YELLOWSTONE MINE

MINE LIFE EXTENSION AMENDMENT TO OPERATING PