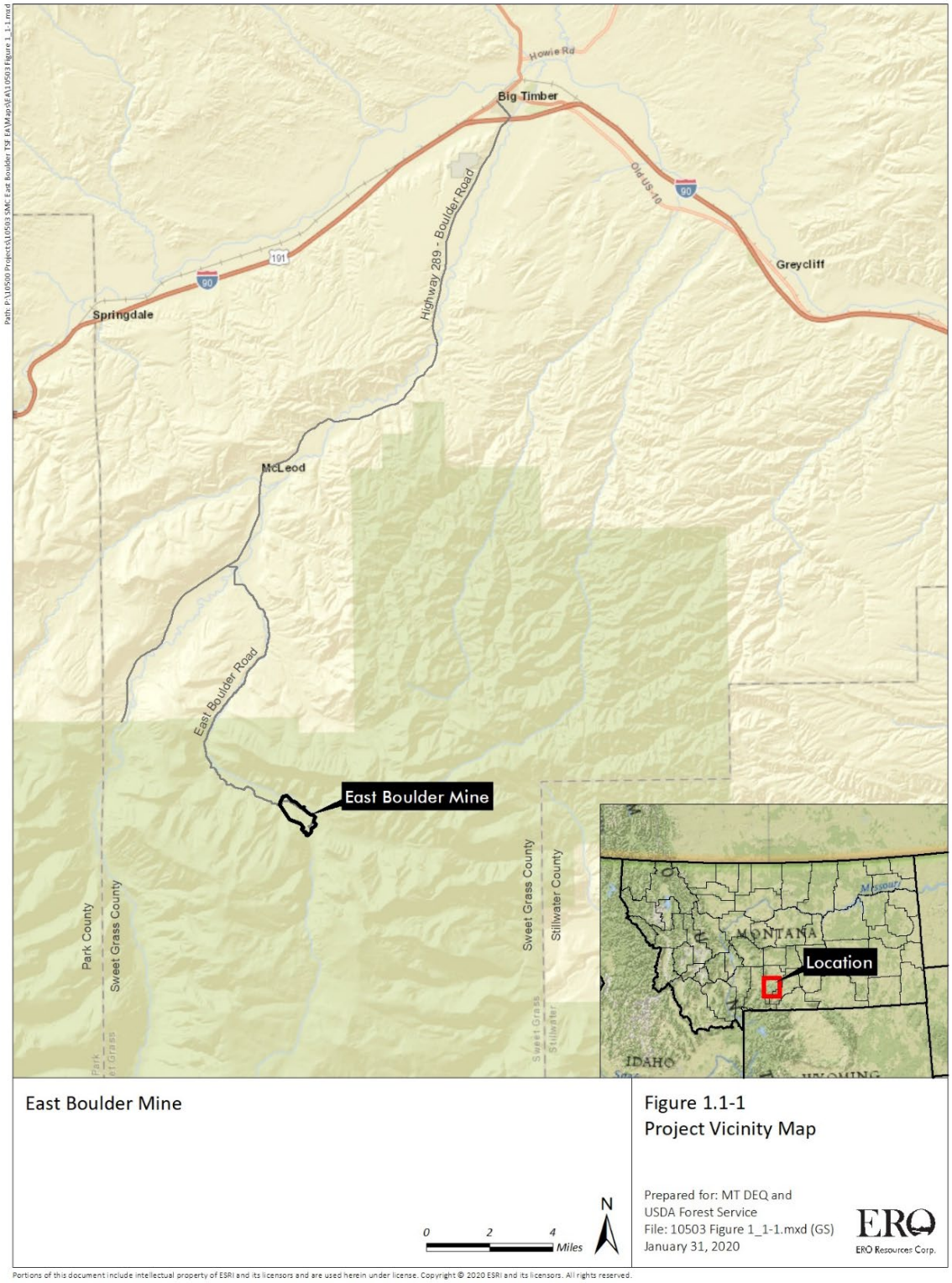



**Figure 1.1-1 Project Vicinity Map**

## 1.2. PURPOSE AND NEED

SMC has proposed to use National Forest System lands in connection with operations authorized by the United States Mining laws (30 USC 21-54), which confer a statutory right to enter public lands to search for minerals. The purpose of the action and of conducting this environmental review is to act upon SMC's proposed amendment and proposed plan of operations revision to construct the Stage 6 TSF expansion at the East Boulder Mine. SMC's need for the proposed amendment and plan revision is to provide secure storage of future tailings material and thereby allow for continued mining operations at the East Boulder Mine.

The need for state action is DEQ's responsibility to issue and amend operating permits under the Metal Mine Reclamation Act (MMRA), Section 82-4-301, *et seq.,* MCA. DEQ is required to review SMC's amendment application to determine whether reclamation requirements and standards set forth in the MMRA would be satisfied and to approve or deny the application.

The proposed Project would be within SMC's existing federal mining claim and is proposed in accordance with federal mining laws. The need for federal action is the Forest Service's responsibility to evaluate SMC's proposed plan of operations revision to ensure that Project activities would minimize adverse environmental impacts on National Forest System lands and comply with applicable laws, regulations, and policies.

## 1.3. AUTHORIZATION ACTIONS

Before SMC could begin the Project, various permits, certificates, licenses, or approvals would be required. **Table 1.3-1** is not a comprehensive list, but it provides the primary authorizations that may be needed for Project implementation.

**Table 1.3-1**
**Permits, Licenses, and Approvals Required for the Project**

| Permit, License, or Approval | Purpose |
|---|---|
| ***Custer Gallatin National Forest*** | |
| Revised Plan of Operations (36 CFR 228 Subpart A)[a] | To allow SMC to conduct activities on or beneath National Forest System (NFS) lands. Approval of the revised plan of operations is contingent on SMC incorporating all stipulations and mitigations (as listed in the Decision Notice) into a revised plan of operations. See **Section 1.7.1.5, Locatable Minerals – 36 CFR 228, Subpart A.** |
| Biological Assessment (Endangered Species Act)[a] | To ensure actions taken by the Forest Service would not jeopardize the continued existence of threatened and endangered species or result in the destruction or modification of designated critical habitat. See **Section 1.7.1.10, Endangered Species Act.** |
| Timber Sale Contract[a] | To allow SMC to harvest merchantable timber from the Project area on National Forest System lands. Harvesting would be conducted to clear vegetation for road and power line construction and soil stockpile areas. |

| Permit, License, or Approval | Purpose |
|---|---|
| ***U.S. Fish and Wildlife Service*** | |
| Concurrence Letter (Endangered Species Act) | Informal consultation with the Forest Service following review of the Forest Service's Biological Assessment. See **Section 1.7.1.10, Endangered Species Act.** |
| ***U.S. Army Corps of Engineers*** | |
| Section 404 Nationwide Permit (Federal Clean Water Act)[a] | To control the discharge of dredged or fill material into waters of the U.S., including wetlands. A Section 404 permit would be necessary for any in-stream work. See **Section 1.7.1.9, Clean Water Act.** |
| ***U.S. Environmental Protection Agency*** | |
| Underground Injection Control Permit | Regulates discharges to groundwater. Permit issued for Boe Ranch deep injection test well as part of DEQ Operating Permit Revision 18-004. |
| ***Montana Department of Environmental Quality*** | |
| Hard Rock Operating Permit Modification (MMRA)[b] | To allow a change in an approved operating permit. See **Section 1.7.2.2, Montana Metal Mine Reclamation Act**. |
| Montana Pollutant Discharge Elimination System (MPDES) Permit (Montana Water Quality Act)[b] | To establish effluent limits, treatment standards, and other requirements for point source discharges, including storm water, to state waters. See **Section 1.7.2.3**, **Montana Water Quality Act**. |
| Storm Water Pollution Prevention Plan (ARM 17.30.1102(28))[b] | To identify all potential pollutant sources that may impact storm water and identify the Best Management Practices to control these pollutant sources. See **Section 1.7.2.3, Montana Water Quality Act**. |
| Short-Term Water Quality Standard for Turbidity (318 Authorization - Montana Water Quality Act)[b] | To allow for short-term increases in surface water turbidity during construction for activities not covered by a MPDES permit. Request may be forwarded from Montana Fish, Wildlife, & Parks (FWP). See **Section 1.7.2.3, Montana Water Quality Act**. |
| 401 Certification (Clean Water Act)[b] | To ensure that any activity requiring a federal license or permit that may result in a discharge to navigable waters complies with Montana water quality standards. May be waived under certain conditions. See **Section 1.7.2.3, Montana Water Quality Act**. |
| ***Montana Fish, Wildlife and Parks and Conservation District*** | |
| Montana Streamside Protection Act (SPA 124 Permit) and Montana Natural Streambed and Land Preservation Act (310 Permit)[b] | Required for any project including the construction of new facilities or the modification, operation, and maintenance of an existing facility that may affect the natural existing shape and form of any stream or its banks or tributaries. A Stream Protection Act 124 permit from the state and a Montana Natural Streambed and Land Preservation Act 310 permit from the local conservation district may be required. |
| ***Montana State Historic Preservation Office*** | |
| Cultural Resource Clearance (National Historic Preservation Act)[b] | To review and comment on federal compliance with the National Historic Preservation Act. See **Section 1.7.1.17, National Historic Preservation Act and Consultation with Federally Recognized Tribes**. |

| Permit, License, or Approval | Purpose |
|---|---|
| ***Sweet Grass County Weed District*** | |
| Noxious Weed Management Plan[b] | To minimize propagation of noxious weeds. See **Section 1.7.2.5, Montana Noxious Weed Act**. |

[a]For additional detail on federal requirements, see **Section 1.7.1, Federal Laws and Regulations**.
[b]For additional detail on state requirements, see **Section 1.7.2, State Laws and Regulations**.

## 1.4. Project Location and History

Located in Sweet Grass County, Montana, within the East Boulder River Drainage and at the end of NFS Road 205 (East Boulder Road), the existing East Boulder Mine comprises an underground platinum and palladium mine, access tunnels, plant site facilities, a lined TSF and other ancillary facilities to support the operation (**Figure 1.4-1**). The ore is upgraded onsite by crushing, grinding, flotation, and filtration to produce an ore concentrate. The concentrate is then filtered and transported to the Smelter and Base Metals Refinery located in Columbus, Montana.

For every 100 tons of ore fed to the mill, the mine generates 99 tons of tailings. The tailings are pumped from the mill to underground sand plants where the coarse sand fraction of tailings is separated from the slimes fraction (finest-sized particles). When extracted and crushed, the volume of rock expands, making it impossible to backfill all the tailings. The coarse sand fraction (about 50 percent of the tailings volume) is pumped throughout the mine to backfill the mined-out areas. The slimes fraction of the tailings is pumped to the TSF at the East Boulder Mine site. Waste rock from the underground mine is fully used in ongoing construction for the TSF embankments. Additional information about the mine can be found in the Consolidated Operations and Reclamation Plan (CORP; SMC 2016).

Operating Permit No. 00149 and the original East Boulder Mine Plan of Operations was approved in 1993 after completion of the East Boulder Mine Project Final Environmental Impact Statement in 1992 (1992 FEIS; Division of State Lands [DSL] et al. 1992) (DSL et al. 1992). The Hard Rock Mine Impact Plan for the East Boulder Mine was updated in 1998. Construction of the mine began in 1999, and the mine reached commercial production in 2002. SMC updated its water management plan for the East Boulder Mine in 2010, adding the Boe Ranch land application disposal (LAD) site. The agencies issued the Final EIS for SMC's Revised Water Management Plans and Boe Ranch LAD in 2012 (2012 FEIS; DEQ and Forest Service 2012a) and their Record of Decision (DEQ and Forest Service 2012b). Additional details regarding the history of the East Boulder Mine can be found in the Consolidated Operations and Reclamation Plan (SMC 2016).

Two amendments to Operating Permit No. 00149 have been approved:

- 001—Approved and permitted on May 20, 1999. This amendment allowed use of National Forest System lands for spray irrigation, snowmaking in LAD areas, and percolation ponds for disposal of water that contains total inorganic nitrogen. It also allowed the construction of structures for water treatment by biological denitrification. The amendment expanded the permit boundary by 136 acres and increased the total allowable disturbance area by 5.7 acres.

- 002—Approved and permitted on August 1, 2012. This amendment allowed for the construction and operation of a LAD system at SMC's Boe Ranch Property to dispose of treated adit and tailings water from the East Boulder Mine during operations and at closure. The amendment also incorporated details for water treatment and water management systems during closure and post-closure.

In addition to the two amendments described above, a number of permit revisions requested by SMC have been authorized by DEQ since 2012. Most of these revisions can be found in SMC's CORP, Appendix C4 (SMC 2016). Revisions in addition to those listed in the CORP and occurring post-2014 are listed below. These revisions and their purposes are described in **Table 1.4-1**.

**Table 1.4-1**
**East Boulder Mine Minor Revisions Since 2014**

| Revision Name | Revision Subject |
|---|---|
| 14-001 | Authorized waste management improvements for the Event Pond and Percolation Pond; no new disturbance authorized |
| 14-002 | Authorized realignment of the Borrow Pit access road; no new disturbance authorized |
| 14-003 | Authorized installation of the Good Neighbor Agreement monitoring well and included new abandonment costs in the bond |
| 14-004 | Authorized the Stage 3 slope cover; no new disturbance authorized |
| 15-001 | Authorized the Stage 3 final design; no new disturbance authorized |
| 15-002 | Authorized the BO Parts Building and included new demolition costs in the bond |
| 15-003 | Authorized geotechnical drilling -and 0.5 acre of new disturbance |
| 16-001 | Authorized the Water Resources Monitoring Plan; no new disturbance authorized |
| 16-002 | Authorized inclinometers and included new abandonment costs in the bond |
| 17-001 | Authorized a Groundwater Mixing Zone |
| 17-002 | Authorized site security gates |
| 18-001 | Updated the Water Resources Monitoring Plan; no new disturbance authorized |
| 18-002 | Authorized the Biological Monitoring Plan; no new disturbance authorized |
| 18-003 | Authorized the Thickener and Portal Collection System |
| 18-004 | Authorized the Boe Ranch Deep Injection Test Well |
| 18-005 | Authorized geotechnical drilling and an inclinometer |
| 19-001 | Authorized monitoring well EBMW-12A |
| 19-002 | Authorized Borrow Area design changes |
| 19-003 | Authorized the WTP disc filter system |
| 19-004 | Authorized the concentrate load-out facility |
| 19-005 | Authorized the Dry Fork monitoring wells |

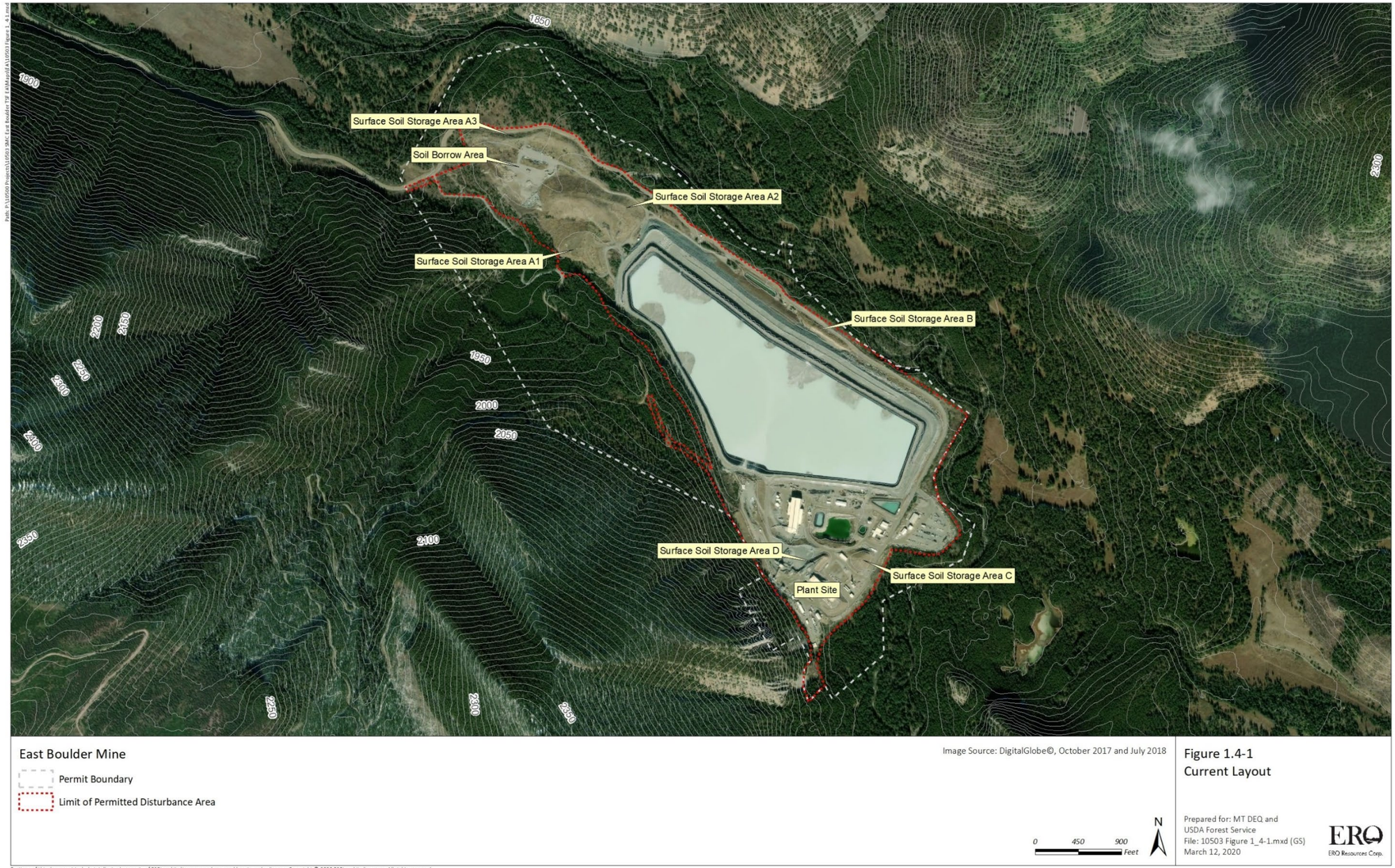



**Figure 1.4-1 Current Layout of the Project Area**

[This page left blank for double-sided printing]

## 1.5. Issues

Issues were identified through internal scoping within the interdisciplinary team, which included staff from DEQ, Forest Service, and the third-party consultant, and from external public scoping comments (see **Section 1.6, Public Involvement**). The scope of this EA was defined through this scoping process and helped to identify potential issues that warranted further evaluation. The agencies also identified issues and resources that would not be affected by the Proposed Action (40 CFR 1500.4(g)). Although these issues were considered, they were not studied in detail. All potential issues analyzed in this EA and those issues considered but dismissed from detailed study are in **Appendix A**.

## 1.6. Public Involvement

### 1.6.1. Scoping

On November 8, 2018, the Forest Service and DEQ published a Request for Comments on SMC's proposed amendment to the East Boulder Mine Operating Permit on the Forest Service Projects website. Public comment was solicited during this 30-day scoping period between November 8 and December 8, 2018. The posting also informed the public that it could review the amendment application on DEQ's website. Direct mailings of the Request for Comments letter were also sent to contacts on Forest Service mailing lists. Two public comment letters were received. Additional details can be found in the Scoping Report (ERM 2019). The public scoping letter and comment letters received can be found on the Forest Service project webpage at https://www.fs.usda.gov/project/?project=55061.

### 1.6.2. Draft EA Public Comment Period

In compliance with 36 CFR 218 Subparts A and B and ARM 17.4.610, this Draft EA is available for public review and comment for 30 days beginning with the day after the publication date of a legal notice in the *Bozeman Chronicle* (the newspaper of record). Information on how to find Project documents and instructions on how to comment are provided on the title page of this EA and in the cover letter.

## 1.7. Applicable Laws, Regulations, and Policies

DEQ and the Forest Service are obligated under certain federal and state laws and regulations to evaluate and take action regarding the proposed action. Although not an exhaustive list, the laws, regulations, and executive orders (EOs) summarized below are key to the Project; compliance with these laws and regulations is demonstrated in the resource sections, as applicable (**Sections 3.2** through **3.11**).

### 1.7.1. Federal Laws and Regulations

#### *1.7.1.1. National Environmental Policy Act*

NEPA (42 United States Code [USC] 4321 *et seq.*, 40 CFR Parts 1500-1508, and 36 CFR Part 220) declares a national environmental policy and promotes consideration of environmental concerns by federal agencies in decision making. Procedures and regulations issued by the Council on Environmental Quality (CEQ), as authorized under NEPA, direct implementation of NEPA by federal agencies.

#### *1.7.1.2. General Mining Act of 1872*

The General Mining Act gives U.S. citizens the right to explore federal lands, locate mining claims, make discoveries, patent claims, and develop mines on National Forest System lands open to mineral entry. SMC conducts its East Boulder Mine operations and exploration activities on private lands (both fee simple and patented mining claims) owned by SMC, and on unpatented mining claims located on public lands administered by the Forest Service.

#### *1.7.1.3. Organic Administration Act*

The Organic Administration Act authorizes the Forest Service to regulate use and occupancy, such as mineral operations, on National Forest System lands and to develop mineral regulations. The Forest Service's mineral regulations are promulgated at 36 CFR 228, Subpart A (see discussion below). If the Project can be approved in a manner that will comply with all applicable environmental laws, the Forest Service has no authority to prohibit or to deny proposals that are reasonably necessary to mining of a private mineral estate or the use of unpatented claims on National Forest System lands subject to the General Mining Act.

#### *1.7.1.4. Mining and Minerals Policy Act of 1970*

The Mining and Minerals Policy Act states that the continuing policy of the federal government is to foster and encourage private enterprise in the development of economically sound and stable domestic mining and mineral industries and the orderly and economic development of domestic mineral resources.

#### *1.7.1.5. Locatable Minerals – 36 CFR 228, Subpart A*

Federal regulations at 36 CFR 228, Subpart A set forth the rules and procedures that enable use of the surface of National Forest System lands in connection with operations authorized by mining laws. The Forest Service approves Plans of Operations under these regulations to ensure that mining-related operations and associated activities are conducted in a manner where feasible, that minimizes adverse environmental impacts on National Forest System surface resources (36 CFR 228.8). Review of each Plan of Operations or plan revision is coordinated with DEQ and other appropriate agencies as 36 CFR 228.8(h) authorizes the Forest Service to accept certification or other approval issued by state agencies or other federal agencies as compliance with 228 regulations and other similar or parallel Forest Service requirements.

These regulations also specifically authorize the Forest Service to calculate and hold a reclamation bond for approved mining operations on National Forest System lands. DEQ and the Forest Service currently hold a joint reclamation bond to ensure reclamation of the East Boulder Mine (see **Section 3.3.3.2, Reclamation Bond**) in compliance with both the locatable minerals regulations and the MMRA. The bond is incrementally increased when the activities that result from revisions or amendments to the Operating Permit indicate increased reclamation expenses would be incurred as a result of the activity. A comprehensive review is undertaken on a minimum of one in five-year cycle to account for ongoing mine development and changes in the cost of accomplishing reclamation.

Pursuant to 36 CFR 228.8, the Forest Service, as the federal land manager, may identify through the plan of operations review process, EA analysis, and other analyses the need for additional financial assurance for long-term care and maintenance (CGNF letter to DEQ, dated February 7, 2020). Mineral development on National Forest System lands is a temporary use of those lands and requires that adequate fiscal resources are available to address post-closure long-term liabilities associated with mining activities, which may be required for many years beyond initial mine closure. Additional financial assurance is an option that would address the federal land manager's need for site care and maintenance beyond any bond release under the "comparable utility and stability to that of adjacent areas" reclamation standard required under the state's MMRA, specifically 82-4-336(9)(a), MCA. Any additional financial assurance would be separate and distinct from the agencies' joint reclamation bond held for mine operations and closure and would be held by the Forest Service.

#### *1.7.1.6. National Forest Management Act of 1976/1987 Gallatin Forest Plan (as amended)*

The National Forest Management Act of 1976 (NFMA) requires the development, maintenance, and, as appropriate, revision of land and resource management plans (forest plans) for units of the National Forest System. NFMA also requires the Forest Service to maintain viable populations of "native and desired nonnative vertebrate species . . . well distributed in the planning area [National Forest]." Forest plans provide for the multiple use and sustained yield of renewable resources in accordance with the Multiple-Use Sustained-Yield Act of 1960 and protection of species. The Gallatin Forest Plan, as amended in November 2015 (Forest Service 2015a) represents the land and resource management plan required by NFMA. The Forest Plan sets forth the CGNF direction for managing the Gallatin portion of the CGNF, as it was developed prior to combining the two forests.

The Gallatin Forest Plan states that existing and future rights to prospect, develop, and mine on National Forest lands open to mineral entry will be recognized in the implementation of the forest plan (Forest Service 2015a). Specific goals of the Gallatin Forest Plan include providing for "orderly and environmentally acceptable exploration and development of minerals." Similarly, forestwide locatable minerals standards state that existing and future rights to prospect, develop, and mine on National Forest System lands open to mineral entry will be recognized. All claimants will be required to submit a Notice of Intent before conducting exploration activities. An operating plan that meets state and federal standards may be required. The type of access

approved in a plan of operations under 36 CFR 228 will be consistent with the stage of exploration or development and will be in accordance with management area goals.

The Gallatin Forest Plan includes forestwide goals and standards, but also subdivides the forest into multiple management areas, each with different area-based goals and appropriate management practices, standards, and guidelines. The East Boulder Mine permit area falls within Management Area (MA) 8, which emphasizes production of timber (Forest Service 2015a). MA 8 direction includes standards for recreation, visual quality, wildlife and fish, range, timber, and fire.

#### *1.7.1.7. Gallatin National Forest Travel Management Plan*

The Gallatin National Forest Travel Management Plan (Forest Service 2006) manages public access and travel within the Gallatin portion of the CGNF. Standards from the Travel Management Plan are applicable to the Project and include Standards E-4 thru E-7: Water, Fisheries, and Aquatic Life. These are discussed in detail in the Aquatic Biological Evaluation (ERO 2020c). The Project is located in the East Boulder Travel Planning Area, which includes goals and objectives relevant to summer and winter recreation and fisheries.

#### *1.7.1.8. Clean Air Act*

The Forest Service is responsible for ensuring that mineral operations that may affect National Forest System surface resources comply with applicable federal and state air quality standards, including the requirements of the Clean Air Act. See the discussion under **Clean Air Act** of Montana in **Section 1.7.2, State Laws and Regulations**.

#### *1.7.1.9. Clean Water Act*

The Forest Service is responsible for ensuring that mineral operations that may affect National Forest System surface resources comply with applicable federal and state water quality standards, including regulations issued pursuant to the Clean Water Act. See the discussion under **Montana Water Quality Act** in **Section 1.7.2, State Laws and Regulations**.

#### *1.7.1.10. Endangered Species Act*

The Endangered Species Act (ESA; 16 USC 1531 *et seq.*) protects threatened and endangered species and their designated critical habitat. Section 7(a)(4) of the ESA requires federal agencies to confer with the U.S. Fish and Wildlife Service (USFWS) on any agency action that is likely to jeopardize the continued existence of any species proposed for listing or result in the adverse modification of critical habitat proposed to be designated. If a federal agency's biological assessment (BA) analysis indicates that the action is not likely to adversely affect the continued existence of proposed species or result in the destruction or adverse modification of proposed critical habitat, and the USFWS concurs, then the consultation is informal, and the USFWS would issue a concurrence letter as the conclusion to the process. If the USFWS does not concur, or if a BA indicates that the action is likely to adversely affect a species or its habitat, then formal consultation is required, and the USFWS would issue a Biological Opinion as the

conclusion to the process. The Forest Service has prepared a BA for terrestrial species (grizzly bear, northern lynx, and wolverine) and submitted it to the USFWS for informal consultation.

#### *1.7.1.11. Cooperative Conservation Agreement for Yellowstone Cutthroat Trout in Montana*

In 1998, the Forest Service and DEQ joined numerous other agencies and the Crow Tribe in forming the Cooperative Conservation Agreement for Yellowstone cutthroat trout (YCT) within the State of Montana. This agreement established a framework of cooperation between the participating parties to work together for the conservation of YCT. The primary goal of the agreement and accompanying YCT conservation program is to ensure the persistence of the YCT subspecies within the historic range in Montana at levels and under conditions that provide protection and maintenance of both the intrinsic and recreational values associated with the subspecies. A commitment identified in the agreement that is most relevant to the Project is "modify land uses to provide the greatest degree of habitat and population protection."

#### *1.7.1.12. Migratory Bird Treaty Act of 1918 (as amended) and EO 13186*

Under the Migratory Bird Treaty Act, it is illegal to take any migratory bird, their eggs, their parts, or any bird nest except as permitted (such as waterfowl hunting licenses, falconry licenses, or bird banding permits) by the USFWS. In addition, EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, requires analysis of effects of federal actions on migratory birds as part of the environmental analysis process.

#### *1.7.1.13. Forest Service Manual and Handbooks*

The Forest Service Manual (FSM) contains legal authorities, objectives, policies, responsibilities, instructions, and guidance needed on a continuing basis by Forest Service line officers and primary staff to plan and execute assigned programs and activities. Forest Service Handbooks provide specialized guidance and instructions to specialists for carrying out the directives of the FSM. Key guidance for this project can be found in Series 2000 – National Forest Resource Management (https://www.fs.fed.us/im/directives/dughtml/fsh2000.html).

#### *1.7.1.14. Best Management Practices*

Soil and water conservation best management practices (BMPs) are the primary mechanism to minimize water quality impacts from nonpoint source pollution and still allow dispersed land management activities to occur on National Forest land. To reach these objectives, the Forest Service developed the R1/R4 Forest Service Soil and Water Conservation Practices Handbook (U.S. Department of Agriculture [USDA] 1988) and National Best Management Practices for Water Quality Management on National Forest System Lands (USDA 2012). While Region 1 of the Forest Service has actively embraced the Montana State Forestry BMPs and the associated interagency/interdisciplinary review process, the Forest Service National Core BMP Program provides a range of BMPs for activities not captured under the Montana State Forestry BMPs. During implementation of the proposed Project, SMC would be required to apply both Montana State Forestry BMPs and Forest Service National Core BMPs where applicable.

#### *1.7.1.15. Executive Orders*

A number of executive orders provide guidance relevant to the proposed Project; others are discussed below under **Section 1.7.1.17, National Historic Preservation Act and Consultation with Federally Recognized Tribes**. Key orders include, but are not limited to, the following:

- EO 11988, as amended by EO 13690, requires federal agencies to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative.
- EO 11990 requires federal agencies to avoid, to the extent possible, the long- and short-term adverse effects associated with the destruction or modification of wetlands.
- EO 12962 mandates disclosure of effects on recreational fishing as part of a nationwide effort to conserve, restore, and enhance aquatic systems and provide for increased recreational fishing opportunities.
- EO 13112 directs federal agencies (in part) to prevent the introduction of invasive species; provide for their control; and minimize the economic, ecological, and human health impacts that invasive species cause.
- EO 13817 is the Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals. It lists 35 mineral commodities deemed critical, including platinum group metals, and outlines a strategy ensure that access to them is not interrupted.

#### *1.7.1.16. Federal Guidelines for Dam Safety*

Federal guidelines apply to management practices for dam safety of all federal agencies responsible for the planning, design, construction, operation, or regulation of dams. A TSF is considered a dam, and the Forest Service is obligated to follow the National Dam Safety Program (NDSP) guidelines regarding the East Boulder TSF. SMC's proposed Stage 6 TSF design (Knight Piésold Ltd. 2020) substantially follows these guidelines (see **Section 3.2, Geotechnical Stability**). The objective of the guidelines is that dam safety would be achieved as management and technical decisions give proper recognition to safety considerations during all project stages. Guidelines were the culmination of efforts initiated by President Carter to review procedures and criteria used by federal agencies involved in the design, construction, operation, and regulation of dams; they are authorized by both public law and a presidential memorandum (Federal Emergency Management Agency [FEMA] 2004):

- National Dam Inspection Act: this law, passed in 1971, authorized inspection of non-federal dams in the nation meeting the size and storage limitations of the act to evaluate their safety, reporting of inspection results to the states and advising the states on actions needed to ensure dam safety, reporting to Congress the information given to the states, preparing a national inventory of dams, and making recommendations to Congress "for a comprehensive national program for the inspection and regulation for safety purposes of dams of the nation" (FEMA 2004).
- Presidential Memorandum (April 23, 1977): this memorandum from President Carter directed federal agencies to review their dam safety practices and address elements of dam safety, including internal and external review, qualifications of personnel,

integration of new technology, emergency preparedness plans, and review of existing dams. The memorandum also established an *ad hoc* interagency committee and established subcommittees for the preparation of the federal dam safety guidelines (FEMA 2004).

#### *1.7.1.17. National Historic Preservation Act and Consultation with Federally Recognized Tribes*

A suite of laws and EOs outline federal obligations to federally recognized tribes. Primary regulations include the National Historic Preservation Act (NHPA) and the American Indian Religious Freedom Act. Section 106 of the NHPA and its implementing regulations under 36 CFR 800 require all federal agencies to consider effects of federal actions on cultural resources, including traditional cultural properties, eligible for or listed in the National Register of Historic Places, and to consult with American Indian tribes to identify and resolve any adverse effects. The Forest Service has identified an area of potential effect and potentially affected resources and has initiated the Section 106 process with the Montana State Historic Preservation Office (SHPO) (see **Section 3.9, Cultural Resources** and **Chapter 5, Consultation and Coordination**).

The American Indian Religious Freedom Act of 1980 requires the United States to protect and preserve for American Indians the inherent right of freedom to believe, express, and exercise traditional religions; to use sacred objects; and to worship through ceremonies and ritual.

Other acts include, but are not limited to, the following:

- EO 12898 (Environmental Justice) requires federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects on minority and low-income populations (see **Section 3.10, Socioeconomics**).
- EO 13007 requires federal agencies managing federal lands to (1) accommodate access to and ceremonial use of American Indian sacred sites by American Indian religious practitioners and (2) avoid adversely affecting the physical integrity of such sacred sites.
- EO 13175 requires federal agencies to consult with American Indian tribal representatives and traditionalists on a government-to-government basis.

### 1.7.2. State Laws and Regulations

#### *1.7.2.1. Montana Environmental Policy Act*

MEPA requires the state to conduct an environmental review when making decisions or planning activities that may impact the human environment. MEPA (Title 75, Chapter 1, Parts 1 through 3, MCA) and its implementing rules (ARM 17.4.601 *et seq.*) define the process to be followed when preparing an EA. Pursuant to ARM 17.4.627(3), when a proposed project is subject to the provisions of both MEPA and NEPA, DEQ may "accede to and follow more stringent requirements, such as additional content or public review periods, but in no case may it accede to less than is provided for in these rules." For this joint EA, the Forest Service and DEQ used the most inclusive requirements. See **Chapter 8, Terminology,** for additional details regarding differences between NEPA and MEPA and the analysis definitions from each that are used in this EA.

#### *1.7.2.2. Montana Metal Mine Reclamation Act*

MMRA's (82-4-301, *et seq.*, MCA) purpose is to ensure that the usefulness, productivity, and scenic values of all lands and surface waters affected by mining and exploration receive the greatest reasonable degree of protection and that the lands are reclaimed to beneficial uses. Other purposes of MMRA are to allow mining as an activity beneficial to the economy of Montana and to allow the production of minerals to meet the needs of society and the economic demands of the marketplace (82.4.302(b) and (c), MCA). MMRA and its implementing rules define the steps to be taken in issuing an exploration license, operating permit, or revising an approved operating plan for reclamation of an applicant's proposed or modified exploration plan or mine operation. A finding that the mining or reclamation plan would violate the MMRA, the Clean Air Act of Montana, or the Montana Water Quality Act, or rules adopted pursuant to these laws, would be grounds to deny an application for a permit or license amendment (82–4–351, MCA).

DEQ also sets reclamation bonding under MMRA (82-4-338, MCA). DEQ and the Forest Service currently hold a joint reclamation bond to ensure reclamation of the East Boulder Mine (see **Section 3.3.3.2, Reclamation Bond**) in compliance with both the MMRA and the Forest Service's locatable minerals regulations (**Section 1.7.1.5, Locatable Minerals – 36 CFR 228, Subpart A**). If SMC's amendment is approved, an additional joint reclamation bond would be calculated using the specifications and stipulations of the approved amendment. The bond would include reclamation costs (e.g., demolition of facilities, regrading and soil placement, seedbed preparation, revegetation and post-closure monitoring of the TSF required by the IRP) and costs for weed control. Bonds must be submitted and accepted before the proposed amendment could be permitted by DEQ or an authorization to proceed could be granted by the Forest Service. The applicant must submit the reclamation bond to DEQ in a form and amount determined adequate by DEQ in accordance with 82-4-338, MCA; and must not be in default of any other reclamation obligation mandated by MMRA or rules implementing MMRA. After reclamation, for bond release consideration, DEQ would compare the completed reclamation against the requirements of the MMRA, including the "comparable utility and stability to that of adjacent areas" reclamation standard identified in 82-4-337(9)(a), MCA. The Forest Service has additional land management objectives to implement, including protection of surface resources pursuant to 36 CFR 228.8(g) (see **Section 1.7.1.5, Locatable Minerals – 36 CFR 228, Subpart A)**.

Other key aspects of MMRA, which were added in 2015 under Senate Bill 409, include (1) TSF design standards (82-4-376, MCA); (2) requirements for Tailings, Operations, Maintenance and Surveillance Manuals (TOMS); and (3) the Independent Review Panel (IRP) (82-4-377, MCA), an independent panel of engineers and specialists that reviews and approves TSF designs. The role of the IRP in regard to SMC's proposed action is described in the section below.

### Independent Review Panel

The Stage 6 amendment application for the East Boulder TSF is subject to Montana statutory provisions that apply to TSF. As a result, the amendment application has been subjected to requirements that include:

- designation of an engineer of record;
- development and submittal of a TSF design document (design document);
- selection and approval of an IRP to review the design document;
- development/update to the TOMS;
- periodic review of the TSF (at least every 5 years) by the IRP members or by a panel meeting the requirements of 82-4-337, MCA; and
- annual inspections of the TSF by the engineer of record during operations.

The design document, the development of the design document by an engineer of record, and the review of the design document by an IRP are all important considerations in the identification of impacts in this EA. Among other requirements, the design document prepared by the engineer of record and reviewed/approved by the IRP is required to address the following (82-4-376, MCA):

- an evaluation indicating that the proposed TSF will be designed, operated, monitored, and closed using the most applicable, appropriate, and current technologies and techniques practicable given site-specific conditions and concerns;
- a site geotechnical investigation commensurate in detail and scope with the complexity of the site geology and proposed TSF design;
- a demonstration through site investigation, laboratory testing, geotechnical analyses, and other appropriate means that the tailings, embankment, and foundation materials controlling slope stability are not susceptible to liquefaction or to significant strain-weakening under the anticipated static or cyclic loading conditions;
- a probabilistic and deterministic seismic evaluation for the area and assessment of peak horizontal ground acceleration;
- a dam breach analysis, a failure modes and effects analysis (or other appropriate detailed risk assessment), and an observational method plan addressing residual risk;
- a list of quantitative performance parameters for construction, operation, and closure of the TSF;
- a description of how the design integrates into a closure plan that facilitates, to the extent possible, dam decommissioning resulting in a maintenance-free closure;
- requirements for post-closure monitoring, inspection, and review, including the frequency of engineer of record inspections, independent panel reviews, and retention of an engineer of record;
- a description of proposed risk management measures for each facility life-cycle stage, including construction, operation, and closure;
- a detailed description of how water, seepage, and process solutions are to be routed or managed during construction, operation, and closure;
- a detailed description of storm water controls, including diversions, storage, freeboard, and how extreme storm events will be managed;
- a design storm event for operation and closure conforming to current engineering best practices for the type of facility proposed that includes, among other criteria, evidence that the dynamic nature of climatology was considered; and
- any other information, drawings, maps, detailed descriptions, or data to assist the IRP in determining if the new or expanded TSF protects human health and the environment.

#### *1.7.2.3. Montana Water Quality Act*

The Montana Water Quality Act, Section 75-5-101 *et seq.*, MCA, and its implementing rules, ARM 17.30.101 *et seq.*, regulate discharges of pollutants into state surface waters through MPDES permits and the adoption of water quality standards. Water quality standards, including the MT nondegradation policy, specify the changes in surface water or groundwater quality that are allowed from a wastewater discharge. A MPDES permit may also include limits for discharges of storm water and would require development of a Storm Water Pollution Prevention Plan (SWPPP). SMC's non-storm water discharge is regulated by MPDES Permit No. MT0026808 (DEQ 2015), and storm water discharge is regulated under a statewide industrial permit (MTR000503; DEQ 2018b) and a SWPPP. SMC currently has a SWPPP but would update it for the Project and submit it to DEQ for approval, if the Proposed Action is approved by the agencies.

Any Project activity that may result in discharge of fill into waters of the U.S. cannot proceed until SMC obtains a Section 404 permit from the U.S. Army Corps of Engineers, per the Clean Water Act (33 USC 1251 *et seq*.), and a 401 certification from DEQ, unless DEQ waives its issuance. Such activities may be permitted under a Nationwide Permit. Plans for avoidance, minimization, and mitigation of effects on wetlands would be required before permit issuance. DEQ provides Section 401 certification pursuant to state regulations.

#### *1.7.2.4. Clean Air Act of Montana*

The State of Montana, through DEQ, has the primary responsibility for carrying out the requirements of the Clean Air Act of Montana through the development and implementation of an Environmental Protection Agency-approved State Implementation Plan, which provides for the attainment and maintenance of federal and state air quality standards.

SMC holds Montana Air Quality Permit (MAQP) No. 2653-06 (DEQ 2018a), which sets emission limitations for specific constituents and includes measures required to minimize fugitive dust during construction and operations. In addition, SMC's CORP includes BMPs to protect air quality, including management of chemical dust suppressants and the use of prescribed fires (SMC 2016). See also **Table 1.6-1**.

#### *1.7.2.5. Montana Noxious Weed Act*

The Sweet Grass County Weed Board administers the County Noxious Weed Control Act (7-22-2101 through 2153, MCA) for any land-disturbing activities within their jurisdiction. SMC has a Weed Control Plan approved by the Sweet Grass County Weed Control District. If needed, SMC would modify its approved plan before surface disturbance.

# 2. PROPOSED ACTION AND ALTERNATIVES

**Chapter 2** describes the No Action Alternative and the Proposed Action. The alternatives development process and alternatives considered but dismissed from detailed consideration are described in **Appendix B,** including the reasons why they were dismissed. A summary of the environmental consequences for the No Action Alternative and Proposed Action is included at the end of this chapter; impacts are fully described in **Chapter 3, Affected Environment and Environmental Consequences**.

## 2.1. NO ACTION ALTERNATIVE

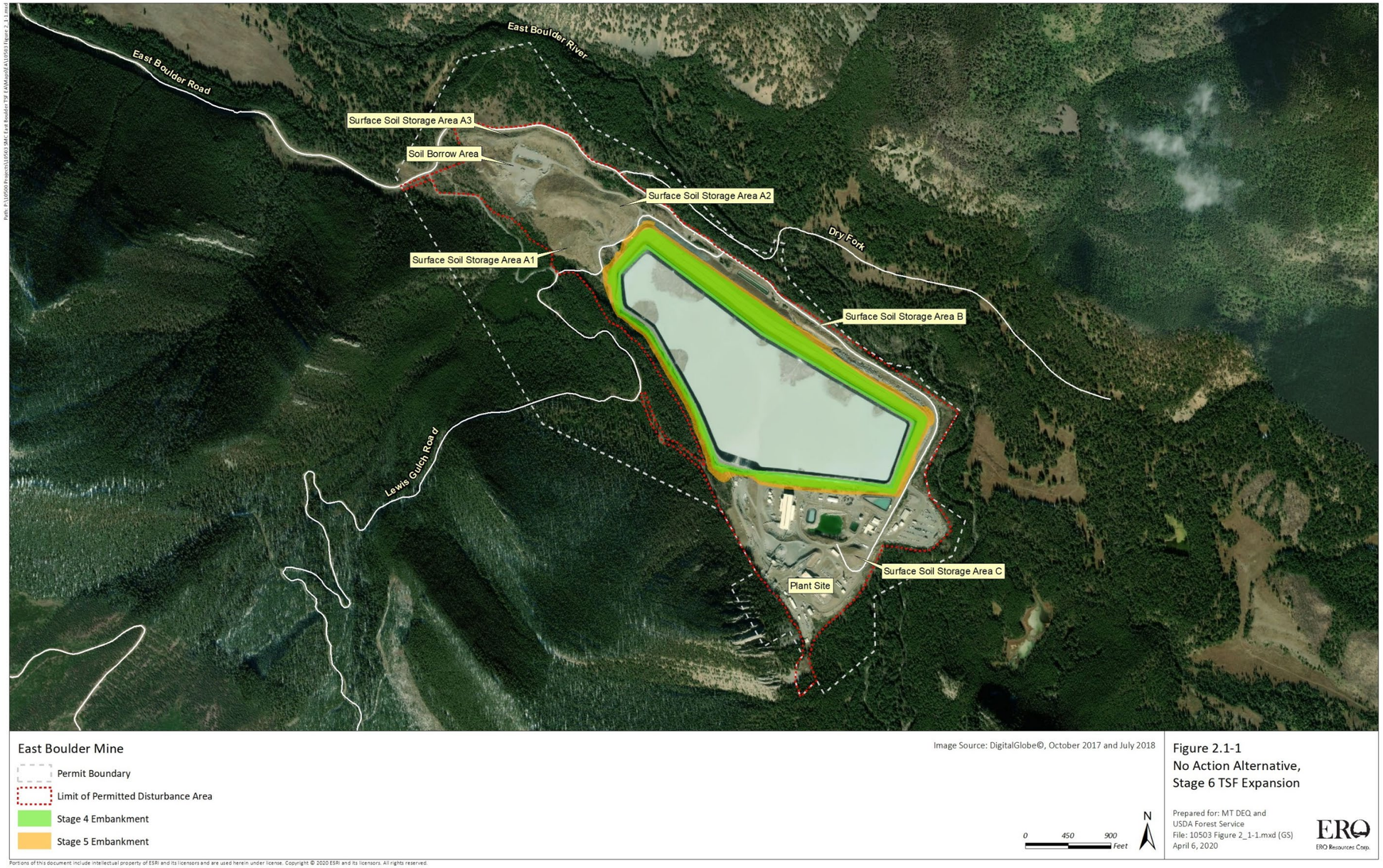
Under the No Action Alternative, DEQ would not approve SMC's application for proposed Amendment 003 to Operating Permit No. 00149, and CGNF would not approve SMC's request for revision of the East Boulder Mine Plan of Operations. SMC would not be allowed to construct the Stage 6 TSF expansion (Proposed Action). The No Action Alternative effectively represents current conditions, with the addition of the construction of TSF embankment Stages 4 and 5, which were permitted and analyzed in the East Boulder Mine Project FEIS (DSL et al. 1992), but have not yet been fully constructed. The No Action Alternative provides a baseline for comparing presently permitted operations at the mine with the action alternative.

The No Action Alternative consists of implementation of the following:

- The ROD for the East Boulder Mine Project FEIS (Forest Service 1993);
- Modifications to the 1993 selected alternative documented in:
  - SMC's Revised Water Management Plans and Boe Ranch LAD, FEIS (DEQ and Forest Service 2012a) and ROD (DEQ and Forest Service 2012b); and
  - The Consolidated Operations and Reclamation Plan (CORP; SMC 2016).
- Authorized revisions (**Table 1.4-1**).

The surface conditions within the 396.58-acre mill site/TSF permit area (Project area) present under the No Action Alternative are summarized below. For locations of the mine infrastructure, see **Figure 2.1-1**.

[This page left blank for double-sided printing]




Source: Knight Piésold Ltd. 2020

**Figure 2.1-1 No Action Alternative**

[This page left blank for double-sided printing]

### 2.1.1. Construction Activities

The remaining embankment raises (Stage 4 and Stage 5) will be constructed using standard construction vehicles and equipment such as pickup trucks, dump trucks, backhoes, excavators, and bulldozers. Construction is guided by the Construction Management Plan for the East Boulder Mine (Knight Piésold Ltd. 2017).

### 2.1.2. Plant Site

The plant site area is southeast of the TSF (**Figure 2.1-1**) and includes infrastructure such as the office building, concentrator, water treatment plant (WTP), mine water recycle pond, rail line, topsoil stockpile, warehouse, waste rock storage, oil storage, and substation, among other features. Water from the WTP is transferred to the mine recycle pond and then pumped to the underground drill water reservoir for use in underground mining operations or discharged to groundwater through the percolation pond.

### 2.1.3. TSF

This section describes the TSF conditions through construction of Stage 5, including the stages of embankment expansion, basin and embankment underdrains, tailings delivery to the TSF, reclaim water system, and TSF monitoring instrumentation.

#### *2.1.3.1. TSF Embankment*

The TSF is being constructed in five stages, using the downstream method for increased stability. The downstream method adds run-of-mine (ROM) rockfill from the underground mine and other borrow material to the top and backside (or downstream side) of the embankment, making the crest higher and the base wider. The resulting embankment's cross-section looks much like a trapezoid.

The TSF basin is lined with a geosynthetic lining system to contain the tailings solids and process water and to reduce seepage from the facility. The geosynthetic lining system consists of a 100-mil high-density polyethylene (HDPE) geomembrane installed over liner bedding, including a 12-ounce-per-square-yard nonwoven geotextile and a sand and gravel cushion layer. All waste rock is used in construction of the TSF embankment; as such, there is no separate waste rock disposal facility.

The five stages of TSF construction are summarized below and authorized in the 1993 ROD (Forest Service 1993). In the 1992 FEIS (DSL et al. 1992) and associated 1993 ROD (Forest Service 1993), the TSF was described in terms of elevation and not stages. SMC developed stages to phase construction of the TSF over time, as additional storage was needed.

- Stage 1 was constructed in 1999. It consisted of a single cell (Cell 1) with confining embankments to an elevation of 6,285 feet. The Stage 1 embankment was constructed of glacial till materials excavated from the Cell 1 basin. Stage 1 was operated as the primary TSF cell from June 2001 to February 2007 and has been used intermittently as a backup since February 2007.

- Stage 2 was constructed in 2006. It consisted of a second storage cell (Cell 2) adjacent to Cell 1. The Stage 2 confining embankments were also built to an elevation of 6,285 feet. A divider berm separated the two cells and allowed for independent operation of Cell 2. The Stage 2 embankment was constructed of glacial till materials excavated from the Cell 2 basin plus ROM rockfill from the underground mine (waste rock).
- Stage 3 was constructed in 2015 and included expanding the confining embankments around Cells 1 and 2 to an elevation of 6,305 feet. Stage 3 was constructed of ROM rockfill. Tailings are currently discharged from the embankment into the storage cell, and Stage 3 allows the TSF to be operated as a single combined cell until approximately May 2020.
- Stage 4 is currently under construction and will reach an elevation of 6,321 feet. ROM rockfill and native borrow currently is being placed (as of April 2019) in the downstream shell to facilitate construction of the Stage 4 embankment raise. Stage 4 will allow the TSF to be operated until approximately January 2025.
- Stage 5, which will be constructed to an elevation of 6,330 feet, will become operational in 2025. ROM rockfill and native borrow will be placed and compacted to construct the embankment raise between 2019 and 2024. Stage 5 will allow the TSF to be operated until approximately November 2027. The Stages 3, 4, and 5 TSF embankments will be constructed at a 2(Height):1(Vertical) outside slope ratio for stability.

#### *2.1.3.2. TSF Basin and Embankment Underdrains*

The TSF basin underdrain system sits on the geosynthetic liner along the floor of Cells 1 and 2 to promote tailings consolidation and reduce pressure head on the lining system to minimize seepage from the TSF. The basin underdrain system empties to a collection sump located adjacent to the TSF north embankment. Sump water is then pumped back into the TSF or to the WTP via a return pipeline.

An embankment underdrain collection system is installed below the Stage 4 north, east, and west embankments to mitigate aqueous nitrogen sourced from the ROM rockfill placed in the embankments. The embankment underdrain collects and drains water to a collection pond located adjacent to the TSF north embankment. Collection pond water is then piped to the TSF via a pipe buried beneath the access road.

#### *2.1.3.3. Tailings Delivery and Reclaim Water System*

Tailings are pumped to the TSF either from the underground Sand Plant or from the Concentrator via 8-inch-diameter pipelines. Tailings slurry is discharged from up to 18 spigot locations extending around the embankment crest.

Reclaimed water from the TSF is reused in the Concentrator milling and flotation circuit. Water is pumped using three reclaim pumps and pipelines located at the south corner of the TSF to the process water head tank in the Concentrator.

### 2.1.4. Monitoring Instrumentation

#### *2.1.4.1. Basin Underdrain Layer*

Twelve vibrating wire piezometers are installed in the basin underdrain layer (six in the Stage 1 basin underdrain and six in the Stage 2 basin underdrain) with piezometer leads extended during each embankment raise. These piezometers are used to monitor groundwater levels, pressure, and stability. Two of the six piezometers installed in the Stage 2 basin underdrain are no longer functioning and have been abandoned. The reasons for the two piezometers (PZ-8 and PZ-12) no longer functioning is unknown.

#### *2.1.4.2. Embankment Crest*

Twelve survey monuments are located along the Stage 3 embankment crest to monitor potential crest movement. Monuments are relocated to the embankment crest with each stage raise.

#### *2.1.4.3. Embankment Foundation*

Three slope inclinometers and two vibrating wire piezometers are installed along the toe of the north TSF embankment to monitor potential movement in the foundation and phreatic surface in the embankment foundation.

#### *2.1.4.4. Embankment Underdrain Piezometers*

Three piezometers are installed in the embankment underdrain to measure the pore pressure in the embankment during temporary storage and transfer of collected underdrain water.

#### *2.1.4.5. TSF Perimeter*

Eight monitoring wells are located along the outer perimeter of the TSF to monitor groundwater quality. Locations of monitoring wells are presented in **Figure 3.4-1** in **Section 3.4, Groundwater Hydrology**.

### 2.1.5. Access Roads, Power Line, Fencing, and Boe Ranch LAD

Two access roads are within the permit boundary. The main site access road extends from NFS Road 205 (East Boulder Road) along the north and east sides of the TSF and is gated (no public access) at the perimeter fence near where it leaves NFS Road 205. The second access road is NFS Road 6644 (Lewis Gulch Road), which runs along and outside the perimeter fence to the southeast of the TSF. The 69-kilovolt power line to the mine is constructed along East Boulder Road and terminates at a substation in the southeast corner of the mine permit area. The power line corridor and substations are under a service utility provider agreement with Park Electric Cooperative. The pipeline to the proposed Boe Ranch LAD also is buried below the East Boulder Road surface.

### 2.1.6. Soil Stockpile and Borrow Areas

Surface soil (topsoil; approximately 0 to 6 inches) and subsoil (approximately 6 to 22 inches) are stockpiled separately. Surface Soil Storage Area A1 consists of topsoil, and Surface Soil Storage Areas A2 and A3 are subsoil stockpiles; all three are west of the TSF. Surface Soil Storage Area B is topsoil and is north of the TSF. Surface Soil Storage Area C is topsoil and is at the plant site. Soil borrow areas are west of the TSF (**Figure 2.1-1**).

### 2.1.7. Closure and Reclamation

This section summarizes mine reclamation activities that would occur under the No Action Alternative, as detailed in the CORP (SMC 2016), which was submitted to the agencies by SMC on June 30, 2016. The following reclamation objectives are stated and defined in the CORP:

- Control erosion to the greatest extent feasible;
- Provide vegetative cover appropriate to the future use of the land and that meets federal, state, and county standards for noxious weed control;
- Maintain comparable utility and stability as that of adjacent undisturbed areas;
- Ensure long-term public safety;
- Protect air, surface water, and groundwater resources at the site and adjacent lands;
- Provide permanent landscaping and contouring to minimize precipitation infiltration into disturbed areas;
- Provide for long-term vegetation community stability and function; and
- Provide measures to prevent objectionable post-mining groundwater discharges.

Reclamation activities are summarized below for operations (concurrent reclamation) and closure/post-closure. Underground decommissioning is expected to take from 6 to 12 weeks; closure is estimated to take approximately 3 years; post-closure activities are estimated to occur for 5 years (see CORP Table 4-3 [SMC 2016]). Standard revegetation/reclamation methods used for each of these phases include the use of salvaged topsoil on the surface, the use of a Forest Service-approved seed mix, the use of standard BMPs to manage storm water and prevent erosion, and monitoring and maintenance of revegetated areas (SMC 2016).

#### *2.1.7.1. Concurrent Reclamation*

To the extent practicable, reclamation is conducted concurrent with mining operations to control erosion and the spread of noxious weeds. Concurrent reclamation has occurred since the start of operations in 2002, with a focus on the power line corridor, soil stockpiles, cut and fill slopes, borrow areas, percolation pond slopes, and TSF embankment slopes. Current reclamation status within the permit boundary are provided in the Operating Permit Annual Reports submitted by SMC to the agencies.

#### *2.1.7.2. Closure and Post-Closure Reclamation*

Reclamation activities during closure are summarized below by facility per the CORP (SMC 2016).

### TSF Pond and Embankment

In the No Action Alternative, the TSF would be closed and reclaimed at the end of mining operations. Storage capacity of Stage 5 would be met around 2027. Post-closure configuration and topography of the TSF is presented in Drawing No. 14 in the CORP (SMC 2016). TSF reclamation activities would include:

- Continued partial dewatering of the tailings;
- Surface cap construction over the tailings surface by placing 24 inches of waste rock and/or borrow material followed by 28 inches of subsoil/topsoil;
- Excavation and contouring of the embankment crest to create an undulating, nonsymmetrical surface (for improved aesthetics);
- Placement of 28 inches of subsoil/topsoil on the embankment crest and embankment slopes;
- Sloping tails surface toward the south side of the TSF to facilitate surface drainage to the percolation pond;
- Placement of erratic boulders on surface cap;
- Revegetation of the embankment; and
- Construction of a seepage outlet channel that will pass storm water.

### Surface Facilities and Roads

All buildings and other infrastructure would be removed from the site at closure, and recycled or salvaged where possible. Most concrete foundations would be broken and buried in place. The percolation pond would remain in place as part of the storm water management system (see Drawings No. 14 and 18 in the CORP [SMC 2016]). All disturbed areas would be contoured, covered with topsoil, and revegetated.

The main site access road (East Boulder Road) and various other site roads would remain in place to provide access for long-term monitoring, as well as for potential recreation access. Any roads, parking, and laydown areas not required for monitoring or other uses would be ripped, recontoured, covered with topsoil, and revegetated. The power line corridor has already been reclaimed and revegetated. The substation and power line would be removed from the site post-closure.

Once agencies are satisfied that water quality standards are being met, all monitoring wells would be reclaimed by removing the pumps, cutting the well casing off below the ground surface, or pulling the casing out and plugging the holes. Monitoring well closure would be completed in compliance with Montana standards specific to well abandonment (ARM 36.21.810).

Fencing would be removed from the site once closure activities are complete and the site has been deemed safe for the public and wildlife.

### Water Management

Water treatment and water management methods for closure were analyzed in the 2012 Final Stillwater Mining Company's Revised Water Management Plans and Boe Ranch LAD FEIS (DEQ

and USDA 2012a) and are summarized here. In the No Action Alternative, treatment of water from the mine would continue uninterrupted during the operation/closure transition.

*TSF Water Management*. TSF water management during closure is described in the CORP Appendix H2 (Closure Water Management Measures) and is summarized here. The TSF pond would be dewatered at closure, and the reclamation cover would be constructed. During closure, supernatant water (water in the pond over the tailings mass) would be pumped from the supernatant pond overlying the tailings surface to the WTP prior to placement of the reclamation cap. During post-closure, there would no longer be a supernatant pond, and management of supernatant water would not be required. Tailings mass water (water contained within the tailings) would be released from the tailings mass, as tailings consolidate under their own weight and as the reclamation cover is placed. The released water would transfer either to a low-point sump or to the basin underdrain system. Post-closure, the basin underdrain would remain open. The collection sump and pumphouse would be removed, and the area would be modified to a natural percolation basin into which the underdrain would flow. Water reporting to the natural percolation basin would percolate through the substrate and into the underlying groundwater system.

Three types of channels would be constructed for TSF water and storm water conveyance: the drainage swale, the (percolation pond) outlet channel, and closure ditches. Each of the channels is designed to convey the 1-in-100-year, 24-hour rainfall storm event. During closure, runoff from and into the TSF cap would be conveyed to the drainage swale to be constructed at the south end of the TSF—to be further conveyed to the percolation pond for disposal—or to the water treatment system, depending on water quality during closure. The final tailings surface of the reclamation cover would slope 1 percent toward the channel inlet to convey the runoff to the drainage swale. Post-closure, the water treatment system would be decommissioned, and surface runoff and seepage would be conveyed to the percolation ponds via the drainage swale or via the basin underdrain. During larger storm events, overflow from the percolation pond would be conveyed to the outlet channel and further conveyed to the East Boulder River. In addition to the drainage swale and outlet channel, five closure ditches would convey storm water from the plant site and upstream areas.

During closure, the embankment underdrain water would continue to be pumped to the WTP as required. During post-closure, the embankment underdrain collection pond would be decommissioned by removal of the liner and modified to a natural percolation basin.

At closure, the TSF waters pumped to the WTP could be discharged to the percolation pond, to land application at the Boe Ranch, or to the East Boulder River. Land application only would be used for additional reduction of nitrogen if compliance with MPDES permit No. MT0026808 limits are not met via discharge to the percolation pond at closure. Alternatively, if nitrogen levels are in compliance with MPDES limits, treated water may be discharged directly to the East Boulder River.

*Storm Water Drainage Channels and Seepage Outlet Channel*. As described above, the seepage outlet channel would be located on the south side of the impoundment (see CORP [SMC 2016] Drawing No. 14 for the location of the storm water channel). The channel alignment would start

on top of the TSF, travel down the south TSF embankment, continue across the reclaimed plant site area, and discharge into the percolation pond. From the percolation pond, overflows would be conveyed along a meandering outlet channel to the East Boulder River.

The drainage swale would convey storm water (runoff and cap infiltration) from the surface of the closed impoundment. Some storm water would infiltrate into the tailings during conveyance and report to the underdrain seepage collection system. The drainage swale would also convey runoff within the channel catchment area itself. The outlet channel would convey the flows from the drainage swale as well as runoff from the channel, percolation pond catchment areas, and upslope catchment areas.

The swale and channel would be excavated along the proposed alignment. Riprap and/or vegetation would be used to line the swale and channel at various locations along the alignment to armor them against erosion. The riprap would have a range of rock sizes, including boulders, to mimic a more natural environment. Other measures would be implemented at various locations along the channel and swale to provide a more naturalized appearance including the installation of deflector logs and embedded root masses, construction of rock berms, and localized widening of the channel (SMC 2016).

In addition to the drainage swale and overflow channel described above, five other storm water channels would be constructed as part of the reclamation measures. These would include a diversion channel located along the southwest side of the TSF and the adit discharge channel located between the portals and the percolation pond. Swales and channels would be designed to pass the peak flows resulting from the 1-in-100-year, 24-hour rainfall event, and to allow for overbank flooding without compromising functionality. Flow volumes at the 1-in-100-year recurrence interval were modeled using current conditions.

### Boe Ranch LAD

The Boe Ranch LAD was authorized by the agencies in 2012 (DEQ and Forest Service 2012b), but has not been constructed yet. Once constructed, operation of the Boe Ranch LAD facilities would continue throughout closure. During closure, the Boe Ranch LAD system would be operated at greater than agronomic rates, if required, to ensure flushing of accumulated salts from the soil. After closure, the Boe Ranch LAD center pivots and LAD storage pond would be left in place for long-term agricultural use. The storage pond embankment height would be reduced so that the impoundment would retain less than 50 acre-feet of water, which would be below the regulatory threshold for a high hazard dam classification. Any areas of disturbance resulting from the reduction of the LAD storage pond embankment would be reclaimed.

### Monitoring and Maintenance

Periodic monitoring and maintenance would be required throughout closure and post-closure periods including monitoring of the physical stability of mine site components (e.g., TSF) and water management structures (e.g., ponds and channels), as well as groundwater and surface water quality monitoring. The water quality monitoring schedule during closure and post-closure is presented in CORP Appendix H3 (SMC 2016).

Physical inspections of the TSF would be conducted by the Engineer of Record on an annual basis during closure (Years 1 through 3) and post-closure (Years 4 through 8). Physical inspections of other surface structures including water management features, reclaimed mine entrances, and reclaimed slopes would be conducted by a qualified engineer. If any physical instability of the TSF or other surface structure is observed during site inspections, the frequency of monitoring may be increased until both stability and safety can be assured. Periodic review of the TSF closure by the Independent Review Panel (IRP) would also be completed at least once every 5 years, per 82-4-380, MCA.

Following Year 8 of monitoring after closure, monitoring would be discontinued, assuming satisfactory results, and dependent on vegetation establishment, stability of reclaimed surfaces, and surface water and groundwater monitoring results. An extension of the monitoring period may be required based on actual site conditions following Year 8. Adjustments to the reclamation bond estimate would be made during the 5-year bond reviews as warranted.

Maintenance would be performed as needed based on monitoring findings. The following features would be maintained: percolation pond, storm water channels and basins, TSF cover and underdrain outlet structures, access roads, and surface water and groundwater monitoring sites. In addition, revegetated areas would be maintained through reseeding and weed control activities.

A schedule of monitoring and maintenance during the closure and post-closure periods is shown in CORP Table 4-3 (SMC 2016).

## 2.2. Proposed Action Alternative

The Proposed Action (Project) analyzed in this EA is Amendment 003 to Operating Permit No. 00149 and a revised East Boulder Mine Plan of Operations consistent with Revision 5 of the *Detailed Design for Stage 6 TSF Expansion* (Knight Piésold Ltd. 2020).

SMC first applied for Amendment 003 and a plan revision on November 30, 2017. SMC also submitted the Stage 6 design to an IRP as required by Title 82 Chapter 4 Part 3 Section 77 of the Montana Code Annotated (82-4-377, MCA). Since 2017, SMC has revised its proposed Stage 6 design five times to address comments from the agencies and IRP. SMC submitted Revision 5 (Knight Piésold Ltd. 2020) to the agencies on February 3, 2020. Revision 5 included the following modification's to SMC's application:

- changed the downstream slope of the TSF embankment from 1.75H to 1.9H at two locations to increase the offset between the downstream toe of the TSF embankment and the adjacent river (this was a modification required by the IRP; see IRP 2019);
- provided for inclusion of a rockfall bench adjacent to the embankment underdrain collection pond to increase the distance between the toe of the TSF embankment and the river by about 30 feet;
- included an option for relocation of the 69 Kilo Volt (KV) transmission line;
- expanded the borrow area for native material used in the Stage 6 TSF construction; and

- relocated a portion of soil stockpile area "A2" that is located above the proposed expanded borrow area, and storm diversion ditches and improvements to Lewis Gulch Road.

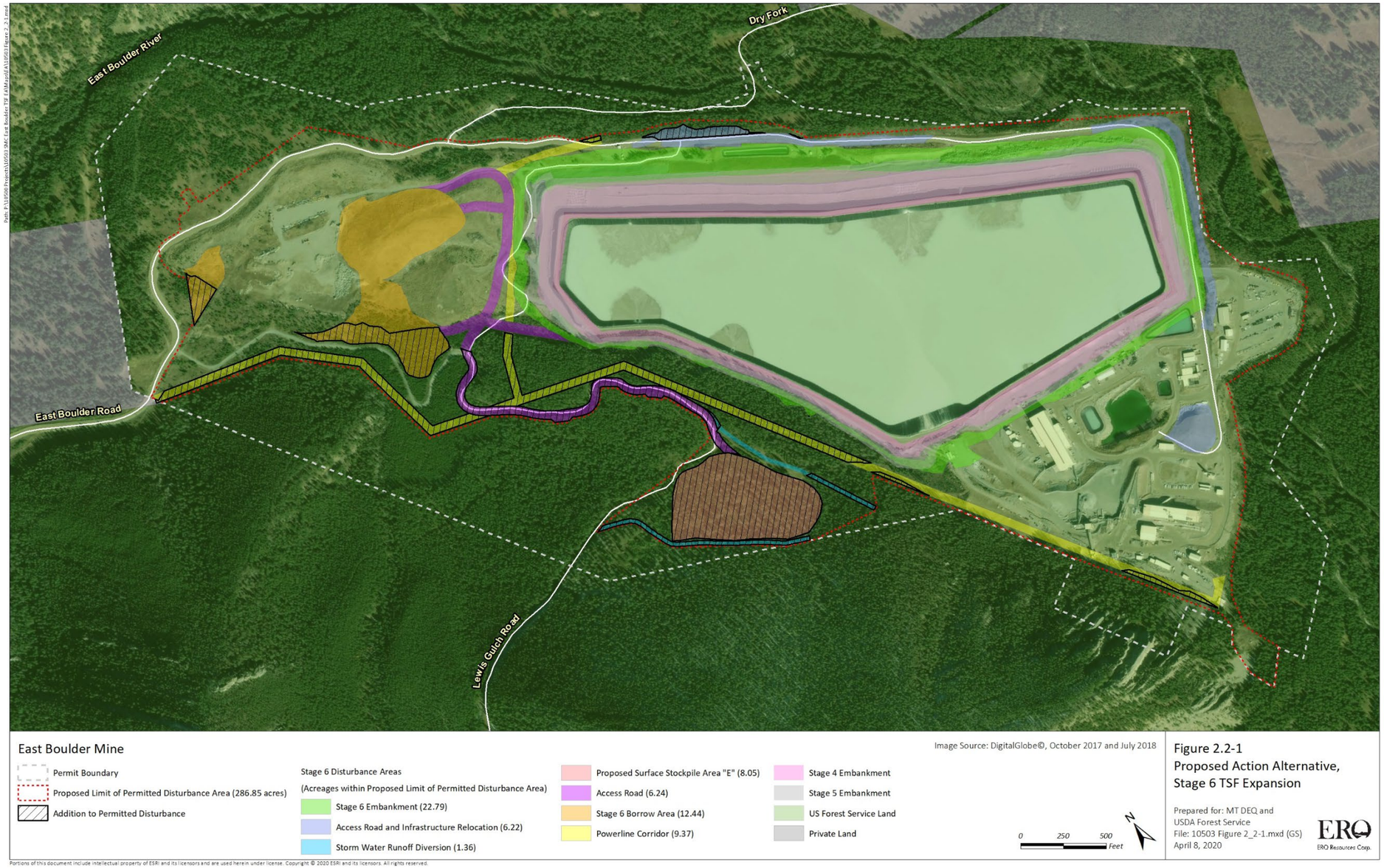
The Forest Service, DEQ, and IRP all reviewed Revision 5 (Knight Piésold Ltd. 2020). In a February 18, 2020 letter to SMC, the IRP concluded that steepening the downstream slope of the TSF near the critical section addressed the long-term risk associated with stability of the valley wall (IRP 2020; see also **Section 2.2.4, TSF**). On February 21, 2020, the Forest Service issued a letter to DEQ stating that they conducted an internal review of Revision 5 and had no concerns with the modification to the proposal (Forest Service 2020a). On March 4, 2020, DEQ responded to SMC by letter indicating that the extent of the changes proposed by SMC in Revision 5 (Knight Piésold Ltd. 2020) were "deemed not to be substantial changes in the amendment application" (DEQ 2020). DEQ concluded that the proposed changes do not impact DEQ's completeness and compliance determination nor the draft permit that was issued on March 6, 2019 (DEQ 2020). Based on these reviews, the Forest Service and DEQ determined that Revision 5 would be analyzed as the Proposed Action in this EA.

To evaluate the Proposed Action, the agencies commissioned three technical memorandums to be completed by an independent third-party consultant. Technical Memorandum 1 reviewed the analysis concerning avulsion/erosion of the TSF by the East Boulder River (Haley & Aldrich 2020a). Technical Memorandum 2 reviewed the Stage 6 TSF capping design (Haley & Aldrich 2020b). Technical Memorandum 3 reviewed the potential effects of the Stage 6 TSF upon groundwater and surface water quantity and quality (Haley & Aldrich 2020c). The results for each of the technical reviews are incorporated into the pertinent **Chapter 3** environmental consequences sections of this EA corresponding to each topic. All three technical memorandums are in the Project administrative record and available upon request (see **Sections 1.1** and **1.6** for website links to download the memorandums).

### 2.2.1. Summary of the Proposed Action

In the Proposed Action, DEQ would approve SMC's proposed Amendment 003 to Operating Permit No. 00149 and CGNF would approve a revised East Boulder Mine Plan of Operations consistent with Revision 5 (Knight Piésold Ltd. 2020). The approval would include any stipulations or required changes/modifications/special mitigations developed as a result of this NEPA/MEPA process. Proposed Project activities would occur within the existing 396.58-acre mine permit boundary (Project area) and would disturb 66.11 acres within the proposed 286.85-acre disturbance boundary. **Table 2.2-1** and **Figure 2.2-1** presents an overview of changes to the site under the Proposed Action; see Drawing No. 0010 in Appendix A of Knight Piésold Ltd. 2020 for additional details.

[This page left blank for double-sided printing]




Source: Knight Piésold Ltd. 2020

**Figure 2.2-1 Proposed Action Alternative, Stage 6 TSF Expansion**

[This page left blank for double-sided printing]

**Table 2.2-1**
**Proposed Project Disturbance**

| Project Activities | *Existing 238-acre Bonded and Permitted Disturbance Area* | | *Proposed 286.85-acre Disturbance Area* |
|---|---|---|---|
| | **Project Disturbance Within Permitted and Bonded Disturbance Area (acres)** | **Project Disturbance Outside Permitted and Bonded Disturbance Area (acres)** | **Project Disturbance within Expanded Disturbance Area (acres)** |
| Lewis Gulch Road Improvements | 3.62 | 2.62 | **6.24** |
| East Boulder Road and Associated Infrastructure Relocations (Guard House, wildlife exclusion fence, etc.) | 5.50 | 0.72 | **6.22** |
| Power Line and Associated Corridor | 3.49 | 5.88 | **9.37** |
| Storm Water Runoff Diversion | 0.33 | 1.03 | **1.36** |
| Soil Stockpile Area "E" | 0.00 | 8.05 | **8.05** |
| Stage 6 Borrow Area | 9.25 | 3.19 | **12.44** |
| Stage 6 Embankment | 22.79 | 0.00 | **22.79** |
| **Total** | **44.62** | **21.49** | **66.11** |

Source: Knight Piésold Ltd. 2020
Note: acreages are approximate due to rounding errors.

In the Proposed Action, SMC would make the following changes to the Operating Plan described in its CORP. Each of these components are presented in greater detail below for construction and operations. See **Figure 2.2-1** for an overview of the permitted mine site and the components of the Proposed Action:

- Raise the TSF by 14 feet (Stage 6) above Stage 5 to an elevation of 6,344 feet with an upstream/downstream slope of 2.0(Height): 1(Vertical) along with two steepened slope areas along the north embankment of 1.75 to 1.9:1 to increase the offset between the downstream toe of the TSF embankment and the adjacent river escarpment; and provide a rockfall bench adjacent to the Embankment Underdrain Collection Pond;
- Maximum tailings filling elevation of 6,338 feet;
- Maximum embankment height of 156 feet with a crest width of 21 feet;
- Similar construction method as earlier phases, including installation of geosynthetic lining and installation of instruments to monitor for potential movement;
- Extension of the TSF operation from 2027 and 2033 (based on current production);
- Expansion of the borrow area;
- Improvement of portions of Lewis Gulch Road;
- Construction of a new surface soil storage area and associated construction of new storm water diversion and conveyance structures;
- Timber harvest in areas of new disturbance;
- Relocation of:

  - Mine water recycle pond;
  - Tailings delivery and water reclaim system pipes;
  - Basin underdrain and embankment underdrain collection systems;
  - Portions of the East Boulder Road (main access road), power line, Boe Ranch LAD pipeline, and the wildlife exclusion fence;
  - Guard House;
  - Topsoil from Surface Soil Storage Area C and Surface Soil Storage Area B to Surface Soil Storage Area A1; and
  - A portion of subsoil from Surface Soil Storage Area A2 to the newly constructed Surface Soil Storage Area E.
- An expanded disturbance boundary (286.85 acres instead of 238 acres);
  - 66.11 acres would be disturbed within the proposed disturbance boundary (**Figure 2.2-1** and **Table 2.2-1**);
  - In terms of the currently permitted and bonded 238-acre disturbance boundary, 44.62 acres within and 21.49 acres outside would be disturbed (see **Table 2.2-1**).

The sections below provide additional detail on proposed Project activities that have not already been completed and permitted (as described above in **Section 2.1, No Action Alternative**).

### 2.2.2. Construction Activities

The Stage 6 embankment would be constructed using the same downstream methods as Stages 1 through 5: SMC would use ROM rockfill and would incorporate glacial till material from the permitted borrow area north of the TSF (**Figure 2.2-1**). A geosynthetic liner would be extended from Stage 5 and installed on the upstream slopes of the Stage 6 embankment.

The total new disturbance within the existing permit boundary would be approximately 66.11 acres (see **Table 2.2-1** and **Figure 2.2-1**). For Project activities, SMC would use standard construction vehicles and equipment, such as pickup trucks, haul trucks, dump trucks, backhoes, excavators, and bulldozers. Construction would follow the Construction Management Plan prepared for the Project (Knight Piésold Ltd. 2017), which includes parameters and levels of acceptability for quality control and quality assurance purposes, frequency of sampling, amount of oversight, qualifications of the oversight personnel, and role of the IRP during and after construction.

As with the No Action Alternative, standard BMPs would be employed during construction, including concurrent reclamation and stabilization of disturbed areas to control erosion, and sediment control using berms and sediment traps where appropriate; these BMPs would be included in SMC's Storm Water Pollution Prevention Plan that would be developed for the Project.

The duration of construction would be approximately 7 years. Beginning in year 1 (assumed to be 2020 for this analysis), SMC would relocate stockpiles and portions of the access road, power line, and fence. In year 2 (2021 is assumed), SMC would relocate the mine water recycle pond, pumps, pipelines, and the underdrain collection system. SMC would then engage in Stage

6 foundation preparation in year 3 (2022 is assumed). Stage 6 embankment fill placement would occur from year 4 through year 7 (2023 through 2027 is assumed).

### 2.2.3. Plant Site

The mine water recycle pond and associated pumphouse would be relocated to the current Surface Soil Storage Area C location, and Surface Soil Storage Area C would be relocated to the Surface Soil Storage Area A1 west of the TSF. Materials stored in the Mill/TSF Laydown would be relocated to other established laydown areas on the mine site. Other buildings and infrastructure would remain unchanged at the plant site.

### 2.2.4. TSF

#### *2.2.4.1. TSF Embankment*

Stage 6 would raise the TSF embankment an additional 14 feet in elevation above Stage 5 to provide approximately 1.8 million cubic yards of additional storage capacity between 2027 and 2033 (at current production levels). The primary goal of raising the TSF is to provide secure storage for tailings and process water while protecting groundwater and surface water.

#### *2.2.4.2. TSF Basin and Embankment Underdrains*

The basin underdrain outlet pipes would be extended and the basin underdrain collection sump and basin underdrain return pipeline would be relocated outside of the Stage 6 embankment footprint. The basin underdrain would continue to be operated, and water would be transferred to the WTP as required to maintain an appropriate pond volume in the TSF.

The embankment underdrain drainpipe would be extended, and the embankment underdrain collection sump and embankment underdrain water transfer pipeline would be relocated outside of the Stage 6 embankment footprint.

#### *2.2.4.3. Tailings Delivery and Reclaim Water System*

The tailings delivery system would function the same as in Stage 5, but the tailings delivery pipework would be moved during Project construction and relocated to the embankment crest following installation of the geosynthetic lining system.

The water reclaim pipework would be relocated to the Stage 6 embankment crest following installation of the geosynthetic lining system. The reclaim pumps would be progressively raised with TSF basin filling.

### 2.2.5. Monitoring Instrumentation

SMC proposes the following changes to instrumentation in the Proposed Action:

- Existing piezometer leads installed during previous TSF stages would be extended with the Stage 6 embankment raise along with the installation of five new slope inclinometers and ten vibrating wire piezometers;

- The 12 survey monuments on the TSF embankment would be relocated to the crest along with the installation of 2 new survey monuments on the East Boulder River escarpment crest to monitor the riverbank for potential movement;
- Existing slope inclinometer casings on the north toe of the TSF embankment would be extended along with the installation of one new slope inclinometer along the river escarpment; monitoring wells EBMW-3, EBMW-4, EBMW-6 and EBMW-7 would be extended, or decommissioned and relocated; monitoring well EBMW-4A would be decommissioned and relocated (see **Figure 3.4-1** in **Section 3.4, Groundwater Hydrology** for well locations); and
- Flow monitoring station EBR-003 would be reestablished to monitor flow levels in the East Boulder River.

Other instrumentation would remain the same as described in **Section 2.1.4** for the No Action Alternative.

### 2.2.6. Access Roads

New access roads, improvements to roads, and relocations would be within the permit boundary. A short portion of the East Boulder Road (main access road) north of the TSF would be relocated farther north for construction of the Stage 6 embankment. New access roads would also be constructed to access the Stage 6 borrow area west of the TSF. An approximately 0.25-mile section of the Lewis Gulch Road would be used to haul soil from Surface Soil Storage Area A2 at the Stage 6 borrow area to the new Surface Soil Storage Area E to facilitate the borrow area boundary adjustment. Improvements to the section of Lewis Gulch Road would be needed to maintain a single lane haul road with pullouts. The existing Lewis Gulch Road has an approximately 18-foot-wide running surface; modification of this surface would be required for haul truck traffic; the required width would vary based on topography, storm water controls, and safety berms (Knight Piésold Ltd. 2020). Some timber removal would be required in areas where the road would be widened (see **Section 2.2.9, Merchantable Timber**). Excess materials from the road modification would be treated as borrow and used for TSF construction. SMC proposes two options for managing traffic on Lewis Gulch Road during improvement work: (1) seek Forest Service approval to close the section of the road during construction when trucks are hauling soil (approximately 2 months); or (2) install remote control traffic signals (controlled by the truck operators) for the 0.25-mile section where trucks would be hauling. The selected options would be incorporated into the traffic plan for the Project (see additional discussion in **Section 3.11, Recreation**).

### 2.2.7. Power Line, Fencing, Boe Ranch LAD, Guard House, and Storm Water Runoff Diversion Structures

Sections of the wildlife exclusion fence, Boe Ranch LAD pipeline, and Guard House would be relocated further north and east to accommodate the extension of the Stage 6 embankment slope. Two storm water diversion structures associated with the new Surface Soil Storage Area E would be constructed as part of the storm water management plan, portions of which would be located outside of the permitted disturbance area.

A section of the power line north of the current TSF embankment would also need to be relocated for construction of the Stage 6 embankment, and two options are proposed for power line relocation routes (both options are considered as part of the Proposed Action). The north option would route a short section (approximately 10 new power poles) of the power line to just north of the proposed Stage 6 embankment. The south option would relocate the power line (approximately 24 power poles) along the south side of Lewis Gulch Road, with a secondary line extending north (6 power poles) to the Guard House and underdrain systems. Both relocation options would require a 60-foot-wide cleared corridor for construction and maintenance.

### 2.2.8. Soil Stockpile and Borrow Areas

Three soil stockpiles would be relocated under the Proposed Action. Surface Soil Storage Areas B and C would be relocated to the Surface Soil Storage Area A1 west of the TSF. A portion of Surface Soil Storage Area A2 located in the Stage 6 borrow area west of the TSF would be relocated to the new Surface Soil Storage Area E, proposed above Lewis Gulch Road in an area currently approved for disposition of treated water. Surface Soil Storage Area E would be located within the existing mine permit boundary area and would require some clearing of timber (see **Section 2.2.9, Merchantable Timber**).

The Stage 6 TSF embankment construction would require additional borrow material, to be sourced from the Stage 6 borrow area west of the TSF. The Stage 6 borrow area would be expanded to the south toward Lewis Gulch Road (**Figure 2.2-1**). Topsoil would be salvaged from newly disturbed areas for final reclamation.

### 2.2.9. Merchantable Timber

Merchantable logs, poles, and firewood created during the Proposed Action would not be removed by SMC without further authorization and payment (see **Table 1.3-1** in **Chapter 1** for required authorization for this action). The Forest Service reserves ownership and the right to sell any merchantable timber and may choose to sell directly to SMC or may advertise the volume and award it to a third party. Salvaged logs would be separated and decked according to product in a secure location until they are valued and disposed of by recommendation of the Authorized Officer.

### 2.2.10. Closure and Reclamation

As with the No Action Alternative (see **Section 2.1.7, Closure and Reclamation** in the Proposed Action), SMC would adhere to the reclamation criteria identified in its 2016 CORP (SMC 2016). Among other objectives, the reclamation plan provides for the reclamation of all disturbed land to comparable utility and stability as that of adjacent areas, as required by 82-4-336(9)(a), MCA. Also, in accordance with 36 CFR 228.8(g), SMC would be required to reclaim the surface disturbed in operations by taking such measures that will prevent or control onsite and offsite damage to the environment and forest surface resources including control of erosion and landslides; control of water runoff; isolation; removal or control of toxic materials; reshaping

and revegetation of disturbed areas, where reasonably practicable; and rehabilitation of fisheries and wildlife habitat.

Three potential closure scenarios exist in the Proposed Action:

1) Closure at the end of the Stage 6 TSF filling: closure of the mine coincides with the Stage 6 TSF reaching its designed fill capacity;
2) Closure beyond the period where Stage 6 TSF is in use: the mine fills Stage 6 TSF to capacity but continues to operate with tailings deposition and process water management transitioned to a future TSF; or
3) Premature closure: the mine is closed prematurely and tailings deposition ceases prior to Stage 6 TSF reaching capacity (Knight Piésold Ltd. 2020).

Reclamation of the TSF under the Proposed Action would be similar as under the No Action Alternative, as described in the CORP (SMC 2016) and summarized above in **Section 2.1.7, Closure and Reclamation**, with the following changes detailed in Revision 5 of the Detailed Design for Stage 6 TSF Expansion (Knight Piésold Ltd. 2020):

- Reclamation of the TSF would require a larger volume of waste rock and soil;
- The final embankment would have a crest width of 21 feet, height of 156 feet, and elevation of 6,344 feet; and
- The active closure phase would take 3 years. This would include up to 18 months to treat adit water and dewater tailings during closure as outlined in the CORP (SMC 2016).

### 2.2.11. Monitoring and Maintenance

The CORP (SMC 2016) identifies various post-closure monitoring activities that would extend to 8 years after shutdown (see CORP Table 4-3 and summary above in **Section 2.1.7.2, Closure and Post-Closure Reclamation, Monitoring and Maintenance**). Following the eighth year of monitoring after closure, assuming reclamation has achieved comparable utility and stability as that of adjacent areas and Forest Service regulations have been met, monitoring would be discontinued. The assessment would depend on vegetation establishment, stability of reclaimed surfaces, and surface water and groundwater monitoring results. An extension of the monitoring period may be required based on actual site conditions following the eighth year of monitoring. The agencies and SMC would review the appropriateness of this assumption as more data from the site are collected during operations (SMC 2016; CORP, p. 180). Adjustments to the reclamation bond estimate would be made during the 5-year bond reviews as warranted. At any time during operations under an approved plan of operations, the authorized officer may ask the operator to furnish a proposed modification of the plan detailing the means of minimizing unforeseen significant disturbance of surface resources (36 CFR 228.4(e)).

As proposed by SMC, all monitoring would be completed in accordance with the applicable environmental permits for the site. Monitoring, maintenance, and subsequent reporting will be conducted by SMC or third-party contractor(s) (SMC 2016; CORP, p. 180).The monitoring and maintenance schedule under the No Action Alternative is presented in CORP Table 4-3 (SMC 2016), which can be compared to the monitoring and maintenance schedule under the

Proposed Action presented in Revision 5 of the Detailed Design for Stage 6 TSF Expansion Table 10.4 (Knight Piésold Ltd. 2020). Monitoring and maintenance activities under the Proposed Action are the same as under the No Action Alternative, as described in the CORP (SMC 2016), with the following changes:

- East Boulder River bank stability monitoring: The two additional survey monuments (see **Section 2.3.5, Monitoring and Instrumentation**, above) would be installed on the downhill side of East Boulder Road along the East Boulder River bank and would be surveyed annually during spring runoff and after greater than 100-year precipitation events during active closure (4.6 inches of precipitation); and after greater than 500-year precipitation events during post-closure (5.5 inches of precipitation). See **Section 3.2.3.2.2, Riverbank Stability** for further discussion.
- TSF embankment stability monitoring: The stability of the TSF embankment and closure cap would be monitored monthly and after large storm events (3.8 inches of precipitation)[1]; during active closure (rather than annually); and after greater than 100-year precipitation events or an earthquake, during post-closure. See **Section 3.2.3.2.1, Embankment Stability** for further discussion.
- Drainage swale and outlet channel stability monitoring: The physical condition of the drainage swale and outlet channel would be monitored monthly and after large storm events (rather than annually) during active closure, and after greater than 100-year precipitation events or an earthquake, during post-closure. The drainage swale and outlet channel would only be maintained as required (rather than annually).

## 2.3. Mitigation Measures

The following mitigation measures would be additions to the Proposed Action to mitigate effects described in the **Chapter 3** resource subsections. The effects of the Proposed Action described in **Chapter 3** assume implementation of these mitigations.

- Vegetation (sensitive species) mitigation: SMC would conduct a sensitive species survey prior to construction. If sensitive plants are found, completion of surveys and successful application of protection measures are expected to mitigate any adverse impacts on sensitive species. See **Section 3.6, Vegetation**.
- Cultural resources mitigation: CGNF required SMC to redesign a portion of the access road relocation to completely avoid the Agate Bench site and to incorporate this mitigation into the Proposed Action as described in Revision 5 (Knight Piésold Ltd. 2020). An archaeologist would be present during implementation of the relocation and construction of the mine access road to identify the site and to ensure it is avoided. During construction, SMC also would place a protective barrier berm along the edge of the existing road above (to the south of) the site to ensure clearing and rubble material does not roll down the slope onto the Agate Bench site. See **Section 3.9, Cultural Resources**.

[1] Defined in Table 10.4 of Knight Piésold Ltd. 2020 as events greater than or equal to the 1-in-25-year precipitation event (3.8 inches of precipitation).

- Visual mitigation: during reclamation and closure, SMC would shape Stage 6 TSF to reflect a more natural landform, including topography variation and boulder placement, especially on the west side of the TSF, where the TSF can be viewed from the East Boulder Road. This would ensure that the Stage 6 west side TSF crest breaks up the horizontal line from viewers along the road.
- Reclamation mitigation: at closer proximity to closure, additional investigations and analysis should be conducted to ensure proper cap design, ensure proper execution of cap contouring, and facilitate a successful positive surface drainage (Haley & Aldrich 2020b). See **Section 3.3, Reclamation**.

## 2.4. Summary of the Environmental Consequences

**Table 2.4-1** below provides a brief summary of the expected impacts on each resource and associated issue from the No Action Alternative and Proposed Action. A detailed discussion of effects is in **Chapter 3, Affected Environment and Environmental Consequences**.

**Table 2.4-1**
**Summary of Environmental Consequences**

| Resource | No Action Alternative | Proposed Action Alternative |
|---|---|---|
| Geotechnical Stability | There would be no effects beyond those previously analyzed and disclosed in the 1992 FEIS (DSL et al. 1992). The TSF embankment would remain stable and the foundation material is not susceptible to liquefaction during an earthquake.<br><br>A TSF breach analysis developed for Stage 3 indicated the existing potential for damage to buildings/structures, loss of life, and release of fine-grained materials to the East Boulder River and Yellowstone River.<br><br>Conditions representative of completion of Stage 5 present the possibility of a greater release of tailings fluid and solids to the East Boulder River and downstream receiving waters if a failure were to occur. | Stability analyses indicate the minimum required factor of safety (FoS) would be met or exceeded at the locations analyzed and that an uncontrolled release of material from the TSF due to a reduction in material strength parameters or an earthquake is very unlikely in both the short term and long term but cannot be ruled out.<br><br>The risk of embankment failure due to riverbank erosion and unknown adverse foundation conditions leading to progressive embankment instability is considered medium (Knight Piésold Ltd. 2020). However, the amount of riverbank erosion and lateral migration necessary to compromise the TSF embankment is unlikely to occur. Revisions made to the design, such as increasing the downstream dam toe set-back distance from the riverbank, reduce the long-term risk, could be accomplished without compromising dam slope stability FoS, and eliminate the need for a Mechanically Stabilized Earth wall at the location.<br><br>In the unlikely event of a failure and release of tailings fluids and solids, downstream effects on surface water resources may not be much greater than that which would be observed under a failure of Stage 5. |
| Reclamation | Reclamation would be completed as described in the CORP (SMC 2016). Full reclamation, which would be completed 5 years earlier (2027) than under the Proposed Action (2033), would continue to reestablish pre-mining conditions and post-mine land use (wildlife habitat). | Similar impacts and reclamation benefits as the No Action Alternative; however, the Proposed Action could result in additional runoff and erosion potential due to an increase in TSF height by 14 additional feet and an increased TSF surface area. A larger volume of waste rock and soil for the TSF cap would be |

| Resource | No Action Alternative | Proposed Action Alternative |
|---|---|---|
| | | needed than in the No Action Alternative, as well as an increase in the amount of seed mix necessary for revegetation.<br><br>**Mitigation:** Closer to closure, additional investigations and analysis should be conducted to ensure proper cap design, ensure proper execution of cap contouring, and facilitate a successful positive surface drainage.<br><br>To minimize reclamation uncertainties, the Forest Service may consider the need for monitoring and maintenance beyond joint reclamation bond release to ensure vegetation success, proper functioning of the drainage channels and sediment pond, cap settlement and pond formation, and river channel stability. |
| Groundwater Hydrology | Effects would be similar to the effects described in the 2012 FEIS (DEQ and Forest Service 2012a) with impacts on groundwater from dissolved salts and nitrogen being less than those disclosed due to implementation of mitigation measures.<br><br>The need for closure treatment is anticipated to be short in duration (up to 18 months; DEQ and Forest Service 2012a).<br><br>Post-closure, SMC would not have to treat adit water once discharge concentrations comply with groundwater quality criteria and the MPDES permit nitrogen load limit. | Dissolved salts and nitrogen impacts on groundwater quality would be similar to the No Action Alternative. During construction, the potential exists for a minor short-term impact from the release of residual nitrogen from waste rock to groundwater prior to completion of extension of the embankment underdrain capture system. SMC is expected to continue to meet state groundwater quality standards and all applicable groundwater beneficial use standards during Project operations.<br><br>During closure and post-closure, the Proposed Action impacts would be the same as described under the No Action Alternative. |
| Surface Water Hydrology | No additional effects other than those previously analyzed and disclosed in the 1992 FEIS (DSL et al. 1992) and the 2012 FEIS (DEQ and Forest Service 2012a) would occur. Potential for surface water quantity and quality impacts related to storm water discharges, adit water discharges, and TSF seepage are unlikely due to implementation of onsite | Impacts from storm water discharge would be the same as described under the No Action Alternative. The timeframe required for post-closure densification of the tailings and cover stabilization would be similar to the No Action Alternative. Post-closure monitoring activities would determine the extent to |

| Resource | No Action Alternative | Proposed Action Alternative |
|---|---|---|
| | physical controls, discharge limits and monitoring activities required by MPDES Permit No. MTR000503 (storm water), and MPDES Permit No. MT0026808 (all other discharges). | which continued maintenance of the drainage swale and sediment basin is necessary.<br><br>Adit water conditions would be the same as described under the No Action Alternative and are not expected to have a measurable impact.<br><br>The potential for TSF seepage issues would be minimal or unlikely due to the design of the TSF and are not expected to create any measurable impacts.<br><br>Adverse effects associated with TSF stability for the construction, operations, and closure phases would be unlikely. |
| Vegetation | Reclamation would be completed as described in the CORP (SMC 2016). Full reclamation, which would be completed 5 years earlier (2027) than under the Proposed Action (2033), would continue to reestablish pre-mining conditions and post-mine land use (wildlife habitat). There would be no additional adverse impacts on vegetation.<br><br>SMC would continue to implement its weed management plan. | 66.11 acres would be disturbed. About 1.48 acres of the new disturbance would be within already developed/unvegetated areas.<br><br>No effect on ESA-listed plant species because none are designated for CGNF. Implementation of mitigation would limit the potential for adverse impacts on sensitive species.<br><br>SMC would continue to implement its weed management plan. The spread of weeds is not expected to increase.<br><br>**Mitigation:** Sensitive plant species surveys prior to construction and application of protective measures and mitigation. |
| Wildlife | Reclamation would be completed as described in the CORP (SMC 2016). Full reclamation, which would be completed 5 years earlier (2027) than under the Proposed Action (2033), would continue to reestablish pre-mining conditions and post-mine land use (wildlife habitat). There would be no additional adverse impacts on wildlife. | 66.11 acres would be disturbed. About 1.48 acres of the new disturbance would be within already developed/unvegetated areas. Temporary displacement of wildlife could occur during construction activities due to increased human activity and noise from heavy equipment. |

| Resource | No Action Alternative | Proposed Action Alternative |
|---|---|---|
| | | May affect, but is not likely to adversely affect, the grizzly bear, Canada lynx, and Canada lynx critical habitat, and would not jeopardize the continued existence of the North American wolverine distinct population segment.<br><br>Minor impacts on the following sensitive species: bald eagles, wolves, and harlequin ducks. Minor impacts on the following management indicator species (MIS): bald eagles, grizzly bears, elk, northern goshawks, and pine martens.<br><br>Potential direct and indirect impacts on bat species of concern (eastern red bat, hoary bat, and little brown myotis).<br><br>Possible impacts on nesting migratory birds. |
| Aquatic Biota | Impacts are not expected to vary beyond those disclosed in the 1992 FEIS and 2012 FEIS (DSL et al. 1992; DEQ and Forest Service 2012a).<br><br>Expected effects from nitrate pollutants in groundwater or surface water on aquatic habitat and biota as result of the No Action Alternative would be minimal.<br><br>Riverbank erosion and stability assessments indicate potential for channel migration is low (Knight Piésold Ltd. 2020), and changes to stream channel form or function would not likely occur. | Potential sediment-generating activities include major storm and runoff events combined with minor removal of vegetative forest cover; relocations of a road, power line, and topsoil stockpile; and potential failure of the TSF. Implementation of administrative standards, physical controls, and monitoring would minimize or eliminate the potential for offsite sediment effects on aquatic habitat and biota.<br><br>Expected effects from nitrate pollutants in groundwater or surface water on aquatic habitat and biota as result of the Proposed Action would be similar to the No Action Alternative.<br><br>The likelihood of channel migration is low, and the Stage 6 TSF embankment would remain stable during operations and after closure (Knight Piésold Ltd. 2020); changes to stream channel form or function would not likely occur.<br><br>No potential for the Project to affect the western glacier stonefly as there is no suitable habit in the analysis area. |

| Resource | No Action Alternative | Proposed Action Alternative |
|---|---|---|
| | | May impact individuals or habitat for Yellowstone cutthroat trout, other wild trout species, and western toad, but would not likely contribute to a trend toward federal listing or loss of viability. |
| Cultural Resources | No new impacts on cultural resources would be expected. | In Revision 5 to its application (Knight Piésold Ltd. 2020), SMC redesigned the access road relocation to avoid direct impacts on the Agate Bench site.<br><br>Indirect effects on potentially affected cultural resources as a result of vegetation clearing and rubble materials rolling onto the site during construction activities.<br><br>**Mitigation:** Place a protective barrier berm along the edge of the existing road to ensure material does not roll down the slope onto the Agate Bench site. |
| Socioeconomics | Mining operations, and the existing economic benefits of operations, would cease in November 2027, when the TSF would reach capacity.<br><br>The economic benefits from decommissioning and reclamation, while substantially lower than for operations, could continue through 2029.<br><br>A decline in mining employment, economic activity, and tax revenues after 2029, resulting in the following direct, indirect, and induced adverse impacts:<br>• Loss of 400 to 470 employees, roughly 15 percent of jobs in Sweet Grass County.<br>• Loss of about 1,430 jobs; an estimated two-thirds of these would be in south-central Montana.<br>• Loss of about $1,867,000 in Category 2 property taxes and metal mine license tax in Sweet Grass | Construction and operational economic benefits would extend beyond 2027 (No Action Alternative) to 2033. These include:<br>• Beneficial, direct, and short-term economic impacts through the continuation of more than 400 operational jobs generated by the East Boulder Mine for an additional 5 years as compared to the No Action Alternative.<br>• Beneficial, secondary, and short-term economic impacts through the continued indirect and induced job creation resulting from the mine operation for an additional 5 years, as compared to the No Action Alternative.<br>• Beneficial and short-term economic impacts, including both secondary and indirect impacts, through the continued generation of tax and other revenues for Sweet Grass County and Montana for an additional 5 years, as compared to the No Action Alternative. |

| Resource | No Action Alternative | Proposed Action Alternative |
|---|---|---|
| | County, representing about 26 percent of county revenues.<br>• Loss in income tax revenues and other property tax revenues, as well as school revenues.<br>• Associated loss of income and economic activity that supports area businesses.<br><br>Short-term adverse impacts through the low or very low risk of TSF failure that would negatively affect socioeconomics, including human health and safety and road infrastructure. | • Adverse and short-term impacts through the low or very low risk of Stage 6 TSF failure that would negatively affect socioeconomics, including human health and safety and road infrastructure.<br><br>The economic benefits from decommissioning and reclamation could continue through 2037, compared to the 2029 completion date under the No Action Alternative.<br><br>A decline in mining employment, economic activity, and tax revenues after 2037, resulting in direct, indirect, and induced adverse impacts, similar to the No Action Alternatives.<br><br>Effects of TSF failure would be the same as the No Action Alternative. |
| Recreation | Recreation would remain similar to current conditions. | Lewis Gulch Road improvements and widening would require full closure of the road for about six weeks. During this work, no recreation users or permitted outfitter guides would be able to use the road, resulting in short-term adverse effects on recreation users and outfitter guides. Alternative recreational opportunities and a traffic control plan that includes public communication measures to notify the public of proposed road closure dates would minimize impacts on recreation users and outfitter guides. |

# 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

**Chapter 3** describes the affected environment (existing setting or baseline conditions) and the environmental consequences (impacts or effects) that would occur as a result of implementing the No Action Alternative or Proposed Action. The analysis considers the direct, indirect, and cumulative effects on identified resource issues in determining if the alternatives could result in impacts that are significant, requiring the preparation of an EIS. See **Chapter 8, Terminology** for definitions of terminology used in the analysis. **Appendix A** provides the rationale for which resource issues were considered in the analysis.

## 3.1. DESCRIPTION OF CUMULATIVE ACTIONS

The following subsection briefly describes the past, present or ongoing, and reasonably foreseeable future related actions that could cumulatively impact specific resources evaluated in this EA (see **Section 8.1, Definitions Used in Impact Analyses**; effects of each type of action are described in each resource section (**Sections 3.2** through **3.11**). The permitting, construction, operation, and reclamation and closure are not considered cumulative actions as they are a continuation of the No Action Alternative and were fully analyzed in the 1992 FEIS (DSL et al. 1992).

### 3.1.1. Past Actions

Forest fires and fire suppression: Wildfires have historically shaped the landscape around the mine permit boundary (CGNF 2011). In recent years, fire suppression around the mine has changed the vegetated landscape.

Timber harvest: Timber harvest in the area has occurred in the past in various areas around the mine permit boundary. Even-aged harvest has occurred on the west and south sides of the permit boundary (CGNF 2011).

Recreation: Hiking and dispersed recreation occurs around the mine permit boundary. Access to the mine is restricted. Winter recreation such as snowmobiling and snowshoeing also occurs in areas around the permit boundary.

Hunting and fishing: Anglers fish the East Boulder River on the north side of the permit boundary, though recreation fishing pressure is low in the area. Hunters access the areas around the mine permit boundary during state-managed hunting seasons.

Road building and maintenance: Construction in 1983 and annual maintenance of the East Boulder Road has facilitated the development of the mine and allowed for Forest Service and public access to areas around the permit boundary. Maintenance includes plowing in the winter and grading as conditions warrant.

Boe Ranch Pipeline: Construction of a buried pipeline to the Boe Ranch in the NFS Road 205 road prism. The pipeline is regularly maintained.

Power line development and maintenance: In 1996, Park Electric cleared and constructed a power line, which was extended to the mine in 1999.

Noxious weed treatments: Weed treatments are conducted annually along the East Boulder Road, power line right-of-way, and around the mine site by SMC, the Forest Service, and Sweet Grass County.

### 3.1.2. Present or Ongoing Actions

Ongoing mining related activities, recreation, hunting and fishing, road, Boe Ranch pipeline, and power line maintenance, and noxious weed treatments described above continue to occur.

### 3.1.3. Future Actions

Recreation, hunting and fishing, road and power line maintenance, and noxious weed treatments described above would continue to occur.

East Boulder fuels reduction projects: The Forest Service would conduct fuel reduction projects through timber harvest in areas along the East Boulder Road and adjacent to the mine permit boundary. For more detail, see the East Boulder Fuels Reduction Projects, Revised Environmental Assessment (CGNF 2011).

Mine development and expansion: There is an out-year proposal being developed by SMC for future expansion at the East Boulder Mine. Final design and locations have not been finalized at this time to be fully considered in this EA. Continued mining activity at the East Boulder Mine can be anticipated, and the agencies will consider the cumulative effects of the Proposed Action (Stage 6) in relation to the new project once the new project is formally submitted to the agencies.

### 3.1.4. Projected Changes in Climate

The Montana Climate Assessment (assessment) was published in 2017 and was the first state climate assessment driven by stakeholder input and based on the best available science (Whitlock et al. 2017). The assessment divides the state into seven climate divisions. The East Boulder Mine, which is in Sweet Grass County near Big Timber, is located in the South Central Division found on the east side of the Continental Divide. The forested landscape surrounding the Project area is mountainous, set at an elevation of 6,265 feet above sea level. The assessment's analysis examines climate parameters from 1950 to 2015. Major findings indicate that annual average temperatures have risen 2 to 3 degrees Fahrenheit (°F) from 1950 to 2015.

The assessment also makes mid-century and end of century projections based on emissions continuing at their current rates (business-as-usual) and a stabilized scenario. Projections based on business-as-usual emission rates for the mid-century (2049-2069) represent the worst-case scenario and are discussed below for the South Central Division.

Projections for the South Central Division indicate an increase of approximately 4.75°F annual average daily maximum temperature by mid-century (2050s) and 5 to 6°F by the end of the century if climate parameters can be stabilized. If no change in climate parameters occurs,

these temperatures could increase by 6°F for both mid- and end of century (Whitlock et al. 2017). Days higher than 90°F are expected to increase 5 to 35 days per year by mid-century, especially in the southern part of the state. Frost-free days are predicted to increase by 24 to 44 days by mid-century.

Precipitation across the state is expected to decrease during summer, but increase during fall, winter, and spring. By mid-century (2049-2069) in the South Central Division under business-as-usual emission scenarios, precipitation is projected to decrease as much as 5 to 8 inches during the summer months and would increase by less than 5 inches during the fall and winter months. During spring months, precipitation may increase as much as 15 inches (Whitlock et al. 2017). Interannual variability (amount of annual change in precipitation) is also expected to increase slightly (i.e., wet years would get wetter and dry years would get drier). The South Central Division would experience less of an increase in variability than other divisions across the state (Whitlock et al. 2017).

Statewide, snowpack has declined since 1930, and increases in temperature are expected to reduce snowpack at mid- and low elevations. Snowmelt is also expected to occur earlier in the spring, reducing late summer water availability in snow-driven watersheds. Total annual streamflows are projected to increase slightly for most Montana rivers, but the magnitude of change in specific rivers, such as the East Boulder River, is difficult to quantify based on model variability (Whitlock et al. 2017). Any reduction in surface water could increase demand for groundwater resources, but the local response would be dependent on several factors, such as the sensitivity of local aquifers to climate variability and water use practices (Whitlock et al. 2017).

Multiyear and decadal scale droughts are expected to continue. Increased temperatures and fuel loads are predicted to increase fire risk, including an increase in the size, frequency, and severity of fires (Whitlock et al. 2017). Rising temperatures are also expected to increase some forest pest survival, such as the bark beetle, which could lead to increased tree mortality including in the vicinity of the Project area.

In 2018, the National Oceanic and Atmospheric Administration published Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II, which includes a discussion of expected climate trends in the Northern Great Plains of the United States including Montana, where the Project Area is located (Conant et al. 2018). This assessment projects the number of heavy precipitation events to increase. The assessment concludes that changes in extreme precipitation events are likely to overwhelm average changes in precipitation (Conant et al. 2018).

## 3.2. GEOTECHNICAL STABILITY

This section assesses geotechnical stability in the analysis area and discloses direct, indirect, and cumulative effects of the No Action Alternative and the Proposed Action. The assessment of geotechnical stability focuses on two issues raised during scoping: (1) whether the location and design of the Proposed Action could adversely affect the stability of the southern bank of the East Boulder River and (2) whether future movement of the East Boulder River could reduce the stability of the proposed road realignment and TSF embankment. Key laws and regulations that provide the regulatory framework for the effects analysis are described in **Section 1.7, Applicable Laws, Regulations, and Policies**. Methods specific to assessment of geotechnical stability are detailed below in **Section 3.2.2, Analysis Methods.**

Design criteria employed by the Project Proponent make reference to the following relevant organizations and their associated standards and guidelines:

- Federal Emergency Management Agency (FEMA)
- International Committee on Large Dams (ICOLD)
- Canadian Dam Association (CDA)

These entities espouse the safe design, operation, and closure of dams that could impact public safety, infrastructure, and the environment.

### 3.2.1. Analysis Area

The analysis area for assessing geotechnical stability is the current authorized mine permit boundary for the mill site and TSF (i.e., the 396.58-acre Project area (**Figure 2.2-1**)). Effects of potential discharge from the TSF can extend beyond this area along the East Boulder River and associated receiving waters. These effects are limited to water resources and associated habitats, and are discussed in other resource subsections (e.g., Surface Water Hydrology, Aquatics, etc.). The time period evaluated for this analysis includes construction (beginning in 2020), through the end of operations (until 2033 under the Proposed Action at current production rates), and completion of reclamation and post-closure monitoring activities (approximately 8 years after completion of operations). The total duration of Project activities analyzed is 21 years. Consideration has also been given to longer term effects and consequences, specifically regarding the Stage 6 TSF expansion and areas potentially subject to impact by an impoundment breach, since the TSF represents a large-scale structure that will exist in perpetuity and downstream areas could be impacted by such a breach.

### 3.2.2. Analysis Methods

This analysis considered previous environmental review documents (DSL et al. 1992; DEQ and Forest Service 2012a) and findings (Forest Service 1993; DEQ and Forest Service 2012b), as well as the application itself (Knight Piésold Ltd. 2020) and findings from the IRP review of the application (IRP 2019, 2020). The standard required by the Montana MMRA is that an applicant must demonstrate “through site investigation, laboratory testing, geotechnical analyses, and other appropriate means that the tailings, embankment, and foundation materials controlling

slope stability are not susceptible to liquefaction or to significant strain-weakening under the anticipated static or cyclic loading conditions, to the extent that the amount of estimated deformation under the loading conditions would result in loss of containment" (82-4-376 (2)(g), MCA). For new TSFs, MMRA requires design factors of safety against slope instability to be equal to or greater than 1.5 for static loading under normal operating conditions (82-4-376 (2)(h)(i), MCA). Although the East Boulder TSF is existing, this MMRA factor of safety (FoS) was used to determine the level of TSF embankment stability. In addition, MMRA requires the design FoS to meet or exceed 1.2 under the effects of an earthquake (82-4-376 (2)(h)(iii), MCA).

Stability analyses for static loading during normal operating conditions and post-earthquake were completed by Knight Piésold Ltd. (2020) using a two-dimensional limit equilibrium stability analysis software package. As required by MMRA, the greater of the Maximum Credible Earthquake or the 1-in-10,000-year earthquake event is to be used for the design of the TSF. A Seismic Hazard Assessment was performed and included a determination that the peak ground acceleration for the 1-in-10,000-year earthquake event represents the larger of the two events and was therefore used for design of the TSF. This design event corresponds to a magnitude 7.5 earthquake (Knight Piésold Ltd. 2020). The potential embankment deformation as a result of the design earthquake event was evaluated using semi-empirical methods (Knight Piésold Ltd. 2020 [Sect. 6.9]). Additionally, the embankment foundation material was conservatively modeled as saturated and with a 20 percent reduction in strength to simulate a potential increase in pore pressure during an earthquake event.

A riverbank erosion and stability assessment was conducted by Knight Piésold Ltd. (2020) to evaluate the risk of progressive embankment instability due to encroachment of the East Boulder River on the north side of the TSF embankment. The assessment included development of peak flow and velocity estimates for the 100-, 200-, 500-, and 1,000-year and probable maximum flood events. The precipitation depths for these various recurrence interval events are described in **Table 3.2-1**.

**Table 3.2-1**
**Precipitation Depths for Probable Maximum Flood Events**

| Recurrence Interval | Precipitation Depth (inches) |
|---|---|
| 100-year | 4.6 |
| 200-year | 5.0 |
| 500-year | 5.5 |
| 1,000-year | 5.9 |
| Probable maximum | 29.0 (plus 18 inches of snowmelt) |

Source: Knight Piésold Ltd. 2020

The peak flow and velocity estimates and other calculated hydraulic parameters (e.g., shear stress) were used to assess the erodibility of the riverbank material during extreme flood events. Additionally, stability analyses were conducted to evaluate the critical embankment section following hypothetical erosion of the riverbank. Haley & Aldrich's Technical

Memorandum 1 summarized a review of this assessment and affirmed their results (Haley & Aldrich 2020a).

In addition to the above, the Forest Service is responsible for adhering to NDSP guidelines on TSF facilities on National Forest System lands. For this Project, the Forest Service has required SMC to adhere to these guidelines in the design for the Stage 6 TSF expansion. Components of these requirements can be viewed in **Section 1.7.1.16, Federal Guidelines for Dam Safety**.

### 3.2.3. Affected Environment

The analysis area is located at the base of a steep mountainside. Topography in the area is slightly variable (hummocky), with small hills and localized depressions. The elevation changes by approximately 140 feet across the analysis area. The stratigraphy of the ground beneath the TSF generally consists of organics and/or fill at the surface with glacial till overlying fine-grained sedimentary bedrock and limestone. The depth to bedrock below the TSF is greater than 250 feet. Porphyritic rock is intersected on the east side of the East Boulder River 135 to 217 feet below the ground surface. The upper surface of the bedrock is weathered to highly weathered. The west end of the TSF includes glaciolacustrine and alluvium/glacial outwash soils. Alluvial soils are south of the analysis area and on the east side of the East Boulder River. Colluvium is generally present along the base of steep slopes surrounding the analysis area (Knight Piésold Ltd. 2020).

The existing embankment toe (No Action Alternative) is offset from the East Boulder River channel by approximately 180 feet and is approximately 55 feet above the river channel. In the Proposed Action, the Stage 6 TSF embankment toe would be offset from the East Boulder River channel by approximately 130 feet and would be approximately 50 feet above the river channel. The river channel at this location is approximately 30 feet wide and 10 feet deep. The base of the river channel consists of cobbles and boulders; the boulders are lag material exposed by downward erosion of the river channel. The river channel has an entrenched meandering planform that is laterally stable, while incising vertically.

Large landslides, interpreted to be earth flows, occur along the tributary drainage lines on the south side of the East Boulder River Valley west of the analysis area. A large area of possible slope instability has been identified on the north side of the Dry Fork Valley east of the analysis area. A terrain hazards assessment performed by Knight Piésold Ltd. (2020) for the Proposed Action hypothesized both of these occurrences to be post-glacial responses to thawing and de-buttressing associated with de-glaciation, respectively. The assessment did not identify recent landslides affecting mine facilities in the analysis area. However, there are moderately steep to steep slopes adjacent to the mine footprint, and the risk for slope instability should not be assumed as negligible (Knight Piésold Ltd. 2020).

## 3.2.4. Environmental Consequences

### *3.2.4.1. No Action Alternative*

The No Action Alternative effectively represents current conditions, which includes the addition of the constructed TSF embankment Stages 4 and 5, which were permitted and analyzed by the agencies in the East Boulder Mine Project FEIS (DSL et al. 1992). The 1992 FEIS noted that static and seismic stability analyses conducted at that time indicated the TSF embankment would remain stable. Additionally, the 1992 FEIS noted that testing indicated the foundation material was not susceptible to liquefaction during an earthquake. There has been no indication that the original analysis was incorrect in terms of stability.

Failures of tailing dams are typically the result of overtopping, slope instability, and earthquakes (Chambers and Higman 2011). Impacts on downgradient resources are dependent on the degree of failure, and a severe failure could potentially cause loss of human life. The impacts would vary depending on the stage of filling, dewatering, and reclamation at the time of failure. Active dams are much more likely to fail than inactive and maintained dams because of cementation of unsaturated tailings in inactive reclaimed dams (Kossoff et al. 2014). Saturated conditions in low permeability materials, such as tailing slimes, tend to raise pore pressure (Kossoff et al. 2014), which creates a loss of strength and thus can render the structure vulnerable to failure (Chambers and Higman 2011). Once the tailings are dewatered, a catastrophic flow failure is very unlikely because flow failures result from saturated or near saturated conditions of the tailings (Pacheco 2019).

A TSF breach analysis developed for Stage 3 indicated the existing potential for damage to buildings/structures, loss of life, and release of fine-grained materials to the East Boulder River and Yellowstone River. Based on this previous analysis, a TSF breach of the approved Stage 5 TSF would result in generally similar adverse impacts. The expanded footprint and height increase adds to the potential quantity of fine-grained materials subject to release to the nearby rivers, but the potential infrastructure damage and risk of loss of life may be of similar magnitude. In absence of a dam breach analysis for the Stage 5 TSF, considering its maximum solids storage and/or maximum likely fluid storage, a more quantitative comparison of the risk difference between Stages 3 and 5 cannot be inferred.

It is noted that previous analyses were silent on long-term stability or the need for monitoring or maintenance to ensure long-term stability. However, engineered structures such as the TSF embankment require some level of monitoring and maintenance to maintain form and function in the long term. For context, long-term can be interpreted as extending well beyond the operating life of the TSF, past final closure and achievement of the stabilization of the reclamation cover. Depending on Project and site conditions, this can entail multiple decades. For East Boulder Mine and its TSF, this duration would potentially extend beyond the 8-year reference timeframe for maintenance of the reclamation bond provided in the CORP (SMC 2016). As such, establishment and maintenance of a long-term financial assurance mechanism for stability of the TSF and other elements may become considerations for the Forest Service

post-closure. Proposed monitoring and instrumentation of the proposed Stage 6 TSF expansion embankment is addressed in the next subsections.

#### *3.2.4.2. Proposed Action Alternative*

##### Embankment Stability

As discussed in **Section 3.2.2**, stability analyses were performed by Knight Piésold Ltd. (2020) as part of the Stage 6 TSF embankment design (Proposed Action). The analyses performed indicate the minimum required FoS would be met or exceeded at all locations analyzed. Specifically, the applicant considered seven cross-sections in their analysis, each examining six locations along the embankment. The lowest FoS obtained was 1.57, while the highest was greater than 3.6.

Additionally, the post-earthquake analysis resulted in a FoS ranging from 1.55 to 2.00, higher than the minimum 1.2 FoS requirement in all seven cross-sections. Therefore, the stability analyses indicate that an uncontrolled release of material from the TSF due to a reduction in material strength parameters or an earthquake is very unlikely in both the short term and long term.

As discussed under the No Action Alternative, a TSF breach analysis developed for Stage 3 indicated the potential for damage to buildings/structures, loss of life, and release of fine-grained materials to the East Boulder River and Yellowstone River. Based on this previous analysis, a TSF breach as a result of construction of the Proposed Action would result in generally similar adverse impacts. The proposed expanded footprint and height increase would add to the potential quantity of fine-grained materials subject to release to the nearby rivers, but the potential infrastructure damage and risk of loss of life may be of similar magnitude to both Stages 3 and 5. In absence of a dam breach analysis for the Stage 6 TSF, considering its maximum solids storage and/or maximum likely fluid storage, a more quantitative comparison of the risk difference between the No Action Alternative (Stage 5) and Proposed Action cannot be inferred. In any case, while the slope stability results indicate the expectation of acceptable performance relative to existing legislative guidance (82-5-376, MCA), there is the existence of finite risk (i.e., non-zero) for both the No Action Alternative and Proposed Action scenarios.

##### Riverbank Stability

The riverbank erosion and stability assessment revealed that the minimum required FoS would be maintained. Overall, the riverbank erosion and stability assessment indicated the amount of riverbank erosion and lateral migration necessary to compromise the TSF embankment is unlikely to occur and the TSF embankment would remain stable during operations and in the long term after closure. A monitoring program would be implemented to confirm assessment conclusions, including monitoring monuments to further evaluate movement over time of the TSF embankment and riverbank crest downgradient of the access road north of the TSF. The instrumentation configuration for the Proposed Action is described in **Section 2.3.5, Monitoring Instrumentation.**

Given the tendency for the river channel to incise vertically, vertical bed movement monitoring and evaluation of its effects should also be considered. The Failure Modes and Effects Assessment (FMEA) completed as part of the Stage 6 TSF design (Knight Piésold Ltd. 2020) characterized erosion of the bank of the East Boulder River and instability as medium risk rating, and assessed the expansion overall as exhibiting a low risk profile. The agencies reviewed this analysis (Haley & Aldrich 2020a) and affirmed the conclusions of Knight Piésold Ltd. 2020.

Both sources relied upon for riverbank stability assessment (Knight Piésold Ltd. 2020; IRP 2020), and its resulting impact on TSF embankment stability, acknowledge that while the risk of failure is within acceptable limits, it remains finite (i.e., non-zero).

#### *3.2.4.3. Cumulative Impacts*

In 2018, the National Oceanic and Atmospheric Administration published Impacts, Risks, and Adaptation in the United States: The fourth National Climate Assessment, Volume II, includes a discussion of expected climate trends in the Northern Great Plains of the United States including Montana (Conant et al. 2018). This assessment projects the number of heavy precipitation events to increase. The assessment concludes that changes in extreme precipitation events are likely to overwhelm average changes in precipitation (Conant et al. 2018). More frequent heavy precipitation events are likely to contribute to extreme flood events in the East Boulder River with the potential to contribute to riverbank erosion. Progressive failure of a localized section of the TSF embankment could potentially result in the release of water and tailings to the East Boulder River Valley. However, this is considered unlikely. Additionally, the net effect of climate change on development of peak flow rates for engineering design of structures is not documented in published literature to an appropriate extent for consideration in this analysis. Further analysis of possible effects of this predicted trend is unwarranted.

Assuming proper performance of the upstream diversion, the cover and drainage swale, and the TSF underdrain, it can be concluded that there would be no cumulative impacts on stability because (1) geotechnical instability is unlikely from construction and operation of the TSF and the risk of riverbank instability is low, and (2) no other cumulative actions have been identified that would contribute to instability. Additionally, during post-closure, the TSF is expected to continue to desaturate and densify naturally. Based on these factors and the assumption the TSF will no longer impound water, the susceptibility of the tailings to liquefaction is expected to continue to decrease with time. Ongoing review by the IRP will help assure proper establishment of operational and closure conditions to mitigate risk of adverse impacts (see **Section 1.7.2.2, Montana Metal Mine Reclamation Act**).

#### *3.2.4.4. Regulatory Compliance and Forest Plan Consistency*

Both the No Action Alternative and the Proposed Action comply with applicable state and federal laws and regulations (see the list in **Section 1.7**) and the Gallatin Forest Plan. ARM 17.24.169(1)(b), (1)(d), and (1)(e) pertain to reclamation plan stability and land use, surface

water and groundwater quality maintenance, and revegetation, respectively. These items are adequately addressed by the No Action Alternative and the Proposed Action.

36 CFR 228 Subpart A, Locatable Minerals deals with the federal requirements for environmental protection and includes the control of erosion; reshaping and revegetation of disturbances; and rehabilitation of wildlife habitat, among others, as part of reclamation of surface disturbance following completion of operations. The Proposed Action is consistent with the provisions in this Forest Service regulation.

To protect life and property, the TSF dam would be reviewed and monitored by a number of agencies and review panels. MMRA would regulate construction, operation, and reclamation of Stage 6. During operation, the IRP would monitor the dam at least every 5 years during ongoing operations of the TSF (82-4-380, MCA).

## 3.3. RECLAMATION

This section describes reclamation in the analysis area and discloses potential direct, indirect, and cumulative effects of the No Action Alternative and Proposed Action on soil, vegetative cover, utility and stability, and public safety in the analysis area. Key laws and regulations that provide the regulatory framework for the effects analysis are described in **Section 1.7, Applicable Laws, Regulations, and Policies**. Methods specific to the reclamation analysis are detailed below in **Section 3.3.2, Analysis Methods.**

### 3.3.1. Analysis Area

The analysis area for evaluating direct, indirect, and cumulative effects on soil and reclamation is the 396.58-acre Project area (**Figure 2.2-1**), which includes the proposed 286.85-acre disturbance area within which 66.11 acres would be disturbed by Project activities. The time period evaluated for this analysis includes construction (beginning in 2020), through the end of operations (until 2033 under the Proposed Action at current production rates), and completion of reclamation and post-closure monitoring activities (approximately 8 years after completion of operations). The total duration of Project activities analyzed is 21 years.

### 3.3.2. Analysis Methods

The analysis of reclamation focuses on issues raised by the public during scoping. The primary issue of concern is that implementation of the Proposed Action's closure and reclamation plans could result in the potential for long-term failure due to erosion, cover loss, vegetation loss due to drought or fire, weed invasion, and storm events. This potential for failure could be further exacerbated by changes in climate.

The impacts from reclamation were estimated using metrics and standards outlined by DEQ and the Forest Service, as well as measuring against other projects of similar scope. BMPs, management plans, and monitoring plans provided materials for comparison. Information was gathered on the depth and breadth of reports and plans, and the current proposal was compared to the 2012 FEIS (DEQ and Forest Service 2012a), 2012 ROD (DEQ and Forest Service 2012b), and 1992 FEIS (DSL et al. 1992) to identify similarities.

### 3.3.3. Affected Environment

Soil and vegetation conditions in the analysis area were described previously in the 1992 FEIS (DSL et al. 1992) and the 2012 FEIS (DEQ and Forest Service 2012a). Current vegetation conditions are described in **Section 3.6, Vegetation**.

The climate in the analysis area is generally dry and cold with annual precipitation of 20 to 25 inches and annual average temperature of 38°F.

#### *3.3.3.1. CORP*

As described in **Section 2.1.7, Closure and Reclamation**, SMC's current approved reclamation plan is outlined in the CORP (SMC 2016). This plan is currently being implemented at the East

Boulder Mine as reclamation occurs concurrently with mine operations. Areas no longer needed for operations are reclaimed over an approximate 2-year period. As outlined in the CORP, the main purpose of mine area reclamation is to provide post-mine land use similar to the pre-mining conditions (primarily wildlife habitat) in compliance with the MMRA and to ensure long-term stability of the TSF (SMC 2016).

#### *3.3.3.2. Reclamation Bond*

DEQ and the Forest Service hold a joint reclamation bond to ensure reclamation of the East Boulder Mine. Currently, approximately 238 acres are bonded (SMC 2019; see also **Section 1.7** for a discussion of the agencies' authorities for financial assurance). The reclamation bond is based on the costs to cover reclamation activities, monitoring, and maintenance. It is incrementally increased when the activities that result from revisions or amendments to the Operating Permit indicate increased reclamation expenses would be incurred as a result of the activity. A comprehensive review is undertaken on a minimum of one in five-year cycle to account for ongoing mine development and changes in the cost of accomplishing reclamation.

The reclamation bond estimates are based upon the premise that an unplanned closure would occur at the facility at some time over the next 5 years. A reclamation bond is calculated to be sufficient to cover the estimated costs associated with reclamation activities, monitoring, and maintenance. The reclamation bond is meant to provide the financial assurance that in the event of an unplanned closure, SMC, not taxpayers, would bear the costs to reclaim the East Boulder Mine and associated facilities.

For bond release consideration, DEQ will compare the completed reclamation against the requirements of the MMRA, including the "comparable utility and stability to that of adjacent areas" reclamation standard identified in the MMRA 82-4-337(9)(a), MCA. The Forest Service has additional land management objectives to implement, including protection of surface resources. 36 CFR 228.8(g) states, *"…the operator shall, where practicable, reclaim the surface disturbed in operations by taking such measures as will prevent or control onsite and off-site damage to the environment and forest surface resources… ."* Promoting healthy and resilient forests and grasslands are key components in ensuring the lands and resources the Forest Service manages are available for future generations. The Forest Service is also tasked with sustaining the health, diversity, and productivity of the nation's forests and grasslands to meet the needs of present and future generations. The agencies will compare the completed reclamation against these requirements in the approved plan of operations and operating permit, determine if the reclamation bond release is acceptable, and only allow full joint reclamation bond release upon successful reclamation to those standards.

### 3.3.4. Environmental Consequences

#### *3.3.4.1. No Action Alternative*

Under the No Action Alternative, DEQ and CGNF would not approve SMC's application for Amendment 003 of its Operating Permit or the revision to its Plan of Operation to construct the

Stage 6 TSF expansion (Proposed Action). Therefore, there would be no additional disturbance beyond what was authorized in the 1993 and 2012 RODs (Forest Service 1993; DEQ and Forest Service 2012b).

Under the No Action Alternative, SMC would continue to limit erosion, manage sediment, and protect water quality. Reclamation would be carried out based on the provisions described in the CORP (SMC 2016). Erosion would be managed through concurrent reclamation and reseeding, among other measures. Implementation of the Storm Water Pollution Prevention Plan would address pollutants, including sediment, and erosion. Groundwater would be protected through the use of various water treatment systems and monitoring measures. Full reclamation would continue to reestablish pre-mining conditions and post-mine land use (wildlife habitat). Post-closure, site maintenance, and environmental monitoring would continue for 5 years.

The direct and indirect impacts from permitted disturbances and the associated site reclamation under the No Action Alternative were evaluated in Sections 4.4.2 and 4.5.2 of the 1992 FEIS (DSL et al. 1992). The impacts that are common to the Proposed Action include:

- Stockpiled soil would be subject to wind and water erosion during short periods of manipulation and revegetation. This impact would be adverse and short-term until vegetation stabilizes the surface, usually within a few years.
- A slight decrease in soil productivity would occur due to soil mixing and prolonged storage in stockpiles, causing slightly less productive vegetation growth during initial reclamation. This impact on soil productivity would be adverse and long-term. Soil productivity would slowly return to pre-mine conditions as organic matter from the decomposition of vegetation accumulates into reclaimed soil, providing nutrients and water holding capacity, but this could take years beyond joint reclamation bond release. The use of fertilizer or mulch, however, would shorten the time for soil productivity to return to pre-mine conditions.
- Road and power line construction would create the opportunity for short-term soil erosion until vegetation is reestablished and erosion-control features are installed.
- An indirect impact from potential spills, leaks, or contamination could adversely affect the ability of affected soils to support protective vegetation cover and productivity. Such events are typically localized and short-term since immediate containment and clean-up of spills and leaks are required.

### CORP Objectives

Reclamation objectives stated in the CORP (SMC 2016) are summarized in **Section 2.1.7, Closure and Reclamation**. The methods, mitigation measures, and monitoring to help ensure the success of each reclamation objective under the No Action Alternative are discussed below.

*Erosion Control*. Erosion would be minimized with concurrent reclamation at pond slopes, TSF slopes, cut-and-fill slopes, borrow area, and soil stockpiles; surface disturbances would be stabilized with reseeding and the addition of chemical stabilization agents; and BMPs, such as drainage ditches, swales, surface rocks, and minimization of slope lengths, would be used.

It typically takes several years for vegetation on reclaimed sites to provide a sufficient canopy cover to protect the soil from accelerated erosion. Some areas, such as steep embankment slopes, may require more time for the ground cover to stabilize reclaimed areas.

During closure, tailings would still be solidifying as they continue dewatering. However, the tailings would still be contained within the impoundment, and tailings deposition during the final years of operation would be managed such that a level surface with a 1 percent grade to provide drainage is achieved prior to closure.

Operation and closure monitoring of erosion is ongoing, and erosion would continue to be monitored on a regular basis for approximately 8 years (about 3 years for closure and 5 years post-closure) to help identify any areas of concern that may require maintenance or more evaluation. Special attention would be on potentially erosion-prone areas such as contoured slopes. Signs of gullying, rilling, or slumping would require immediate attention (SMC 2016).

According to the SMC 2018 annual report (SMC 2019), through 2018 approximately 214 acres have been disturbed on the mine site; of that 51.5 acres have been reclaimed, of which about 12 acres have completed final reclamation.

*Vegetative Cover*. To help ensure successful establishment of a vegetation cover, revegetation would follow procedures outlined in the reclamation plan (SMC 2016). Seeding would occur as soon after seedbed preparation as possible and on soil stockpiles. The seed mix would consist of native species and would meet Forest Service seeding guidelines, including nursery-developed grasses, forbs, shrubs, and trees. The mix would continue to balance rapid establishment, erosion control, and long-term stability, function, and biological diversity of the vegetation community. Monitoring of revegetation success would be conducted annually for about 5 years post-closure and, if needed, reseeding, cultural treatments, and adjustments to seeding methods would be carried out until the vegetation cover is healthy and sustainable.

The integrated weed management plan for the site (Appendix E8 of the CORP [SMC 2016]) was designed to meet state, county, and Forest Service standards to control noxious weeds. The key objectives of the plan are to prevent and minimize the introduction, reproduction, and spread of noxious weeds, and to reduce or eliminate current noxious weed infestations. These objectives would be met by identifying weed infestations and applying chemical and other controls to eliminate weed infestations and would follow the BMPs outlined in the Noxious Weed EISs and FSMs.

*Comparable Utility and Stability*. Post-mine land use would be similar to the pre-mine utility, primarily providing for wildlife habitat. To achieve this, reclaimed areas would be seeded with vegetative species to promote wildlife habitat and foraging opportunities. Saplings would be replaced at a similar density as what was removed from the site to return reclaimed areas to coniferous forest providing for wildlife habitat. Reclaimed areas not having existing subsoil would receive about 22 inches of subsoil followed by 6 inches of organic-rich topsoil. This would provide adequate rooting depth and, with annual monitoring of vegetation success, would help ensure long-term stability of the vegetation community.

Approximately 8 years of monitoring during closure and post-closure are required to ensure pre-mine utility and stability are met. Following the 8 years of monitoring and assuming the reclamation has achieved comparable utility and stability as that of adjacent areas, monitoring would be discontinued. If after the 8 years of monitoring the reclamation has not achieved comparable utility and stability, additional monitoring and maintenance would be required, and would focus on vegetation establishment, stability of reclaimed surfaces, and surface water and groundwater monitoring results (SMC 2016). In addition, the Forest Service requires disturbed areas be reclaimed, reshaped, and revegetated, and to prevent onsite and offsite damage to the environment (36 CFR 228.8).

*Long-Term Public Safety*. Failures of tailing dams are typically the result of overtopping, slope instability, and earthquakes (Chambers and Higman 2011). Depending upon the degree of failure, any failure would impact downgradient resources, and a severe failure could potentially cause loss in human life. The impacts would vary depending on the stage of filling, dewatering, and reclamation at the time of failure. Active dams are much more likely to fail than inactive and maintained dams because of cementation of unsaturated tailings in inactive reclaimed dams (Kossoff et al. 2014). Saturated conditions in low permeability materials, such as tailing slimes, tend to raise pore pressure (Kossoff et al. 2014), which creates a loss of strength and thus can render the structure vulnerable to failure (Chambers and Higman 2011). Once the tailings are dewatered, a catastrophic flow failure is very unlikely because flow failures result from saturated or near saturated conditions of the tailings (Pacheco 2019).

The tailings would naturally consolidate and dewater as they self-drain, and this results in reduced pore pressure in the tailings slimes and corresponding reduction in the risk of long-term failure. SMC estimates partial dewatering of the tailings would require 18 months. The final cap of the TSF surface and embankments would consist of 24 inches of waste rock under 22 inches of subsoil followed by 6 inches of organic-rich topsoil, which would provide a growth medium for vegetation and minimize erosion (SMC 2016). Geotechnical and environmental monitoring would be periodically conducted to ensure stability (SMC 2016).

Once the TSF is dewatered, erosional failures could occur but any erosion and stability issues would be monitored, identified, and repaired for a minimum of 8 years during closure and post-closure, and stability of the TSF would be monitored once every fifth year following post-closure. With continued dewatering of the TSF, it would transition from an acute threat to public safety and the environment to a more chronic threat to the environment and less so to public safety. Depending on the degree, TSF failure could create a long-term adverse impact, and it could be many years before impacted resources are restored to pre-failure conditions. The loss of human life would be irreplaceable.

Static and seismic stability analyses were conducted on the TSF embankment and indicated the embankment would remain stable. The seismic analysis assumed the maximum credible earthquake (magnitude 7) and a saturated foundation. Testing indicated that the foundation material does not possess the characteristics that cause liquefaction during an earthquake (1992 FEIS [DSL et al. 1992]). The conclusions of these analyses, however, do not imply that

there is not a risk of failure. To meet long-term TSF stability requirements, the slopes of the TSF embankment would be 2H:1V and constructed of waste rock and some native borrow and tunnel material (SMC 2016).

Annual inspections of the TSF and dam safety reviews by a third-party qualified engineer would be done every 5 years, and a corrective action plan would be prepared for any problems identified in these inspections. The potential causes of a dam breach have been considered in an Emergency Preparedness Plan (EPP). The EPP has been prepared to identify emergency and hazard conditions threatening the facility, expedite effective response actions to prevent failure, and reduce loss of life and property damage should failure occur (Appendix E of the CORP [SMC 2016]).

Ongoing monitoring of the TSF and 5 years of post-closure monitoring and maintenance would be conducted annually and, after 5 years, then once every fifth year to ensure stability. If problems potentially affecting stability after the fifth year of post-closure monitoring are identified, continued annual monitoring may be required. In addition, more long-term stability monitoring may be required as requested by the IRP and the Forest Service (SMC 2016).

Three types of channels would be constructed for the TSF water and storm water conveyance: a drainage swale would convey runoff from the TSF cap, which would slope at 1 percent, to a percolation pond; an outlet channel would convey overflow from the percolation pond during larger storm events to the East Boulder River; and five closure ditches would convey storm water from the plant site and upstream areas (SMC 2016). Proper functioning of these channels is critical to the functionality and stability of the TSF. These channels could potentially fail due to bank erosion from very large precipitation events, sediment loading, blockage, or earthquakes. Failures could cause improper drainage of the TSF, creating overland flow and the formation of gullies dumping sediments into the East Boulder River.

All drainage channels would be designed to pass the peak flows resulting from a 1-in-100 year, 24-hour rainfall event, and to allow for overbank flooding without compromising functionality. All channels would be monitored annually for approximately 8 years during closure and post-closure and necessary maintenance would follow inspections of the channels and percolation pond (SMC 2016).

*Protect Resources*. Air quality is monitored at the site pursuant to the current Air Quality Permit and the data are reported annually. The permit allows for the use of chemical dust suppressants on the site, and once the tailings surface is dewatered for closure, a waste rock cover of 24 inches would be placed on the surface to control dust.

Nitrogen and ammonia residues resulting from ammonium nitrate-based explosives used in underground mining are the primary wastewater contaminants requiring treatment at the site. To ensure surface water and groundwater resources are protected, mine waters are treated by clarification followed by biological nitrification and denitrification, with a reverse osmosis system constructed to be used as a backup system during maintenance or if issues arise with the primary system. TSF water evaporators, a groundwater capture system at the foot of the TSF embankment, and an embankment underdrain system are also used to protect water

resources. The site is a zero-discharge storm water facility so that all storm water runoff drains internally within the site into collection basins and vegetative buffers, and other BMPs are used to manage storm water runoff. To date there have been no storm water discharges from the mine site (SMC 2016).

Groundwater and surface water quality would be monitored according to the approved Water Resources Monitoring Plan (Hydrometrics, Inc. 2018a) and permits. Water quality monitoring includes the process water from the tailings pond and basin underdrain collection sump, groundwater from monitoring wells, and surface water around the TSF. Water quality monitoring is required for 8 years during closure and post-closure; however, monitoring would be conducted until applicable water quality standards are met.

*Permanent Landscaping and Contouring*. To minimize infiltration into disturbed areas, the TSF surface would be sloped at about 1 percent to the south end of the impoundment to allow storm water to drain toward the storm water channel. Nonhazardous material buried onsite, such as concrete, would be covered with 48 inches of soil and graded to promote drainage. Disturbances on native soil would receive 6 inches of topsoil and would not be graded.

There would likely be differential settlement of the capped TSF surface, which could result in the formation of shallow depressions. These depressions would not affect the performance of the reclamation cover and they would add to ecosystem diversity (SMC 2016), which would be beneficial for post-closure use for wildlife habitat.

State law requires that there would be no accumulation of stagnant water in the development area to the extent that it could serve as a host or breeding ground for mosquitoes or other disease-bearing or noxious insect life (82-4-336(5), MCA). Settlement of the TSF cap could potentially create ponded water. The cap would be monitored annually with required maintenance for 5 years during post-closure, and longer if deemed necessary by the agencies (SMC 2016). It is possible that settlement could take place over many years, even after post-closure.

*Long-Term Vegetation Community Stability and Function*. Adequate rooting depth for most seeded and planted vegetation would be achieved by applying 6 inches of organic-rich topsoil over 22 inches of subsoil to all disturbed surfaces that are not over native soil. Deep-rooted vegetation may penetrate the tailings, but existing indications are that toxicity of the tailings would not be an issue.

Some mine reclamation failures in Montana are the result of waste rock and tailings contributing to the release of high levels of acidity, heavy metals, and low soil pH (Tafi and Neuman 2006). Soils at the East Boulder Mine are typically moderately alkaline to moderately acid and have no chemical elements that would pose a hazard to plants or animals. Waste rock and tailings are monitored and have been found to be non-acid generating (SMC 2016).

Topsoil to cover the TSF surface and other disturbances that would not be reclaimed until closure would be stockpiled for many years. Chemical effects would occur in soil stockpiled for prolonged periods. Degradation of chemical properties may include changes in available

nutrients, accumulation of ammonium, and the loss of organic carbon through heat and leaching. When the input of organic matter ceases, there would be a reduction or loss of nutrients (Strohmayer 1999). Changes in biological properties also would occur in soil that is stored for prolonged periods—most importantly the loss of soil microorganisms such as mycorrhizal fungi (Abdul-Kareem and McRae 1984). Mycorrhiza development in native soil greatly exceeds that in disturbed soil (Stahl et al 1988). Many plants depend on mycorrhizae, which are important structures that develop when certain fungi and plant roots form a mutually beneficial relationship. They are important to phosphorus nutrition and water uptake in plants (Skujins and Allen 1986). The loss of microorganisms in soil stored for prolonged periods could initially lower plant diversity and vigor, but eventually mycorrhizae would invade reclaimed soil (within a few years to more than a decade, depending on soil conditions). Mycorrhizae seem to be sensitive to soil properties such as organic matter, salts, structure, and water-holding capacity, so as soil conditions improve, mycorrhizae would colonize more quickly. Impacts on physical, chemical, and biological soil characteristics would be long-term and adverse, and may adversely affect short-term stability of the vegetation community. It would be many years before these soil characteristics return to pre-mine conditions. Where less-fertile stockpiled soil is used, such as on the TSF surface, soil amendments such as fertilizer and mulch may need to be applied to ensure revegetation success.

#### Prevent Post-Mining Groundwater Discharges

During closure, water on the TSF surface, tailings mass water, and water infiltrated into the TSF embankment would be pumped to the water treatment system. During post-closure, the embankment underdrain water would drain to a natural percolation basin or be biologically treated prior to disposal in the percolation pond. In addition, a geosynthetic lining system lines the TSF basin to reduce seepage into groundwater and surface water (SMC 2016).

To ensure that water quality standards are met, groundwater monitoring is required for about 8 years during closure and post-closure. An extension of the monitoring period may be required based on site conditions following the 8 years of monitoring. It is, however, anticipated that groundwater would return to near baseline conditions that are within state groundwater standards (SMC 2016).

### *3.3.4.2. Proposed Action Alternative*

SMC proposes that this Stage 6 TSF amendment to the operating permit and revision to the approved plan of operations will adhere to the reclamation criteria identified in the current CORP (SMC 2016) that was submitted to the agencies by SMC on June 30, 2016. In addition, the Stage 6 amendment application is subject to Montana statutory provisions that apply to Tailings Storage and Facilities and, consequently, the amendment application has been subjected to the requirements outlined in **Section 1.7.2.2, Montana Metal Mine Reclamation Act**.

Among other objectives, the reclamation plan provides for the reclamation of all disturbed land to comparable utility and stability as that of adjacent areas, as required by 82-4-336(9)(a), MCA. The CORP identifies various post-closure monitoring activities extending out to 8 years after

shutdown (see CORP Table 4-3 [SMC 2016]). Following the eighth year of monitoring and assuming the reclamation has achieved comparable utility and stability as that of adjacent areas, monitoring would be discontinued. The assessment would depend on vegetation establishment, stability of reclaimed surfaces, and surface water and groundwater monitoring results. An extension of the monitoring period may be required based on actual site conditions following the eighth year of monitoring. The agencies and SMC would review the appropriateness as more data from the site are collected during operations (SMC 2016). In addition, the agencies will continue with annual bond reviews and comprehensive 5-year bond reviews until the joint reclamation bond is released and the plan of operations and permit are closed. Should the bond reviews reveal that comparable utility and stability to that of adjacent lands has not been achieved, the bond amount may be adjusted and/or the assessed time for bond release may be extended.

While the design, construction, operations, and closure of the Stage 6 TSF may conform with 82-4-301 *et seq.*, MCA and 36 CFR 228.8A, the Forest Service, as the federal land manager, may identify through the plan of operations review process and EA analysis the need for additional financial assurance for long-term care and maintenance of reclaimed mine facilities (Forest Service 2020b). Since the Forest Service would assume oversight of the property after joint reclamation bond release, it would determine the scope, frequency, and cost of any long-term oversight beyond the obligations of the joint bond held by DEQ and the Forest Service for reclamation covered in the Proposed Action (plan of operations) and current reclamation bond for the existing operation.

Mineral development on National Forest System lands is a temporary use of those lands and requires that adequate fiscal resources are available to address post-closure long-term liabilities associated with mining activities, which may be required for many years beyond initial mine closure. Additional financial assurance is an option that would address the federal land manager's need for site care and maintenance beyond any bond release under the "comparable utility and stability to that of adjacent areas" reclamation standard required under 82-4-336(9)(a), MCA. Any additional financial assurance would be separate and distinct from the agencies' joint reclamation bond held for mine operations and closure and would be held by the Forest Service.

As proposed by SMC, all monitoring would be completed in accordance with the applicable environmental permits for the site. Monitoring, maintenance, and subsequent reporting would be conducted by SMC or third-party contractor(s) (SMC 2016).

Reclamation under the Proposed Action would be similar to the No Action Alternative; however, the Proposed Action could result in additional runoff and erosion potential due to an increase in TSF height by 14 additional feet and an increased TSF surface area. The TSF changes would lead to the need for a larger volume of waste rock and soil for the TSF cap, as well as an increase in the amount of seed mix necessary for revegetation. Although expansion of the TSF could require additional management of sediment and potential increases in erosion, implementing reclamation in accordance with the same objectives and regulatory requirements

as the No Action Alternative would result in similar potential impacts and corresponding benefits.

In addition to the impacts listed for the No Action Alternative, the Proposed Action would directly impact approximately 66.11 acres of soil from expansions of the TSF and the soil borrow pit; construction of a haul road, access roads, and power line; construction of new storm water diversion and conveyance structures; and relocation of some plant site facilities and soil stockpiles. Areas cleared of vegetation would be susceptible to soil erosion from wind and water. Soil salvage would occur at the borrow area and at all new disturbance areas, and salvaged soil, if not used for concurrent reclamation, would be stockpiled until 2035 to 2038. Impacts from soil stockpiling would be the same as under the No Action Alternative.

By raising the TSF 14 feet, resulting erosion, cover loss, and vegetation failure could indirectly lead to potential TSF failure. Depending on the degree, TSF failure, as with the No Action Alternative, could create a long-term adverse impact, and it could be many years before impacted resources are restored to pre-failure conditions; a catastrophic failure could cause loss of human life.

### CORP Objectives

The Proposed Action would adhere to the reclamation criteria identified in the 2016 CORP (SMC 2016). The methods, mitigation measures, and monitoring to help ensure the success of each reclamation objective described under the No Action Alternative are the same as for the Proposed Action. Differences between the 2016 CORP (SMC 2016) and the Proposed Action are discussed below along with potential additional care and maintenance measures to be considered by the Forest Service to minimize long-term liability of reclamation uncertainties that could develop beyond joint reclamation bond release. These reclamation uncertainties include long-term settlement of the TSF, functionality of drainage channels and the sediment pond, stability of the river channel, and effects from climate change.

*Long-Term Public Safety*. Numerous buildings/structures and 10 to 100 people could be affected with a hypothetical dam breach (Knight Piésold Ltd. 2020). Multiple tailings dam failures have occurred over the past hundred years, typically from overtopping, erosion, seepage and piping, slope instability, structural damage, or foundation failure (Larrauri and Lall 2017). Dam failure at the site could result from an extreme storm or a large seismic event (Knight Piésold Ltd. 2020).

As with the No Action Alternative, the impacts of a TSF failure would vary depending on the stage of filling, dewatering, and reclamation at the time of failure. Because of the larger volume of tailings (1.8 million cubic yards of additional storage capacity [Knight Piésold Ltd. 2020]) from raising the TSF by 14 feet, impacts resulting from a dam failure would likely be more severe than a failure if the dam height was not raised. If a TSF failure occurred, best available technology would be immediately implemented to mitigate impacts on water quality and downstream uses (Knight Piésold Ltd. 2020). Several stability analyses have been conducted for

the TSF design, and all tests indicate that the risk of failure is low. These analyses are described in **Section 3.2, Geotechnical Stability**.

A FMEA was completed to identify risks associated with the Stage 6 TSF expansion (Knight Piésold Ltd. 2020). A total of 37 risks were identified – 1 medium risk rating, 29 low risk ratings, and 7 very low risk ratings, resulting in an overall low risk rating. An analysis was also performed to evaluate the TSF stability after an earthquake. The analysis indicated an uncontrolled release of material from the TSF due to an earthquake in a 1-in-10,000-year event is very unlikely in both the short term and long term. Even though these analyses concluded a low risk of failure, they do not imply a zero risk of failure.

Annual inspections of the TSF would be conducted by the engineer of record during operations. Following cessation of operations, erosion and stability of the TSF would be monitored for a minimum of 8 years, stability would be monitored once every fifth year following post-closure, and dam safety reviews would be conducted by the IRP members or by a panel meeting the requirements of 82-4-337, MCA. Under the Proposed Action, the TSF (embankment and cap) would be monitored monthly rather than annually (as with the No Action Alternative) and after large storm events (+ 25-year precipitation event) with necessary maintenance. When the TSF is considered in steady state condition, it would then be monitored with required maintenance after + 100-year precipitation events and earthquakes (Knight Piésold Ltd. 2020).

It is possible that settlement of the TSF could take place over many years, even after post-closure and joint reclamation bond release, and possibly affecting the stability of the TSF embankment. The Forest Service may consider continuation of the embankment slope inclinometer, survey monument monitoring, and LIDAR surveys to monitor long-term movement and settlement of the embankment and embankment crest (see **Section 3.2, Geotechnical Stability**). The Forest Service could also consider conducting long-term vegetation monitoring and maintenance to ensure reclaimed surfaces are adequately protected from erosional forces and to prevent weed infestations.

Since the original TSF was permitted, finer than anticipated tailings are being generated resulting in “slimes” tailings being stored in the TSF. Placement of a woven geotextile over the tailings at closure to assist in traversing and placing the waste rock cap is being considered for the Stage 6 TSF (Knight Piésold Ltd. 2020). This geotextile layer beneath the capping layers and over the TSF slimes adds reinforcement. Reinforcement would assist in the construction as waste rock is placed for the cap and would assist in the short term following cover placement as the underlying slimes desaturate and strengthen. The tailings surface would be soft and subject to deformation and differential settlement, and strengthening the tailings surface through the addition of reinforcement would be beneficial (Haley & Aldrich 2020b).

Impacts from potential failure modes of the drainage swale, outflow channel, and percolation pond could be more detrimental to the environment than a failure under the No Action Alternative because of the potential larger release of tailings and water. Unlike the No Action Alternative, these TSF drainage structures would be monitored monthly rather than annually and after large storm events (± 25-year precipitation event) with necessary maintenance. When

the structures are considered in steady state condition, they would then be monitored with required maintenance after ± 100-year precipitation events and earthquakes (Knight Piésold Ltd. 2020).

Settlement of the TSF surface could take place over many years, potentially causing the elevation of the drainage swale inlet, which would drain the TSF surface, to be too high and hence not adequately drain the TSF surface. Additional investigations at closer proximity to closure could be stipulated to ensure long-term functionality of the drainage channels and percolation pond and to determine the correct inlet elevation of the drainage swale. Also, to reduce the risk of systemwide failures of the TSF, the Forest Service could consider additional monitoring and maintenance beyond joint reclamation bond release both annually and after large storm events to ensure proper functioning of the drainage channels and sediment pond by removing sediment buildup and repairing erosional damage.

*Permanent Landscaping and Contouring*. As with the No Action Alternative, the eventual final surface topography of the TSF slimes is expected to be uneven from differential settlement. There is a risk of development of excess pore pressure that could initiate liquefaction of the slimes and mobilization of both cap fill and slimes. Additional investigations and analysis, described below in **Section 3.3.4.3, Mitigation**, and in Technical Memo 2 (Haley & Aldrich 2020b), could help mitigate the risk of excess pore pressure.

Surface variation is expected to occur naturally from consolidation and cap settlement. A variable reclamation surface in terms of landform and microhabitats would foster a more diverse ecological system that can still be protective of the integrity of the final cap.

A quantitative performance parameter for TSF closure under the Proposed Action and a state requirement (82-4-336(5), MCA) is to have no ponded water on the TSF cap (Knight Piésold Ltd. 2020). Settlement of the TSF cap could potentially create ponded water. The cap would be monitored monthly (rather than annually as under the No Action Alternative) and after large storm events (± 25-year precipitation event) with necessary maintenance, such as filling in depressions. When the TSF cap is considered in steady state condition, the cap would then be monitored after ± 100-year precipitation events and earthquakes, and settlement would be repaired. As mentioned above, settlement could take place over many years, well beyond joint reclamation bond release. To minimize this potential liability, the Forest Service may consider the need for long-term monitoring and LIDAR surveys to detect and repair cap settlement and pond formation and installing piezometers to monitor the phreatic surface within the tailings (see **Section 3.2, Geotechnical Stability**).

Potential future erosion and potential bank instability at a critical section of the East Boulder River bank during extreme runoff events were identified as a potential risk to the Stage 6 TSF expansion. If the river were to migrate and undercut the TSF, highly erodible fine-grained sediments in the TSF would wash into the East Boulder River, causing potential flooding and bank erosion impacting downgradient resources and destroying aquatic life and habitat. Mitigations to manage this risk are described in the IRP Revision 5 letter (IRP 2020) and Knight Piésold's Revision 5 Design Report (Appendix I, [Knight Piésold Ltd. 2020]). A riverbank erosion

and stability assessment also was conducted and found that lateral migration necessary to compromise the TSF embankment is improbable, but not impossible (Knight Piésold Ltd. 2020). Riverbank stability would be monitored annually during spring runoff and after greater than 100-year precipitation events (4.6 inches of precipitation) during active closure, and after greater than 500-year precipitation events (5.5 inches of precipitation) during post-closure (Knight Piésold Ltd. 2020).

*Long-Term Vegetation Community Stability and Function*. As with the No Action Alternative, where less-fertile stockpiled soil is used, such as on the TSF surface, soil amendments such as fertilizer and mulch may need to be applied to ensure revegetation success. In addition, sprinklers, irrigation, and browse protection measures may also be needed until vegetation is successfully re-established.

There is the potential for upward flow through the tailings and the cover in the early stages of tailings consolidation after cover placement. As a result, the potential exists for limited salt-affected areas to develop where upward flow through the cover is routed with storm water from the tailings impoundment. There is no indication that these limited areas would negatively affect reclamation, but rather would contribute to diversity in post-reclamation plant communities (Haley & Aldrich 2020c).

#### *3.3.4.3. Mitigation*

As discussed above, in the Proposed Action there is a risk of development of excess pore pressure that could initiate liquefaction of the slimes and mobilization of both cap fill and slimes caused by rapid or uneven loading of cap material. As discussed in Technical Memo 2 (Haley & Aldrich 2020b), to mitigate this risk, it is recommended that at a closer proximity to closure, additional investigations and analysis should be conducted to ensure proper cap design, proper execution of cap contouring, and to facilitate a successful positive surface drainage. To minimize reclamation uncertainties, the Forest Service may consider the need for monitoring and maintenance beyond joint reclamation bond release to ensure vegetation success, proper functioning of the drainage channels and sediment pond, cap settlement and pond formation, and river channel stability.

#### *3.3.4.4. Cumulative Impacts*

Past actions that have adversely affected soil and water quality resources within the area include mining and exploration related activities since the mid-1980s, forest fires, timber harvest, road building and maintenance, and power line development. These projects, through surface disturbances, have increased erosion rates and sedimentation to waterways.

Present and future actions, such as fuels reduction projects, noxious weed treatments, and road and power line maintenance, would continue to provide similar post-mine land use further contributing to wildlife habitat, forestry, visual quality, dispersed recreation, and overall beneficial cumulative impacts over time.

Environmental changes as a result of climate change, which may cause a rise in temperatures and changes in precipitation patterns, as described in **Section 3.1.4, Projected Changes in Climate**, could make reclamation actions more challenging. These types of changes could result in more intense storm events or reduce the success of revegetation for certain species used in reclamation. In addition, changing climate parameters could increase invasive weed establishment and persistence, and change the frequency and intensity of forest fires. However, reclamation and closure would require monitoring of reclamation actions to make sure they are successful until they meet regulatory compliance.

The uncertainties of climate change, such as severity and duration of droughts and number of heavy precipitation events, could affect long-term reclamation success and TSF stability over time. Droughts could reduce vegetation cover on reclaimed surfaces, which could result in accelerated erosion of the TSF cap and embankment and potentially affect stability of the TSF. An increase in the number of heavy precipitation events also could cause accelerated erosion of the TSF embankment, drainage channels, and riverbank, all potentially affecting stability of the TSF. Post-bond considerations for the Forest Service presented above and in **Section 3.2, Geotechnical Stability** would provide long-term care and maintenance of reclaimed surfaces and the river channel due to potential impacts resulting from climate change.

#### *3.3.4.5. Regulatory Compliance and Forest Plan Consistency*

Both the No Action Alternative and Proposed Action comply with applicable state and federal laws and regulations (see the list in **Section 1.7**) and the Gallatin Forest Plan. The reclamation plan (SMC 2016) outlines BMPs and monitoring procedures to protect soil, air, surface water, and groundwater resources in compliance with 36 CFR 228 and the MMRA. Seeding and planting of reclaimed surfaces would consist of native species of grasses, forbs, shrubs, and trees to promote wildlife habitat and foraging opportunities as described in the reclamation plan (SMC 2016), and infestations of noxious weeds would be identified and treated to meet state and county standards. SMC's integrated weed management plan was designed to control the spread of noxious weeds and to reduce or eliminate current noxious weed infestations (Appendix E8 of the CORP [SMC 2016]) in compliance with EO 13112. SMC has a Weed Control Plan approved by the Sweet Grass County Weed Control District in the County Noxious Weed Control Act. If needed, SMC would modify its approved plan before surface disturbance.

To protect life and property, the TSF dam would be reviewed and monitored by several agencies and review panels. MMRA would regulate the construction, operation, and reclamation of Stage 6 TSF dam, as it currently does for all other stages. During operation, the IRP would monitor the dam at least every 5 years during ongoing operations of the TSF (82-4-380, MCA).

In compliance with the Clean Air Act of Montana and the federal Clean Air Act, SMC holds MAQP No. 2653-06, which sets emission limitations for specific constituents and includes measures required to minimize fugitive dust during construction and operations. In addition, SMC's CORP includes best practices to protect air quality, including management of chemical dust suppressants and the use of prescribed fires (SMC 2016).

## 3.4. GROUNDWATER HYDROLOGY

This section describes the analysis area for groundwater and discloses potential effects for the No Action Alternative and Proposed Action on groundwater quality and quantity in the analysis area. Key laws and regulations that provide the regulatory framework for this analysis are described in **Section 1.7, Applicable Laws, Regulations, and Policies**. Methods specific to the groundwater analysis are detailed below in **Section 3.4.2, Analysis Methods**. The extent of the analysis of groundwater hydrology focuses on issues identified during scoping, which suggested that groundwater discharges could adversely affect groundwater quality through elevated nitrogen levels (**Table 1.5-1**).

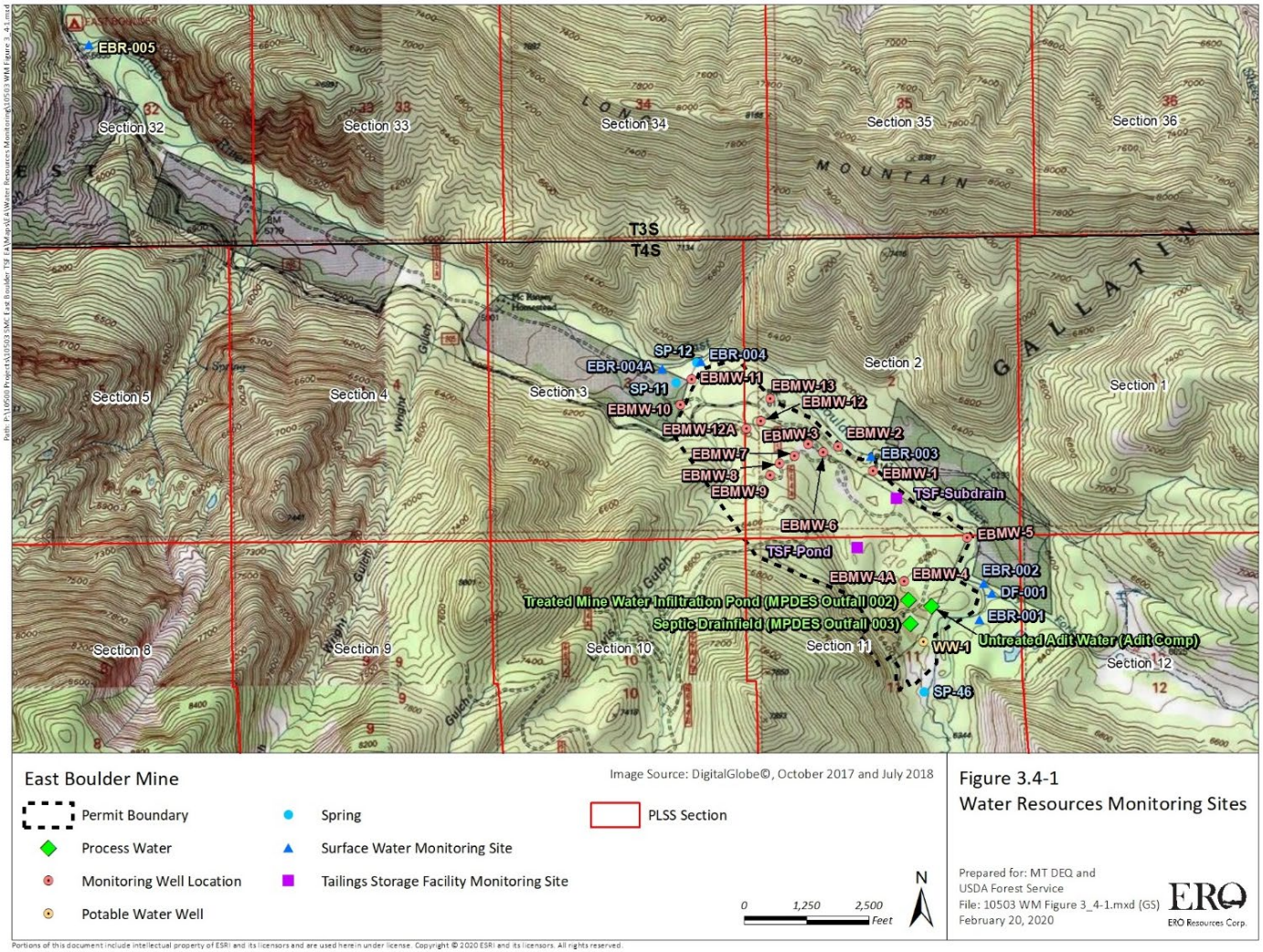
### 3.4.1. Analysis Area

The groundwater analysis area is the Project area, which is the 396.58-acre mill site/TSF permit area and immediately downstream of the Project area, as shown on **Figure 3.4-1**. The time period evaluated for this analysis includes construction (beginning in 2020), through the end of operations (until 2033 under the Proposed Action at current production rates), and completion of reclamation and post-closure monitoring activities (approximately 8 years after completion of operations). The total duration of Project activities analyzed is 21 years.

### 3.4.2. Analysis Methods

This groundwater analysis considers analysis completed by SMC's consultant, Knight Piésold Ltd. While conducting analysis for a design of the Stage 6 TSF Expansion, Knight Piésold Ltd. completed stability analysis using SLOPE/W© (a two-dimensional Limit Equilibrium stability analysis software package) and the TSF's basin seepage analysis using analytical models (Knight Piésold Ltd. 2020). The impact analysis of groundwater hydrology completed by Knight Piésold Ltd. considers past water management and monitoring plans, results, and information provided in the Detailed Design for Stage 6 TSF Expansion - Revision 5 Report (Knight Piésold Ltd. 2020). The groundwater quantity analysis evaluated potential Project impacts on groundwater flow and gradients.

This impact analysis also considers potential impacts on groundwater quality. Specifically, the analysis focuses on elevated nitrogen levels related to the use of explosives during mining. The groundwater quality impact analysis considers current groundwater quality monitoring data, Montana water quality standards, and projections presented in the Detailed Design for Stage 6 TSF Expansion - Revision 5 Report (Knight Piésold Ltd. 2020). Technical Memorandum 3 details water quality and quantity impacts related to the Proposed Action (Haley & Aldrich 2020c). In addition to the human health groundwater standard of 10 milligram per liter (mg/L) for nitrate (DEQ 2019), Montana regulations also limit changes in the concentration of nitrate in groundwater that will not cause degradation of surface water if the sum of the predicted concentrations of nitrate at the boundary of any applicable mixing zone does not exceed 7.5 mg/L for nitrate sources other than domestic sewage (ARM 17.30.715(1)(d)(i)). A groundwater




Sources: Hydrometrics, Inc. 2018a and 2018b, Revision 19-001

**Figure 3.4-1 Water Resources Monitoring Sites**

mixing zone was approved by DEQ under Operating Permit No. 00149 as Revision 17-001 on September 6, 2017 (DEQ 2017).

### 3.4.3. Affected Environment

Groundwater around the Project area is present in bedrock, unconsolidated surficial alluvium, and glacial deposits of the East Boulder River Valley (DEQ and Forest Service 2012a; Hydrometrics, Inc. 2017).

#### *3.4.3.1. Groundwater Monitoring*

SMC uses standard methods to characterize and monitor groundwater resources in the analysis area, including a network of monitoring wells sampled on a quarterly basis for water quality analysis and water level measurement (Hydrometrics, Inc. 2018a). The East Boulder Mine employs a comprehensive monitoring network that includes 16 wells used to monitor groundwater (WW-1, EBMW-1 through EBMW-4, EBMW-4A, EBMW-5 through EBMW-12, EBMW-12A, and EBMW-13) around the TSF (Hydrometrics, Inc. 2018a, 2018b) (see **Figure 3.4-1**). Those wells, as well as three springs (SP-11, SP-12, and SP-46), are subject to systematic monitoring and sampling to document the quantity and quality of groundwater resources upgradient and downgradient of the mine and to assure that Montana groundwater quality standards described in the current DEQ Circular 7 (DEQ 2019) are being met at the permit boundary (Hydrometrics, Inc. 2018a). Monitoring wells EBMW-10 and EBMW-11 are located at the permit boundary and represent the downgradient compliance point for the approved mixing zone. The quarterly groundwater monitoring schedule would be increased to monthly in the event that trigger levels for total inorganic nitrogen (5.0 or 7.5 mg/L depending on the well) are exceeded (Hydrometrics, Inc. 2018a, Table 4-6).

#### *3.4.3.2. Groundwater Quantity*

At the East Boulder Mine, Paleozoic sediments and igneous rocks of the Stillwater Complex underlie the unconsolidated surficial alluvium and glacial deposits. Groundwater in that complex fills primary matrix porosity and joints, fractures, and fault zones, which form a secondary porosity. Although groundwater flow through unfractured rock matrix is slow, the rocks are extensively jointed and faulted, providing potential for some groundwater movement (DEQ and Forest Service 2012a).

Glacial deposits in the Project area are an unconsolidated mix of silt, sand, gravel, and boulders. Lenses of coarse-grained deposits are located within the glacial deposits at depths of 100 to 200 feet (Hydrometrics, Inc. 2017). Where present, such lenses are typically 10 to 40 feet thick and variable in grain size distribution. Alluvial deposits are relatively shallow and underlain by glacial deposits, except where they encounter shallow bedrock on the valley's sides. The coarse-grained lenses convey most of the groundwater in the analysis area. Their permeability ranges from moderate to extremely high: hydraulic conductivities derived from aquifer pumping tests ranged from 12 to 567 feet per day (Hydrometrics, Inc. 2017). Hydraulic conductivities of other types of glacial deposits are one or more orders of magnitude lower than those of the coarse-grained glacial lenses.

The shallow alluvium is considered an important formation as it contributes a bulk of recharge to the groundwater system below. However, information on the hydrologic characteristics of the alluvial formation is limited as no wells are installed in it downgradient of the mine site.

Beneath the mine site, depth to groundwater ranges from 120 to 150 feet with groundwater becoming shallower as the land surface slopes toward the East Boulder River (Hydrometrics, Inc. 2017). Water level data indicate that the regional groundwater flow direction is approximately parallel to the axis of the valley, flowing from southeast to northwest, with a hydraulic gradient on the order of 0.026 percent and increasing to approximately 0.040 percent as it approaches the terminal moraine near the downgradient permit boundary (Hydrometrics, Inc. 2017).

Groundwater levels within individual wells fluctuate seasonally, typically between 10 and 35 feet (Hydrometrics, Inc. 2017). The extent of water level fluctuations is related to distance from the East Boulder River, with wells farther away from the river showing greater fluctuations (DEQ and Forest Service 2012a).

In addition to precipitation and snowmelt recharge, the shallow groundwater system of the Project area is recharged through groundwater inflow from upgradient areas, infiltration of surface water from the East Boulder River, and mine-related discharges (DEQ and Forest Service 2012a). Mine-related discharges include water discharged to the percolation pond, septic system discharge, seepage through the TSF, and seepage through the TSF embankment. Hydrometrics, Inc. (2017) modeled the groundwater system and estimated groundwater recharge from direct precipitation (rain and snowmelt) of 37 gallons per minute (gpm) across the valley in the vicinity of the permit boundary. Hydrometrics, Inc. (2017) also estimated mine-related discharges of 208 gpm for the percolation pond, 5.3 gpm for the septic system, 2 gpm for seepage through the TSF, 10 gpm for seepage through the TSF embankment prior to the 2015 construction of the embankment capture system, and 2 gpm for seepage through the TSF embankment since construction of the system. SMC's discharge design maximum flow is 737 gpm (SMC 2016). SMC's MPDES permit (MPDES Permit No. MT0026808; DEQ 2015) for the percolation pond (Outfall 002) lists the expected average discharge, in tandem with Outfall 001 (not constructed), to be up to 500 gpm of treated wastewater from the mine adit but does not specify a maximum permitted amount allowed.

The East Boulder River serves as a source of both recharge and discharge for the shallow groundwater system. River levels are higher than adjacent groundwater levels along the upstream portion of the Project area, resulting in groundwater recharge, but approximately equal to, and lower in elevation at the downstream end of the area, resulting in groundwater discharge (DEQ and Forest Service 2012a). Synoptic survey results indicate the groundwater system discharges to the river between wells EBR-003 and EBR-004 with the influx limited by the low permeability glacial till in the area (Hydrometrics, Inc. 2017). Between well EBR-004 and above Wright Gulch, which is near the toe of the glacial terminal moraine, the groundwater system gains about 3 cubic feet per second (cfs; 1,300 gpm) from this losing section of the river where the river channel passes from the low permeability glacial till into much higher

permeability proglacial alluvium (Hydrometrics, Inc. 2017). See **Section 3.5, Surface Water Hydrology** for further discussion of the East Boulder River.

#### *3.4.3.3. Groundwater Quality*

Groundwater present in unconsolidated sediments in the Project area is primarily a calcium-bicarbonate-type with the exception of water from EBMW-4 and EBMW-4A, located between the percolation pond and the TSF, which is a sodium-bicarbonate type (Hydrometrics, Inc. 2018b). Overall, Project area groundwater displays a neutral to slightly alkaline pH and contains low to moderate concentrations of total dissolved solids (TDS; 83 to 747 mg/L) and low concentrations of sulfate (2 to 82 mg/L) (Hydrometrics, Inc. 2017; SMC 2016).

Groundwater nitrogen concentrations (typically measured as nitrate plus nitrite or total inorganic nitrogen) as well as the measurement of dissolved salts (typically measured as TDS or electrical or specific conductivity) have increased during operations, compared to the baseline period (DEQ and Forest Service 2012a). In 2007, an untreated adit water release occurred, resulting in a sharp increase in dissolved salts and nitrogen as measured in groundwater monitoring well EBMW-6 located at the north embankment (DEQ and Forest Service 2012a). The release resulted in the exceedance of SMC's MPDES Permit No. MT0026808 limit of 30 pounds per day of nitrogen and exceedance of the Class I groundwater beneficial use criterion for electrical conductivity of 1,000 micromhos per centimeter (DEQ and Forest Service 2012a)[2]. In response, SMC initiated several mitigation measures including construction of a secondary containment pond, commissioning of a biological nitrification system to supplement the existing denitrification system, installation of a reverse osmosis system as a backup treatment, in-situ groundwater treatment, and a hydrogeologic and geochemical investigation into the source of the problem (SMC 2016).

DEQ issued an Administrative Order on Consent (AOC) on August 6, 2010 detailing violations and the need for SMC to implement corrective actions (SMC 2016; Hydrometrics, Inc. 2018b). The primary source of nitrogen measured in groundwater was determined to be due to the leaching of explosives residues from waste rock construction materials (Hydrometrics, Inc. 2018b). Following the identification of the source of nitrogen increases, SMC implemented nonpoint source control measures to reduce the amount of residual nitrogen on waste rock by 50 percent as well as the construction of an embankment underdrain capture system on the Stages 4 and 5 TSF foundation to reduce the source of nitrogen from reaching and impacting groundwater quality (Hydrometrics, Inc. 2018b). A groundwater mixing zone was approved by DEQ under Operating Permit No. 00149 as revision MR-17-001 on September 6, 2017 (DEQ 2017) to address nitrate concentrations measured in groundwater wells in close proximity to the TSF. As a result of corrective actions and approval of the groundwater mixing zone, the conditions of the AOC were satisfied, and the AOC was closed on January 10, 2018 (Hydrometrics, Inc. 2018b). Results from continued groundwater monitoring have shown an overall improvement in water quality following the corrective actions taken. Nitrogen

[2] Since electrical conductivity is a measure of dissolved anions and cations, an increase in nitrogen (an anion) will result in a corresponding increase in electrical conductivity.

concentrations measured in monitoring wells EBMW-10 and EBMW-11 located at the end of the approved mixing zone are less than both the 7.5 mg/L nondegradation limit and 10 mg/L human health groundwater standard (Hydrometrics, Inc. 2018b).

### 3.4.4. Environmental Consequences

The following is an abbreviated summary regarding groundwater quantity and quality impacts. Additional details and discussion can be found in the East Boulder Mine Project FEIS (DSL et al. 1992), the FEIS for SMC's revised water management plan for closure and post-closure (DEQ and Forest Service 2012a, 2012b), as well as the CORP (SMC 2016). Additionally, Technical Memorandum 3 details water quality and quantity impacts related to the Proposed Action (Haley & Aldrich 2020c).

#### *3.4.4.1. Groundwater Quantity*

#### No Action Alternative

See **Section 2.1** for a full description of the No Action Alternative. The No Action Alternative effectively represents current conditions, with the addition of the construction of TSF embankment Stages 4 and 5, which were permitted and analyzed in the East Boulder Mine Project FEIS (DSL et al. 1992) but have not yet been fully constructed.

The construction of TSF embankment Stages 4 and 5 would increase the overall duration of water capture and treatment related to the various permitted activities. Although the duration of mine water use would also increase, since existing conditions are currently within permitted limits regarding water quantity, no exceedances of regulatory limits governing mining activities are expected to occur under the No Action Alternative.

Upon closure following construction of TSF embankment Stages 4 and 5, a short-term increase in water sent for treatment and discharged to groundwater via the percolation pond would be expected as water is no longer used for processing and the supernatant pond is drained to allow construction of the TSF reclamation cover. The amount of supernatant water would be, in part, dependent on the amount of net precipitation received the year TSF closure activities began. Approximately 98 million gallons of tailings waters would be removed from the tailings impoundment during installation of the cover (DEQ and Forest Service 2012a). The intended purpose of constructing a closure cover over the TSF would be to shed precipitation away from the TSF, thus minimizing the amount of precipitation entering the TSF and, along with the gradual consolidation of the tailings, minimizing the amount of water collected from the underdrain system over time. However, localized settlement and compaction of the tailings could result in areas of standing water that would increase infiltration and TSF seepage locally if these developed. Uncertainties in cover and drainage swale performance lead to corresponding uncertainties in groundwater quantity estimates prior to more detailed investigation and design planned nearer to closure, which would reduce the risk of developing standing water (see **Section 3.2, Geotechnical Stability**; Haley & Aldrich 2020b). Any short-term increase in water discharged to groundwater would have to be managed by SMC under the options outlined in

the 2012 FEIS (DEQ and Forest Service 2012a) and approved in the ROD (DEQ and Forest Service 2012b).

Since the No Action Alternative would not result in any additional effects on the Project area groundwater system's physical conditions, the system would remain in a state as described in **Section 3.4.3.2, Groundwater Quantity**. Climate change, as described in **Section 3.1.4, Projected Changes in Climate**, could potentially affect groundwater quantity. Such effects would depend on the change in precipitation patterns, which could change the rates of groundwater recharge. Any reduced availability of surface water could cause local users to offset water shortages by using groundwater. In the event of increased water availability due to extreme precipitation events, groundwater recharge could increase, and groundwater use could decrease due to increased surface water availability. The changing seasonality of precipitation would require mine activities to adapt to those changes. East Boulder Mine's potential annual water surplus or deficit can be managed with the basin underdrain system and by adjusting the operating TSF pond volume within the recommended operating range (Knight Piésold Ltd. 2020). Given the location of the Project, it is unlikely that any climate-induced changes in groundwater quantity would represent a significant impact for the mine and downstream water users during the life of the Project.

### Proposed Action Alternative

Under the Proposed Action, the TSF embankment would be raised by 14 feet (Stage 6) and ancillary facilities would be relocated to accommodate the embankment raise (see **Section 2.2, Proposed Action Alternative,**).

The Detailed Design for Stage 6 TSF Expansion - Revision 5 Report (Knight Piésold Ltd. 2020) documents the results of seepage and stability analyses. The report provides the following information:

- The TSF is lined with a 100-mil HDPE geomembrane, which was installed over the entire TSF's basin area, including the floor and upstream face of the embankments. The upstream face of the Stage 6 expansion would also be lined with a 100-mil HDPE geomembrane. A basin underdrain system was installed on the floor of the TSF, above the geomembrane, to enhance consolidation of the tailings mass, collect seepage, and lower the hydraulic head on the geomembrane.
- The potential leakage through the lining system was estimated with the tailings at the Stage 6 maximum filling level ([elevation] 6,338 feet). The seepage analyses consider the leakage due to the presence of geomembrane defects and due to permeation through the geomembrane. Permeation leakage rates are estimated to be several orders of magnitude less than the rates resulting from geomembrane defects and were found to represent an insignificant component of the total estimated potential leakage.
- The total estimated seepage from the TSF following filling of the Stage 6 expansion with tailings ranges from approximately 4 to 24 gpm for the lower and upper bound cases that were evaluated, respectively. The estimated seepage rates for the lower and upper bound cases are approximately 0.4 and 2.4 gpm, respectively, greater than the estimated seepage rates from the Stage 5 TSF. Such change in seepage rate is

insignificant compared to the estimated East Boulder River baseflow (DEQ and Forest Service 2012a, Section 3.1.2.2.1).

- The mine currently discharges mine water to the Percolation Pond at a rate of approximately 250 gpm and this rate is projected to increase to approximately 500 gpm with ongoing mine development.
- Seven cross-sections were analyzed to evaluate the stability and seismic displacement of the TSF embankments. Those analyses indicate that "the uncontrolled release of materials from the TSF due to a reduction in material strength parameters or the presence of a foundation Glaciolacustrine Unit is very unlikely."

Consideration of this information and its comparison with the results of previous analyses leads to a conclusion that expanding the TSF to Stage 6 would not have any significant effect on the groundwater system around the Project area in terms of groundwater flow and gradients (Haley & Aldrich 2020c). As such, the assessment of the groundwater impacts potentially caused by operating the TSF provided in the 2012 FEIS (DEQ and Forest Service 2012a) would remain valid for the Stage 6 TSF expansion. The 2012 FEIS analysis (DEQ and Forest Service 2012a) considered a maximum discharge rate of 737 gpm which is greater than the predicted increase to approximately 500 gpm. The 18-month closure period determined in the 2012 FEIS (DEQ and Forest Service 2012a) would remain valid given the minor addition to the TSF footprint and height (Haley & Aldrich 2020c).

Potential impacts on groundwater quantity as a result of climate change would be the same as described for the No Action Alternative; however, any potential effects would last the additional 5 years (compared to the action evaluated by the 2012 FEIS) the mine is in operation.

#### *3.4.4.2. Groundwater Quality*

SMC handles three wastewater streams from its operations at the East Boulder Mine. One stream is adit water, which is composed of intercepted groundwater and any make-up water needed for operations underground. The second stream is process water, which includes water used in the milling and concentrating circuits and for slurrying tailings. Process water reports to the tailings impoundment and is also called tailings waters. The third stream is storm water that has contacted mine-related wastes such as waste rock and tailings. Storm water produces both surface runoff and embankment face seepage that is subsequently managed by the embankment underdrain and is pumped into the TSF (Knight Piésold Ltd. 2020). Further discussion of these wastewaters is provided in **Section 3.5, Surface Water Hydrology**. The infiltration of any one of these wastewater streams has the potential to impact groundwater, and their related impacts on groundwater are discussed below.

### No Action Alternative

Under the No Action Alternative, groundwater quality would be similar to that described in the 2012 FEIS (DEQ and Forest Service 2012a) with impacts on groundwater from dissolved salts and nitrogen being less than those disclosed due to measures implemented following the 2012 analysis to reduce residual nitrogen on waste rock, construction of the embankment underdrain capture system installed in 2015, as well as approval of the groundwater mixing

zone in 2017 (Hydrometrics, Inc. 2018b; DEQ 2017). Current levels would continue to be assessed during ongoing water quality monitoring (Hydrometrics, Inc. 2018b). The measures have reduced the amount of residual nitrogen on waste rock, thereby reducing the amount of nitrogen leached by storm water infiltration. The reduction in residual nitrogen, along with the underdrain capture system, have resulted in a reduction in nitrogen concentrations in groundwater to levels lower than those measured in 2015. With these actions being maintained under the No Action Alternative, the No Action Alternative is unlikely to adversely impact groundwater quality above regulatory limits at the downgradient end of the approved mixing zone.

Tailings backfill and waste rock placed underground during operations would be the primary source of nitrogen and salts at closure in adit water. The quality of adit water at closure would initially be similar to operational water quality with nitrogen continuing to be the contaminant requiring treatment. However, the nitrogen load of the adit water would decrease due to the cessation of mining and its related use of explosives. The need for closure treatment is anticipated to be short in duration (up to 18 months; DEQ and Forest Service 2012a). Groundwater flowing through backfilled areas into the open mine workings is expected to flush some nitrogen and salts into water accumulating in the mine void. Land application would be utilized for additional reduction of nitrogen if compliance with MPDES permit limits were not being met via discharge to the percolation pond at closure (SMC 2016). Post-closure, SMC would not have to treat adit water once discharge concentrations comply with groundwater quality criteria and the MPDES permit nitrogen load limit. Once regulatory groundwater standards are met, mine water would be allowed to be directly discharged to groundwater, surface water[3], or as part of a land application.

Based on the above information, the No Action Alternative is unlikely to adversely impact groundwater quality above regulatory limits outside the approved mixing zone. Changes in climate in the area of the mine are unlikely to affect groundwater quality, unless it resulted in significant reduction of groundwater recharge, which might limit dilution effects and result in increasing the concentration of regulated water quality substances. However, a more detailed assessment of such possibility would be highly speculative in nature.

### Proposed Action Alternative

Under the Proposed Action, groundwater quality mitigation measures consisting of reducing residual nitrogen on waste rock would remain in place, and the embankment underdrain capture system would be extended under Stage 6. The Stage 6 expansion would extend the TSF liner and would include extension of the TSF underdrain system. During Stage 6 construction, the potential exists for a short-term release of residual nitrogen from waste rock used for construction prior to completion of the extension of the embankment underdrain capture system. This would be considered minor due to SMC's reduction of residual nitrogen by 50 percent because of their change in explosives. The increase of between 0.4 gpm and 2.4 gpm as

[3] As long as the discharge to surface water does not cause an increase in streamflow greater than 15 percent of the $7Q_{10}$ value (lowest 7-day average flow that occurs on average every 10 years) to avoid violation with Montana nondegradation rule ARM 17.30.715(1)(a)).

a result of Stage 6 would result in additional nitrogen to groundwater but since this increase in flow is of the order of 10 percent in comparison to the Stage 5 condition, mass loading of nitrogen would be inconsequential (Haley & Aldrich 2012c). Additionally, since the range of nitrate plus nitrite concentrations of the East Boulder Mine TSF Subdrain was 0.06 to 6.78 mg/L for the period 2013 through 2017 (Hydrometrics, Inc. 2018b) along with the approved mixing zone, the small increase in nitrogen load would not be expected to increase groundwater concentrations at the end of the mixing zone. Consequently, it is expected that the SMC would continue to meet state groundwater quality standards at the end of the approved mixing zone and with regard to their MPDES discharge limits. It is also expected that all applicable groundwater beneficial use standards would be met during the Project operation.

During closure and post-closure, the Proposed Action impacts would be the same as described under the No Action Alternative. Downstream beneficial uses would not be compromised by the Proposed Action during closure or post-closure periods.

Changes in climate in the Project area and associated effects on groundwater quality would be the same as described under the No Action Alternative.

#### *3.4.4.3. Cumulative Effects*

The No Action Alternative would not result in any new impacts on groundwater resources; therefore, cumulative impacts would not occur. The Proposed Action is unlikely to result in additional effects beyond those described for the No Action Alternative; therefore, the Proposed Action would also not contribute to any cumulative impacts on groundwater quantity. Similarly, given the lack of other actions in the analysis area that could affect groundwater quality, and the lack of expected changes in groundwater quality under the Proposed Action, cumulative impacts are not expected.

#### *3.4.4.4. Regulatory Compliance and Forest Plan Consistency*

Both the No Action Alternative and Proposed Action comply with applicable state and federal laws and regulations (see the list in **Section 1.7**) and the Gallatin Forest Plan. The Proposed Action includes feasible and practicable measures to minimize adverse environmental impacts on National Forest resources and to maintain and protect fisheries habitat in compliance with 36 CFR 228.8, the Gallatin Forest Plan, and the MMRA, such as conducting groundwater monitoring, lining the TSF to minimize seepage, and collecting and treating wastewaters. By applying for and complying with the following permits and authorizations, SMC's current operations (No Action Alternative) and Proposed Action would be in compliance with Clean Water Act and Montana Water Quality Act as follows:

- Required water quality monitoring in the East Boulder Mine Plan of Operations, Operating Permit No. 00149, and MPDES permit.
- MPDES permit MT0026808: Discharge of excess treated adit water from the Project area is regulated by MPDES Permit No. MT0026808, which allows for a surface discharge point in the East Boulder River (Outfall 001 – not constructed), a groundwater discharge point at an onsite percolation pond (Outfall 002), and a septic wastewater discharge to

groundwater (Outfall 003). Water quality monitoring is required under the MPDES permits (DEQ 2015).

## 3.5. SURFACE WATER HYDROLOGY

This section describes the analysis area for surface waters, including the East Boulder River, and discloses potential effects of the No Action Alternative and Proposed Action on surface water quality and quantity in the analysis area. Key laws and regulations that provide the regulatory framework for the effects analysis are described in **Section 1.7, Applicable Laws, Regulations, and Policies**. Methods specific to the surface water analysis are detailed below in **Section 3.5.2, Analysis Methods**. To address public scoping comments (see **Table 1.5-1** in **Chapter 1**), the analysis focused on potential effects on surface water quantity and quality from: (1) storm water discharge (sediment); (2) treated adit water discharge (nitrates and other constituents); and (3) tailings water seepage (nitrates and other constituents). This analysis also considered the potential discharge of tailings water/materials in the unlikely event of a TSF failure and the possibility of stream channel avulsion.

### 3.5.1. Analysis Area

The analysis area for evaluating direct, indirect, and cumulative effects on surface water quantity and quality includes the East Boulder River and reaches of its tributary streams and wetlands within the Project area, which is the 396.58-acre mill site/TSF permit area (**Figure 2.2-1**), and immediately downstream of the Project area (**Figure 3.4-1**). The time period evaluated for this analysis includes construction (beginning in 2020), through the end of operations (until 2033 under the Proposed Action at current production rates), and completion of reclamation and post-closure monitoring activities (approximately 8 years after completion of operations). The total duration of Project activities analyzed is 21 years.

### 3.5.2. Analysis Methods

Analysis methods included review of previous NEPA/MEPA documents and a comparison of current and proposed plans, and monitoring data with regulatory standards for surface water discharges. Following is a list of key documents that were reviewed for this analysis:

- 1992 East Boulder Mine Project FEIS
- 1999 Water Management Plan
- 2011 Spill Prevention, Control, and Countermeasure Plan
- 2012 Revised Water Management Plans and Boe Ranch LAD FEIS
- 2016 CORP
- 2017 Water Resources Monitoring Report
- 2018 East Boulder River Biological Monitoring Plan
- 2018 SWPPP
- 2018 Operational Water Resources Monitoring Plan
- 2019 Tailings Operations, Maintenance, and Surveillance Manual
- 2020 Detailed Design for Stage 6 TSF Expansion and Appendix F: Storm Water Management
- 2020 Field Visit Observation Notes

Surface water investigations conducted in the vicinity of the East Boulder Mine include several baseline studies and operational monitoring reports (DEQ and Forest Service 2012a; Hydrometrics, Inc. 2018a, 2018b). These studies established specific surface water monitoring locations and protocol for measurement of stream flow and collection of surface water samples for chemical analyses (**Figure 3.4-1** and **Section 3.4.2, Analysis Methods**).

### 3.5.3. Affected Environment

The analysis area is located in the East Boulder River watershed. The East Boulder River is a second order tributary to the Boulder River. The drainage ranges in elevation from more than 10,000 feet at the headwaters in Placer Basin down to 4,840 feet at its confluence with the Boulder River. The analysis area is at an elevation of approximately 6,300 feet above sea level, immediately northwest of the confluence of the East Boulder River with Dry Fork Creek. The analysis area reach of the East Boulder River (adjacent to and immediately downstream of the Project area) is fully supporting all of its beneficial uses as defined in Section 303(d) of the Clean Water Act. The analysis area represents the uppermost potential source of human impacts within the East Boulder River watershed (DEQ and Forest Service 2012a).

Pursuant to Operating Permit No. 00149 and the East Boulder Mine Plan of Operations, the SMC currently employs a comprehensive network of monitoring sites for surface water, process waters, springs, and groundwater (see **Section 3.4, Groundwater**). Six surface water monitoring sites are operated upstream from (EBR-001, EBR-002, and DF-001); adjacent to (EBR-003); and downstream from (EBR-004A and EBR-005) the Project area (**Figure 3.4-1**) and provide up to 30 years of monitoring data. Investigators operated five of those sites for more than 20 years, while adding monitoring site EBR-004A in 2007 downstream of EBR-004. In 2016, surface water site EBR-004 was taken off the monitoring plan after being sampled in January, February, and March due to redundancy in data between EBR-004 and EBR-004A. Monthly monitoring at three of the six current sites and quarterly monitoring at three of the six current sites includes surface water quantity (flow rate) monitoring and collection of water samples subject to laboratory chemical analysis for 16 general parameters/major ions, 6 nutrients including nitrates, and 8 metals (Hydrometrics, Inc. 2018a, 2018b).

Discharge of excess treated adit water from the Project site is regulated by MPDES Permit No. MT0026808 (DEQ 2015), which allows for a surface discharge point in the East Boulder River (Outfall 001 – not constructed), a groundwater discharge point at an onsite percolation pond (Outfall 002), and a septic wastewater discharge to groundwater (Outfall 003). Water quality monitoring is required under the MPDES permit and includes 21 parameters for Outfall 001 (in the event that it is constructed in the future), 15 parameters for Outfall 002, and 4 parameters for Outfall 003. Reporting requirements primarily include daily maximum and monthly averages for Outfalls 001 and 002, and monthly and quarterly averages for Outfall 003.

#### *3.5.3.1. Surface Water Quantity*

### East Boulder River

Flows in the East Boulder River are typically highest during the spring runoff and lowest during the winter and early spring. Historic data from a United States Geologic Survey gaging station (06197800) located below the confluence of Dry Fork Creek indicates streamflow varied from a low of 5 cubic feet per second (cfs) in March 1982 to a high of 588 cfs in late June of the same year (DEQ and Forest Service 2012a). Measured 2017 streamflow rates in the East Boulder River ranged from 5.7 cfs in February at EBR-004A to 177 cfs in June at EBR-003 (Hydrometrics, Inc. 2018b).

Interaction of groundwater with the East Boulder River is controlled by streambed permeability and the relative elevation difference between the groundwater table and stream stage. Synoptic survey results indicate relative changes in groundwater/surface water interaction in three reaches of the East Boulder River adjacent to and downstream from the Project area (Hydrometrics, Inc. 2017). These three reaches from upstream to downstream include: (1) a gaining reach between EBR-003 and EBR-004 that experiences approximately 1 cfs (400 gpm) of groundwater discharge to the river through low permeability till; (2) a losing reach between EBR-004 and Wright Gulch that experiences approximately 3 cfs (1,300 gpm) of groundwater recharge from the river through high permeability proglacial alluvium; and (3) a gaining reach between Wright Gulch and EBR-005 that experiences approximately 5.3 cfs (2,400 gpm) of groundwater discharge to the river. The majority of groundwater discharging to the river occurs within the lower portion of the third reach with an approximate 4.4-cfs (1,970 gpm) increase in flow to the river (Hydrometrics, Inc. 2017).

### Storm Water Discharge

Existing storm water controls in the Project area were designed and constructed to contain and percolate 100 percent of onsite storm water through a series of diversion channels, collection channels, sedimentation ponds, and a percolation pond. Runoff from areas upslope from the Project area are diverted around the TSF with diversion channels that have been sized for the 24-hour Probable Maximum Flood (PMF). The TSF has been designed to contain the Inflow Design Flood (IDF) resulting from the 24-hour PMF. East Boulder Road (main access road for the mine) prevents storm water from discharging toward the East Boulder River. Facility Design Criteria described in the current SWPPP promote internal site drainage through collection and percolation structures. The following SWPPP Best Management Practices (BMPs) provide for continued control of storm water runoff in the Project area:

- Upslope storm water diversion channels
- Onsite storm water collection channels
- Storm water percolation basins
- Sediment containment basins
- Road BMPs
- Vegetative buffer zones
- Interim and permanent revegetation

- Reclamation/stabilization of surface disturbances concurrent to operations
- Monitoring and inspection activities
- Maintenance and corrective actions

Since obtaining an authorization (MPDES Permit No. MTR000503) to discharge storm water under a Multi-Sector General Permit (MSGP) in 1997 (renewed in 2018; DEQ 2018b), the SMC has not experienced a storm water discharge at any of the three East Boulder Mine storm water outfalls (Outfalls 001, 002, and 003; not shown on EA figures). Therefore, no storm water discharge flow rates have been recorded.

#### Adit Water Discharge

Mine adit water consists of a combination of unaltered, intercepted groundwater and water recycled from mine and mill operations that is collected in a central sump underground and pumped to the surface where it is clarified and treated to remove excess nitrogen that is present due to explosives residues. Mine water flows through fixed-bed bioreactors for primary denitrification followed by a moving bed bioreactor where nitrifying bacteria convert ammonia to nitrate in aerobic cells and then denitrifying bacteria to reduce nitrate compounds to nitrogen gas in an anoxic cell. After treatment, water is recycled and pumped underground for use in mining operations or discharged in accordance with MPDES Permit No. MT0026808 (DEQ 2015) to the percolation pond (Outfall 002; see **Figure 3.4-1**). While direct discharge to the East Boulder River is permitted (MPDES Permit No. MT0026808 Outfall 001), the outfall structure (a planned instream diffuser in the East Boulder River) has not been constructed; therefore, no discharges have occurred.

Measured flows of adit water at monitoring site “Adit Comp” have widely varied over the site’s monitoring history as they are a function of variable groundwater inflow, mine usage, and underground water management practices. Adit water flows showed a gradual upward trend from 2009 through 2016 and, beginning in January 2017, Adit Comp decreased to a historic low of 65 gpm. The second, third, and fourth quarters of 2017 ranged from 248 gpm in April to 420 gpm in December (Hydrometrics, Inc. 2018b).

#### TSF Seepage

The existing TSF is lined with a 100-mil HDPE geomembrane over the entire basin area, and a basin underdrain system on the floor of the TSF above the geomembrane collects seepage. Leakage of TSF tailings mass water through the lining system can occur due to geomembrane defects and permeation (Knight Piésold Ltd. 2020).

### *3.5.3.2. Surface Water Quality*

#### East Boulder River

Surface waters in the Project area are typically a calcium-bicarbonate type with neutral to slightly alkaline pH and low concentrations of salts (DEQ and Forest Service 2012a; Hydrometrics, Inc. 2018b). Baseline nitrogen concentrations average less than 0.14 mg/L (DEQ and Forest Service 2012a). Nitrate plus nitrite concentrations ranged from less than 0.01 mg/L

to 0.50 mg/L at East Boulder River monitoring sites from 2013 through 2017 (Hydrometrics, Inc. 2018b). The synoptic studies described above in **Section 3.5.2.1** reflect nitrate plus nitrite concentrations in the East Boulder River varying from 0.01 mg/L at EBR-003 with concentrations generally increasing downstream to 0.39 mg/L at EBR-005. The Human Health Standard for nitrate plus nitrite in surface water is 10 mg/L (DEQ 2019). Numerous environmental reviews and analyses have not identified other constituents of concern in the East Boulder River during water quality monitoring (DEQ and Forest Service 2012a).

In compliance with the 1993 East Boulder Mine ROD (Forest Service 1993), a cooperative sediment monitoring program was conducted jointly by the Forest Service and SMC in 2000, 2001, 2002, 2003, 2006, and 2010, measuring East Boulder River flow, turbidity, suspended sediment, and bedload sediment. According to the CORP, "During this period no changes were measured in sediment or turbidity that could be attributed to the East Boulder Mine and it was documented that the East Boulder stream system is very low in suspended sediment, bed load sediment and turbidity." (SMC 2016). Subsequent direction from the agencies, and objectives of the 2018 East Boulder River Biological Monitoring Plan, conclude that SMC will "monitor sediment in the East Boulder River stream channel only if mine construction/production activities with sediment delivery potential occur."

### Storm Water Discharge

Since obtaining authorization (MPDES Permit No. MTR000503) to discharge storm water under a MSGP in 1997 (renewed in 2018; DEQ 2018b), the SMC has not experienced a storm water discharge at any of the three East Boulder Mine storm water outfalls (Outfalls 001, 002, and 003; not shown on EA figures). Therefore, no storm water discharge quality samples have been collected.

### Adit Water Discharge

Adit Comp water is primarily a sodium-sulfate type (DEQ and Forest Service 2012a). The range of nitrate plus nitrite concentrations of adit water prior to treatment was 14.5 to 132 mg/L for the period 2013 through 2017 (Hydrometrics, Inc. 2018b). The Human Health Standard for nitrate plus nitrite is 10 mg/L (DEQ 2019). The MPDES permit (MPDES Permit No. MT0026808; DEQ 2015) for the percolation pond (Outfall 002) lists an effluent limitation of 30 pounds per day of total nitrogen.

While direct discharge to the East Boulder River is permitted (MPDES Permit No. MT0026808; Outfall 001), the outfall structure (a planned instream diffuser in the East Boulder River) has not been constructed; therefore, no discharges to surface water have occurred.

### TSF Seepage

The range of nitrate plus nitrite concentrations of the East Boulder Mine supernatant tailings water was 28.1 to 102 mg/L for the period 2013 through 2017 (Hydrometrics, Inc. 2018b). The range of nitrate plus nitrite concentrations of the East Boulder Mine TSF Subdrain was 0.06 to

6.78 mg/L for the period 2013 through 2017 (Hydrometrics, Inc. 2018b). The Human Health Standard for nitrate plus nitrite is 10 mg/L (DEQ 2019).

### 3.5.4. Environmental Consequences

The following is an abbreviated summary regarding surface water quantity and quality impacts of the Project. Additional details can be found in the East Boulder Mine Project FEIS (DSL et al. 1992), the FEIS for SMC's revised water management plan for closure and post-closure (DEQ and Forest Service 2012a, 2012b), and the CORP (SMC 2016). Additionally, Technical Memorandum 3 details water quality and quantity impacts related to the Proposed Action (Haley & Aldrich 2020c).

#### *3.5.4.1. Surface Water Quantity*

#### No Action Alternative

See **Section 2.1** for a full description of the No Action Alternative. The No Action Alternative effectively represents current conditions, with the addition of the construction of TSF embankment Stages 4 and 5, which were permitted and analyzed in the East Boulder Mine Project FEIS (DSL et al. 1992) but have not yet been fully constructed.

The No Action Alternative would not result in any additional effects on the analysis area for surface water quantity that have not been previously analyzed and disclosed in previous NEPA/MEPA documents (DSL et al. 1992; DEQ and Forest Service 2012a).

*Storm Water Discharge*. The potential for storm water quantity effects associated with the No Action Alternative are minimal or unlikely due to implementation of onsite physical controls and monitoring activities required by the MPDES Permit. Since obtaining authorization (MPDES Permit No. MTR000503) to discharge storm water under a MSGP in 1997 (renewed in 2018), SMC has not experienced a storm water discharge at any of the three East Boulder Mine storm water outfalls (Outfalls 001, 002, and 003; not shown on EA figures).

**Section 3.5.3.1** describes specific storm water controls currently implemented in the Project area. During operations associated with the No Action Alternative, upslope diversion channels minimize the potential for upslope run-on. TSF design associated with the IDF minimizes the potential for TSF failure. Design and construction of collection and percolation structures and BMPs minimize or eliminate potential for onsite surface water transfer to offsite areas and support zero surface water discharge except in cases of an extreme runoff event (SMC 2016).

Storm water management during closure associated with the No Action Alternative would include control of storm water runoff from the reclaimed TSF surface and other areas within the permit boundary (SMC 2016). A series of drainage swales and channels would direct site storm water to the percolation pond where it would percolate to groundwater. During larger storm events, overflow from the percolation pond would report to an overflow swale and be conveyed along a meandering outlet channel to the East Boulder River. Swales and channels would be designed to pass the peak flows resulting from the 1-in-100-year, 24-hour rainfall event, and would also be designed to allow for overbank flooding without compromising

functionality. Riprap and/or vegetation would be used to line the swales and channels at various locations along the alignment to armor them against erosion (SMC 2016).

Closure activities associated with the No Action Alternative would include continued monitoring and inspection activities and maintenance and corrective actions as described in the CORP (SMC 2016).

*Adit Water Discharge*. The potential for adit water effects on surface water quantity associated with the No Action Alternative are minimal or unlikely due to the design and implementation of alternative operations that receive and use excess treated adit water. During operations and closure, adit water is intended to be used in multiple water management alternatives (recycle water, percolation pond, and multiple LAD sites) prior to considerations for discharge in the East Boulder River, which is intended to be a last resort option (SMC 2016; CORP Drawings 19 and 20). While direct discharge to the East Boulder River is permitted (MPDES Permit No. MT0026808; Outfall 001), the outfall structure (a planned instream diffuser in the East Boulder River) has not been constructed; therefore, no discharges have occurred. If SMC were to directly discharge to the East Boulder River, during low-flow periods it would have to avoid violation with the Montana nondegradation rule (ARM 17.30.715(1)(a)) by limiting discharge to surface water so that it does not cause an increase in streamflow greater than 15 percent of the 7Q10 value (lowest 7-day average flow that occurs on average every 10 years). Since SMC has options to limit or avoid direct discharge to surface water, any discharge to surface water could be managed by SMC under the options outlined in the 2012 FEIS (DEQ and Forest Service 2012a) and approved in the ROD (DEQ and Forest Service 2012b) to avoid violation of the nondegradation rule.

Closure activities associated with the No Action Alternative would include continued monitoring and inspection activities and maintenance and corrective actions as described in the CORP (SMC 2016).

*TSF Seepage*. The potential for TSF seepage effects on surface water quantity associated with the No Action Alternative are minimal or unlikely due to the design of the TSF. The Detailed Design for Stage 6 TSF Expansion Revision 5 report (Knight Piésold Ltd. 2020) provides the results of seepage analysis for various stages. The total estimated seepage rate from the TSF following filling of the Stages 4 and 5 expansion with tailings ranges between 4 and 22 gpm (0.009 to 0.049 cfs). This seepage rate represents a small fraction of the flows observed in the East Boulder River (5 to 588 cfs). Upon closure, a reclamation cap and surface water controls would be placed on the TSF, thereby effectively reducing, from operational conditions, the amount of tailings mass water, infiltration of meteoric water, and seepage.

Closure activities associated with the No Action Alternative would include continued monitoring and inspection activities and maintenance and corrective actions as described in the CORP (SMC 2016).

### Proposed Action Alternative

The Proposed Action involves raising the embankment crest with ancillary relocation of specific mine infrastructure. Relocated infrastructure includes a new surface soil stockpile and

corresponding haul road along the southwest portion of the site, a power line with northern and southern site relocation options, and the Embankment Underdrain Collection Sump planned with a corresponding rockfall collection bench and steepened downstream embankment slope along the northeast embankment of the TSF. This section evaluates the extent to which Project activities could impact surface water quantity through potential discharge of: (1) storm water runoff; (2) excess treated adit water; (3) tailings water seepage; and/or (4) tailings water/materials in the unlikely event of a failure in the TSF.

Implementation of the Proposed Action would not be expected to have any significant adverse effect on the surface water quantity in the analysis area. As such, the assessment of the surface water quantity impacts potentially caused by operating the TSF provided in the 2012 FEIS (DEQ and Forest Service 2012a) would remain valid for the Stage 6 TSF expansion.

*Storm Water Discharge*. Storm water conditions for the Proposed Action would be essentially the same as for the No Action Alternative with the addition of storm water diversion and collection channels associated with the new Surface Soil Storage Area E, new haul roads, and minor removal of vegetation associated with the power line relocation. Storm water controls and permit requirements would be maintained during construction, operation, and closure associated with the Proposed Action without any expected measurable change to surface water quantity from the noted ancillary activities. Therefore, impacts from storm water discharge associated with the Proposed Action would be the same as described under the No Action Alternative.

Furthermore, as noted in Technical Memorandum 3 (Haley & Aldrich 2020c), the Proposed Action would have little impact relative to the timeframe required for post-closure densification of the tailings and cover stabilization, where the main drainage swale is expected to be fully functional post-closure for storm water control. Inherent uncertainties exist with the existing design and subsequent performance of both the cover and the drainage swale. These would be addressed in part during detailed investigation and analysis as part of a more detailed design to be completed closer to closure. Despite this advance in the design and reduction in uncertainty, performance uncertainties would inherently remain. As such, post-closure monitoring activities would determine the extent to which continued maintenance of the drainage swale and sediment basin is necessary.

*Adit Water Discharge*. Adit water conditions for the Proposed Action would be the same as described under the No Action Alternative. Adit water controls and permit requirements would be maintained during construction, operation, and closure associated with the Proposed Action without any expected measurable change to surface water quantity.

The MPDES permit (MPDES Permit No. MT0026808; DEQ 2015) for the percolation pond (Outfall 002) lists the expected average discharge, in tandem with Outfall 001 (not constructed), to be up to 500 gpm of treated wastewater from the mine adit. In the DEQ and Forest Service's (2012a) analysis of effects for SMC's water management plan, DEQ and the Forest Service evaluated a range of 150 to 737 gpm. Knight Piésold Ltd. (2020) notes that the mine currently discharges mine water to the percolation pond at a rate of approximately 250 gpm, and this rate is projected to increase to approximately 500 gpm with ongoing mine development. The

maximum discharge rate of 737 gpm evaluated during the 2012 FEIS (DEQ and Forest Service 2012a) analysis is considered a valid upper range to conservatively evaluate the Proposed Action.

*TSF Seepage*. The potential for TSF seepage issues associated with the Project affecting surface water quantity are minimal or unlikely due to the design of the TSF. The Detailed Design for Stage 6 TSF Expansion Revision 5 report (Knight Piésold Ltd. 2020) provides the results of seepage analysis for various stages. The total estimated seepage rate from the TSF following filling of the Stage 6 expansion with tailings ranges between 0.4 and 2.4 gpm (0.001 to 0.005 cfs) greater than TSF Stage 5. Assuming this increased rate of seepage directly increased surface water flows in the East Boulder River by the same amount, this increased seepage rate represents a small fraction of the flows observed in the East Boulder River (5 to 588 cfs).

TSF seepage water controls and permit requirements would be maintained during construction, operation, and closure of the Proposed Action without any expected measurable change to surface water quantity. Therefore, TSF seepage water discharge associated with the Proposed Action would not be expected to create any measurable impacts on surface water quantity.

*TSF Stability*. The potential for TSF stability issues affecting surface water quantity for the Proposed Action would be minimal or unlikely due to the design of the TSF. An FMEA was completed to characterize risks associated with the Stage 6 expansion, including considerations for the construction, operations, and closure phases. Risks included consideration for riverbank erosion and embankment instability adjacent to the East Boulder River. The mitigation measures included in the design for the Stage 6 TSF expansion would result in an overall low-risk profile for the facility; therefore, adverse effects on surface water quantity associated with TSF stability for the construction, operations, and closure phases of the Proposed Action would be unlikely. Although the risk profile is low and adverse effects on surface water quantity are unlikely, it is noted that there is some risk associated with TSF stability.

Care and maintenance of storm water infrastructure and the TSF embankment may be necessary beyond mine closure and joint reclamation bond release to prevent post-reclamation damage. As the federal land manager, the Forest Service would determine the scope, frequency, and cost of any long-term oversight beyond the obligations of the joint bond held by DEQ and the Forest Service for reclamation covered in the Proposed Action for the TSF Stage 6 (plan of operations) and current reclamation bond for the existing operation.

### *3.5.4.2. Surface Water Quality*

#### No Action Alternative

The No Action Alternative effectively represents current conditions, with the addition of the construction of TSF embankment Stages 4 and 5, which were permitted and analyzed in the East Boulder Mine Project FEIS (DSL et al. 1992) but have not yet been fully constructed.

The No Action Alternative would not result in any additional effects on the analysis area for surface water quality that have not been previously analyzed and disclosed in previous NEPA/MEPA documents (DSL et al. 1992; DEQ and Forest Service 2012a).

*Storm Water Discharge*. The potential for storm water quality effects associated with the No Action Alternative during construction, operations, and closure is minimal or unlikely due to implementation of existing physical controls described in **Section 3.5.2.1** and **Section 3.5.3.1**. Storm water controls provide for 100 percent storm water capture under normal operating conditions. Since obtaining the original MPDES storm water permit in 1997, the East Boulder Mine has not experienced a storm water discharge at any of the three MPDES storm water outfalls (MPDES Permit No. MTR000503; Outfalls 001, 002, and 003).

Furthermore, results of monitoring activities suggest minimal or unlikely offsite sediment effects. As noted in **Section 3.5.3.2**, pursuant to a cooperative sediment monitoring program, no changes were measured in sediment or turbidity that could be attributed to the East Boulder Mine. Objectives of the 2018 East Boulder River Biological Monitoring Plan (Rhithron 2018) conclude that SMC will monitor sediment in the East Boulder River stream channel only if mine construction/ production activities with sediment delivery potential occur, which is not expected to be measurable for the No Action Alternative as existing and planned.

Closure activities associated with the No Action Alternative would include continued monitoring and inspection activities and maintenance and corrective actions as described in the CORP (SMC 2016).

*Adit Water Discharge*. **Section 3.5.2.1** describes the relationship between groundwater and surface water in the East Boulder River. **Section 3.5.2.2** describes the nitrogen concentrations in adit water discharge and in the East Boulder River. Data presented in those sections indicate that although groundwater quality has been impacted by mine adit water, and although there appears to be an impact on surface water quality (increasing nitrogen concentrations in gaining reaches), those impacts have not translated to East Boulder River nitrogen concentrations that exceed regulatory standards.

While direct discharge of adit water to the East Boulder River is permitted (MPDES Permit No. MT0026808 Outfall 001), the outfall structure (a planned instream diffuser in the East Boulder River) has not been constructed; therefore, no discharges have occurred. If Outfall 001 would be constructed, management of adit water (e.g., recycling, percolation pond, and land application) would be required to ensure that discharge of adit water to Outfall 001 would not violate the nondegradation rule described in **Section 3.5.4.1**.

In order to meet the MPDES permit effluent limit of 30 pounds per day of untreated adit water to the East Boulder River, assuming the upper limit of disposal of 737 gpm, the nitrogen concentration would have to be 3.4 mg/L or less when streamflow is at the 7Q10—the lowest 7-day average flow that occurs on average once every 10 years. The projected concentration of nitrogen, together with the low total phosphorus concentration, would meet the Montana narrative surface water quality standard for prevention of undesirable aquatic growth.

Closure activities associated with the No Action Alternative would include continued monitoring and inspection activities and maintenance and corrective actions as described in the CORP (SMC 2016).

*TSF Seepage*. Seepage analyses (Knight Piésold Ltd. 2020) were completed to assess the implications on groundwater and surface water due to the proposed TSF expansion. Key findings of this study for the No Action Alternative are summarized in **Section 3.5.3.1** and indicate that potential seepage and permeation rates would not have any significant effect on the groundwater system in terms of water quantity. In turn, associated loadings from groundwater discharges are not expected to have any significant effect on surface water quality for the No Action Alternative. Tailings water quality associated with the No Action Alternative are expected to be the same as disclosed in previous environmental documents (DEQ and Forest Service 2012a). Upon closure, a reclamation cap and surface water controls would be placed on the TSF, thereby effectively reducing the amount of tailings mass water, infiltration of meteoric water, and seepage from operational conditions.

Closure activities associated with the No Action Alternative would include continued monitoring and inspection activities and maintenance and corrective actions as described in the CORP (SMC 2016).

### Proposed Action Alternative

As discussed under **Section 3.5.4.1, Surface Water Quantity**, the Proposed Action primarily involves raising the embankment crest with ancillary relocation of specific mine infrastructure. Project activities could impact surface water quality in the East Boulder River through potential discharge of (1) storm water runoff; (2) excess treated adit water; (3) tailings water seepage; and/or (4) tailings water/materials in the unlikely event of a failure in the TSF.

Implementation of the Proposed Action would not be expected to have any significant adverse impacts on the surface water quality in the analysis area; water quality associated with the Proposed Action would be very similar to what is described for the No Action Alternative.

*Storm Water Discharge*. Storm water conditions for the Proposed Action would be essentially the same as for the No Action Alternative with the addition of storm water diversion and collection channels associated with the new Surface Soil Storage Area E and haul road and minor removal of vegetation associated with the power line relocation. Storm water controls and permit requirements associated with the No Action Alternative would be maintained during construction, operation, and closure associated with the Proposed Action without any expected measurable change to surface water quality from the noted ancillary activities. Therefore, storm water discharge associated with the Proposed Action is not expected to create any measurable impacts on surface water quality.

*Adit Water Discharge*. Adit water conditions for the Proposed Action would be essentially the same as for the No Action Alternative. Adit water controls and permit requirements associated with the No Action Alternative would be maintained during construction, operation, and closure associated with the Proposed Action without any expected measurable change to surface water quality. Therefore, adit water discharge associated with the Proposed Action would be the same as described under the No Action Alternative.

*TSF Seepage*. TSF seepage conditions for the Proposed Action would be essentially the same as for the No Action Alternative with a minor increase in seepage rates associated with the Stage 6

expansion as described in **Section 3.5.3.1**. TSF seepage water controls and permit requirements associated with the No Action Alternative would be maintained during construction, operation, and closure associated with the Proposed Action without any expected measurable change to surface water quality. Therefore, TSF seepage water discharge associated with the Proposed Action would be the same as described under the No Action Alternative.

*TSF Stability*. The potential for TSF stability issues affecting surface water quality for the Proposed Action would be minimal or unlikely due to the design of the TSF. A FMEA was completed to characterize risks associated with the Stage 6 TSF expansion, including considerations for the construction, operations, and closure phases. Risks included consideration for riverbank erosion and embankment instability adjacent to the East Boulder River. The mitigation measures included in the design for the Stage 6 TSF expansion would result in an overall low-risk profile for the facility; therefore, adverse effects on surface water quality associated with TSF stability for the construction, operations, and closure phases of the Proposed Action would be unlikely. Although the risk profile is low and adverse effects on surface water quality are unlikely, it is noted that there is some risk associated with TSF stability.

Care and maintenance of storm water infrastructure and the TSF embankment may be necessary beyond mine closure and joint reclamation bond release to prevent post-reclamation damage. As the federal land manager, the Forest Service would determine the scope, frequency, and cost of any long-term oversight beyond the obligations of the joint bond held by DEQ and the Forest Service for reclamation covered in the Proposed Action for the TSF Stage 6 (plan of operations) and current reclamation bond for the existing operation.

#### *3.5.4.3. Cumulative Effects*

The No Action Alternative would not result in any new impacts on surface water quantity or quality; therefore, cumulative impacts would not occur. The Proposed Action is unlikely to result in additional effects beyond those described for the No Action Alternative; therefore, the Proposed Action would also not contribute to any cumulative impacts on surface water quantity. Similarly, given the lack of other actions in the analysis area that could affect surface water quality, and the lack of expected changes in surface water quality under the Proposed Action, cumulative impacts are not expected.

Climate change, as described in **Section 3.1.4.3, Projected Changes in Climate**, could potentially affect surface water quantity depending on the potential change in precipitation patterns and effects on groundwater recharge. However, it is unlikely that the mine would experience issues associated with surface water quantity as a result of climate change. Surface water monitoring would be completed in accordance with the applicable environmental permits for the site during closure and post-closure.

#### *3.5.4.4. Regulatory Compliance and Forest Plan Consistency*

Both the No Action Alternative and Proposed Action comply with applicable state and federal laws and regulations (see the list in **Section 1.7**) and the Gallatin Forest Plan. The Proposed

Action includes feasible and practicable measures to minimize adverse environmental impacts on National Forest resources and to maintain and protect fisheries habitat in compliance with 36 CFR 228.8, the Gallatin Forest Plan, and the MMRA. Design features that limit impacts include storm water BMPs such as storm water diversion and collection channels, storm water percolation and sediment containment basins, vegetative buffer zones, interim and permanent revegetation, and reclamation/stabilization of surface disturbances concurrent with operations. By applying for and complying with the following permits and authorizations, SMC's current operations (No Action Alternative) and Proposed Action would be in compliance with the Clean Water Act and Montana Water Quality Act:

- Required water quality monitoring in the East Boulder Mine Plan of Operations, Operating Permit No. 00149, and MPDES permits.
- MPDES permits:
  - MPDES Permit No. MTR000503 (DEQ 2018b): Storm water discharge from the Project site is regulated by a SWPPP and corresponding BMPs authorized under MPDES Permit No. MTR000503, a Multi-Sector General Permit for Storm Water Discharges Associated with Industrial Activities, which allows for three surface water discharge points (Outfalls 001, 002, and 003) to the East Boulder River. SMC currently holds a SWPPP dated March 15, 2018 and will apply for a new permit for activities associated with the Proposed Action.
  - MPDES Permit No. MT0026808 (DEQ 2015): Discharge of excess treated adit water from the Project site is regulated by MPDES Permit No. MT0026808, which allows for a surface discharge point in the East Boulder River (Outfall 001 – not constructed), a groundwater discharge point at an onsite percolation pond (Outfall 002), and a septic wastewater discharge to groundwater (Outfall 003) (see also **Section 3.5, Groundwater Hydrology**). Water quality monitoring is required under the MPDES permits.
- 318 permit, 310 permit, and 404 Nationwide Permit. SMC has applied for and received short-term exemptions from Montana's surface water quality turbidity standards for construction projects that have the potential to affect the East Boulder River.

# 3.6. VEGETATION

This section describes the vegetation, noxious weeds, and sensitive plant species in the analysis area and discloses potential direct, indirect, and cumulative effects of the No Action Alternative and Proposed Action on these resources. Key laws and regulations that provide the regulatory framework for the effects analysis are described in **Section 1.7, Applicable Laws, Regulations, and Policies**. Methods specific to the vegetation analysis are detailed below in **Section 3.6.2, Analysis Methods.** See the *Vegetation Report and Biological Evaluation East Boulder Mine Stage 6 Tailings Storage Facility Expansion Project* (Vegetation BE; ERO 2020a) for a more detailed discussion of impacts and for the regulatory framework specific to the vegetation analysis.

## 3.6.1. Analysis Area

The analysis for evaluating direct, indirect, and cumulative effects on vegetation is the 396.58-acre Project area (**Figure 3.6-1**), which includes the proposed 286.85-acre disturbance area within which 66.11 acres would be disturbed by Project activities. The time period evaluated for this analysis includes construction (beginning in 2020), through the end of operations (until 2033 under the Proposed Action at current production rates), and completion of reclamation and post-closure monitoring activities (approximately 8 years after completion of operations). The total duration of Project activities analyzed is 21 years. Effects on vegetation are not expected to persist beyond completion of construction, operations, and final reclamation. A majority of the mine permit area has been previously disturbed and substantially altered and, therefore, only areas within the mine permit area that have not been disturbed were analyzed.

## 3.6.2. Analysis Methods

A desktop assessment of land cover, including vegetation, was completed in ArcGIS using aerial imagery to digitize distinct land cover (vegetation, water, and developed areas) polygons within the analysis area. Vegetation polygons were then classified into coarse vegetation types based on plant species and tree density. A cursory field verification of the vegetation types occurred during an April 2019 site visit by ERM; ERM was the third-party consultant hired by DEQ and CGNF prior to ERO Resources Corporation to analyze impacts of the proposed Project. The area of new disturbance under the Proposed Action was then overlain on the vegetation type layer to quantify the acreage of new vegetation clearing under the Proposed Action.

Many species are listed as sensitive for CGNF (ERO 2020a). To determine their potential for occurring within the Project area, this list of sensitive plant species was screened based on a review of existing information relating to species extent and ecological requirements. Listed sensitive species with potential habitat in the Project area were evaluated for inclusion in this analysis. Site-specific information from aerial photographs, topographic position, GIS data, past activities, and existing habitat and survey information were used to evaluate potential habitat presence for sensitive plants within the Project area.

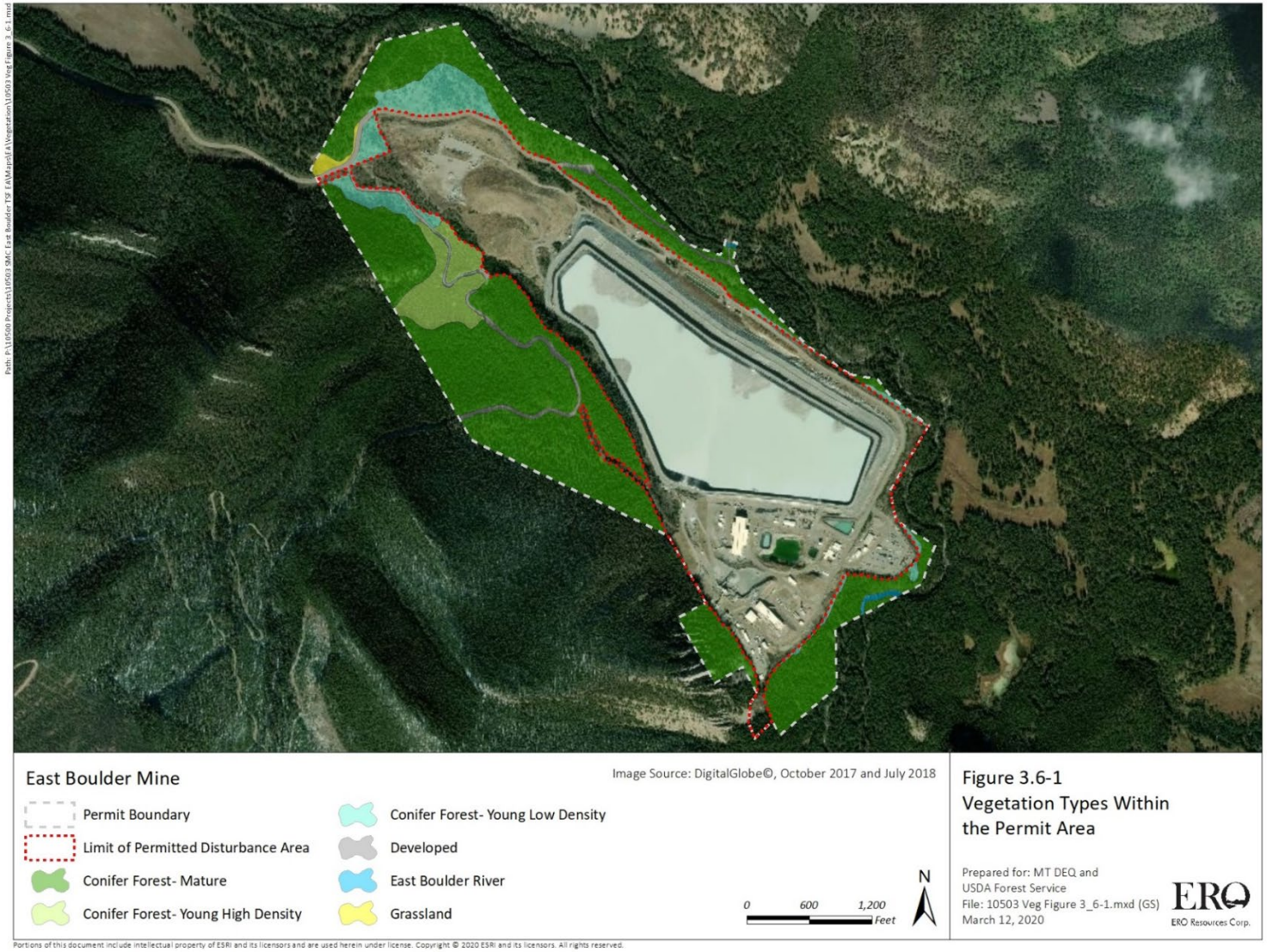



**Figure 3.6-1. Vegetation Types within the Permit Area**

## 3.6.3. Affected Environment

Vegetation types, sensitive species, and noxious weeds for the larger, original East Boulder Mine Project area were described in the 1992 FEIS (DSL et al. 1992) and the 2012 FEIS (DEQ and Forest Service 2012a). Current conditions specific to the vegetation analysis area are described below.

### *3.6.3.1. Vegetation*

Four vegetation types were identified in the analysis area. Land cover types (vegetation, developed areas, and water) are presented in **Table 3.6-1** and shown on **Figure 3.6-1**.

**Table 3.6-1**
**Land Cover Types in the Permit Area**

| Vegetation Types | Mine Permit Area (acres) | Percent of Analysis Area |
|---|---|---|
| Grassland | 1.04 | 0.7 |
| Conifer Forest - Mature | 123 | 77.8 |
| Conifer Forest - Young High Density | 10.97 | 6.9 |
| Conifer Forest - Young Low Density | 16.12 | 10.2 |
| Developed | 6.39 | 4.0 |
| Water (East Boulder River) | 0.65 | 0.4 |
| **Total** | **158.17** | **100** |

#### Grassland

Grassland in the analysis area is limited to the area north of East Boulder Road (the mine access road) where it enters the mine permit area from the west. This grassland area is disturbed and is dominated by disturbance-tolerant grasses such as smooth brome (*Bromus inermis*), Timothy (*Phleum pratense*), western wheatgrass (*Pascopyrum smithii*), and Kentucky bluegrass (*Poa pratensis*).

#### Conifer Forest - Mature

This vegetation type is the most common in the analysis area (**Figure 3.6-1**) and is found on the slopes south of the TSF, north of the TSF between the main access road and the East Boulder River, and along Lewis Gulch Road. This vegetation type consists of an overstory dominated by lodgepole pine (*Pinus contorta*), with areas of Douglas-fir (*Pseudotsuga menziesii*), subalpine fir (*Abies lasiocarpa*), and Engelmann spruce (*Picea engelmannii*), and an understory of buffaloberry (*Shepherdia canadensis*), Rocky Mountain juniper (*Juniperus communis*), kinnikinnick (*Arctostaphylis uva-ursi*), snowberry (*Symphoricarpos* spp.), ninebark (*Physocarpus malvaceus*), and Oregon grape (*Mahonia aquifolium*).

Much of the lodgepole pine, Douglas-fir, and spruce trees in this vegetation type are merchantable timber (logs, poles, and firewood). Merchantable timber would not be removed

by SMC without Forest Service authorization. The Forest Service reserves the right to sell any merchantable timber and may choose to sell directly to SMC or may advertise the volume and award it to a third party. Salvaged logs would be separated and decked according to product in a secure location until they are valued and disposed of by recommendation of the Forest Service Authorized Officer.

#### Conifer Forest - Young High Density

This vegetation type is a logged and regenerating version of the mature conifer forest described above. It is located on the steeper slopes south of Lewis Gulch Road (**Figure 3.6-1**) and consists of lodgepole pine and Douglas-fir regrowth, with buffaloberry, Idaho fescue (*Festuca idahoensis*), and other grasses and forbs.

#### Conifer Forest - Young Low Density

This vegetation type consists of scattered low-density conifers among grassland. Most of the areas were logged in recent decades or cleared for adjacent development and are a regenerating earlier seral version of the mature conifer forest described above. The young conifers are lodgepole pine and Douglas-fir with scattered buffaloberry, and a grassland of Idaho fescue, western wheatgrass, Kentucky bluegrass, Timothy, and bluebunch wheatgrass (*Pseudoroegneria spicata*).

### *3.6.3.2. Federally Listed Threatened or Endangered Species*

The USFWS has not designated any threatened, endangered, or proposed plant species for CGNF (USFWS 2019). On July 19, 2011, the USFWS published in the Federal Register its 12-month status review finding on a petition to list whitebark pine under the ESA. After a review of all available scientific and commercial information, the USFWS concluded that listing the species as threatened or endangered is warranted, but precluded by higher priority actions. This finding results in whitebark pine being a USFWS candidate for listing. Because of this finding, the Regional Forester designated whitebark pine as sensitive.

### *3.6.3.3. Regional Forester Sensitive Species*

Sensitive species, as determined by the Regional Forester, are those for which population viability is a concern. This can be indicated by a current or predicted downward trend in population numbers or suitable habitat, which would reduce the species' existing distribution. Currently, the Gallatin side of CGNF recognizes 22 species as sensitive.

Potential habitat for three Regional Forester sensitive species occurs within the analysis area:

- Short-styled columbine (*Aquilegia brevistyla*), a species in mesic forest habitats with a state rank of S2S3[4]

[4] Montana State rank codes (MNHP 2019):
S2: At risk because of very limited and/or potentially declining population numbers, range and/or habitat, making it vulnerable to global extinction or extirpation in the state.

- Small yellow lady's slipper (*Cyoripedium calceolus* var. *parviflorum*), a species found in fens and mesic forest habitat with a state rank of S3S4
- Northern rattlesnake plantain (*Goodyera repens*), a species found in mesic forest habitat with a state rank of S3

Of these, only small yellow lady's slipper has been documented on the Yellowstone Ranger District of CGNF (MNHP 2019). The 1992 FEIS (DSL et al. 1992) reports that field surveys of sensitive plants in 1989 documented one species of potential concern - Rydberg's springbeauty (*Claytonia multiscapa*; also known as western springbeauty [*Claytonia lanceolate* var. *flava*]). This species was removed from the species of concern list in 1993 (MNHP 2019).

In 2009, CGNF conducted sensitive plant surveys within the proposed East Boulder Fuels Reduction Project treatment areas (Forest Service 2011). Given that the proposed treatment areas are adjacent to the mine permit area, the results are discussed here. The EA (Forest Service 2011) reports that "…there is some potential habitat for 5 [special status] species within the proposed treatment areas: Small-flowered columbine, small yellow lady's slipper, Northern rattlesnake plantain, Hall's Rush (*Juncus hallii*; removed from the species of concern list in 2012 [MNHP 2019]), California false hellebore (*Veratrum californicum*)." These species were targeted in the 2009 surveys but were not documented in the proposed treatment areas.

#### *3.6.3.4. Noxious Weeds*

The Montana Department of Agriculture maintains the list of noxious weeds for the state, with the most recent list published in 2017 (MT DOA 2017). Weeds are classified into five categories (priority type) based on known presence in MT and management criteria.

In 2015, SMC developed the East Boulder Mine Integrated Weed Management Plan (weed management plan). Weed surveys were completed on SMC lands in the 1980s, yet there is no up-to-date weed map for the East Boulder Mine permit area. As such, one of the short-term (1- to 3-year) objectives of the weed management plan is to conduct a comprehensive weed survey and develop a weed infestation map. In the meantime, the weed management plan presents the current status of weeds in the area. It describes Canada thistle (*Cirsium arvense*) as the primary noxious weed in the SMC-controlled areas. Canada thistle is classified as a Priority 2B weed (MT DOA 2017), defined as a weed that is abundant and widespread in MT, with eradication or containment required where it is less abundant. Other introduced weed species targeted for control are houndstongue (*Cynoglossum officinale*), leafy spurge (*Euphorbia esula*), and spotted knapweed (*Centaurea stoebe*) (SMC 2016), all of which are also classified as Priority 2B species. Other weeds previously identified in the Project area include oxeye daisy (*Leucanthemum vulgare*), nodding plumeless thistle (*Carduus nutans*), yellow salsify (*Tragopogon dubius*), and bull thistle (*Cirsium vulgare*).

S3: Potentially at risk because of limited and/or declining numbers, range and/or habitat, even though it may be abundant in some areas.
S4: Apparently secure, though it may be quite rare in parts of its range, and/or suspected to be declining.

## 3.6.4. Environmental Consequences

This section evaluates consequences of the No Action Alternative and Proposed Action on the vegetation, sensitive species, and noxious weeds in the vegetation analysis area.

### *3.6.4.1. No Action Alternative*

Under the No Action Alternative, Amendment 003 and the revised East Boulder Mine Plan of Operations would not be approved. No additional surface disturbance, noise, human activity, or additional expansion of the TSF would occur beyond what is currently authorized under Operating Permit No. 00149 and the currently approved plan of operations. Mining activities would end in 2027. Currently permitted surface disturbance would be reclaimed in accordance with the reclamation plan detailed in the CORP (SMC 2016). Therefore, there would be no additional adverse impacts on vegetation.

### *3.6.4.2. Proposed Action Alternative*

Construction would occur concurrently with mining activities, occurring over approximately 7 years, beginning in 2020. Expansion of the TSF would allow the mine to remain active for approximately 7 years beyond the current plan of operations, from the end of 2027 through 2033 at current production rates (Knight Piésold Ltd. 2020). Reclamation and post-closure monitoring of all disturbed areas would be completed within approximately 8 years. Therefore, the surface disturbance and human activities associated with the Proposed Action would span approximately 21 years before reclamation would be completed.

Implementation of the Proposed Action would result in a total of 66.11 acres of disturbance within the proposed 286.85-acre disturbance area; in terms of the currently permitted disturbance area, 44.62 acres would be disturbed within the 238-acre bonded disturbance area and 21.49 acres would be disturbed outside this area (**Figure 3.6-2**). The 44.62 acres within the currently permitted disturbance area is already disturbed and is mostly unvegetated and, thus, provides low-quality habitat for sensitive plant species. The 21.49 acres of new disturbance would occur mostly within mixed conifer stands of Douglas-fir and lodgepole pine in areas adjacent to the existing mine. Vegetation would be removed in these areas for access road and infrastructure relocation, and construction of a power line, storm water runoff diversion, temporary soil stockpile, and borrow area. Approximately 1.48 acres of the new disturbance is within already developed/unvegetated areas. **Table 3.6-2** lists the acreage of each vegetation type affected by the Proposed Action.

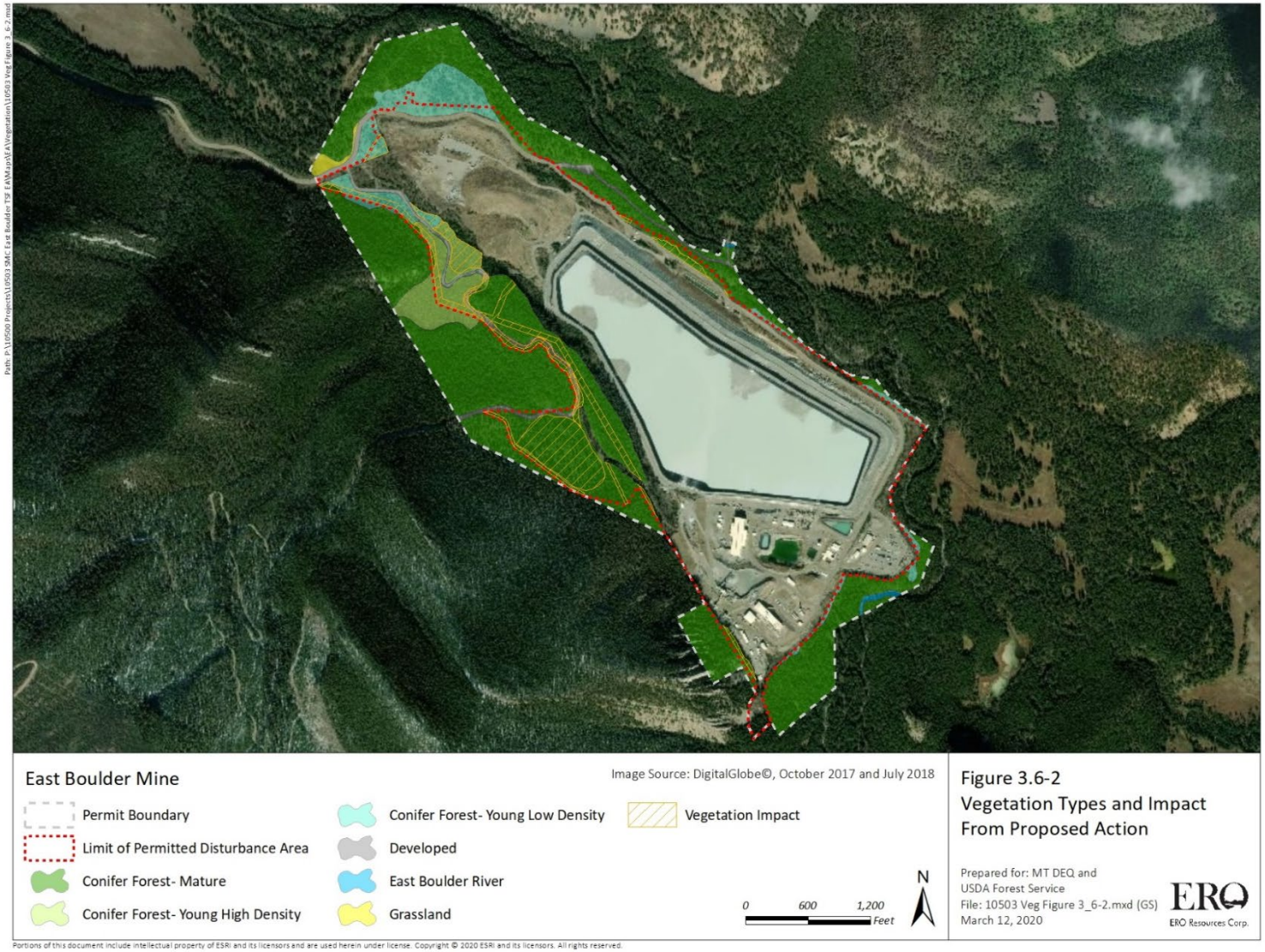



**Figure 3.6-2 Vegetation Types and Impact from Proposed Action**

**Table 3.6-2**
**Direct Vegetation Impacts under the Proposed Action**

| Vegetation Types | Disturbance Outside of Currently Permitted Disturbance Area (Acres) |
|---|---|
| Grassland | 0 |
| Conifer Forest - Mature | 14.61 |
| Conifer Forest - Young High Density | 3.41 |
| Conifer Forest - Young Low Density | 1.99 |
| **Total** | **20.01** |

The 20 acres of direct impacts on vegetation resulting from the Proposed Action are not expected to significantly adversely impact vegetation as a whole within the analysis area/mine permit area. With approximately 158 acres of total vegetation within the mine permit boundary (**Table 3.6-1**), the permanent removal of 20 acres represents only 13 percent of the total vegetation. Reclamation would seek to restore vegetation during closure to provide post-mining uses, such as wildlife habitat. Therefore, direct adverse impacts on vegetation would be minimal and short-term.

Care and maintenance of the TSF's vegetative cover may be necessary beyond mine closure and joint reclamation bond release to prevent post-reclamation damage. As the federal land manager, the Forest Service would determine the scope, frequency, and cost of any long-term oversight beyond the obligations of the joint bond held by DEQ and the Forest Service for reclamation covered in the Proposed Action for the TSF Stage 6 (plan of operations) and current reclamation bond for the existing operation.

### *3.6.4.3. Statement of Findings for Special Status Species*

Threatened and endangered and Forest Service plant sensitive species were evaluated and disclosed for the No Action Alternative and the Proposed Action. These effects are detailed in the Vegetation BE (ERO 2020a) and summarized below.

#### Threatened, Endangered, and Sensitive Species

The Proposed Action would not impact any ESA-listed plant species as there is no potential for ESA-listed species to be present in the analysis area. The Proposed Action could potentially cause short- or long-term direct impacts on Forest Service sensitive species as a result of construction activities and Project infrastructure. Pre-field review revealed potential habitat for three sensitive species within the Project area. Implementation of mitigation, described in **Section 3.6.4.4**, would limit the potential for adverse impacts to sensitive species. Due to the limited amount of habitat in the Project area, the potential for impacts on any sensitive species is expected to be low.

### Noxious Weeds

The Project has the potential to increase the spread of noxious weeds directly through the transport of plant material or seeds, or indirectly through ground disturbance, which could increase the susceptibility of the disturbed areas to weed infestation.

The weed management plan (Appendix E8 of the CORP [SMC 2016]) would be implemented on all lands within and adjacent to the mine permit area as part of construction, operation, and closure/reclamation to minimize the spread of noxious weeds. Key aspects of this mitigation program include conducting a weed survey and developing a weed map, semiannual weed spraying, timely revegetation of all disturbed areas to minimize weed infestation, and educating the workforce to identify weed species. Park Electric is responsible for weed management within the power line corridor.

Given the weed management plan and the current extent of noxious weeds in the mine permit area boundary, the spread of weeds is not expected to increase under the Proposed Action.

#### *3.6.4.4. Mitigation*

As described in the Vegetation BE (ERO 2020a), SMC would conduct a sensitive species survey prior to construction. The plant survey results would be provided to the agencies for review prior to construction. If sensitive plants are found, completion of surveys and successful application of protection measures are expected to mitigate any adverse impacts on sensitive species. Due to the limited amount of habitat in the Project area, the potential for impacts on any sensitive species is expected to be low. Adverse impacts may occur if protection measures are not successfully applied. The degree of effects depends on many factors such as the size and health of the population and the species' state status.

#### *3.6.4.5. Cumulative Effects*

Because the No Action Alternative would not result in any additional impacts, no cumulative impacts would occur.

When combined with other past, present, or reasonably foreseeable future actions, the human disturbance that would occur as part of the Proposed Action is not expected to have any cumulative impacts. The activity would be similar to current levels of activity at the East Boulder Mine and would not result in a significant cumulative impact on vegetation. New vegetation disturbance that would occur from the Proposed Action could result in minimal, adverse, and short-term cumulative impacts on vegetation and sensitive plant species. Past and present actions that have or could result in vegetation effects include forest fires, timber harvest, infrastructure building, noxious weed treatments, and fuels reduction efforts (see **Section 3.1, Description of Cumulative Actions** for more information on these actions). The vegetation disturbance from the Proposed Action would be minimal (20 acres) and would be restored during post-mining reclamation efforts. For both the No Action Alternative and the Proposed Action, the effects of climate change could reduce the success of reclamation and revegetation efforts.

#### *3.6.4.6. Regulatory Compliance and Forest Plan Consistency*

Both the No Action Alternative and Proposed Action comply with applicable state and federal laws and regulations (see the list in **Section 1.7**) and the Gallatin Forest Plan. A survey for sensitive species would be completed prior to Project construction; therefore, the Project is consistent with Gallatin Forest Plan (Forest Service 2015a) and NFMA direction. The Project would follow the Gallatin National Forest Noxious and Invasive Weed Treatment EIS and ROD regarding weed treatment protocols within the Project area. The Project is consistent with the Travel Management Plan. As discussed above, no designated federally threatened, endangered, or proposed plants occur within CGNF and, therefore, the Project complies with the ESA.

# 3.7. WILDLIFE

This section describes the wildlife in the analysis area and discloses potential direct, indirect, and cumulative effects of the No Action Alternative and Proposed Action on wildlife species and their habitats (including Forest Service sensitive species) in the analysis area. Key laws and regulations that provide the regulatory framework for the effects analysis are described in **Section 1.7, Applicable Laws, Regulations, and Policies**. Methods specific to the wildlife analysis are detailed below in **Section 3.7.2, Analysis Methods.** See *Wildlife Report and Biological Evaluation East Boulder Mine Stage 6 Tailings Storage Facility Expansion Project* (Wildlife BE; ERO 2020b) for a more detailed discussion of impacts on wildlife and their habitats and the Forest Service (2020b) *Biological Assessment for the East Boulder Mine Stage 6 Tailings Storage Facility Expansion Project* for a more detailed discussion specific to threatened and endangered species.

## 3.7.1. Analysis Area

The analysis area for evaluating direct, indirect, and cumulative effects on wildlife species and their habitats varies by species. For grizzly bear, the analysis area is the Boulder Bear Analysis Unit (BAU). The analysis area for Canada lynx and lynx critical habitat is the East Boulder Lynx Analysis Unit (LAU). The cumulative effects analysis area for wolverine is the Distinct Population Segment (DPS). The analysis areas for the grizzly bear, Canada lynx, and wolverine are described in greater detail in the BA prepared by the Forest Service for the Project (Forest Service 2020c). The direct and indirect effects analysis area for elk is the project area, and the cumulative effects analysis area for elk is the Elk Analysis Unit (EAU). The analysis area for all other special status animal species is the Project area plus a 1-mile buffer (**Figure 3.7-1**). The analysis area boundary was extended to 1 mile because noise, disturbance, and displacement can extend beyond the Project area.

## 3.7.2. Analysis Methods

Impacts examined in this section include the following: ground disturbance, noise, human activity, vehicle traffic, habitat modification, and reclamation. The analysis considered previous analyses performed for the same general area in the 1992 FEIS (DSL et al. 1992), 2012 FEIS (DEQ and Forest Service 2012a), and the East Boulder Fuels Reduction EA (Forest Service 2011). The impact analysis considered short-term and long-term impacts, especially during important periods for different wildlife species (e.g., breeding, denning, and feeding). One issue related to wildlife resources was identified during scoping (ERM 2019) and is analyzed below for the No Action Alternative and Proposed Action: the removal of habitat in previously undisturbed areas of the permit boundary and presence of construction equipment could adversely affect sensitive species.

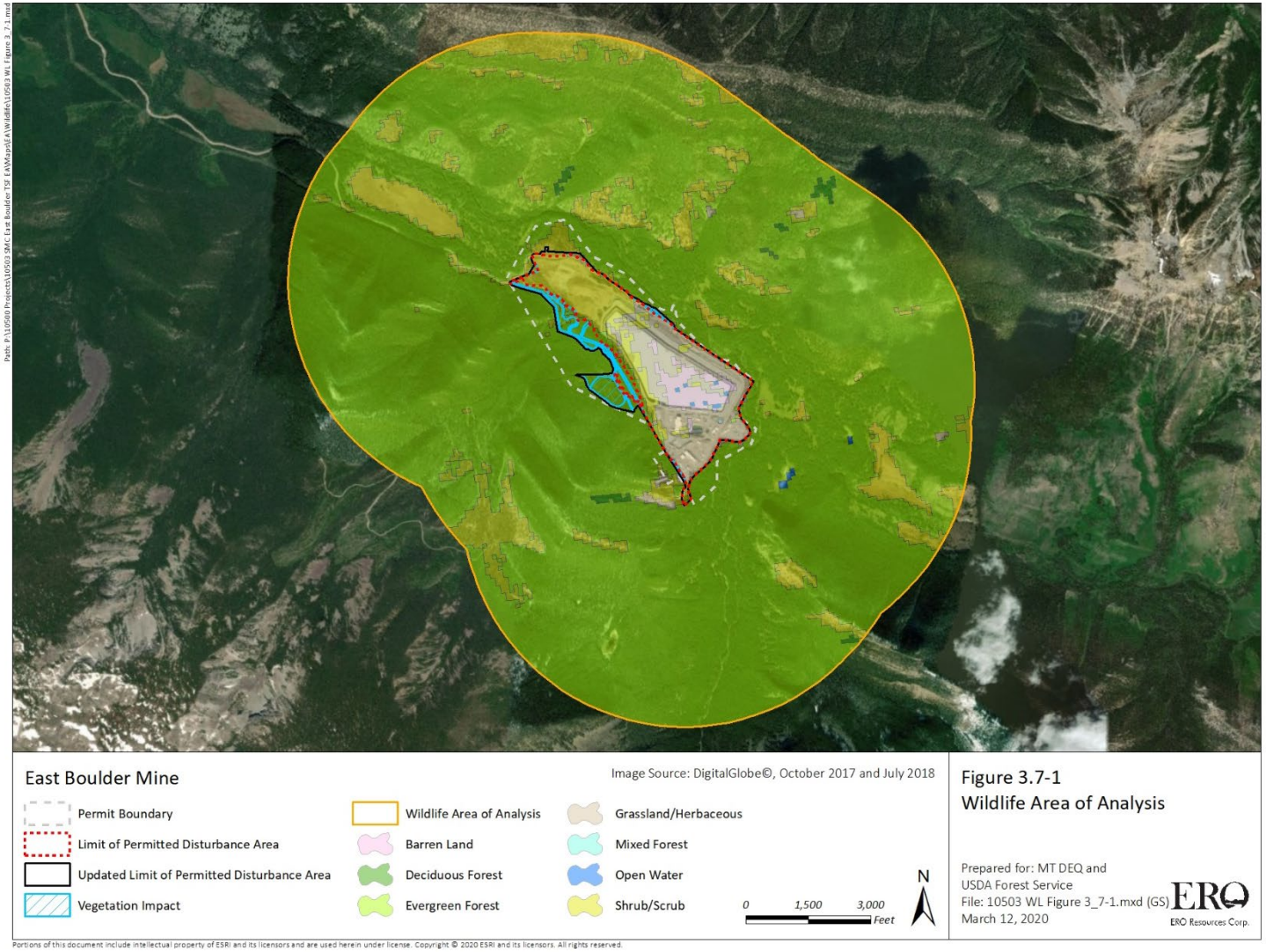



**Figure 3.7-1 Wildlife Area of Analysis**

## 3.7.3. Affected Environment

### *3.7.3.1. General Wildlife*

The primary habitat type within the wildlife analysis area consists of evergreen forest. Additional habitat types include shrub/scrub, grasslands, and developed areas of the mine, with small areas of deciduous forest, open water, and mixed forest (**Figure 3.7-1**).

Wildlife information from the 1992 FEIS (DSL et al. 1992) is summarized, as applicable, in this section to provide information on the affected environment for the No Action Alternative and Proposed Action impact analyses. Baseline biological studies were conducted from 1983 through 1990 to support the 1992 FEIS. A wildlife resources review for the East Boulder Mine was conducted by DEQ and the Forest Service as part of the 2012 FEIS (DEQ and Forest Service 2012a). Effects on species of special concern and sensitive species, MIS, and threatened and endangered species addressed in the past environmental analyses were updated as part of the 2012 FEIS (DEQ and Forest Service 2012a).

Categories of wildlife species associated with the habitat types listed above include the following:

- Breeding birds
- Raptors (e.g., owls, hawks, and eagles)
- Big game (e.g., deer, elk, and moose)
- Large mammals (e.g., bears, large cats, and coyotes)
- Small mammals (e.g., rabbits, squirrels, and marmots)

### *3.7.3.2. Federally Listed and Proposed Species*

Section 7 of the Endangered Species Act (ESA, Public Law 93-205, as amended) directs federal agencies to ensure that actions authorized, funded, or carried out on National Forest lands, such as approval of a revised plan of operations, are not likely to jeopardize the continued existence of threatened or endangered species or result in the destruction or adverse modification of habitat of their critical habitat (16 USC 1536). CGNF is required to consult with the USFWS on Forest Service determinations of effects on federally listed/proposed species and critical habitat in accordance with the ESA, its implementation regulations (50 CFR 402.13), and FSM 2671.4. **Table 3.7-1** lists the federally listed and proposed species that occur or may occur on the CGNF.

**Table 3.7-1**
**Federally Listed and Proposed Wildlife Species that May Occur on the CGNF**

| Species | Status | Habitat and Occurrence |
|---|---|---|
| Grizzly bear<br>*Ursus arctos* | Threatened | Coniferous and aspen forests, grasslands, shrublands, open parklands, riparian areas, and wet meadows. Habitat occurs in the project area, and grizzly bears may be present. |
| Canada lynx<br>*Lynx Canadensis* | Threatened | Mesic mid- to high-elevation forests including Engelmann spruce, subalpine fir, lodgepole pine, and possibly Douglas-fir. Also uses aspen when mixed with or adjacent to suitable conifer forests. Needs areas of dense understory cover for foraging and mature forests with large coarse woody debris for denning. Habitat occurs in the project area, and lynx may be present. |
| Canada lynx<br>Critical Habitat | Designated | |
| Wolverine<br>*Gulo luscus* | Proposed Threatened | High-elevation alpine and cold boreal forests that receive enough winter precipitation to reliably maintain deep persistent snow late into the warm season. Habitat occurs in the project area and wolverines may be present. |
| Northern long-eared myotis<br>*Myotis septentrionalis* | Threatened | Caves, abandoned mines, live trees, and snags. May occur on the eastern portion of CGNF. Potential habitat is present; however, the closest known occurrence is 300 miles northeast of the Project area. |
| Whooping crane<br>*Grus americana* | Endangered | Wetlands; a migrant in eastern Montana. No habitat is in or near the Project area. |

Source: USFWS 2020

### *3.7.3.3. Regional Forester Sensitive Species*

As previously described, sensitive species are managed under the authority of NFMA and are administratively designated by the Regional Forester. FSM 2670.22 requires the maintenance of viable populations of native and desired nonnative species and to avoid actions that may cause a species to become threatened or endangered. **Table 3.7-2** lists Regional Forester sensitive species that are known or have potential to occur in the Project area.

**Table 3.7-2**
**Regional Forester Sensitive Species with the Potential to Occur in the Project Area**

| Regional Forester Sensitive Species | Habitat and Occurrence |
|---|---|
| American peregrine falcon<br>*Falco peregrinus* | Breeding habitat is steep, high, large cliffs without human disturbance for nesting. Potentially suitable habitat exists along the Boulder and East Boulder rivers. Although habitat is available nearby, no recent observations of peregrines in or near the area have been documented. |
| Bald eagle<br>*Haliaeetus leucocephalus* | Large trees/snags near large lakes, reservoirs, and rivers. Populations of bald eagles have increased statewide and on the CGNF. Bald eagles are known to nest along the Yellowstone and Boulder rivers. Bald eagles have been observed during the winter along the East Boulder River; however, no potential nesting or foraging habitat occurs in the Project area. |
| Bighorn sheep<br>*Ovis canadensis* | Cliffs, mountain slopes, and rolling foothills. Minimal snow depth is important in winter for foraging; high-quality green forage is most important in spring and summer. Immediate or nearby cliff-rocky areas are important year-round. Semiopen to open vegetation types are preferred, often on south aspects. Potential habitat is present in the analysis area; however, bighorn sheep are not known to occur (Montana Natural Heritage Program (MNHP) 2020a). |
| Black-backed woodpecker<br>*Picoides arcticus* | Primary habitat is burned forested areas or areas with high insect and disease; secondary habitat is late-seral and old-growth conifer forests. Although black-backed woodpeckers occur on the CGNF, they are rarely observed. No burned forest areas or old-growth forest is present in the Project area. |
| Flammulated owl<br>*Otus flammeolus* | Ponderosa pine and mixed conifer forests with meadows. There are no records of this species in or near the analysis area (MNHP 2020a). |
| Gray wolf<br>*Canis lupus* | Rocky Mountain forested and nonforested habitat generalist. Mule deer and elk, which provide prey for wolves, are likely to occur in the analysis area. However, the area immediately around the mine, including the 20 acres of new disturbance, is unlikely to be used extensively by wolves due to the ongoing disturbance and human presence at the mine. |
| Harlequin duck<br>*Histrionicus histrionicus* | Fast-moving water in riparian streams. Harlequin ducks were documented about 6 miles west of the mine in 2011 (MNHP 2020a) and could potentially occur in streams in the analysis area. |
| Townsend's big-eared bat<br>*Corynorhinus townsendii* | Caves or crevices, mines, buildings, bridges, live trees with cracks or sloughing bark, and snags. There are no records of Townsend's big-eared bat in the action area or surrounding areas (MNHP 2020a). |
| Trumpeter swan<br>*Cygnus buccinator* | Nesting habitat includes marshes, lakes, beaver ponds, and oxbows and backwaters of rivers. Suitable habitat must include approximately 100 yards or more of open water for takeoff from the water's surface. There are no records of trumpeter swans in the action area or surrounding areas (MNHP 2020a). Trumpeter swans are unlikely to occur in the action area due to a lack of suitable habitat. |

### *3.7.3.4. Management Indicator Species*

Regulations at 36 CFR 219.19(a)(1) require that certain vertebrate and/or invertebrate species present in the area be identified as MIS in the planning area for the Gallatin Forest Plan and that these species be monitored as "their population changes are believed to indicate the

effects of management activities." Monitoring of MIS and determinations of population change occur at the forest planning level. The MIS for the Gallatin National Forest are bald eagle, grizzly bear, elk, northern goshawk, and pine marten. **Table 3.7-3** describes the habitat requirements and occurrence of MIS in the action area.

**Table 3.7-3**
**Management Indicator Species for the Gallatin National Forest**

| Species | Habitat and Occurrence |
|---|---|
| Bald eagle | Large trees and snags near large lakes, reservoirs, and rivers. Populations of bald eagles have increased statewide and on the CGNF. As described above, bald eagles are known to nest along the Yellowstone and Boulder rivers. Bald eagles have been observed during the winter along the East Boulder River; however, no potential nesting or foraging habitat occurs in the Project area. |
| Grizzly bear | Coniferous and aspen forests, grasslands, shrublands, open parklands, riparian areas, and wet meadows. Management activities on the CGNF have increased secure habitat for grizzly bears, which may be contributing to the increasing occupation and populations of grizzly bears on the CGNF outside of the recovery zone. The Project area is not within secure habitat. |
| Elk<br>*Cervus canadensis* | Elk are generalist feeders, grazers, and browsers, foraging on a variety of grasses, forbs, and shrubs year-round. Most elk herds migrate between summer and winter ranges, with winter ranges typically occurring at lower elevations. Elk are known to occur in the Project area. |
| Goshawk<br>*Accipiter gentilis* | Coniferous and mixed forest. Timber stands selected by goshawks for nesting are usually mature and old-growth forests with more than 60 percent closed canopy. Based on detection surveys, goshawks are present and well distributed across the CGNF, with more goshawks nesting on the Yellowstone Ranger District compared to other ranger districts. Goshawk populations appear to be stable. Suitable goshawk habitat is present in the action area. |
| Pine marten<br>*Martes americana* | Pine martens are typically associated with subalpine and alpine coniferous forests. They prefer habitat associated with older growth mixed-aged stands and rarely venture far from forest cover. Habitat for this species is present in the action area. |

### *3.7.3.5. Montana Species of Concern*

MNHP and the Montana Department of Fish, Wildlife, and Parks jointly maintain the list of Montana Animal Species of Concern (MNHP 2020a). These species are native to Montana and are considered "at risk" due to declining population trends, threats to their habitats, or restricted distribution. **Table 3.7-4** lists species of concern for Sweet Grass County, not including species previously addressed above.

**Table 3.7-4**
**Montana Species of Concern for Sweet Grass County**

| Species | Habitat |
|---|---|
| Mammals | |
| Black-tailed prairie dog<br>*Cynomys ludovicianus* | Flat, open grasslands and shrub/grasslands with low, relatively sparse vegetation. This species is unlikely to occur in the action area due to a lack of suitable habitat. |
| Eastern red bat<br>*Lasiurus borealis* | Present across much of central and eastern Montana during the summer and fall, particularly in wooded and riparian areas. Potential foraging habitat for this species is present in the action area. |
| Hoary bat<br>*Lasiurus cinereus* | Migratory summer resident in Montana, occupying forested areas. Potential habitat for this species is present in the action area. |
| Little brown myotis<br>*Myotis lucifugus* | Found in a variety of habitats across a large elevation gradient. Summer day roosts include attics, barns, bridges, snags, loose bark, and bat houses. Known maternity roosts in Montana are primarily buildings. Hibernacula include caves and mines. Potential habitat for this species is present in the action area. |
| Merriam's shrew<br>*Sorex merriami* | Occupies mostly arid sagebrush-grassland habitats in Montana. This species is unlikely to occur in the action area due to a lack of suitable habitat. |
| Preble's shrew<br>*Sorex preblei* | Occupies mostly sagebrush-grassland habitats in Montana, sometimes in openings surrounded by subalpine coniferous forest. This species is unlikely to occur in the action area due to a lack of suitable habitat. |
| Birds | |
| Baird's sparrow<br>*Centronyx bairdii* | Breeds in native mixed-grass and fescue prairie. Winters in grasslands. This species is unlikely to occur in the action area due to a lack of suitable habitat. |
| Bobolink<br>*Dolichonyx oryzivorus* | Breeds in open areas, preferring large fields with a mixture of grasses and broad-leaved plants. This species is unlikely to occur in the action area due to a lack of suitable habitat. |
| Brewer's sparrow<br>*Spizella breweri* | Sagebrush obligate species that depends almost exclusively on the sagebrush ecosystem. This species is unlikely to occur in the action area due to a lack of suitable habitat. |
| Brown creeper<br>*Certhia americana* | Prefers forests with many large live trees for foraging and large loose-barked (often dead or dying) trees for nesting. Uses a wider variety of wooded habitats in the winter, including deciduous forests, suburbs, parks, and orchards. Suitable habitat for this species is present in the action area. |
| Cassin's finch<br>*Haemorhous cassinii* | Breeds mostly between 3,000 and 10,000 feet in elevation. Often lives in mature conifer forests, but some breed in open sagebrush shrubland with scattered junipers. Suitable habitat for this species is present in the action area. |
| Chestnut-collared longspur<br>*Calcarius ornatus* | Breeds on shortgrass plains and prairies. Winters in open cultivated fields. This species is unlikely to occur in the action area due to a lack of suitable habitat. |
| Clark's nutcracker<br>*Nucifraga columbiana* | Open coniferous forests between 3,000 and 12,000 feet in elevation. Suitable habitat for this species is present in the action area. |
| Evening grosbeak<br>*Coccothraustes vespertinus* | Breeds in mature and second-growth coniferous forests. In winter, lives in coniferous forest and deciduous forest as well as in urban and suburban areas. Suitable habitat for this species is present in the action area. |

| Species | Habitat |
|---|---|
| Golden eagle<br>*Aquila chrysaetos* | Open and semiopen country featuring native vegetation. Found primarily in mountains up to 12,000 feet in elevation, canyonlands, rimrock terrain, and riverside cliffs and bluffs. A golden eagle was observed during a site visit on January 9, 2020 along the East Boulder River about 6 miles below the mine. Although suitable foraging habitat is available in the more open country downstream, the area around the mine is not suitable habitat and no nests are known to occur in the action area. |
| Great blue heron<br>*Ardea herodias* | Freshwater habitats. Forage in grasslands and agricultural fields where they stalk frogs and mammals. Most breeding colonies are located within 2 to 4 miles of feeding areas, often in isolated swamps or on islands, and near lakes and ponds bordered by forests. This species is unlikely to occur in the action area due to a lack of suitable habitat. |
| Great gray owl<br>*Strix nebulosa* | Pine and fir forests adjacent to montane meadows between 2,500 and 7,500 feet in elevation. Potential habitat is present; however, great gray owls are unlikely to nest in or near the Project area because of the ongoing human presence and disturbance at the mine. |
| Greater sage-grouse<br>*Centrocercus urophasianus* | Sagebrush obligate species using only sagebrush steppe ecosystems. This species is unlikely to occur in the action area due to a lack of suitable habitat. |
| Green-tailed towhee<br>*Pipilo chlorurus* | Dense, shrubby habitat. Usually do not live in unbroken forest. Also live in sagebrush shrub-steppe, often intermixed with shrubs and trees. May occur up to about 10,000 feet in elevation. In winter they move to dry washes, arroyos, mesquite thickets, oak-juniper woodland, creosote bush, and desert grasslands, typically below 4,000 feet in elevation. This species is unlikely to occur in the action area due to a lack of suitable habitat. |
| Lewis's woodpecker<br>*Melanerpes lewis* | Breeds in open ponderosa pine forests and burned forests with a high density of standing dead trees (snags), as well as woodlands near streams, oak woodlands, orchards, and pinyon-juniper woodlands. This species is unlikely to occur in the action area due to a lack of suitable habitat. |
| Loggerhead shrike<br>*Lanius ludovicianus* | Open country with short vegetation and well-spaced shrubs or low trees, particularly those with spines or thorns. They frequent agricultural fields, pastures, old orchards, riparian areas, desert scrublands, savannas, prairies, golf courses, and cemeteries. This species is unlikely to occur in the action area due to a lack of suitable habitat. |
| Long-billed curlew<br>*Numenius americanus* | Areas with sparse, short grasses, including shortgrass and mixed-grass prairies as well as agricultural fields. After young leave the nest, they may move to areas with taller, denser grasses. This species is unlikely to occur in the action area due to a lack of suitable habitat. |
| McCown's longspur<br>*Rhynchophanes mccownii* | Sparse shortgrass plains, plowed and stubble fields, and bare or nearly bare ground. This species is unlikely to occur in the action area due to a lack of suitable habitat. |
| Pacific wren<br>*Troglodytes pacificus* | Forested habitats from sea level to 12,000 feet in elevation. Most common in old-growth evergreen forests, but also lives in deciduous forests, mixed evergreen and deciduous forests, and aspen stands. Potential habitat for this species is present in the action area. |
| Pinyon jay<br>*Gymnorhinus cyanocephalus* | Occupies pinyon-juniper woodlands, sagebrush, scrub oak, chaparral, and ponderosa pine forests year-round. This species is unlikely to occur in the action area due to a lack of suitable habitat. |

| Species | Habitat |
|---|---|
| Red-headed woodpecker *Melanerpes erythrocephalus* | Breeds in deciduous woodlands with oak or beech, groves of dead or dying trees, river bottoms, burned areas, recent clearings, beaver swamps, orchards, parks, farmland, grasslands with scattered trees, forest edges, and roadsides. This species is unlikely to occur in the action area due to a lack of suitable habitat. |
| Sage thrasher *Oreoscoptes montanus* | Breeds exclusively in shrub-steppe habitats. During migration and wintering, uses arid or semiarid open country with scattered bushes, grasslands, and open pinyon-juniper woodlands. This species is unlikely to occur in the action area due to a lack of suitable habitat. |
| Sprague's pipit *Anthus spragueii* | Breeds and winters in open grassland with good drainage and no shrubs or trees. This species is unlikely to occur in the action area due to a lack of suitable habitat. |
| Veery *Catharus fuscescens* | Breeds in dense, damp, mostly deciduous woodlands, often near rivers, streams, and swampy areas. This species is unlikely to occur in the action area due to a lack of suitable habitat. |
| Reptiles | |
| Greater short-horned lizard *Phrynosoma hernandesi* | Sparse shortgrass and sagebrush with sun-baked soil. This species is unlikely to occur in the action area due to a lack of suitable habitat. |

#### *3.7.3.6. Migratory Birds*

Migratory birds include raptors, waterfowl, shorebirds, upland game birds, and songbirds. As discussed above in **Regulatory Framework**, migratory bird species are protected under the International Migratory Bird Treaty Act of 1918 and EO 13186, which places an emphasis on species of concern. Individual species of concern with potential to occur in the analysis area are listed in **Table 3.7-4**.

### 3.7.4. Environmental Consequences

#### *3.7.4.1. No Action Alternative*

Under the No Action Alternative, Amendment 003 and the revised East Boulder Mine Plan of Operations would not be approved. No additional surface disturbance, noise, human activity, or additional expansion of the TSF would occur beyond what is currently authorized under DEQ Operating Permit No. 00149 and the currently approved plan of operations. Impacts on wildlife for the larger, original East Boulder Mine Project area were described in the 1992 FEIS (DSL et al. 1992) and the 2012 FEIS (DEQ and Forest Service 2012a). Mine-related human activity would not increase under the No Action Alternative. Mining activities would continue for an additional 7 years, ending in 2027. Reclamation and post-closure monitoring activities would continue for up to 8 years following the end of operations. The total duration of surface disturbance and human activities associated with the Proposed Action would span approximately 15 years. Currently permitted surface disturbance would be reclaimed in accordance with the reclamation plan detailed in the Consolidated Operations and Reclamation Plan document (SMC 2016). Therefore, there would be no additional adverse impacts on wildlife resources. However, reclamation would seek to reestablish wildlife habitat as the post-mining use.

Reestablishment of suitable habitat for wildlife would vary depending on the habitat needs of each species; habitat for forest-dependent species would take several decades to reestablish.

### *3.7.4.2. Proposed Action Alternative*

#### General Wildlife

Construction of the Proposed Action would occur concurrently with mining activities, occurring over approximately 7 years, beginning in 2020. Expansion of the TSF would allow the mine to remain active beyond the current plan of operations, from the end of 2027 through 2033 (Knight Piésold Ltd. 2020). Reclamation and post-closure monitoring activities would continue for up to 8 years following the end of operations. The total duration of surface disturbance and human activities associated with the Proposed Action would span approximately 21 years. As described above for the No Action Alternative, reestablishment of suitable habitat for wildlife would vary depending on the habitat needs of each species, and habitat for forest-dependent species would take several decades to reestablish. Success of revegetation would be verified through annual monitoring until the reclamation cover meets bond release criteria. See **Section 3.3, Reclamation** for further details on reclamation.

Implementation of the Proposed Action would result in a total of 66.11 acres of disturbance within the proposed 286.85-acre disturbance area; in terms of the currently permitted disturbance area, 44.62 acres would be disturbed within the currently permitted disturbance area and 21.49 acres would be disturbed outside of the currently permitted disturbance area (**Figure 2.2-1**). The 21.49 acres of new disturbance would occur mostly within mixed conifer stands of Douglas-fir and lodgepole pine in areas adjacent to the existing mine, including about 20 acres of new disturbance to vegetation. Vegetation would be removed in these areas for access road and infrastructure relocation, including construction of a power line, storm water runoff diversion, temporary soil stockpile, and borrow area.

Temporary displacement of wildlife could occur during construction activities due to increased human activity and noise from heavy equipment. Fencing would be installed to keep wildlife out of the TSF. It is anticipated wildlife would return to the general area after construction activities are completed. Forest-dependent species would be expected to return to disturbed areas over a period of several decades as forest vegetation reestablishes in the disturbed areas.

Vehicle collisions with wildlife are not anticipated due to the low speed limits posted and enforced along the access road within and outside the mine. Vehicle traffic is anticipated to have no effect on wildlife. All vehicle trips would be within the number authorized in the 1993 ROD (Forest Service 1993).

Specific impacts for federally listed and proposed species, Forest Service sensitive species, MIS; and state species of concern are described below.

## Federally Listed and Proposed Species

*Grizzly Bear.* There would be no effects on whitebark pine, a grizzly bear food source, or denning habitat because none occurs in the Project area. Approximately 16.91 acres of mixed conifer stands of Douglas-fir and lodgepole pine would be removed as a result of the Proposed Action. Activities involving heavy equipment and personnel would occur year-round for 5 to 7 years in the Project area. These activities would occur during periods when bears may be active in the Project area. However, these activities would occur within 0.3 mile of open roads in nonsecure habitat. While there would be a slight increase in noise and personnel disturbance during periods when bears may be active, it would be concentrated in a small area adjacent to the TSF and mine site, which already have active mining operations 7 days a week, 24 hours a day. In the BA for the Project as part of Section 7 consultation under the ESA, the Forest Service (2020) determined that the Proposed Action may affect, but is not likely to adversely affect, the grizzly bear.

*Canada Lynx*. Approximately 22.5 acres of lynx habitat would be removed, including 0.7 acre of multistory habitat that provides snowshoe hare habitat. Up to 6.1 acres of stand initiation structural stage that provides snowshoe hare habitat and up to 4.2 acres of other structural stage may be removed. Project activities would not be expected to impede lynx movements. Low speed limits for vehicular traffic on the roads approaching the mine are strictly enforced, reducing the likelihood of vehicle strike and injury. The BA prepared for the Project determined that the Proposed Action may affect, but is not likely to adversely affect, the Canada lynx (Forest Service 2020c).

*Canada Lynx Critical Habitat.* Approximately 6.8 acres of stand initiation, early stand initiation, and multistory habitat, one of the Primary Constituent Elements (PCEs) of lynx critical habitat, would be removed. No denning habitat, also a PCE, would be removed. This minor amount of snowshoe hare habitat affected would not reduce or remove understory vegetation in boreal forest stands, significantly reduce the quality of snowshoe hare habitat, or cause permanent loss or conversion of the boreal forest on a landscape-level scale. In the BA, the Forest Service (2020b) determined that the Proposed Action may affect, but is not likely to adversely affect, Canada lynx critical habitat.

*North American Wolverine.* Approximately 66.1 acres of modeled wolverine dispersal and foraging habitat would be removed. Given the large home range size of an individual wolverine, effects on foraging habitat at a population-level scale would be insignificant. In the BA prepared for the Project, the Forest Service (2020b) determined that implementation of the proposed Project activities would not jeopardize the continued existence of the North American wolverine DPS based on the following rationale:

- The Project would not contribute to the identified primary or secondary threats to the wolverine DPS.
- None of the proposed activities are considered a threat to the wolverine DPS.

- The individual Project activities on 66.1 acres and cumulative actions would result in small-scale disturbances in relation to the large wolverine home range size, and wolverines are able to adjust to and co-exist with moderate levels of disturbance.

### Regional Forester Sensitive Species

The Proposed Action would have no effect on American peregrine falcon, bighorn sheep, black-backed woodpecker, flammulated owl, Townsend's big eared bat, or trumpeter swan because these species are not expected to occur in the analysis area. Bald eagles have been observed during the winter along the East Boulder River; however, no potential riparian nesting, roosting, or foraging habitat would be affected by the Proposed Action. Mule deer and elk, which provide prey for wolves, occur in the action area. However, the area immediately around the mine, including the 20 acres of new disturbance, is unlikely to be used extensively by wolves due to the ongoing disturbance and human presence at the mine. No direct impacts on harlequin ducks or their habitat are expected because no impacts on riparian areas or streams would result from the Project. Impacts on bald eagles, wolves, and harlequin ducks would be minor and could include temporary displacement during construction activities due to increased human activity and noise from heavy equipment as described above for general wildlife. These minor impacts could affect individuals at the local level in the analysis area but would not affect these species at the population level.

### Management Indicator Species

The Proposed Action would have minor impacts on bald eagles, grizzly bears, elk, northern goshawks, and pine martens. Impacts on bald eagles are described above under *Regional Forester Sensitive Species* and impacts on grizzly bears are described above under *Federally Listed and Proposed Species*. The Project would impact about 20 acres of coniferous forest that is potential habitat for elk, northern goshawk, and pine marten. Elk are known to occur in the action area and goshawks and pine martens could occur. These species could avoid the area during project activities due to loss of habitat and increased noise and human activity. The Proposed Action would not likely result in direct mortalities of these species, although removal of coniferous forest vegetation would reduce the likelihood that goshawks or pine martens would occur in affected areas. If nesting goshawks were present in the action area, noise and construction activities during the breeding season could affect the breeding activities of individual birds. The proposed activities would have minor adverse effects from loss of about 20 acres of habitat and displacement of individuals but would not affect MIS at the regional or population level. Elk would be expected to occupy the disturbed areas soon after reclamation is complete. Goshawks and pine martens would be expected to reoccupy the disturbed areas over several decades as coniferous forest reestablishes after completion of mine activities and reclamation.

### Montana Species of Concern and Migratory Birds

It is unknown if eastern red bat, hoary bat, and little brown myotis occur in the action area, although potential habitat is present. Potential direct and indirect impacts on bat species of

concern could include noise disturbance during roosting and hibernation, tree removal during construction, and impacts on foraging habitat. The Proposed Action would remove about 20 acres of coniferous forest that provides potential roosting and foraging habitat for these species. No buildings, mines, or caves that could provide maternity roosts or hibernacula for little brown myotis would be affected.

The 20 acres of impacted coniferous forest also provides suitable habitat for Montana bird species of concern such as brown creeper, Cassin's finch, Clark's nutcracker, evening grosbeak, great gray owl, Pacific wren, and other migratory birds. If vegetation-clearing activities occur during the nesting season, it is possible that impacts on nesting birds could occur. Potential impacts on nesting birds could include loss of adults and young, and loss of nest tees. In addition, nesting birds could be adversely affected by noise from construction activities, resulting in flushing from nests or changes in normal nesting behavior. The proposed activities would have minor adverse effects from loss of about 20 acres of habitat and displacement of individuals as described above for general wildlife but would not affect these species at the regional or population level. These forest-dependent species would be expected to reoccupy the disturbed areas over several decades as coniferous forest reestablishes after completion of mine activities and reclamation.

#### *3.7.4.3. Cumulative Effects*

Because the No Action Alternative would not result in any additional impacts, no cumulative impacts would occur.

When combined with other past, present, or reasonably foreseeable future actions, the human disturbance that would occur as part of the Proposed Action is not expected to have any cumulative impacts. The activity would be similar to current levels of activity at the East Boulder Mine and would not result in a significant cumulative impact on wildlife. New habitat modifications that would occur from the Proposed Action could result in minimal, adverse, and short-term cumulative impacts on general or sensitive wildlife species. Past and present actions that have or could result in habitat modification include forest fires, timber harvest, infrastructure building, noxious weed treatments, and fuels reduction efforts (see **Section 3.1, Description of Cumulative Actions** for more information on these actions). The habitat modification from the Proposed Action is minimal (20 acres) and would be restored during post-mining reclamation efforts.

For both the No Action Alternative and the Proposed Action, the effects of climate change could reduce the success of reclamation and revegetation efforts, ultimately resulting in a reduction of reestablished wildlife habitat. Climate change such as higher temperatures, lower snowpack, and habitat changes could further stress wildlife and reduce overall survivability in terms of reduced food sources and reproductive success.

#### *3.7.4.4. Regulatory Compliance and Forest Plan Consistency*

Both the No Action Alternative and the Proposed Action comply with applicable state and federal laws and regulations (see the list in **Section 1.7**) and the Gallatin Forest Plan. The Forest Service completed a BA for the Proposed Action as part of Section 7 consultation under the ESA (Forest Service 2020c). The BA concluded that the Proposed Action would not jeopardize the North American wolverine DPS and would not adversely affect Canada lynx, Canada lynx critical habitat, or grizzly bear. The Proposed Action includes feasible and practicable measures to minimize adverse environmental impacts on National Forest resources in compliance with 36 CFR 228.8 and incorporates provisions for wildlife habitat in compliance with standards in the Gallatin Forest Plan. Neither the No Action Alternative nor the Proposed Action would contribute toward federal listing or loss of viability of Regional Forester sensitive wildlife species or Montana species of concern within the analysis area.

## 3.8. AQUATIC BIOTA

This section describes the aquatic biota in the analysis area and discloses potential direct, indirect, and cumulative effects of the No Action Alternative and Proposed Action on aquatic species and their habitats (including Forest Service sensitive species) in the analysis area. Key laws and regulations that provide the regulatory framework for the effects analysis are described in **Section 1.7, Applicable Laws, Regulations, and Policies**. Methods specific to the aquatic biota analysis are detailed below in **Section 3.6.2, Analysis Methods.** See *Aquatics Biological Evaluation East Boulder Mine Stage 6 Tailings Storage Facility Expansion Project* (Aquatic BE; ERO 2020c) for a more detailed discussion of impacts on the aquatic biota.

### 3.8.1. Analysis Area

The analysis area for evaluating direct, indirect, and cumulative effects on aquatic species and their habitats includes the East Boulder River and reaches of its tributary streams and wetlands within the Project area (**Figure 2.2-1**) at or immediately downstream of the Project area (see Figure 3 in the Aquatic BE). Several named drainages are tributary to the East Boulder River adjacent or upstream of the Project area including Brownlee Creek, Burnt Gulch, Canyon Creek, Dry Fork Creek, Forge Creek, and Lewis Gulch. The time period evaluated for this analysis includes construction (beginning in 2020), through the end of operations (until 2033 under the Proposed Action at current production rates), and completion of reclamation and post-closure monitoring (approximately 8 years after completion of operations). The total duration of Project activities analyzed is 21 years.

### 3.8.2. Analysis Methods

Effects of sediment delivery, water quality, and possible changes to floodplain form and function on aquatic resources, including Yellowstone cutthroat trout (YCT; *Oncorhynchus clarkii bouvieri* - Forest Service sensitive species), western toad (*Anaxyrus boreas* - Forest Service sensitive species), western glacier stonefly (*Zapada glacier* - federally listed threatened species), and several species of wild trout. Forest Service MIS were identified as potential issues from internal and external scoping. These issues are further defined and described for this analysis using the following issue indicators:

*Issue Indicator #1 – Sediment effects on aquatic habitat and biota*: Raising the elevation of the TSF embankment and relocating or expanding several of the mine site's components (water recycle pond, system pipes, underdrain collection system, access road, power lines, and soil stockpile) can disturb soils and vegetation, thus increasing the potential for erosion and sediment transport to streams. This issue indicator is discussed in qualitative terms of the potential for increased fine sediment in streams to reduce habitat quality and cause adverse effects on fish and other aquatic biota.

*Issue Indicator #2 – Pollutant (nitrates) effects on aquatic habitat and biota*: TSF embankment construction from run-of-mine rockfill has been a source of aqueous nitrate. This issue indicator is discussed in qualitative terms of the potential for seepage of nitrates to contaminate waters or wetlands and affect aquatic biota.

*Issue Indicator #3 – Physical disturbance and modification to aquatic habitats*: Disturbance and modification to aquatic habitats is discussed in qualitative terms of the potential for modifications to stream form and function.

The effects discussed assume the proposed activities would be implemented according to SMC's operating permit and its plan of operations with associated Environmental Protection Measures.

This analysis incorporates analysis in **Section 3.4, Groundwater Hydrology** and **Section 3.5, Surface Water Hydrology**. It considers information described in the 2012 FEIS (DEQ and Forest Service 2012a), the CORP (SMC 2016), and SMC's proposed amendment and plan of operations revision (Knight Piésold Ltd. 2020), as well as stream water quality and biomonitoring data provided by the applicant and the Forest Service (Hydrometrics, Inc. 2018b; Rhithron 2018; Story and Hancock 2011). Project area stream reaches were characterized from existing data included in the 1992 FEIS, the 2012 SMC's Revised Water Management Plans and Boe Ranch LAD FEIS, and GEI's Fisheries Monitoring Report (DSL et al. 1992; DEQ and Forest Service 2012a; GEI 2015).

### 3.8.3. Affected Environment

The Project area is located in the East Boulder River watershed (**Figure 2.2-1**). The East Boulder River is a second order tributary to the Boulder River. The drainage ranges in elevation from more than 10,000 feet at the headwaters in Placer Basin down to 4,840 feet at its confluence with the Boulder River. The Project area is at an elevation of approximately 6,300 feet, immediately northwest of the confluence of the East Boulder River with Dry Fork Creek. The stream is approximately 22.7 miles long and has been characterized as a high-quality cold water river that supports several self-sustaining populations of trout, including nonnative rainbow trout (*Oncorhynchus mykiss*), brook trout (*Salvelinus fontinalis*), and brown trout (*Salmo trutta*), as well as native YCT, nongame fish species, and macroinvertebrates (FWP 2020b; DSL et al. 1992). Other species known to occur in the analysis area include mottled sculpin (*Cottus bairdi*) and mountain white fish (*Prosopium williamsoni*) (FWP 2020c; GEI 2015).

See **Figure 3.8-1** for a photograph of the river in the analysis area and associated aquatic habitats.

**Figure 3.8-1 The East Boulder River North of the East Boulder Mine**

### *3.8.3.1. Aquatic Habitats*

A variety of instream habitat is supported in the East Boulder River, including riffles, runs, and pools. The section of the East Boulder River running adjacent to the East Boulder Mine is boulder strewn with pocket water, which functions as holding habitat for many fish species (DSL et al. 1992; DEQ and Forest Service 2012a). Several named drainages are tributary to the East Boulder River adjacent or upstream of the Project area including Brownlee Creek, Burnt Gulch, Canyon Creek, Dry Fork Creek, Forge Creek, and Lewis Gulch (see Figure 3 in the Aquatic BE).

The channel types that are most common in the Project area have boulder- and cobble-dominated substrates and lesser amounts of gravel. The channel bed and banks are considered stable and contribute only small quantities of sediment during runoff events. These streams are subject to high spring runoff events with comparatively low late summer flows. Channel sensitivity to increased streamflow, streambank erosion potential, and sediment discharge is low for these channel types.

Wetlands within the analysis area are characterized as freshwater emergent, freshwater pond, riparian forested, and riverine (MNHP 2020c). Columbia spotted frogs (*Rana luteiventris*) and boreal chorus frogs (*Pseudacris maculata*) were the only amphibian species with observations reported within the Upper East Boulder River watershed, which includes just downstream of the Project area and tributary streams (MNHP 2020b).

#### *3.8.3.2. Existing Watershed Conditions*

Biological monitoring of macroinvertebrates, periphyton, and chlorophyll a have shown inconsistent results, indicating both unimpaired and moderate impairment conditions in the East Boulder River (Rhithron 2018). Macroinvertebrates assemblages in 2018 indicate improved biological integrity since 2015 (the last sampling effort) and potential mild stress from nutrient enrichment. The invertebrate assemblage data suggest stream habitats are intact and there is little to no evidence of metals contamination (Rhithron 2018). Diatoms suggested low probability of impairment related to sediment deposition or nutrient enrichment, and chlorophyll a concentrations were below the suggested nuisance level standard (125 milligrams (mg) per square meter), excluding outliers, but were higher than in previous years (Rhithron 2018).

Sediment monitoring conducted in coordination with the Gallatin National Forest and SMC in the East Boulder River stream system documents "a system that is very low in suspended sediment, bedload, and turbidity" (Story and Hancock 2011). The report describes a system with very limited supply of sediment due to coarse-textured substrates. Sediment monitoring found no measured changes in sediment or turbidity due to the mine exploration and road construction activities, and the concern for sediment discharge was so low that unless there were new potential sources, the interval for monitoring was recommended to be extended.

Water resources monitoring at the East Boulder Mine documents the quality and quantity of water resources in the vicinity of the mine including the monitoring of adit and tailings water (see **Section 3.4, Groundwater Hydrology** and **Section 3.5, Surface Water Hydrology**). Groundwater studies have identified explosives residue washed from waste rock used for construction of the TSF embankments as the source of elevated nitrate concentrations in downgradient groundwater. SMC implemented various mitigations to reduce nitrogen sources, limit leaching of nitrogen from waste rock, and collect meteoric water infiltrating through waste rock on the Stages 4 and 5 TSF embankment foundations with an embankment underdrain collection system (Hydrometrics, Inc. 2018b). Continued groundwater monitoring indicates nitrate plus nitrite concentrations have stabilized mostly below the 7.5 mg per liter (mg/L) degradation limit outside of the mixing zone. See the 2012 FEIS for additional information on ground and surface water conditions (DSL et al. 1992).

#### *3.8.3.3. Threatened and Endangered, Sensitive, and Management Indicator Species*

The western glacier stonefly is the only federally listed threatened aquatic species with the potential to occur within the Project area. This species requires high-elevation, fishless, alpine streams linked to glacial meltwater sources. Because the type of aquatic habitat required for this species is not present within the Project area and there are no known occurrences of this species in the Project area, this analysis does not further consider effects on this species.

The Forest Service's Northern Region (Region 1) Sensitive Species list includes three aquatic species known to occur on the east side of Gallatin National Forest, including the YCT, western toad (WT), and northern leopard frog (ERO 2020c). The YCT is the only sensitive fish species occurring in the analysis area; and one sensitive amphibian, the WT, has potential to occur in

the analysis area. Occurrence of the northern leopard frog is possible, but not probable, because of the high elevation of the Project area (FWP 2020a). Therefore, no impacts on individual northern leopard frogs or their habitat are expected. This analysis only considers effects on those aquatic species likely to occur within the Project area based on suitable habitat and existing distribution data.

MIS within the analysis area include wild trout (brook trout, brown trout, and rainbow trout). Brook trout, rainbow trout, brown trout, and cutthroat trout hybrids are present in the downstream sections of the East Boulder River, below the fish barrier (FWP 2020c, 2020d; GEI 2015).

See the 2020 Aquatic BE (ERO 2020c) for additional information on aquatic species and existing habitat conditions in the analysis area.

### 3.8.4. Environmental Consequences

#### *3.8.4.1. No Action Alternative*

Under the No Action Alternative, DEQ and CGNF would not approve SMC's application for implementation of the Project. The No Action Alternative effectively represents current conditions and the full construction of TSF embankment Stages 4 and 5, which were permitted and analyzed in the 1992 FEIS (DSL et al. 1992).

No change in sediment delivery to stream channels or other aquatic habitats would occur as a result of activities under the No Action Alternative. No change in pollutant delivery to stream channels or other aquatic habitats would occur as a result of activities under the No Action Alternative. Riverbank erosion and stability assessments indicate potential for channel migration is low (Knight Piésold Ltd. 2020). Consequently, changes to stream channel form or function would not likely occur as a result of the No Action Alternative.

Impacts of the No Action Alternative are not expected to vary beyond those disclosed in the 1992 FEIS and 2012 FEIS (DSL et al. 1992; DEQ and Forest Service 2012a).

#### *3.8.4.2. Proposed Action Alternative*

Under the Proposed Action, DEQ would approve Amendment 003 and CGNF would approve the revised East Boulder Mine Plan of Operations to authorize construction of the Stage 6 TSF expansion. The TSF would be raised 14 feet above Stage 5 to an elevation of 6,344 feet, with a maximum embankment height of 156 feet. This would allow for extension of mining activities and operation of the TSF between 2027 and 2033 at current production rates. The Project would not result in a change to the permit area. Potential sediment-generating activities associated with the Project include major storm and runoff events combined with minor removal of vegetative forest cover, and relocations of a road, power line, and topsoil stockpile. Implementation of administrative standards, physical controls, and monitoring would minimize or eliminate the potential for offsite sediment effects due to Project activities. Potential failure of the TSF, a low likelihood potential consequence of the Proposed Action, would also generate

sediment, but design features have been incorporated to minimize potential for TSF failure. Annual inspections of the TSF would be conducted by the engineer of record during operations. Following cessation of operations, erosion and stability of the TSF would be monitored for a minimum of 8 years following closure, stability would be monitored once every fifth year following post-closure, and dam safety reviews would be conducted by the IRP members or by a panel meeting the requirements of 82-4-337, MCA. As such, the potential for sediment effects associated with the Project on aquatic habitat and biota would be minimal due to the implementation and results of administrative standards, physical controls, and monitoring activities.

Sources of nitrate pollution from activities associated with the Proposed Action include TSF embankment construction from run-of-mine rockfill and the seepage of nitrates through the TSF liner that could contaminate groundwater or wetlands and affect aquatic biota. SMC has a DEQ-approved groundwater mixing zone and a MPDES permit. Because mitigation and monitoring measures associated with these approvals are in place, expected effects from nitrate pollutants on groundwater quality and surface water quality as result of the Proposed Action would be minimal. Consequently, effects on aquatic habitat and biota also would be minimal or unlikely.

Because no work is proposed in the East Boulder River, and because physical storm water controls, design features, BMPs, and monitoring (as described further in the Aquatics Biological Assessment Design Feature and Mitigations section of the Aquatic BE (ERO 2020c) and detailed in the 2016 CORP and 2013 SWPPP (SMC 2016)) would be implemented, the potential for the Proposed Action to affect aquatic habitats has been minimized. Additionally, assessments of bank erosion and stability were completed to analyze erosion potential due to flood risk and evaluate risk to the TSF embankment. The assessments indicate the likelihood of channel migration is low and the Stage 6 TSF embankment would remain stable during operations and after closure (Knight Piésold Ltd. 2020). Consequently, no change in stream channel form or function is likely to occur as a result of activities under the Proposed Action.

There would be some potential for effects of the Proposed Action on aquatic habitat and biota including YCT and WT, although these effects are expected to be minimal and limited due to design features, mitigations, and BMPs designed to reduce risk with respect to the aquatic species in and along the East Boulder River.

#### *3.8.4.3. Statement of Findings for Special Status Species*

Threatened and endangered, Forest Service aquatic sensitive species, and Forest Plan aquatic MIS were evaluated and disclosed for the No Action Alternative and the Proposed Action. These effects are detailed in the Aquatic BE (ERO 2020c) and summarized below.

##### Threatened and Endangered Species

One federally listed threatened aquatic species, the western glacier stonefly, has a general habitat range that overlaps the analysis area; however, no suitable habitat for that species

occurs within the Project area or the larger analysis area; therefore, there is no potential for the Project to affect the western glacier stonefly.

### Forest Service Region 1 Sensitive Species and MIS

For YCT, wild trout, and WT, the Proposed Action "May impact individuals or habitat but will not likely contribute to a trend toward federal listing or loss of viability to the population or species."

The Proposed Action would have little or no effect on YCT and wild trout because the Proposed Action incorporates BMPs and design criteria that prevent materials from being deposited into the East Boulder River. Proposed activities that may generate sediment to the East Boulder River if construction BMPs were overwhelmed, such as removal of vegetative cover or soil stockpile relocation, may harm individual eggs or fry, if present immediately downstream of the Project area during sediment pulses, but would not likely contribute to a trend toward federal listing or loss of viability to the population or species. Additionally, implementation of administrative standards, physical controls, and monitoring would minimize or eliminate the potential for offsite sediment effects.

Wetlands occur along the East Boulder River drainage and tributaries in the analysis area. Although WT has not been detected in the Project area, these wetlands do provide suitable habitat for this Forest Service Region 1 sensitive species. The Proposed Action would have no effect on WT breeding habitat because the Proposed Action incorporates design criteria that prevent materials from being deposited in wetlands. Proposed activities such as the soil stockpile relocation may harm individuals, if present in the Project area during removal of woody ground cover, but would not likely contribute to a trend toward federal listing or loss of viability to the population or species.

#### *3.8.4.4. Cumulative Effects*

Past, present, and reasonably foreseeable future land management activities have occurred and still occur within the general area of the proposed activities. Ongoing and reasonably foreseeable activities that could contribute to cumulative effects include recreation, livestock grazing, timber management, and future mining activity. The East Boulder Fuels Reduction Project may be implemented as early as summer 2020. No cumulative sediment effects from the East Boulder Fuels Reduction Project with the Proposed Action are anticipated due to the implementation of administrative standards, physical controls, and monitoring activities for both projects. A conceptual proposal is being developed for a future expansion at the East Boulder Mine. Engineering design and facility locations for this expansion are not finalized at this time. Because details of the potential future expansion are not available at this time, future proposals cannot be fully considered in this analysis effort. However, continued mining activity and expansion of the existing facilities are reasonably foreseeable actions at the developed East Boulder Mine. Any future proposals would consider the cumulative effects of the Stage 6 TSF proposal on those actions.

#### *3.8.4.5. Regulatory Compliance and Forest Plan Consistency*

Both the No Action Alternative and Proposed Action comply with applicable state and federal laws and regulations (see the list in **Section 1.7**) and the Gallatin Forest Plan, including the CGNF Travel Plan Standard. The Proposed Action is consistent with management direction in the Gallatin Forest Plan (Forest Service 1987, amended in 2015); all Presidential Executive Orders (#12962, #11990, and #11988); and all state and national Clean Water Acts. The Proposed Action is compliant with NFMA and FSM 2670.5 and 2672.42. The Proposed Action includes feasible and practicable measures to minimize adverse environmental impacts on National Forest resources and maintain and protect fisheries habitat in compliance with 36 CFR 228.8, the Gallatin Forest Plan, and the MMRA. These measures include storm water BMPs (diversion channels, collection channels, and percolation basins); sediment containment basins; road BMPs; vegetative buffer zones; revegetation and surface stabilization treatments; monitoring and inspection activities; and maintenance and corrective actions. By applying for and complying with its MPDES permits and other water quality authorizations, SMC's current operations (No Action Alternative) and Proposed Action would be in compliance with the Clean Water Act and Montana Water Quality Act (see **Section 3.4, Groundwater Hydrology** and **Section 3.5, Surface Water Hydrology**). Neither the No Action Alternative or the Proposed Action would contribute toward federal listing or loss of viability of YCT, WT, or western glacier stonefly within the analysis area. Both the No Action Alternative and Proposed Action meet the intent of the Cooperative Conservation Agreement for YCT in Montana.

## 3.9. CULTURAL RESOURCES

This analysis considers the affected environment and potential environmental consequences to cultural resources from the proposed East Boulder Mine Stage 6 TSF Expansion. Cultural resources or sites are the physical remains of archaeological, historical, and architectural sites and/or places of traditional cultural practices.

Key laws and regulations that provide the regulatory framework for the effects analysis are described in **Section 1.7, Applicable Laws, Regulations, and Policies**. Methods specific to the cultural analysis are detailed below in **Section 3.9.2, Analysis Methods.**

### 3.9.1. Analysis Area

The analysis area for evaluating direct, indirect, and cumulative impacts on cultural resources is the 396.58-acre Project area, which is the area of potential effects (APE). Approximately 66.11 acres would be disturbed by proposed Project activities in the analysis area.

### 3.9.2. Analysis Methods

For this analysis, cultural resource sites that have not been formally evaluated for nomination to the NRHP are treated as historic properties. The issue identified during scoping and analyzed here suggested that ground-disturbing activities in previously undisturbed areas within the permit boundary could adversely affect cultural resources.

File and literature searches were conducted to define previous cultural resource investigations within, and in the vicinity of, the Project area or APE. At least eight previous investigations have been conducted within and around the APE, associated with mine expansion, timber sales, and transmission line development and operation. CGNF prepared a confidential Cultural Resource Specialist Report that documents archaeological work performed within the analysis area to date (CGNF 2019 FOIA EXEMPT).

Since historic properties would be protected under Section 106 of the NHPA, the potential to affect those properties becomes the measure of the effect of the Proposed Action. An effect, according to 36 CFR 800.9(a), may include an alteration to the property's characteristics of location, setting, or use. Adverse effects are defined as those that may diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association and include, but are not limited to:

- Physical destruction, damage, or alteration of all or part of the property;
- Alteration of the character of the setting when that character contributes to the property's qualification for listing in the NRHP; and
- Introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting.

An effect occurs when the action of the undertaking itself impacts the cultural resource, either directly or indirectly. For example, ground-disturbing activities such as construction of the mine access road, pipelines, power lines, mine-water recycle pond, borrow areas, and staging areas may damage or demolish a site.

### 3.9.3. Affected Environment

Prehistoric and historic cultural resources are a nonrenewable resource. Cultural resources have many values including their use for the gathering of scientific information on human culture history, interpretive and educational value, values associated with important people and events of importance in our history, and often an aesthetic value as in a prehistoric petroglyph or a historic landscape. For Native American Indian tribes, as well as other traditional culture groups, archaeological and historic sites often have importance for religious and ceremonial purposes or as locations for traditional uses important in a particular group's ongoing cultural identity.

Based on past surveys, the APE for the Proposed Action has been completely inventoried for cultural resources (CGNF 2019 FOIA EXEMPT). One site, called the Agate Bench site, is located within the APE of the Proposed Action. This site, recorded in 1981, was discovered during shovel testing for proposed road construction. Fourteen shovel tests were dug in and around the Forest Service Boulder Bridge, and two additional sites were found when buried cultural materials were exposed. At the time, no surface cultural materials were apparent, but the location of the sites suggested the possibility of buried cultural material.

One of the additional sites is described as a buried prehistoric occupation site located on a small bench overlooking the East Boulder River and bordered by an old river channel to the north. Additional testing was conducted at the site in 1989 and it was determined that while the site revealed a light scattering of buried lithic material, more investigation was needed to determine site significance (Lahren 1990). Lahren further states that the site may be part of an "archaeological site complex" that includes the Boulder Bridge site and the Trailgate site.

Based on the finding of subsurface cultural deposits, the Agate Bench site may be potentially eligible for nomination to the NRHP under criterion D: "has yielded or may be likely to yield information important in prehistory or history" (USDI 1997). For this analysis, it is considered a historic property. Two water monitoring wells, installed in 1981, are located within the site boundaries and may have partially disturbed the site.

The most recent inventory was conducted by GCM Services, Inc. (GCM) for the East Boulder Amendment Area in 2016 (GCM 2016 FOIA EXEMPT and CGNF 2019 FOIA EXEMPT). The 250-acre inventory revealed four previously recorded sites consisting of three prehistoric sites and one historic site. GCM recommended all sites should be avoided by disturbance activities until they were evaluated for potential listing in the NRHP and, if appropriate, mitigation plans developed (GCM 2016 FOIA EXEMPT). None of these sites are within the disturbance areas of the Proposed Action.

### 3.9.4. Environmental Consequences

#### *3.9.4.1. No Action Alternative*

Under the No Action Alternative, no new impacts on cultural resources would be expected compared to what was originally disclosed in the 1993 ROD (Forest Service 1993) and 2012 ROD

(DEQ and Forest Service 2012b). As described in the 1992 FEIS (DSL et al. 1992), the applicant would be limited to work within the permit boundary in areas authorized for disturbance. However, operations could "perpetuate the indirect effect cause by changing recreational use patterns" (DSL et al. 1992).

#### *3.9.4.2. Proposed Action Alternative*

Direct effects on the Agate Bench site involve the proposed relocation and construction of the mine access road within the western boundary of the site, potentially causing physical destruction, damage, or alteration of part of the historic property. This is considered an adverse effect under Section 106 of the NHPA. Implementing mitigation described in **Section 3.9.4.3**, would prevent these adverse direct effects.

Indirect effects on potentially affected cultural resources and historic properties could result from vegetation clearing and rubble materials rolling onto the site during construction activities. Rubble from previous road construction was observed along the south boundary of the site. Implementing mitigation described in **Section 3.9.4.3** would prevent these adverse indirect effects.

#### *3.9.4.3. Mitigation*

To avoid adverse direct effects on the Agate Bench site, CGNF required SMC to redesign a portion of the access road relocation to completely avoid the site and to incorporate this mitigation into the Proposed Action as described in Revision 5 (Knight Piésold Ltd. 2020). Avoidance measures included additional realignment of the portion of the road adjacent to the site and reducing the width of the road to one lane from two lanes to avoid the site (CGNF 2019 FOIA EXEMPT). An archaeologist would be present during implementation of the relocation and construction of the mine access road to identify the site and to ensure it is avoided.

To mitigate indirect effects during construction, SMC would place a protective barrier berm along the edge of the existing road above (to the south of) the site to ensure clearing and rubble material does not roll down the slope onto the Agate Bench site.

#### *3.9.4.4. Cumulative Impacts*

Under NEPA, any cumulative effects on cultural resources from other actions, such as fuels reduction projects, would require CGNF review prior to implementation. This review would require survey of the area of the future action and compliance with Section 106 of the NHPA. Avoidance of cultural resource sites would be preferred, if not required.

Since no new impacts would occur from implementation of the No Action Alternative, there would be no cumulative impacts. Similarly, there would not likely be any cumulative effects from the Proposed Action when combined with other past, present, or reasonably foreseeable future actions.

Changes in local climate parameters could impact cultural resources in several ways. More intense storm events could result in the erosion of cultural sites and resources being damaged

or lost. In addition, changes in the fire regime in terms of more frequent and intense fires could result in adverse effects on cultural resources through damage from fire, or emergency fire response to suppress fire. However, neither alternative would contribute to these impacts.

#### *3.9.4.5. Regulatory Compliance and Forest Plan Consistency*

The No Action Alternative complies with applicable state and federal laws and regulations (see the list in **Section 1.7**) and the Gallatin Forest Plan. By implementing mitigation described above in **Section 3.9.4.3, Mitigation**, the Proposed Action activities would avoid adverse effects on historic properties as outlined in Section 106 of the NHPA and its implementing regulations at 36 CFR 800; the Proposed Action would be in compliance with other applicable laws, regulations, and policy, including the Gallatin Forest Plan (CGNF 2019 FOIA EXEMPT).

# 3.10. SOCIOECONOMICS

This socioeconomic assessment addresses potential direct, indirect, and cumulative demographic and economic impacts of the Stage 6 TSF, focusing on the following issues of concern that were identified in the scoping process (ERM 2019):

- Effects on economic conditions in Sweet Grass County; and
- Impacts on property values as well as damage to infrastructure, such as bridges and roads, due to a TSF failure.

Key laws and regulations that provide the regulatory framework for the effects analysis are described in **Section 1.7, Applicable Laws, Regulations, and Policies**. Methods specific to the socioeconomic analysis are detailed below in **Section 3.10.2, Analysis Methods.**

## 3.10.1. Analysis Area

The analysis area for evaluating direct, indirect, and cumulative demographic and economic impacts is Sweet Grass County, Montana. Big Timber is the county seat. The time period evaluated for this analysis includes construction (beginning in 2020), through the end of operations (until 2033 under the Proposed Action at current production rates), and completion of reclamation and post-closure monitoring (approximately 8 years after completion of operations). The total duration of Project activities analyzed is 21 years.

## 3.10.2. Analysis Methods

This section describes trends in employment, population, and the metal mining industry in the analysis area; identifies the socioeconomic impacts of the proposed project; and identifies potential socioeconomic impacts of potential failure of the Stage 6 TSF. Relevant statistics are provided for the State of Montana for comparison purposes.

Data from the U.S. Census Bureau and Headwaters Economics, and information from SMC's Risk Assessment, which is included in Section 7 of the SMC's application (Knight Piésold Ltd. 2020), was used in this analysis.

Potential issues related to housing, local government services, and fiscal impacts were not identified during scoping and are not anticipated to occur under the No Action Alternative or Proposed Action. Therefore, these issues are not addressed in this analysis.

A conceptual proposal is being developed for a future expansion at the East Boulder Mine. Engineering design and facility locations for this expansion are not finalized at this time. Because details of the potential future expansion are not available at this time, future proposals cannot be fully considered in this analysis effort. However, continued mining activity and expansion of the existing facilities are reasonably foreseeable actions at the developed East Boulder Mine. Any future proposals would consider the cumulative effects of the Stage 6 TSF proposal on those actions.

## 3.10.3. Affected Environment

### *3.10.3.1. Population and Employment*

The populations in both the analysis area and in the State of Montana are included in **Table 3.10-1**. From 1990 through 2000, both the population and labor force of Sweet Grass County grew by about 450 people. Growth during this period was greater than in the state. Sweet Grass County's population has been level since 2000, while the labor force dropped by about 200 people from 2000 through 2017. Montana's population has continued to grow since 2000, albeit at a slower rate than prior to 2000, while Sweet Grass County's population has remained steady. Unemployment in both Sweet Grass County and Montana overall has fluctuated since 1990, and has noticeably declined since 2000.

**Table 3.10-1**
**Population and Employment Trends in Sweet Grass County and Montana**

| | Sweet Grass County | Sweet Grass County % Change | Montana | Montana % Change |
|---|---|---|---|---|
| Population | | | | |
| 1990 | 3,154 | | 799,065 | |
| 2000 | 3,609 | 14.4 | 902,195 | 12.9 |
| 2010 | 3,651 | 1.2 | 989,415 | 9.7 |
| 2017 | 3,646 | -0.1 | 1,029,862 | 4.1 |
| Labor Force | | | | |
| 1990 | 1,539 | | 403,136 | |
| 2000 | 1,984 | 28.9 | 467,293 | 15.9 |
| 2010 | 1,738 | -12.4 | 500,525 | 7.1 |
| 2017 | 1,796 | 3.3 | 524,914 | 4.9 |
| Unemployment Rate | | | | |
| 1990 | 2.5% | | 6.0% | |
| 2000 | 3.3% | | 5.0% | |
| 2010 | 5.5% | | 7.3% | |
| 2017 | 3.1% | | 3.9% | |

Sources: U.S. Census Bureau 2012, 2018; Montana Department of Labor and Industry 2019

The 1992 FEIS for the East Boulder Mine projected that the mine workforce would be approximately 250 workers during the first year (for construction and operations), would increase during years 2 through 6, and would level off at about 600 employees for years 6 through 20 (DSL et al. 1992). The 1992 FEIS estimated that about one-third of the workforce would be hired locally and the remaining two-thirds would move to the county or nearby areas. Mine construction and operation began in 1998. The East Boulder Mine may have been a factor in the population and labor force increase prior to 2000, but the expected growth in the East Boulder Mine workforce during years 2 through 6 did not lead to a corresponding increase in the population of Sweet Grass County. Mine workers often live in neighboring Park County and Stillwater County, as well as in Sweet Grass County (SMC 2018b).

As indicated by **Table 3.10-2**, Sweet Grass County's average earnings and per capita income are lower than the Montana averages. However, the county's average earnings increased by 58 percent from 2000 through 2017, a substantially greater increase than the state average earnings. A portion of this increase is likely due to the presence of the East Boulder Mine.

**Table 3.10-2**
**Earnings and Income, 2000-2017**

| | Sweet Grass County | Percent Change, 2000-2017 | Montana | Percent Change, 2000-2017 |
|---|---|---|---|---|
| Average earnings per job (2018 $) | | | | |
| 2000 | 24,236 | | 37,608 | |
| 2017 | 38,519 | 58.3 | 45,537 | 21.1 |
| Per capita income (2018 $) | | | | |
| 2000 | 23,383 | | 33,818 | |
| 2017 | 29,637 | 26.7 | 46,475 | 37.4 |

Sources: Headwaters Economics 2019a, 2019b, using data from the U.S. Department of Commerce 2018, Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C.
Notes: Average earnings per job is total earnings divided by total employment. Full-time and part-time jobs are counted at equal weight. Employees, sole proprietors, and active partners are included.
Per capita income is total personal income (from job earnings and also from nonlabor sources) divided by total population.

**Table 3.10-3** includes 2017 data for mining-related jobs in Sweet Grass County and Montana. More than a quarter of Sweet Grass County's employed labor force works in the metal mining industry. Of the total 1,130 workers employed by private businesses in Sweet Grass County, about 360 (or 32 percent of the total) work in metal mining. Statewide, 0.5 percent of private business employment is in the metal mining industry.

**Table 3.10-3**
**Mining Employment and Private Employment, 2017**

| | Sweet Grass County | | Montana | |
|---|---|---|---|---|
| | Number Employed | Percent of Total Private Employment | Number Employed | Percent of Total Private Employment |
| Mining/Fossil Fuel Employment: | | | | |
| Fossil Fuels (oil, gas, coal) | 0 | 0 | ~3,429 | 0.9 |
| Metal Mining | ~360 | ~31.9 | 1,881 | 0.5 |
| Nonmetallic Minerals Mining | 0 | 0 | ~709 | 0.2 |
| Pipeline Construction and Transportation | 0 | 0 | 1,394 | 0.4 |
| Total Mining/Fossil Fuels Employment | ~404 | ~35.8 | 7,406 | 2.0 |
| Other Private Employment | ~726 | ~64.2 | 372,451 | 98.4 |
| Total Private Employment | 1,130 | 100.0 | 378,463 | 100.0 |

Source: Headwater Economics 2019c. Based upon data from the U.S. Census Bureau, County Business Patterns 2018.
Notes: Employment data for government, agriculture, railroads, or the self-employed are not reported by County Business Patterns and, therefore, the data above do not include these jobs.
The U.S. Census Bureau withholds some data to avoid disclosure of potentially confidential information. Headwaters Economics used other data sources from the U.S. Department of Commerce to estimate these data gaps.
Estimated figures are indicated by a tilde (~).

**Table 3.10-4** shows 2017 employment data for Sweet Grass County by industry sector. The total employment (2,776 jobs) in the county exceeds the county's labor force of 1,796 workers, indicating that commuters from outside the county fill many jobs. The largest employment sector is agriculture, which provided nearly 400 jobs (14 percent of the total county jobs) in 2017. Jobs in construction and government have declined since 2001, while jobs in the information/finance/insurance/real estate and education/health care/social assistance sectors show notable increases.

The Bureau of Economic Analysis does not show employment data for the mining/quarrying/oil and gas sector to avoid sharing potentially confidential information about the limited number of mining employers in the county. The East Boulder Mine's 2017 Annual Progress Report (SMC 2017) states that the mine had 403 to 409 employees during 2017, consistent with the number of mining sector jobs indicated in **Table 3.10-3**. Based solely on the East Boulder Mine, the mining industry is the largest contributor to county employment, providing about 15 percent of the jobs in Sweet Grass County. The mine's 2018 Annual Progress Report states that the mine had 422 workers during most of 2018 and expected to have up to 470 workers in 2019.

Montana's eight largest hardrock mines (including the East Boulder Mine) generate about 12,300 jobs statewide and increase Montana's population by about 20,300 people (University of Montana 2018). Of those 12,300 hardrock mining jobs, an estimated 23 percent (about 2,800 jobs) are "direct" jobs in mining exploration and mining production. The remaining jobs are in other sectors supported by mining company expenditures on support services ("indirect" jobs) or spending by mining employees, tax revenues, and spending by increased population made

possible by mining jobs ("induced" jobs). Thus, on average, each direct job in one of the state's eight largest hardrock mines generates approximately another 3.4 indirect and induced jobs.

Based on this ratio, the East Boulder Mine's 420 direct employees (2018 numbers) generate approximately 1,430 jobs in other sectors.

**Table 3.10-4**
**Employment by Industry in Sweet Grass County**

| | 2001 | 2001 | 2010 | 2010 | 2017 | 2017 |
|---|---|---|---|---|---|---|
| **Employees[a]** | **Number** | **Percent** | **Number** | **Percent** | **Number** | **Percent** |
| **Industry** | | | | | | |
| Agriculture | 451 | 16.8 | 364 | 14.7 | 394 | 14.2 |
| Forestry, fishing, and related | ND[b] | | ND[b] | | ND[b] | |
| Mining, quarrying, oil, and gas | ND[b] | | ND[b] | | ND[b] | |
| Utilities | ND[b] | | ND[b] | | ND[b] | |
| Construction | 324 | 12.0 | 201 | 8.1 | 235 | 8.5 |
| Manufacturing | 84 | 3.1 | 83 | 3.4 | 109 | 3.9 |
| Wholesale trade | 46 | 1.7 | 37 | 1.5 | 25 | 0.9 |
| Retail trade | 264 | 9.8 | 194 | 7.8 | 231 | 8.3 |
| Transportation and warehousing | ND[b] | | ND[b] | | ND[b] | |
| Information, finance, insurance, and real estate | 140 | 5.3 | 200 | 8.1 | 274 | 9.8 |
| Professional, scientific, and technical | 104 | 3.9 | 91 | 3.7 | 86 | 3.1 |
| Management, administrative, business support, and waste management | 30 | 1.1 | ND[b] | | 39 | 1.4 |
| Education, health care, and social assistance | 52 | 1.9 | ND[b] | | 160 | 5.8 |
| Arts, entertainment, and recreation | 68 | 2.5 | 76 | 3.1 | 65 | 2.3 |
| Accommodation and food services | 131 | 4.9 | 157 | 6.3 | 195 | 7.0 |
| Other services | 136 | 5.1 | 144 | 5.8 | 166 | 6.0 |
| Government (federal, state, local, and military) | 375 | 13.9 | 389 | 15.7 | 243 | 8.8 |
| **Total Employment** | **2,693** | | **2,478** | | **2,776** | |

Source: U.S. Department of Commerce, Bureau of Economic Analysis 2018
[a]The estimates of employment for 2001 are based on the 2002 North American Industry Classification System (NAICS). The estimates for 2010 are based on the 2007 NAICS. The estimates for 2017 forward are based on the 2017 NAICS.
[b]ND = No data. Not shown to avoid disclosure of confidential information; estimates are included in higher level totals.

### *3.10.3.2. Tax Revenue*

Since beginning production in 1998, the East Boulder Mine has paid taxes to the state and Sweet Grass County in the form of the metal mine license tax, gross proceeds tax, and other taxes. As the only sizeable hard metal mine in Sweet Grass County, the East Boulder Mine generates most or all of the county's metal mining tax revenues.

**Table 3.10-5** lists property tax revenues generated for fiscal year (FY) 2018 based on the value of properties in Montana and Sweet Grass County. Property taxes are paid to the State of Montana, counties, cities, towns, school districts, and other local taxing authorities. Property taxes include a tax on gross proceeds from metal mines, established by Montana statute as Class 2 Property Taxes. For FY 2018, about 30 percent of all revenues generated by Sweet Grass County property assessments were from metal mining proceeds. In Montana as a whole, 0.7 percent of property tax revenues were generated based on the value of metal mine gross proceeds (Montana Department of Revenue 2018).

**Table 3.10-5**
**FY 2018 Property Tax Revenues**

| | Sweet Grass County | Montana |
|---|---|---|
| Total property tax revenues generated | $10,295,408 | $1,752,457,716 |
| Class 2 property taxes (tax on gross proceeds of metal mines) | $3,144,945 | $13,047,519 |
| Class 2 property taxes as a percentage of all property tax revenues generated | 30.5 | 0.7 |

Source: Montana Department of Revenue 2018

In addition to the property tax on mine proceeds, Montana collects a license tax from metal mines with gross product values exceeding $250,000. State law divides the funds between state agencies and counties, with 35 percent of the funds distributed to the counties in which the mine is located or to counties experiencing fiscal impacts from the mine. The counties must place at least 37.5 percent of license tax revenues in a trust fund for mitigation of mine closure or workforce reductions. The counties must distribute the remainder of the license tax revenues equally among impacted elementary school districts, high school districts, and county government planning and economic development functions (15- 37-117, MCA). In FY 2018, the total metal mine license tax collected in Montana was $13,385,537 (Montana Department of Revenue 2018). The portion distributed to Sweet Grass County government was $549,833 (Sweet Grass County 2019).

**Table 3.10-6** demonstrates the importance of metal mining to Sweet Grass County tax revenues. The gross mining proceeds tax (property tax) and metal mines license tax together generated about $1,867,000 in revenue to the county, or almost 26 percent of county government revenue. Not included in **Table 3.10-6** is the approximately $320,000 that would have been distributed to local school districts in Sweet Grass County; school budgets are separate from the county's general funds.

**Table 3.10-6**
**FY 2018 Sweet Grass County Tax Revenue from Metal Mining**

| Type of Revenue | County Revenue ($1,000s) |
|---|---|
| Total county revenue | $7,215 |
| Revenues from Category 2 property tax (gross proceeds of metal mines)[a] | $1,318 |
| Metal mine license tax revenue for county mine trust fund | $389 |
| Metal mine license tax revenue for county government operations[b] | $161 |
| Total revenue from metal mining | $1,867 |
| Percent of county revenue from metal mines | 25.9 |

Sources: Sweet Grass County 2019; Montana Department of Revenue 2018
[a]Total County property tax revenue was $4,322,387. Approximately 30.5 percent, or $1,318,328, was from Category 2 sources.
[b]Sweet Grass County received about $550,000 in Metal Mines License Taxes and dedicated $389,000 to the county's metal mine trust fund. The remaining $161,000 would be for county planning and economic development functions.

In addition to the metal mine taxes listed above, the East Boulder Mine pays property tax to the state, county, and other local taxing entities based on the value of its land and improvements, and mine operation results in tax revenues from personal and corporate income taxes.

Statewide, the hardrock mining industry pays state and local taxes and state lands fees totaling $44.8 million, not including payroll taxes. In addition to these taxes and fees paid by the mining industry, the employment and economic activity from mines results in income, sales, corporate, and other taxes and fees. A 2018 University of Montana study estimated that annual state and local government revenue would be $199.4 million less without the state's hardrock mines due to the lower population, employment, production, and sales (University of Montana 2018).

## 3.10.4. Environmental Consequences

### *3.10.4.1. No Action Alternative*

#### Direct, Indirect, and Induced Impacts

Under the No Action Alternative, the approved Stage 5 TSF for the East Boulder Mine would become operational in 2025, and mining operations would cease in November 2027, when the TSF would reach capacity (**Section 2.1.3**). Following cessation of mining activities, closure and reclamation activities would take approximately 18 to 24 months to complete, followed by periodic monitoring and maintenance (**Section 2.1.7**).

Current employment levels at the East Boulder Mine would continue through November 2027. Closure and reclamation of the mine would require fewer workers, and the monitoring and maintenance phase would require only periodic visits to the mine site. The economic benefits from decommissioning and reclamation, while substantially lower than for construction or operations, could continue through 2029. Upon complete closure of the mine, and assuming no other mining activity in the county, the economic benefit from the East Boulder Mine would end. The No Action Alternative would result in a decline in mining employment, economic activity, and tax revenues after 2029 as summarized below:

- Direct
  - Loss of 400 to 470 employees, roughly 15 percent of jobs in Sweet Grass County
- Indirect and Induced
  - Loss of about 1,430 jobs; an estimated two-thirds of these would be in south-central Montana
  - Loss of about $1,867,000 in Category 2 property taxes and metal mine license tax in Sweet Grass County, representing about 26 percent of county revenues
  - Loss in income tax revenues and other property tax revenues, as well as school revenues
  - Associated loss of income and economic activity that supports area businesses

### Socioeconomic Impact of TSF Failure

The design features for the existing TSF and Stage 5 have been described, analyzed, and approved in past NEPA documents (DSL et al. 1992; DEQ and Forest Service 2012). These potential risks associated with TSF failure risk were also addressed in Section 7 and Appendix J of SMC's application (Knight Piésold Ltd. 2020). The likelihood of a breach is "Very Unlikely," defined as circumstances that are "Conceivable, but only in extreme circumstances; occurs once every 1,000 years."

Overall, the risk of a TSF failure that would impact socioeconomics, including human health and safety and road infrastructure, is low or very low. If failure occurred, the impacts would be adverse, short-term, and indirect, except in a very unlikely case of a TSF failure that directly leads to human injury or fatality.

## *3.10.4.2. Proposed Action Alternative*

The Proposed Action would entail construction and use of the Stage 6 TSF and would extend the operating life of the East Boulder Mine. Construction of the Stage 6 TSF would begin in 2020 and last approximately 7 years (**Section 2.2.2**). The Stage 6 TSF would support mine operation until 2033 at current production rates. Mine closure, reclamation, and post-closure monitoring would last up to 8 years (**Section 2.2.10**). The total duration of proposed project activities is assumed for this analysis to be 21 years.

### Economic Impact on Sweet Grass County

The Proposed Action would extend the mine's construction and operational economic benefits beyond 2027 (No Action Alternative) to 2033. The economic benefits from decommissioning and reclamation, while substantially lower than for construction or operations, could continue through 2037, compared to the 2029 completion date under the No Action Alternative. The losses of jobs, tax revenue, and economic activity summarized under the No Action Alternative (**Section 3.10.4.1**) would be deferred until after 2033, rather than in 2027. Upon complete closure of the mine, the economic benefit from the mine would end and socioeconomic conditions would likely return to the pre-mine period. The Proposed Action would therefore result in a decline in mining employment, income, and spending after 2037.

### Socioeconomic Impact of TSF Failure

Potential TSF failure risk is addressed in Section 7 and Appendix H of SMC's application (Knight Piésold Ltd. 2020). Section 7 assesses risk based on several qualitative analyses: a dam breach analysis, a terrain hazards assessment, and a riverbank erosion and stability assessment. Appendix H of SMC's application (Knight Piésold Ltd. 2020) provides the FMEA required by 82-4-376 (2)(n), MCA. The FMEA identifies and rates 37 risks to the TSF based on the likelihood of occurrence and severity of consequences. The potential consequences of the 37 risks to the TSF that could affect socioeconomics include effects on land uses (i.e., the ability to derive economic benefit from the use of land); loss of jobs, income, and tax revenue from affected businesses and homes; human health and safety effects; and damage to transportation infrastructure. Regulatory and legal consequences, monetary costs, and community/media/reputation effects are related to socioeconomics, but would impact SMC rather than the community.

Thirty -six risks and associated consequences related to TSF failure for the Proposed Action are classified as a low or very low risk classification and one (stability of the East Boulder River bank) is classified as medium (Knight Piésold Ltd. 2020; Haley & Aldrich, Inc. 2020a). None of the 37 potential TSF failure risks would affect land use. Numerous risk scenarios could affect human health and safety, including:

- Nine risks with a "critical" severity rating. These risks include those that could cause embankment failure, instability, deformation, or overtopping such that contents of the TSF are released. All of these risks have a "very unlikely" likelihood rating, but could have severe human health and safety consequences, including one or more fatalities.
- Six risks have a moderate severity rating, including events that could reduce the TSF capacity or allow seepage from the TSF, cause failure of pipelines carrying tailings or process water, produce acidic water within the embankment, or result in excessive metals in groundwater or surface water. All of the moderate risks have a "very unlikely" or "unlikely" likelihood rating. Contamination of groundwater or surface water could have human health effects, but would not likely result in direct or immediate fatalities.
- Four risks have minor severity and "possible" likelihood. These risks refer to water quality impacts that would be monitored and, if they occur, would be mitigated and treated.

Care and maintenance of survey monuments, the East Boulder River bank, the TSF closure cap (including drainage swales and storm diversions), and the percolation pond may be necessary beyond mine closure and joint reclamation bond release to prevent post-reclamation damage. As the federal land manager, the Forest Service would determine the scope, frequency, and cost of any long-term oversight beyond the obligations of the joint bond held by DEQ and the Forest Service for reclamation covered in the Proposed Action for the TSF Stage 6 (plan of operations) and current reclamation bond for the existing operation.

Overall, the risk of a TSF failure that would impact socioeconomics, including human health and safety and road infrastructure, is low or very low. If failure occurred, the impacts would be

adverse, short-term, and indirect, except in a very unlikely case of a TSF failure that directly leads to human injury or fatality.

### Summary of Impacts

In conclusion, the Proposed Action would generate the following socioeconomic impacts:

- Beneficial, direct, and short-term economic impacts through the continuation of more than 400 operational jobs generated by the East Boulder Mine for an additional 5 years as compared to the No Action Alternative.
- Beneficial, indirect, and short-term economic impacts through the continued indirect and induced job creation resulting from the mine operation for an additional 5 years, as compared to the No Action Alternative.
- Beneficial and short-term economic impacts, including both direct and indirect impacts, through the continued generation of tax and other revenues for Sweet Grass County and Montana for an additional 5 years, as compared to the No Action Alternative.
- Adverse and short-term impacts through the medium, low, or very low risk classifications of Stage 6 TSF failure that would negatively affect socioeconomics, including human health and safety and road infrastructure.

### *3.10.4.3. Cumulative Impacts*

Past, present, and reasonably foreseeable future actions that may impact socioeconomics in the vicinity of the mine permit boundary include timber harvesting, fuels reduction, recreational use, road maintenance, power line maintenance, and noxious weed treatment. These activities contribute to the economy and generate local employment, providing a cumulative and beneficial socioeconomic impact. In addition, several of the activities, such as fuels reduction projects (Forest Service 2011), provide long-term cumulative benefits to public safety and private property protection. The No Action Alternative would result in a decline in mining employment, economic activity, and tax revenues after 2027. The Proposed Action would extend the mine's construction and operational economic benefits for 5 years beyond the No Action Alternative. However, the Proposed Action would result in a decline in mining employment, income, and spending after 2037.

Climate change could have potential impacts on the No Action Alternative and Proposed Action in terms of erosion, stability, and revegetation. Climate change could also alter local resource conditions through increased temperatures, changes in precipitation patterns, and changes to the wildfire regime. These conditions would result in shifting socioeconomic impacts if additional personnel were needed to correct climate-related impacts or if the economic or practical feasibility of mine operations was impacted. Given the added duration of mining, these effects would be extended compared to the No Action Alternative.

### *3.10.4.4. Regulatory Compliance and Forest Plan Consistency*

Both the No Action Alternative and Proposed Action comply with applicable state and federal laws and regulations (see the list in **Section 1.7**) and the Gallatin Forest Plan. While no specific

Gallatin Forest Plan requirements are applicable, both the No Action Alternative and Proposed Action meet the goals of the Gallatin Forest Plan. The goals of the Gallatin Forest Plan include providing for "orderly and environmentally acceptable exploration and development of minerals." Additionally, the Forest Plan states it will recognize existing and future rights to prospect, develop, and mine on National Forest lands open to mineral entry in the implementation of the Forest Plan (Forest Service 2015a).

EO 12898, Environmental Justice, requires federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects on minority and low-income populations when implementing their respective programs, including American Indian programs. Minority or low-income populations would not be disproportionately affected by the Project. American Indians are a minority population, and although the Project area is not located within or adjacent to any tribal reservations, it is located within the boundaries of land historically used by tribes. The Proposed Action would continue to restrict access to the Project area to all members of the public, including tribal members. See also **Chapter 5, Consultation and Coordination.**

# 3.11. RECREATION

This section describes existing recreation in the analysis area and discloses potential direct, indirect, and cumulative effects of the No Action Alternative and Proposed Action on recreation activities. Key laws and regulations that provide the regulatory framework for the effects analysis are described in **Section 1.7, Applicable Laws, Regulations, and Policies**. Methods specific to the socioeconomic analysis are detailed below in **Section 3.11.2, Analysis Methods.**

## 3.11.1. Analysis Area

The recreation analysis area includes the area of potential impacts from Proposed Action activities within the 396.58-acre mine permit area and adjacent publicly accessible lands (**Figure 3.11-1**). This recreation analysis area is limited in scope compared to the 1992 FEIS (DSL et al. 1992) because the Proposed Action is not expected to change the conditions adjacent to the mine permit area beyond the conditions previously evaluated in the 1992 FEIS (e.g., changes to noise, visual quality, land use, or traffic).

## 3.11.2. Analysis Methods

This section analyzes potential impacts on recreation that were not previously analyzed and permitted as part of the 1992 FEIS (DSL et al. 1992). During the scoping process, the only issue identified regarding recreation (see **Section 1.5**) was public access of NFS Road 6644 (Lewis Gulch Road) during the Project's proposed road improvements. No changes in access or recreational use would occur along NFS Road 6645 (Dry Fork Road) or NFS Road 205 (East Boulder Road).

This analysis includes a review of existing recreational uses on and adjacent to Lewis Gulch Road including the type of uses, seasonal timing, and the estimated number of users. Potential direct and indirect impacts on the access and quality of the recreation were evaluated for each recreation user type.

The CGNF has not conducted a formal recreation survey to quantify recreational use along Lewis Gulch Road and adjacent areas accessed by the road. Personal communication with CGNF Recreation Program Manager Becca Hammargren (Hammargren, pers. comm. 2020) was used to inform the current recreational use of Lewis Gulch Road and the drainage.

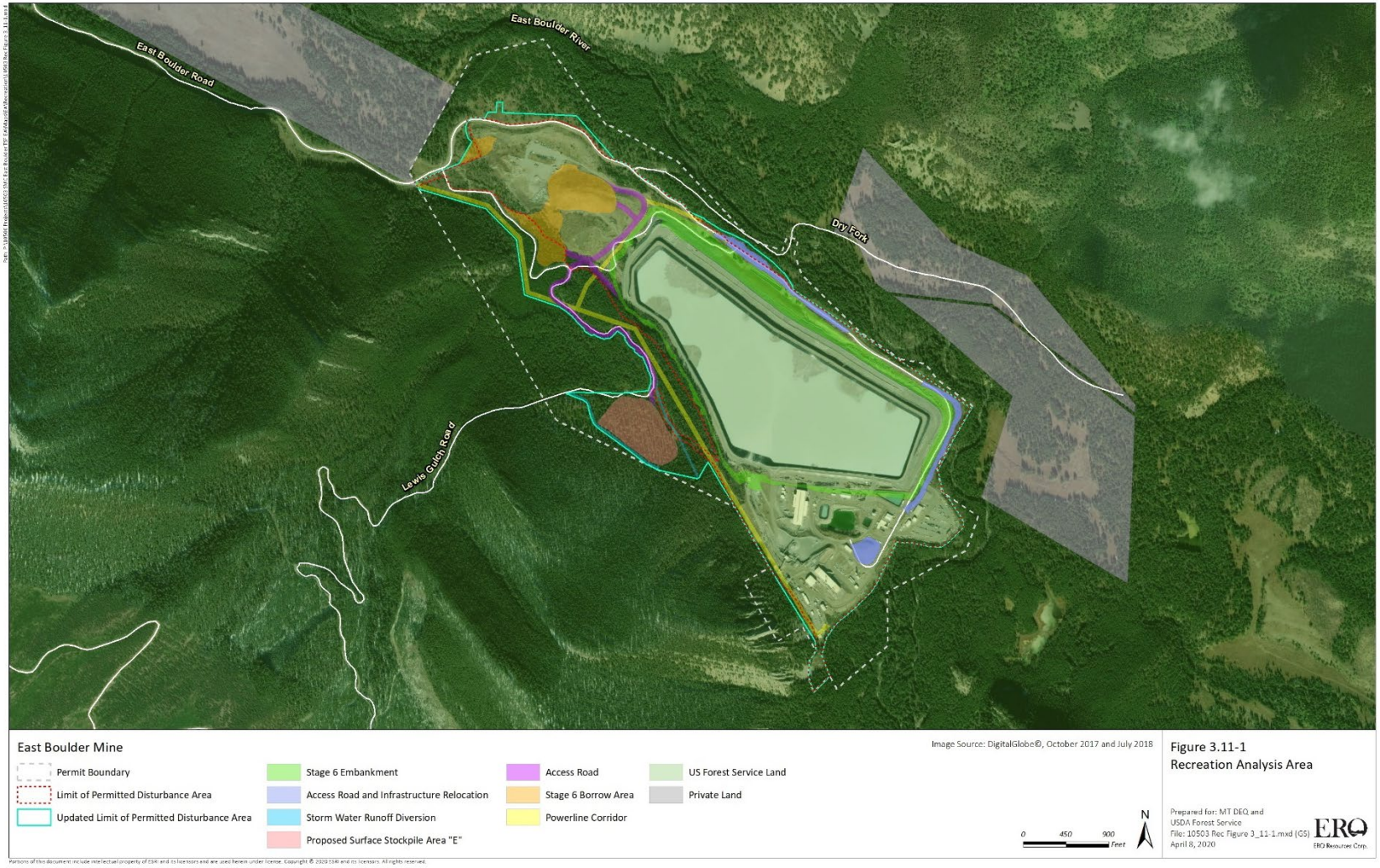



**Figure 3.11-1 Recreation Analysis Area**

### 3.11.3. Affected Environment

Lewis Gulch Road is located on Forest Service land, beginning at East Boulder Road and continuing about 4 miles south and then west to the terminus in Lewis Gulch. SMC is permitted by CGNF to use a portion of Lewis Gulch Road to access topsoil and water management facilities through a Road Maintenance Agreement (Agreement) (presented as Appendix G (Appendix J 2000) of the CORP [SMC 2016]). The Agreement allows SMC nonexclusive use of Lewis Gulch Road and allows the public or other Forest Service permittees to access the road.

The road is open year-round to motorized use for highway legal vehicles only (Forest Service n.d.). The off-road vehicle (OHV) ranger in Livingston noted that OHV use on Lewis Gulch Road is “very minimal to none.” Dispersed camping is limited, but allowed along the road, and may be used by the public during the summer and fall.

Lewis Gulch Road and the adjacent lands receive very limited public use, primarily because the road is less than 4 miles long and does not provide access to trailheads or other recreation facilities. The most common use is hunting from early September to November.

Two outfitter guide companies, Lazy J Bar O Outfitters (Colpo) and Sweetwater Travel Company (Vermillion), are permitted to access CGNF in proximity to the recreation analysis area. Colpo is permitted 281 days of overnight fall hunting, 12 days of day-use winter mountain lion hunting, and up to 22 days of day-use spring bear hunting. Vermillion is permitted 286 days of day-use summer horseback rides, hiking, and fishing.

### 3.11.4. Environmental Consequences

#### *3.11.4.1. No Action Alternative*

Under the No Action Alternative, recreation would remain similar to current conditions described above in the recreation analysis area.

#### *3.11.4.2. Proposed Action Alternative*

The Proposed Action would result in direct effects on recreation and recreation users along Lewis Gulch Road during the time when improvements are made to the road and during mine soil hauling operations.

#### Lewis Gulch Road Improvement Closure

Lewis Gulch Road improvements and widening would require full closure of the road for about six weeks. During this work, no recreation users or permitted outfitter guides would be able to use the road, resulting in short-term adverse effects on recreation users and outfitter guides.

Alternative opportunities for motorized and nonmotorized recreation in the upper East Fork Boulder River drainage, including Dry Fork Road to the north of the recreation analysis area and NFS Road 205 (East Boulder Road) to the west, would minimize the impacts of the six-week road closure. A traffic control plan would also include public communication measures to notify

the public of proposed road closure dates and minimize impacts on recreation users and outfitter guides (see below for more information).

### Lewis Gulch Road Hauling Closure or Delays

Under the Proposed Action, a 0.25-mile section of Lewis Gulch Road would be used to haul soil from stockpile area A2 to stockpile area E1 during a two-month period at the beginning of the Project. To accommodate the haul trucks, SMC would need to control public vehicular access along Lewis Gulch Road. Two options for traffic control are proposed under the Proposed Action (see **Section 2.2.6**, **Access Roads** for more information) and include either full closure of the road or the use of traffic signals during haul truck operation.

While recreational use of Lewis Gulch Road is known to be limited, the proposed closure or use of traffic signals would cause short-term adverse effects on recreation in the recreation analysis area. The magnitude of the impacts on recreation would depend on the type of traffic control measures selected, with a full closure causing a greater impact than traffic control options.

Per SMC's Agreement with CGNF, SMC is allowed to reduce or curtail nonessential traffic due to road conditions or road construction (Condition 5A) (SMC 2016). The Agreement also states that if traffic control (or closure) is warranted, SMC would draft a traffic control plan for Forest Service approval. Under the Proposed Action, a traffic control plan would be developed and approved by the Forest Service prior to implementing the proposed road improvements and traffic control options.

To minimize short-term adverse impacts on recreation, the traffic control plan would include the following measures:

- Public notification of the timing and locations of Lewis Gulch Road closures would occur before the closures or traffic control begins. Notifications would be posted at the Livingston and Ranger Station and in the local newspapers at least three weeks before the proposed closures or traffic control would begin.
- Signs about the closure or traffic control would be posted on East Boulder Road at the junction with the Boulder River Highway.

No long-term or indirect recreation effects are anticipated under the Proposed Action.

### *3.11.4.3. Cumulative Effects*

Past, present, and reasonably foreseeable future actions that may impact recreation in the recreation analysis area includes motor vehicle use, continued mine operations, hunting, and dispersed recreation. The Proposed Action would result in short-term closures and/or traffic control along Lewis Gulch Road and would not contribute to long-term adverse cumulative impacts on recreation in the recreation analysis area. Recreational use in the vicinity is unlikely to change substantially given the limited existing facilities.

#### *3.11.4.4. Regulatory Compliance and Forest Plan Consistency*

Both the No Action Alternative and Proposed Action would be in compliance with the Gallatin Forest Plan and the management practices, standards, and guidelines for Management Area 8 (see **Section 1.7**). Both would also be in compliance with the Gallatin National Forest Travel Management Plan and, specifically, with goals A.1 and A.2 for the East Boulder Travel Planning Area, which call for providing "opportunities for summer recreation use with an emphasis on challenging high-clearance vehicle, ATV and motorcycle use" (A.1) and providing "opportunities for dispersed snowmobile use"(A.2). While the Proposed Action would result in short-term motor vehicle access restrictions during construction and hauling for recreationists using Lewis Gulch Road, it would not preclude dispersed recreational opportunities for the majority of the year.

# 4. REGULATORY RESTRICTIONS

MEPA requires state agencies to prepare a Regulatory Restriction Analysis whenever the agency prepares an EA or an EIS for a proposed action on private property that appears to restrict the use of the private property. If the agency has discretion on the implementation of state or federal laws, the agency must include: a description of the impact of the restriction on the use of private property; an analysis of reasonable alternatives that reduce, minimize, or eliminate the restriction on the use of private property while satisfying state and federal laws; and the agency's rationale for decisions concerning the regulatory restriction analysis (75-1-201(1)(b)(iv)(D), MCA).

The East Boulder Mine is located on public lands within CGNF. The alternatives being evaluated would neither include the use of private property nor result in effects on private property. As such, a regulatory restrictions analysis is not required.

[This page left blank for double-sided printing]

# 5. CONSULTATION AND COORDINATION

In addition to permits and approvals provided by DEQ and the Forest Service, approvals from several other state and federal agencies may be required (see **Table 1.3-1** in **Chapter 1, Purpose and Need**).

As described in **Section 1.7.1.17, National Historic Preservation Act and Consultation with Federally Recognized Tribes,** the Forest Service must consult with the Montana SHPO if its federal undertaking (action) could impact prehistoric or historic resources (Section 106 of the NHPA, 54 USC 300101 *et seq.*). This process includes notifying tribes and other interested parties to provide comment on the effects determination. The Forest Service has identified an area of potential effects and potentially affected resources and has initiated the Section 106 process with the Montana SHPO (see **Section 3.9, Cultural Resources**).

The Forest Service is also required to consult with any American Indian tribe that could be affected by the proposed federal action. Consultation is intended to ensure that the concerns of tribes are adequately considered. During the scoping process, the Forest Service sent consultation invitations to the Fort Peck Assiniboine and Sioux Tribes, Northern Cheyenne Tribe, and the Crow Apsaalooke Tribe. A data request was made from the Fort Peck Assiniboine and Sioux Tribes, to which the Forest Service responded. The Forest Service has not received any other requests or responses to its invitation to consult.

In compliance with federal consultation requirements, the Forest Service will provide this Draft EA to the Fort Peck Assiniboine and Sioux Tribes, Northern Cheyenne Tribe, and the Crow Apsaalooke Tribe for review and comment. To comply with MEPA, DEQ will provide notice to MT tribes regarding the availability of the Draft EA for review and comment.

[This page left blank for double-sided printing]

# 6. LIST OF PREPARERS

DEQ and the Forest Service used third-party consultants to prepare this EA in accordance with NEPA and MEPA. Consistent with NEPA (40 CFR 1506.5) and MEPA (ARM 17.4.635), responsible federal and state officials furnished guidance, participated in the preparation of this EA, and independently evaluated this EA, taking responsibility for its scope and contents. DEQ and Forest Service specialists and third-party consultants who participated in the preparation and evaluation of this EA are listed in the following sections.

## 6.1. MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

| Name | Role | Education |
|---|---|---|
| Blend, Jeff | Socioeconomics | Ph.D., Agricultural Economics<br>M.S., Economics<br>B.S., Economics |
| Freshman, Charles | Mining Engineer, P.E. | M.S., Geological Engineering<br>B.S., Civil/Environmental Engineering |
| Lane, Jen | MEPA Coordinator | B.A., Environmental and Social Justice |
| Jepson, Wayne | Hydrologist | M.S., Geology<br>B.S., Earth Sciences |
| Olsen, Millie | Reclamation Specialist | M.S., Land Resources and Environmental Sciences |
| Rolfes, Herb | Hard Rock Section Supervisor | M.S., Land Rehabilitation<br>B.A., Earth Space Science<br>A.S., Chemical Engineering |
| Smith, Garrett | Geochemist | M.S., Geoscience/Geochemistry<br>B.S., Chemistry |
| Walsh, Dan | Hard Rock Mining Bureau Chief and Decision Maker | B.S., Environmental Engineering |
| Whitaker, Nicholas | Staff Attorney | J.D., Law |

## 6.2. U.S. Forest Service

| Name | Role | Education |
|---|---|---|
| Erickson, Mary C. | Forest Supervisor and Decision Maker | M.S., Forest Economics<br>B.S., Forest Management |
| Daley, Marna | Public Affairs Officer | B.S., Public Relations |
| DiGiacomo, Suzanne | Sensitive Plants<br>Noxious Weeds | M.S., Biology<br>B.S., Biology |
| Gatton, Angela | Wildlife Biologist (ongoing since February 2020) | M.S., Forestry<br>B.S., Biological Sciences |
| Grosvenor, Robert | NEPA Lead/Minerals Administrator | B.A., Environmental Studies Minor, Business Administration<br>A.S., Conservation Law Enforcement |
| Hammargren, Becca | Recreation, Wilderness, and Trails | M.E.S.M., Environmental Management<br>B.A., Political Science, Environmental Studies |
| La Point, Halcyon | Heritage Program Manager | M.A., Anthropology<br>B.A., Archaeology and Philosophy |
| Ruchman, Jane | Landscape Architect | M.L., Landscape Architect<br>M.A., Teaching Education/Teaching Art<br>B.A., Fine/Studio Arts |
| Sestrich, Clint | Fisheries Biologist | M.S., Fish and Wildlife Management<br>B.S., Fish and Wildlife Management |
| Sienkiewicz, Alex | Yellowstone District Ranger | Ph.D., Forestry<br>J.D., Law<br>M.P.A., Environmental Policy<br>B.A., History |
| Seth, Teri | NEPA Planner | B.S., Resource Conservation Minor, Botany |
| Werner, Peter | Mining Engineer | M.S., Mining Engineering<br>B.S., Geology |
| White, Dale | Forest Hydrologist | M.S., Forest Hydrology<br>B.S., Civil Engineering |
| York, Julie | Wildlife Biologist (2019 – January 2020) | M.S., Conservation Biology<br>B.A., Spanish |

## 6.3. THIRD-PARTY CONSULTANTS

### 6.3.1. ERO Resources Corporation (Primary Consultant, January 2020 – Present)

| Name | Role | Education |
|---|---|---|
| *ERO Resources Corporation* | | |
| Butler, Steve | Wildlife | M.E.M., Water and Air Resources<br>B.S., Biology |
| Corsi, Emily | Project Manager | M.S., Natural Resources Conservation<br>Graduate Certificate in Natural Resources Conflict Resolution<br>B.A., Politics |
| Croll, Kathy | Cultural Resources | Ph.D., Anthropology<br>M.A., Anthropology<br>B.S., Social Science |
| DenHerder-Bauman, Nicole | Principal | M.S., Environmental Policy and Management<br>B.A., Communication |
| Fowler, Aliina | Recreation, Socioeconomics, and Public Outreach | Masters of Urban and Regional Planning<br>B.A., Political Science<br>B.S., Community Development & Applied Economics |
| Gerstung, Heidi | Aquatic Species | B.S., Ecology |
| Olmsted, Brian | Deputy Project Manager, Groundwater, and Chapter 2 | M.S., Geochemistry<br>B.S., Geology |
| Smith, Garth | GIS Specialist | M.A., Geography<br>B.S., Geography |
| Wall, Kay | Technical Editor and Document Production | B.A., Behavioral Science |
| Worah, Moneka | Vegetation | M.S., Environmental Science<br>B.A., Environmental Studies |
| *Haley & Aldrich (ERO Subcontractor)* | | |
| Frechette, Richard | Senior Geotechnical Engineer | P.E.<br>B.Sc., Geological Engineering (Geotechnics Option) |
| Hatton, Christopher | Principal Geotechnical Engineer | P.E.<br>M.S., Civil Engineering<br>B.S., Civil Engineering |
| Jones, Christopher | Professional Geologist | P.G.<br>M.S., Geosciences<br>B.S., Geology |

| Name | Role | Education |
|---|---|---|
| Rastall, Bradley | Geotechnical Engineer/Hydrologist | P.E.<br>B.S., Civil Engineering Technology<br>B.S., Agricultural Mechanization |
| *Buscher Soil and Environmental (ERO Subcontractor)* | | |
| Buscher, Dave | Reclamation | M.S., Ecological Engineering<br>B.S., Geological Engineering<br>B.S., Wildlife Biology, Minor in Soil Science |
| *Confluence Water (ERO Subcontractor)* | | |
| Brown, Matt | Surface Water | P.E.<br>M.S., Civil Engineering<br>B.S., Civil Engineering<br>A.S., Computer Engineering Technology |

### 6.3.2. Environmental Resources Management (February – December 2019)

| Name | Role | Education |
|---|---|---|
| *Environmental Resources Management (ERM)* | | |
| Alves, Monte | Visual | M.S., Forest Resource Management and Economics |
| Bernard, Shane | GIS | Graduate Certificate, GIS<br>B.A., Geography |
| Cox, Mike | Partner in Charge | B.S., Geological Engineering |
| House, Patricia | Hydrology | M.S., Environmental Science<br>B.A.S., Bio-Resource Engineering |
| Kulczycki, Ezra | Geochemistry | Ph.D., Geology<br>M.S., Geology and Geochemistry<br>B.S., Environmental Geoscience |
| Lindsey, Stephen | Geotechnical | M.S., Civil Engineering<br>B.S., Civil Engineering |
| Martin, Cianne | Document Production | M.S., Environmental Science<br>B.S., Environmental Science |
| Mayer, Michael | Project Manager | J.D., Environmental Law<br>M.S., Wildlife and Fisheries Conservation<br>B.S., Wildlife and Fisheries Biology |
| Moores, Becky | Deputy Project Manager Wildlife | B.S., Environmental Biology |
| Rzepecki, Piotr | Hydrogeology | Ph.D., Geology<br>M.Sc., Geology and Geography |

| Name | Role | Education |
|---|---|---|
| Shoutis, Levia | Alternatives and Botany | M.S., Ecology<br>B.S., Biology |
| Smith, Emily | Document Production | B.A., Journalism |
| Sussman, Ben | Socioeconomics | M.S., City and Regional Planning<br>B.S., Technology and Society |
| Thornton, Andrea | Reclamation | B.A., Environmental Geology and Environmental Studies |
| *Sacrison Engineering (ERM Subcontractor)* | | |
| Sacrison, Ralph | Process Engineer | M.S., Mining Engineering<br>B.A., Geology |

[This page left blank for double-sided printing]

# 7. NEED FOR FURTHER ANALYSIS AND SIGNIFICANCE OF POTENTIAL IMPACTS

The Forest Service and DEQ are required to determine the significance of the impacts of the Proposed Action to determine if preparation of an EIS is necessary. The state's criteria for determining significance are described below. The Forest Service must consider the significance of impact in terms of context and intensity as described in 40 CFR 1508.27. If the Forest Service determines that an EIS is not necessary based on federal significance criteria, then the Forest Service significance determination would be included in a Finding of No Significant Impact to accompany their decision notice.

## 7.1. STATE CRITERIA

Under MEPA, state agencies, including DEQ, must consider the following seven criteria in making a significance determination (ARM 17.4.608):

- The severity, duration, geographic extent, and frequency of the occurrence of the impact;
- The probability that the impact will occur if the proposed action occurs; or conversely, reasonable assurance, in keeping with the potential severity of an impact, that the impact will not occur;
- Growth-inducing or growth-inhibiting aspects of the impact, including the relationship or contribution of the impact to cumulative impacts;
- The quantity and quality of each environmental resource or value that would be affected, including the uniqueness and fragility of those resources or values;
- The importance to the state and to society of each environmental resource or value that would be affected;
- Any precedent that would be set as a result of an impact of the proposed action that would commit the department to future actions with significant impacts or a decision in principle about such future actions; and
- Potential conflict with local, state, or federal laws, requirements, or formal plans.

## 7.2. DEQ DETERMINATION

The severity, duration, geographic extent, and frequency of the occurrence of the impacts associated with the Proposed Action, SMC's proposed TSF expansion, would be limited to the areas within and adjacent to the current permit boundary. SMC's Proposed Action, as described in Knight Piésold Ltd. 2020, would raise the TSF an additional 14 feet above what was previously authorized by the agencies. This action would extend the operating life of the mine by approximately 5 years, and it would disturb 66.11 acres within the proposed 286.85-acre disturbance boundary. All activities would occur within the existing 396.58-acre mill site/TSF permit boundary. Disturbed areas would be reclaimed following mining.

DEQ has not identified any significant impacts on the resources evaluated. Identified impacts (summarized in **Table 2.4-1**) range from no impact to minor impacts, and no undue or unnecessary degradation of resources would occur.

- DEQ has determined that the risk of riverbank instability is acceptable based on SMC's revised impoundment design, Revision 5 (Knight Piésold Ltd. 2020) and the IRP's review (IRP 2020) and approach to monitoring. Stability analyses performed as part of the Stage 6 TSF embankment design indicate the minimum required FoS would be met or exceeded at all locations analyzed (see **Section 3.2, Geotechnical Stability**).
- DEQ has not identified any significant impacts on groundwater or surface water hydrology. Existing groundwater quality mitigation measures would remain in place, and no significant effects on groundwater flow or gradients are expected. Changes in tailings water quality are not expected with any element of the Proposed Action, including impoundment and storm water runoff. Adit water quality would not change due to the Proposed Action, and known concentrations of both nitrogen and salts that result from adit water disposal would be compliant with water quality standards at the mine site, likely well below required standards.
- DEQ recognizes the presence of aquatic biota in the East Boulder River, including several self-sustaining populations of trout as well as non-gamefish species and macroinvertebrates. While there would be some potential for effects on aquatic habitat and biota, including the YCT and WT, these effects are expected to be minimal and limited due to design features, mitigations, and BMPs designed to reduce risk with respect to the aquatic species in and along the East Boulder River. The Proposed Action would not result in any instream activities in the East Boulder River or its tributaries, and reclamation is expected to improve water quality over time, providing for long-term benefits to aquatic species as nitrogen, salts, and TDS levels continue to decrease.
- Impacts on wildlife habitat as a result of clearing additional acres would result in short-term minimal adverse impacts on general and sensitive wildlife species and their associated habitat; however, sufficient suitable habitat is available adjacent to the new disturbance areas, and impacts would end upon reclamation of the site.
- The Proposed Action would require vegetation removal. The applicant would be required to revegetate disturbance to provide post-mining uses, such as wildlife habitat. Therefore, impacts on vegetation would be minimal and short-term. In addition, SMC is required to conduct a sensitive species survey prior to construction, and, if any sensitive plants are found, apply protection measures to mitigate any adverse impacts.
- While adverse impacts on cultural resources along the north side of the permit boundary would occur under the original road design, the redesigned road alignment in Revision 5 would avoid all cultural resources (see **Section 3.9, Cultural Resources**).
- Lewis Gulch Road improvements and widening would require full closure of the road for about six weeks, resulting in short-term adverse effects on recreation users and outfitter guides. However, alternative recreational opportunities and a traffic control plan that includes public communication measures to notify the public of proposed closure dates would minimize impacts on recreation users and outfitter guides.

Mitigations, which are described in **Section 2.3, Mitigation Measures**, would further limit impacts of the Proposed Action. DEQ has not identified any growth-inducing or growth-inhibiting aspects due to the Proposed Action. DEQ's approval of the Stage 6 TSF does not set any precedent and would not commit DEQ to any future action with significant impacts, nor is it a decision in principle about any future actions that DEQ may act on. Finally, the Proposed Action does not conflict with any local, state, or federal laws, requirements, or formal plans.

Based on a consideration of the criteria set forth in ARM 17.4.608, DEQ has determined that SMC's proposal to raise the TSF an additional 14 feet above what was previously authorized is not predicted to significantly impact the quality of the human environment. Therefore, preparation of an EA is the appropriate level of review under MEPA.

[This page left blank for double-sided printing]

# 8. TERMINOLOGY

Terms used in the impacts analysis are listed and defined below in **Section 8.1, Definitions Used in Impact Analyses.** Other terms used in this EA are defined in **Section 8.2, Glossary**. Acronyms are defined at the beginning of the document prior to **Chapter 1**.

## 8.1. DEFINITIONS USED IN IMPACT ANALYSES

The following terms were used in this EA to describe environmental impacts. Although state and federal definitions are similar, MEPA definitions tend to be narrower in their scope than those used for the NEPA. Per the ARM 17.4.627(3), when a proposed project is subject to the provisions of both MEPA and NEPA, the DEQ may "accede to and follow more stringent requirements, such as additional content or public review periods, but in no case may it accede to less than is provided for in these rules." For this joint EA, DEQ and the Forest Service (the agencies) used the most inclusive definitions in the analyses.

Effect/impact – In this EA, the terms "effect" and "impact" are used interchangeably and synonymously. An environmental impact or effect is any change from the present condition of any resource or issue that may result from the decision by the agencies to implement the Proposed Action or an alternative.

Impact Type – Impacts can be direct, indirect, or cumulative:

- Direct impacts occur at the same time and place as the action that triggers the effect.
- Indirect impacts under NEPA are caused by the action and occur later in time or farther away in distance but are still reasonably foreseeable. Secondary impacts under MEPA are similar to indirect impacts under NEPA but are defined in ARM 17.4.603(18) as "a further impact to the human environment that may be stimulated or induced by or otherwise result from a direct impact of the action." Under MEPA, secondary impacts flow from a direct impact of an action, not from the action itself. For purposes of this joint EA, the NEPA definition of indirect impacts was used.
- Cumulative impacts under NEPA are the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions. Under MEPA, cumulative impacts are the "collective impacts on the human environment of the proposed action when considered in conjunction with other past and present actions related to the proposed action by location or generic type." For purposes of this joint EA, the NEPA definition of cumulative impacts was used.
  - Past actions – those that have previously taken place and are largely complete, but that have lasting effects on one or more of the resources that also would be affected by the alternatives.
  - Present actions – those that are currently occurring and result in impacts on the same resources that the alternatives could affect. Present actions generally include ongoing land management and utilization activities (such as recreation and timber harvest), as well as recently completed residential and industrial development.

- Reasonably foreseeable future [related] actions – those actions that are likely to occur and affect the same resources as the alternatives. Related future actions must also be considered when these actions are under concurrent consideration by any state agency through pre-impact statement studies, separate impact statement evaluation, or permit processing procedures per ARM 17.4.603(7).

Impact Duration – Impacts can be short-term or long-term:

- Short-term – an impact that would no longer be detectable over a limited period, as the resource returns to its predisturbance condition. These impacts would not last longer than the life of the Project, including final reclamation (closure) and post-closure monitoring.
- Long-term – an impact that would remain or occur beyond post-closure and joint agency bond release.

Impact Change – Impacts can be beneficial, adverse, or both:

- Beneficial – a positive change in the condition or appearance of the resource or a change that moves the resource toward a desired condition (e.g., improved water quality).
- Adverse – a negative change in the condition or appearance of the resource or a change that moves the resource away from a desired condition.

Analysis Areas – where effects could be located (i.e., spatial boundaries) and when in time these effects would take place (i.e., temporal boundaries).

- Appropriate spatial boundaries vary by resource and are described in each resource section (**Sections 3.2** through **3.11**).
- The Proposed Action evaluated in this EA is 21 years in duration, beginning with construction in 2020 through active operations ending in 2033, and the completion of reclamation and post-closure monitoring 8 years later.
- Effects are discussed in the context of total duration of the Project and/or for certain phases (i.e., construction, operations, closure, and post-closure).

## 8.2. GLOSSARY

| Term | Definition |
|---|---|
| adit | An access tunnel from the surface to the mine workings that is nearly horizontal. |
| adit water | Groundwater intercepted by the mine workings that exits the adits. |
| affected environment | The natural, physical, and human-related environment that is sensitive to changes due to the Proposed Action. |
| bear analysis unit (BAU) | Land area containing sufficient quantity and quality of all seasonal habitat components to support a female grizzly. |

| Term | Definition |
|---|---|
| best management practice (BMP) | A practice or combination of practices determined by the state to be the most effective and practicable (including technological, economic, and institutional considerations) means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals. |
| channel | A drainageway constructed to convey water from one point to another. |
| closure | The period after operations have ceased, during which the TSF is being dewatered and reclaimed, mine facilities are being reclaimed, and active water treatment is ongoing. SMC estimates TSF dewatering and water treatment would be 18 months in duration, and the remainder of closure activities would be 3 years in duration. |
| discharge | The volume of water flowing past a point per unit time, commonly expressed as cubic feet per second (cfs), gallons per minute (gpm), or million gallons per day. |
| erosion | Detachment or movement of soil or rock fragments by water, wind, ice, or gravity. |
| Glaciolacustrine | Sediments deposited into lakes that have come from glaciers. |
| groundwater | All subsurface water in the zone of saturation, especially that as distinct from surface water. |
| high-density polyethylene (HDPE) | A high-density, man-made geomembrane used for reservoir liners and pipelines. This material deforms with a low probability of puncturing or splitting. Seams are heat welded instead of glued, thus preventing rupture. |
| land application disposal (LAD) | The beneficial use of treated mine water applied to the land through center pivots or snowmakers. Application of water to the land is based on the objectives of maximizing vegetative uptake of nitrogen, maximizing evaporation, and minimizing deep percolation. |
| liner leakage | Tailings water that has infiltrated through the tailings impoundment and leaks through the liner. |
| mitigation | An action to avoid, minimize, reduce, eliminate, replace, or rectify the effect of a management practice. |
| mixing zone | An area established in a permit or final decision on nondegradation issued by DEQ where water quality standards may be exceeded, subject to conditions that are imposed by DEQ consistent with the rules adopted by the Board of Environmental Review, and a limited area of a surface water body or a portion of an aquifer where initial dilution of a discharge takes place, where water quality changes may occur, and where certain water quality standards may be exceeded. |
| monitor | To systematically and repeatedly watch, observe, or measure environmental conditions to track changes. |
| operations | The period during which active mining is taking place, tailings are being generated, and active adit water treatment is ongoing. |
| percolation ponds | Ponds constructed to discharge treated process water into shallow groundwater. |

| Term | Definition |
|---|---|
| plan of operations | As required by 36 CFR 228.4, the operator submits a plan of operations to the Forest Service that includes: the name and address of the operator, location of the proposed area of operations, information sufficient to describe the type of operations proposed, and measures to be taken to meet the requirements for environmental protection. |
| porphyritic | A rock texture containing embedded distinct crystals or crystalline particles. |
| post-closure | The period after closure (see definition above) when reclamation has been completed and water treatment is no longer required until joint agency bond release. Monitoring and maintenance would continue during post-closure. SMC estimates post-closure would be 5 years in duration. |
| reclamation cover or cap | The glacial borrow material and waste rock that will be used to cover the TSF during closure activities. |
| riparian | To be situated on or pertaining to the bank of a river, stream, or other body of water. Riparian is normally used to refer to plants of all types that grow along streams, rivers, or at spring and seep sites. |
| run-on diversion channel | A constructed feature used to control storm water from either entering or discharging from the mine site. |
| runoff | That part of precipitation that appears in surface streams; precipitation that is not retained on the site where it falls and is not absorbed by the soil. |
| sediment | Material suspended in or settling to the bottom of a body of water. Sediment input comes from natural sources, such as soil erosion, and rock weathering from soil erosion as a result of agricultural practices or construction activities. |
| seepage through the cover | Water that infiltrates through the reclamation cover to the tailings interface and discharges laterally to the embankment edge. |
| seepage through the cover | Precipitation that infiltrates through the reclamation cover into the tailings impoundment. |
| slimes | The fine fraction of tailings that is smaller than 45 microns in size. |
| slurry | A mixture of fine-grained solid material and water used to allow pumping as a way to transport the solid material over long distances. |
| storm water | Rain and snow melt that runs off a slope into streams and ponds or infiltrates into the ground. |
| subsidence | The sudden sinking or gradual downward settling of the earth's surface with little or no horizontal motion. |
| supernatant water | The freestanding water on top of the tailings mass (solid materials) that needs to be disposed before reclamation can begin. |
| tailings | The materials left over after the process of separating the valuable fraction from the uneconomical ore waste (ground up rock, sand, and silt). |
| tailings storage facility (TSF) | A structure made up of one or more dams built for the purposes of storing tailings and water from the milling process. |
| tailings water | Water that has been mixed with and carries the tailings through the milling process and is stored between particles in the tailings (water in the tailings mass). |

| Term | Definition |
|---|---|
| underdrain water | Tailings water that has infiltrated the tailings mass and has been captured by an engineering drainage layer at the base of the TSF. |
| underdrain sump | An engineered water collection tank that captures underdrain water and facilitates pumping of the water back to the tailings pond during operations. |
| whole tailings | Tailings that contain both the coarse fraction (sandfill) and the fine fraction (slimes), which are directed to the cyclones in the sand plant for separation into the coarse and fine fractions. |
| water in the tailings mass | The water held within the tailings mass that is freed upon tailings consolidation. |

[This page left blank for double-sided printing]

# 9. REFERENCES

Abdul-Kareem, A.W. and S.G. McRae. 1984. The Effects on Topsoil of Long-Term Storage in Stockpiles. *Plant and Soil*. 76:1. Pages 357–363.

Burton, L.L. 2016. Failure Mode Analysis for East Boulder Mines Future Tailings Impoundment Options and Waste Rock Storage Impoundment Options. December 2015.

CEQ (Council on Environmental Quality). 1997. Considering Cumulative Effects under the National Environmental Policy Act. January.

CEQ. 1981. Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations. 46 Fed. Reg. 18026. March 23.

CEQ. 2005. Guidance on the consideration of past actions in cumulative effects analysis. Memorandum. June. 4 pages.

CGNF (Custer Gallatin National Forest). 2011. East Boulder Fuels Reduction Projects Revised Environmental Assessment. Yellowstone Ranger District. April 2011.

CGNF. 2019. Cultural Resources Specialist Report. Sibanye Stillwater – East Boulder Mine Stage 6 Tailings Storage Facility Expansion Amendment Environmental Assessment. June. FOIA EXEMPT.

CGNF. 2020. Forest Service Website for Sibanye Stillwater Mining Company's East Boulder Mine Stage 6 Tailings Storage Facility Amendment. Accessed: March 04, 2020. Retrieved from: https://www.fs.usda.gov/project/?project=55061.

Chambers, D.M. and B. Higman. 2011. Long-term Risk of Tailings Dam Failure. Center for Science in Public Participation. Bozeman, Montana.

Comer, P., D. Faber-Langendoen, R. Evans, S. Gawler, C. Josse, G. Kittel, S. Menard, M. Pyne, M. Reid, K. Schulz, K. Snow, and J. Teague. 2003. Ecological Systems of the United States: A Working Classification of U.S. Terrestrial Systems. NatureServe, Arlington, Virginia.

Conant *et al.* (Conant, R.T., M. Anderson, A. Badger, B.M. Boustead, J. Derner, L. Farris, M. Hayes, B. Livneh, S. McNeeley, D. Peck, M. Shulski, and V. Small). 2018. "Northern Great Plains." Included as Chapter 22 In *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA. Pages 941–986. doi: 10.7930/NCA4.2018.CH22.

DEQ (Montana Department of Environmental Quality). 2009. Boulder River Watershed: Total Maximum Daily Loads. Y03-TMDL.02a. September. 134 pages.

DEQ. 2015. MPDES Permit MT0026808. Planning, Prevention, and Assistance Division. Issued on September 15.

DEQ. 2017. Re: Approval of Revision 17-001, Stillwater East Boulder Mine, Operating Permit 00149, Groundwater Mixing Zone. Letter to Matt Wolfe from Herb Rolfes. September 6, 2017.

DEQ. 2018a. Montana Air Quality Permit #2653-06. Air, Energy & Mining Division. Issued on July 25.

DEQ. 2018b. Authorization MTR000503 under the Montana Pollutant Discharge Elimination System Multi-Sector General Permit for Storm Water Discharges Associated with Industrial Activity. Water Protection Bureau. Issued on May 16.

DEQ. 2019 Circular DEQ-7 Montana Numeric Water Quality Standards. June 2019.

DEQ. 2020. Re: Modification to Amendment 003 Application, Stillwater Mining Company, East Boulder Mine, Operating Permit 00149. Letter to Matt Wolfe from Herb Rolfes. March 4, 2020.

DEQ and Forest Service (Montana Department of Environmental Quality and U.S. Forest Service). 2012a. Final Environmental Impact Statement. Stillwater Mining Company's Revised Water Management Plans and Boe Ranch LAD. May 2012.

DEQ and Forest Service. 2012b. Record of Decision for Stillwater Mining Company's Revised Water Management Plans and Boe Ranch LAD. July. 48 pages.

DSL et al. (Montana Department of State Lands, U.S. Forest Service, Montana Department of Health and Environmental Sciences, and Stillwater PGM Resources). 1992. Final Environmental Impact Statement, East Boulder Mining Project. Montana Department of State Lands, Helena, Montana.

EQC (Environmental Quality Council). 2017. A Guide to the Montana Environmental Policy Act. Legislative Environmental Policy Office. Helena, Montana.

ERM (Environmental Resources Management, Inc.). 2019. Final Scoping Report: East Boulder Mine Stage 6 Tailings Facility Expansion Environmental Assessment. Prepared for the Montana Department of Environmental Quality. April 2019.

ERO (ERO Resources Corporation). 2020a. Vegetation Report and Biological Evaluation East Boulder Mine Stage 6 Tailings Storage Facility Expansion Project. Prepared for Montana Department of Environmental Quality and the Custer Gallatin National Forest. April 13, 2020.

ERO. 2020b. Wildlife Report and Biological Evaluation East Boulder Mine Stage 6 Tailings Storage Facility Expansion Project. Prepared for Montana Department of Environmental Quality and the Custer Gallatin National Forest. May 6, 2020.

ERO. 2020c. Aquatics Biological Evaluation East Boulder Mine Stage 6 Tailings Storage Facility Expansion Project. Prepared for Montana Department of Environmental Quality and the Custer Gallatin National Forest. April 13, 2020.

FEMA (U.S. Department of Homeland Security Federal Emergency Management Agency). 2004. Federal Guidelines for Dam Safety. Prepared by the Interagency Committee on Dam Safety. June 1979 and reprinted in 2004.

Forest Service (U.S. Forest Service). 1993. Record of Decision, East Boulder Mine Project Final Environmental Impact Statement. February 1993.

Forest Service. 2006. Gallatin National Forest Travel Management Plan. Gallatin National Forest. October 2006.

Forest Service. 2011. Revised Environmental Assessment: East Boulder Fuels Reduction Project. Yellowstone Ranger District, Big Timber Office. April 2011.

Forest Service. 2015a. 1987 Gallatin Forest Plan, as amended in 2015. Gallatin National Forest. December. 385 pages.

Forest Service. 2020a. Re: Custer Gallatin Review of the East Boulder Mine Revision 5 - Stage 6 TSF Amendment Modification. Letter to Herb Rolfes from Alex Sienkiewicz. File Code: 2810. February 21, 2020.

Forest Service. 2020c. Re: Long Term Mine Reclamation Financial Assurance at Sibanye Stillwater Mining Company's East Boulder and Stillwater Mines. Letter from CGNF Forest Supervisor, Mary Erickson, to Dan Walsh, DEQ Hard Rock Mining Bureau Chief. File Code: 2840. February 7, 2020.

Forest Service. 2020c. Biological Assessment for the East Boulder Mine Stage 6 Tailings Storage Facility Expansion Project. March 27, 2020.

Forest Service. n.d. Absaroka-Beartooth (East) Motor Vehicle Use Maps (MVUMs). Retrieved from: https://www.fs.usda.gov/detail/custergallatin/maps-pubs/?cid=fseprd557674.

FWP (Montana Department of Fish, Wildlife, and Parks). 2020a. Northern Leopard Frog - Lithobates pipiens. Montana Field Guide. Montana Natural Heritage Program and Montana Fish, Wildlife and Parks. Accessed: January 28, 2020. Retrieved from: http://fieldguide.mt.gov/speciesDetail.aspx?elcode=AAABH01170.

FWP. 2020b. Western Toad - Anaxyrus boreas. Montana Field Guide. Montana Natural Heritage Program and Montana Fish, Wildlife and Parks. Accessed: January 23, 2020. Retrieved from: http://FieldGuide.mt.gov/speciesDetail.aspx?elcode=AAABB01030.

FWP. 2020c. FishMT Survey and Inventory Data, East Boulder River. Accessed: January 28, 2020. Retrieved from: https://myfwp.mt.gov/fishMT/reports/surveyreport.

FWP. 2020d. MFISH Mapper. Accessed: January 28, 2020. Retrieved from: https://fwp.mt.gov/gis/maps/mFish.

GCM Services, Inc (GCM). 2016. A Class III Cultural Resource Inventory of Stillwater Mining Company's East Boulder Amendment Area, Sweet Grass County, Montana. Prepared for Stillwater Mining Company. FOIA EXEMPT.

GEI (GEI Consultants). 2015. East Boulder River Fisheries Monitoring Report 2014. Big Timber, MT. 45 pp.

Haley & Aldrich, Inc. 2020a. Technical Memorandum 1, Review and Findings for Analysis of River Avulsion/Erosion. Submitted to Montana Department of Environmental Quality and Custer Gallatin National Forest. March 2, 2020.

Haley & Aldrich, Inc. 2020b. Technical Memorandum 2, Stage 6 Impoundment Capping Review. Submitted to Montana Department of Environmental Quality and Custer Gallatin National Forest. April 10, 2020.

Haley & Aldrich, Inc. 2020c. Technical Memorandum 3, Potential effects of the Stage 6 TSF upon Groundwater Quantity—Operational and Post-closure; Post-closure Tailing Densification and Post-closure Water Quality (Surface Water and Groundwater). Submitted to Montana Department of Environmental Quality and Custer Gallatin National Forest. April 13, 2020.

Hammargren, Becca. 2020. Email communication. Recreation Program Manager with Custer Gallatin National Forest personal communication with Emily Corsi with ERO. January 23, 2020.

Headwaters Economics 2019a and 2019b, using data from the U.S. Department of Commerce 2018, Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C.

Hydrometrics, Inc. 2017. Fate and Transport Model Report, East Boulder Mine, Stillwater Mining Company. August 2017.

Hydrometrics, Inc. 2018a. East Boulder Mine – Water Resources Monitoring Plan (Operational). Prepared for Stillwater Mining Company. March 2018.

Hydrometrics, Inc. 2018b. 2017 Water Resources Monitoring Report - East Boulder Mine. Prepared for Stillwater Mining Company. April 2018.

IRP (Independent Review Panel). 2019. Review of East Boulder Mine Detailed Design for Stage 6 TSF Design (Rev 4) Review. Dated October 3, 2018. June 12, 2019.

IRP. 2020. Review of East Boulder Mine Detailed Design for Stage 6 TSF Design (Rev 5) Review. February 18, 2020.

Knight Piésold Ltd. 2017. Tailings Storage Facility - Construction Management Plan. October 6, 2017. North Bay, Ontario. Ref No. NB101-45/38-3, Rev. 0.

Knight Piésold Ltd. 2020. Detailed Design for Stage 6 TSF Expansion. Prepared for Stillwater Mining Company (East Boulder). NB101-45/38-1. Revision 5. January 27, 2020.

Kossoff, D., W.E. Dubbin, M. Alfredsson, S.J. Edwards, M.G. Macklin, and K.A. Hudson-Edwards. 2014. Applied Geochemistry 51 (229-245).

Lahren, L.A., C. Anderson, S. Lahren, T. Jerde, and E. Anderson. 1990. Cultural Resource Evaluations of the East Boulder Area and Placer Basin Permit Areas of Sweet Grass

County, Montana. Prepared for Stillwater PGM, Big Timber, Montana and the U.S. Forest Service.

Larrauri, P.C. and U. Lall. 2017. Assessing Risks of Mine Tailing Dam Failures. An interim report of a research project sponsored by Norges Bank Investment Management.

MT DOA (Montana Department of Agriculture). 2017. Montana Noxious Weed List. Effective: February 2017. Accessed: June 20, 2019. Retrieved from: https://agr.mt.gov/Portals/168/Documents/Weeds/2017%20Noxious%20Weed%20List.pdf.

Montana Department of Labor and Industry. 2018. Employment and Unemployment Statistics by County. Accessed June 2019. Retrieved from: https://lmi.mt.gov/Home/DS-Results-LAUS.

Montana Department of Revenue. 2018. Biennial Report: July 1, 2016 - June 30, 2018. December 2018.

Montana Natural Heritage Program (MNHP). 2019. Montana Natural Heritage – SOC Report. Filter: species of concern with a U.S. Forest Service ranking on the Custer Gallatin National Forest. Accessed June 21, 2019. Retrieved from: http://MNHP.org/SpeciesOfConcern/?AorP=p.

MNHP. 2020a. Species of Concern List. Accessed February 2020. Retrieved from: http://mtnhp.org/SpeciesOfConcern/?AorP=a.

MNHP. 2020b. Montana Natural Heritage Map Viewer. Observations by Species. Accessed January 28, 2020. Retrieved from: http://MNHP.org/mapviewer/.

MNHP. 2020c. Montana Natural Heritage Map Viewer. Wetland and Riparian Mapping. Accessed January 28, 2020. Retrieved from: http://MNHP.org/mapviewer/.

Pacheco, R.L.R. 2019. Static Liquefaction in Tailings Dam and Flow Failure. Geological Survey of Spain. Madrid, Spain.

Rhithron (Rhithron Associates, Inc.). 2018. Biological Assessment of Sites on the East Boulder River: Sweet Grass County, Montana. December.

Skujins, J. and M.F. Allen. 1986. Use of Mycorrhizae for Land Rehabilitation. *MIRCEN Journal*. Volume 2. Pages 161–176.

SMC (Stillwater Mining Company). 2016. East Boulder Mine Consolidated Operations and Reclamation Plan (CORP). June 30, 2016.

SMC. 2017. East Boulder Mine: Annual Progress Report for Operating Permits. May 11, 2018.

SMC. 2018a. East Boulder Daily Traffic Report.

SMC. 2018b. Re: 2018 Metal Mines License Tax Allocation. Submitted to Hard Rock Mining Impact Board by Randy Weimer with Sibanye-Stillwater. June 8.

SMC. 2019. East Boulder Daily Traffic Report.

Stahl, P.D., S.E. Wouldiams, and M. Christensen. 1988. Efficacy of Native Vesicular-Arbuscular Mycorrhizal Fungi after Severe Soil Disturbance. *New Phytol*. Volume 110. Pages 347-354.

Story, M. and K. Hancock. 2011. East Boulder River Sediment, Turbidity, and Discharge Monitoring Report April 2010 – July 2010. Prepared for Stillwater Mining Company. Gallatin National Forest.

Strohmayer, P. 1999. Soil Stockpiling for Reclamation Activities and Mining and Construction. Restoration and Reclamation Review. Vol. 4, No. 7, Spring 1999. Department of Horticultural Science. University of Minnesota, St. Paul, MN.

Sweet Grass County. 2019. County Audit for FY 2018. April 2019.

Tafi, T. and D.R. Neuman. 2006. Reclamation Effectiveness at Three Reclaimed Abandoned Mine Sites in Jefferson County, Montana. Proceedings America Society of Mining and Reclamation. 2006. Pages 720-738.

University of Montana. 2018. The Economic Contribution of Montana's Hardrock Mining Industry. Executive Summary. September 2018. Bureau of Business and Economic Research, University of Montana.

U.S. Census Bureau. 2012. Montana: 2010 Population and Housing Unit Counts, 2010 Census of Population and Housing. CPH 2-28. September 2012.

U.S. Census Bureau. 2018. American Community Survey 2013-2017 DP03. 2018.

U.S. Department of Commerce, Bureau of Economic Analysis. 2018. Total Full-Time and Part-Time Employment by NAICS Industry. Accessed June 2019. Retrieved from: https://apps.bea.gov/iTable/iTable.cfm?reqid=70&step=1&isuri=1.

USDA (U.S. Department of Agriculture). 1988. R1/R4 Forest Service Soil and Water Conservation Practices Handbook.

USDA. 2012. National Best Management Practices for Water Quality Management on National Forest System Lands.

USDI (U.S. Department of the Interior National Park Service). 1997. National Register Bulletin *How to Apply the National Register Criteria for Evaluation* as revised.

USFWS (U.S. Fish and Wildlife Service). 2019. List of Threatened and Endangered Species. Information for Planning and Consultation (IPaC). Stillwater East Boulder Mine Stage 6 TSF. June 25, 2019.

USFWS. 2020. List of Threatened and Endangered Species for Custer Gallatin National Forest. Accessed February 2020. Retrieved from: https://www.fws.gov/montanafieldoffice/Endangered_Species/Listed_Species/Forests/CusterGallatin_sp_list.pdf.

USGS (U.S. Geological Survey). 2019. National Land Cover Database.

Whitlock et al. (Whitlock C., W. Cross, B. Maxwell, N. Silverman, and A.A. Wade). 2017. 2017 Montana Climate Assessment. Bozeman and Missoula MT: Montana State University and University of Montana, Montana Institute on Ecosystems. 318 pages. doi:10.15788/m2ww8w.

[This page left blank for double-sided printing]

# *Appendix A Issues Considered and Issues Not Studied in Detail*

## A.1. Issues

Potential issues analyzed in this EA are listed in **Table A.1-1** along with the EA subsection where the analysis is located. Many issues related to the development, operation, reclamation, and closure of the mine have been previously analyzed in the 1992 FEIS (DSL et al. 1992) and the 2012 FEIS (DEQ and Forest Service 2012a). The analyses described in those previous EISs are incorporated by reference (CFR 1502.21) to allow this EA to focus on specific issues associated with the Proposed Action. All documents incorporated by reference can be found in the Project's Administrative Record.

**Table A.1-1**
**Potential Issues and Concerns and EA Subsections Where Analyzed**

| Issue Area | Specific Issues | EA Subsection Where Analyzed |
|---|---|---|
| Geotechnical Stability | • The proposed location and design of the TSF and associated development could adversely affect the stability of the southern bank of the East Boulder River.<br>• Future movement of the East Boulder River could reduce the stability of the proposed road realignment and TSF embankment. | 3.2 |
| Reclamation | • Implementation of the Proposed Action's closure and reclamation actions could result in the potential for long-term failure due to erosion, cover loss, vegetation loss due to drought or fire, weed invasion, and storm events. This potential for failure could be further exacerbated by changes in climate. | 3.3 |
| Groundwater Hydrology | • Groundwater discharges could adversely affect groundwater quality through elevated nitrogen levels. | 3.4 |
| Surface Water Hydrology | • Surface water management could adversely affect water quality through elevated nitrogen levels. | 3.5 |
| Vegetation | • The removal of vegetation to implement the Proposed Action could adversely affect sensitive plant species or valuable timber stands.<br>• Ground disturbance and construction could result in an increase and spread of noxious weeds in the National Forest. | 3.6 |

| Issue Area | Specific Issues | EA Subsection Where Analyzed |
|---|---|---|
| Wildlife | • The removal of habitat in previously undisturbed areas within the permit boundary and presence of construction equipment could adversely affect sensitive species, threatened and endangered species, and MIS. | 3.7 |
| Aquatic Biota | • Groundwater and surface water discharges and runoff could affect water quality and adversely affect aquatic biota in the East Boulder River. | 3.8 |
| Cultural Resources | • Ground-disturbing activities in previously undisturbed areas within the permit boundary could adversely affect cultural resources. | 3.9 |
| Socioeconomics | • Economic conditions within Sweet Grass County could be affected.<br>• Downstream property values and infrastructure could be adversely affected by TSF failure. | 3.10 |
| Recreation | • The Proposed Action calls for changes to Lewis Gulch Road, a public access point into the National Forest that could adversely affect public access. The Proposed Action could result in adverse impacts on public recreation traffic on Lewis Gulch Road. | 3.11 |

## A.2. Issues Considered but Not Studied in Detail

Issues not carried forward for detailed analysis in this EA are listed below in **Table A.2-1** with explanations of why these issues were not carried forward.

**Table A.2-1**
**Stage 6 TSF Expansion Project Issues Not Studied in Detail**

| Issue Area | Reason for Dismissal |
|---|---|
| Air Quality | Impacts on air quality were thoroughly analyzed in the 1992 FEIS. The CORP (SMC 2016) includes operating permit stipulations related to best practices to protect air quality, which would continue under the Proposed Action, including management of chemical dust suppressants and the use of prescribed fires. In addition, since construction, the East Boulder Mine has been operating under an air quality permit issued by DEQ. A new permit, MAQP No. 2653-06), was issued by DEQ in July 2018 and an EA was completed through the MEPA process as a part of that permitting action (DEQ 2018). In addition to setting emission limitations for specific constituents, the air quality permit includes measures required to minimize fugitive dust during construction and operations. SMC continues to meet its air quality permit, and the Proposed Action would not result in an exceedance of permit requirements. Given SMC's adherence to air quality permits and no increase in emissions expected from the Proposed Action, air quality was dismissed from further analysis. |
| Geology | Impacts on geology were thoroughly analyzed in the 1992 FEIS. The Proposed Action would not affect the geology of the area beyond what was originally analyzed and would not occur outside the current mine permit area; therefore, this issue was dismissed from further analysis. |

| Issue Area | Reason for Dismissal |
|---|---|
| Land Use | Overall, land use goals for the Project area are defined by the Gallatin Forest Plan. Impacts on land use and post-mining land use were fully analyzed in the 1992 FEIS. The assessment of closure and reclamation found that successful reclamation would restore the Project area over time to its pre-mining uses of wildlife habitat, timber production, and recreation. The Proposed Action would adhere to previously agreed-upon closure and reclamation plans. Reclamation standards and methods are described in detail in the CORP (SMC 2016) and are summarized in this EA in **Section 2.1.7.2, Closure and Post-Closure Reclamation**. These reclamation methods would also be implemented under the Proposed Action. Mitigation could be required to reduce impacts on other resources; however, impacts on land use would not be different compared to the No Action Alternative. Therefore, land use was dismissed from further analysis. For more information on the Proposed Action's consistency with the 1987 Gallatin Forest Plan, see **Section 1.7.1, Federal Laws and Regulations, National Forest Management Act of 1976/1987 Gallatin Forest Plan (as amended)** and **Chapter 3** resource subsections. |
| Noise | Impacts on ambient noise levels were fully analyzed for the construction, operation, and reclamation of the East Boulder Mine in the 1992 FEIS. The CORP (SMC 2016) also presents mitigation measures and operating permit stipulations for minimizing noise at the mine site, which would be implemented under the Proposed Action. Effects from the Proposed Action are not expected to elevate noise levels beyond what is currently occurring. Although the expansion of the TSF would enable mining to continue for an additional 5 to 6 years prior to the implementation of closure and reclamation, daily noise levels during this additional period are not expected to exceed those currently occurring. Once reclamation and closure have occurred, noise levels would return to pre-mining levels. Given the expectation that noise levels would not exceed those currently occurring, this issue was dismissed from further analysis. |

| Issue Area | Reason for Dismissal |
|---|---|
| Visual | The 1993 Record of Decision (ROD) (Forest Service 1993) for the authorization of the East Boulder Mine assessed the visual impacts on Forest Service resources and established a site-specific amendment to the 1987 Gallatin Forest Plan. Under the 1987 Gallatin Forest Plan, the area of the mine is deemed "Partial Retention." The Forest Service determined that all action alternatives would not meet this forest plan visual quality standard in the permit area. As part of the site-specific amendment, the Forest Service required that SMC ensure that color texture and line of developments would blend, to the extent possible, with natural features and that terrain features and visual screening would be used to reduce visual impacts where practicable. Site-specific plans for mine facilities would be reviewed and approved by CGNF staff trained in visual resource management. These plans would be reviewed in relation to their ability to meet the visual quality parameters listed above prior to construction. (Forest Service 1993). As discussed in **Section 2.3, Mitigation Measures**, the agencies will require reclamation of the Stage 6 west side TSF crest at closure in a manner that breaks up the horizontal line viewed from the East Boulder Road. |

| Issue Area | Reason for Dismissal |
|---|---|
| Soils | There would be no disturbance or soil impacts outside of the permit area boundary assessed in the 1992 FEIS, subsequent amendments, and revisions. Although some disturbance to soils would occur in previously undisturbed areas, those impacts are anticipated to be similar to those previously examined and currently occurring at the mine. As stated in the 1992 FEIS, impacts on soils would be minor and short-term due to the amount of area disturbed. Any soil removed would be stockpiled and used for future onsite reclamation activities. The Proposed Action would result in the disturbance of approximately 21.49 acres of previously undisturbed areas. In addition, the CORP (SMC 2016) and the Detailed Design for Stage 6 TSF Expansion (Knight Piésold Ltd. 2020) describe mitigation measures, operating permit stipulations, and reclamation standards and methods for soils and vegetation included in the Proposed Action. Reclamation standards are summarized in this EA in **Section 2.1.7.2, Closure and Post-Closure Reclamation**. Proposed management and reclamation activities include minerals management Best Management Practices for soil conservation per the National Forest Management Act, Multiple Use Sustained Yield Act, Forest Service Region 1 policy, and Gallatin Forest Plan. Such management activities are intended to maintain long-term soil quality and productivity. Effective implementation of all outlined and prescribed reclamation activities would result in maintenance of long-term soil quality and productivity. Given the lack of potential issues associated with the limited proposed soil disturbance and proposed reclamation methods and mitigation measures, this issue was dismissed from further analysis. |
| Transportation | The 1992 FEIS and associated 1993 ROD analyzed and approved 170 average daily total (ADT) vehicles during operation of the mine. Based on the last 2 years of traffic counts provided by the applicant (SMC 2018; SMC 2019), the maximum ADT for 2018 and 2019 was 38 trips (January through December) and 40 trips (January through May), respectively. The Proposed Action would not result in an increase in ADT beyond what is currently allowed under the 1993 ROD; therefore, this issue was dismissed from further analysis. In addition, the CORP (SMC 2016) describes mitigation measures and operating permit stipulations related to transportation that would also be included in the Proposed Action. |

| Issue Area | Reason for Dismissal |
|---|---|
| Wilderness and Inventoried Roadless Areas (IRAs) | The closest wilderness area to the East Boulder Mine is the Absaroka-Beartooth Wilderness Area a few miles south of the permit area. Topography and distance would screen visual, noise, and other effects of the Project to wilderness and IRA characteristics in the wilderness area and nearby IRAs. In addition, Forest Service Manual 2320 provides guidance related to this issue, stating that forests "Do not maintain buffer strips of undeveloped wildland to provide an informal extension of wilderness." Impacts on the wilderness area were thoroughly analyzed in the 1992 FEIS. Concerns assessed in that EIS were potential noise impacts on the adjacent wilderness area. Based on that analysis, the 1993 ROD required noise mitigation such as muffling systems and systems that sound audio backup signals only when necessary. The CORP (SMC 2016) also presents mitigation measures and operating permit stipulations for minimizing noise at the mine site, which would be implemented under the Proposed Action. The Proposed Action has not proposed activities that would increase ambient noise levels; therefore, wilderness was dismissed from further analysis. No IRAs are located in the Project area; however, the closest area is less than 1 mile from the Project area. No changes to roads or IRAs outside the permit area would occur. |

[This page left blank for double-sided printing]

# *Appendix B Alternatives Development*

## B.1. Development of Alternatives

### B.1.1. Project Planning and Informal Alternatives Development

An extensive planning process was undertaken by the Project Proponent, SMC, including informal alternatives development, prior to submitting applications to the agencies for an operating permit amendment and a plan of operations revision. SMC's planning phase included discussions and design review sessions with the Northern Plains Resource Council and the Cottonwood Resource Council (Councils) as part of SMC's Good Neighbors Agreement, as well as discussion and design review sessions with the agencies. A Failure Modes Analysis Workshop also was conducted in December 2015 and included SMC, the agencies, and the Councils. Results of the workshop are summarized in the Failure Mode Analysis Report(Burton 2016). Throughout the planning phase, SMC, the Councils, and the agencies considered a number of alternatives, including multiple designs and approaches to meet SMC's tailings storage needs. Many of the alternatives were dismissed by SMC and their consultant, Knight Piésold Ltd., with concurrence from the agencies and the Councils, as being infeasible or cost prohibitive based on 75-1-201(1)(a)(iv)(C)(I), MCA. In November 2017, after completion of the planning phase, SMC officially submitted its applications to the agencies for Amendment 003 to Operating Permit 00149 and a revised East Boulder Mine Plan of Operations.

### B.1.2. Federal and State Criteria for Development and Consideration of Alternatives

Under CEQ regulations, the Forest Service is required to study, develop, and describe appropriate alternatives to recommend courses of action in any proposal that involves unresolved conflicts concerning alternative uses of available resources as provided in NEPA (40 CFR 1501.2(c)). Furthermore, under NEPA, reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and use common sense, rather than are simply desirable from the standpoint of the applicant (CEQ 1981). Specific to the Forest Service NEPA regulations (36 CFR 220.7), the EA shall briefly describe the proposed action and alternative(s) that meet the need for action. No specific number of alternatives is required or prescribed.

Under MEPA, an "alternative must be achievable under current technology" and "must be economically feasible as determined solely by the economic viability for similar projects having similar conditions and physical locations and determined without regard to the economic strength of the specific project sponsor" (75-1-201(1)(b)(iv)(C)(I), MCA). For a project that is not a state-sponsored project, such as the Proposed Action, an alternatives analysis does not include an alternative facility or an alternative to the proposed project itself (Section 75-1-220, MCA).

### B.1.3. Formal Alternatives Development

In May 2019, as part of the NEPA/MEPA process, DEQ and CGNF engaged in a formal alternatives development process to identify any other reasonable alternatives for evaluation.

During the alternatives development meeting, the agencies discussed other options for modifying the Proposed Action. This meeting was followed by a teleconference meeting to consider additional options. The agencies used the reasonable alternative definitions described above to assess alternatives and to identify potential mitigation measures to reduce potential impacts of the Proposed Action.

Since 2017, SMC has revised its proposed Stage 6 design five times to address comments from the agencies and the Independent Review Panel (IRP). The Proposed Action (Project) analyzed in this EA is consistent with the final revision, Revision 5 (Knight Piésold Ltd. 2020). Throughout the revisions to the Proposed Action, the agencies have considered if any other reasonable alternatives or mitigation measures could be identified. No additional alternatives were developed, but mitigation measures that would be required by the agencies to mitigate potential effects of the Proposed Action are listed in **Section 2.3, Mitigation Measures** and described in detail in **Chapter 3** environmental consequences discussions. Alternatives considered but dismissed from detailed consideration are discussed below in **Section B.2, Alternatives Considered But Dismissed**.

## B.2. Alternatives Considered But Dismissed

The following alternatives or alternative components were considered but not carried forward for analysis in this EA after agency review. The reasoning for dismissal is provided for each alternative below.

### B.2.1. Alternative Capping Design

Agencies reviewed whether a cap thicker than the proposed 52-inch cap (24 inches of waste rock, 22 inches of subsoil, and 6 inches of topsoil) would increase consolidation and densification of the tailings and reduce tailings exposure. This alternative was dismissed because it did not provide an environmental benefit over the Proposed Action. One concern raised was the need to consider the overpressure or overloading of the tailings, as it is important to allow pore pressure to dissipate without detrimental results. Rapid overloading has been observed to contribute to liquefaction of susceptible media. In addition, a thicker cap was considered in the 1992 FEIS (DSL et al. 1992) as documented in the 1993 ROD (Forest Service 1993). The ROD selected all agency proposed alternatives *except* the increased tailings capping (the Agency Proposed Alternative 3 proposed to increase the waste rock/borrow used on the cap from 24 inches to 48 inches). However, the agencies considered the proposed capping as adequate to grow vegetation and minimize the need for additional borrow. Therefore, an alternative cap thickness was dismissed from further consideration. There is no specific analysis that supports a greater alternative thickness being either more or less advantageous than the Proposed Action cap thickness. Uncertainties related to the existing design can be reduced during the more advanced investigation and design proposed for implementation nearer to closure.

## B.2.2. Alternative TSF Expansion and Closure Designs Evaluated at the 2015 Failure Modes Analysis Workshop

The following alternative TSF designs for TSF expansion and closure were reviewed during the Failure Modes Analysis Workshop conducted in December 2015 and the Multiple Accounts Analysis Review Session Report (Burton 2016); see also **Section B.1.1. Project Planning and Informal Alternatives Development** above. Five ideas were considered related to TSF expansion, and two ideas were considered related to the TSF closure cap (as a method of waste rock storage). A description and the rationale for dismissal are summarized below.

### *B.2.2.1. Raise TSF Embankment to 6,356 Feet*

This alternative would raise the TSF embankment to an elevation of 6,356 feet using a modified centerline design, which would be 26 feet above the Stage 5 elevation of 6,330 feet. Expansion to this elevation would be constructed in two lifts above the proposed Stage 5 elevation using upstream construction methods. This idea was dismissed because it did not provide an environmental benefit (including health and safety) over the Proposed Action. Specifically, there were concerns of upstream slope and tailings failures caused by "…loading on weak tailings, liquefaction between layers, and other similar issues" (Burton 2016).

### *B.2.2.2. New TSF Storage Cell*

Three ideas involved construction of a new TSF storage cell. These options were dismissed because they did not provide an environmental benefit over the Proposed Action. The primary issue of a new storage cell is that compared to the Proposed Action, it would not maximize use of the existing disturbed area, and it would increase the disturbance footprint. Therefore, a new TSF storage cell option was dismissed. The following is a brief description of the three approaches considered.

**New Storage Cell, Conventional Tailings**

One approach considered was a new conventional tailings storage cell that would be constructed from borrow materials and waste rock, northwest of the TSF, with embankments constructed to an elevation of 6,240 feet.

**New Storage Cell, Filtered Tailings**

Another approach considered was a new filtered tailings storage cell that would be constructed from borrow materials, northwest of the TSF, with embankments constructed to an elevation of 6,330 feet. The tailings would be dewatered, placed in lifts, and compacted. Tailings would either be hauled to the new storage cell or a conveyor system would be used. This idea was dismissed due to potential issues with managing moisture content in filtered tailings due to changing weather conditions and possible TSF instability.

**New Storage Cell, ROM Rockfill**

A third approach considered was a new conventional tailings storage cell that would be constructed from ROM rockfill, with embankments constructed to an elevation of 6,257 feet. The embankment could be constructed similar to the existing TSF.

#### *B.2.2.3. Co-Disposal of Tailings and Rock*

This considered approach would have included construction of four new internal storage cells in a new TSF, to an elevation of 6,339 feet. Thickened tailings would be placed in the storage cells and capped with ROM rockfill. This alternative was dismissed because it did not provide an environmental benefit over the Proposed Action. This idea also generated the most concern of all the alternative TSF design ideas and was determined not to be a viable option.

### B.2.3. Alternative TSF Closure Cap Design

#### *B.2.3.1. Thicker Cap for TSF Closure*

Two approaches considered included construction of a thicker cap on the TSF at closure using waste rock as a method of waste rock disposal (which is what distinguishes this alternative from the thicker cap alternative described above). The first approach proposed to construct a 20-foot-thick cap over the existing TSF (per the Stage 5 design) at closure using waste rock, to an elevation of 6,350 feet. A second approach proposed to place an additional 50 feet raise of waste rock over the 20-foot-thick cap, to an elevation of 6,400 feet. Both options for a thicker cap were considered as part of the Failure Modes Analysis Workshop (Burton 2016) and dismissed by workshop participants because a thicker cap did not provide an environmental benefit over the Proposed Action. Specifically, there was concern with tailings displacement caused by the thicker and heavier cap, seepage management, and surface water runoff.

### B.2.4. Alternate Access Road Post-Closure

CGNF considered requesting an alternate access road for post-closure monitoring that would avoid crossing the high bank on the East Boulder River, just north of the TSF embankment. This alternative was dismissed because it did not provide an environmental benefit over the Proposed Action. After discussion, CGNF decided that maintaining the existing access road (East Boulder Road) at this location would be the preferred option rather than constructing a new access road as it would provide better access for long-term monitoring.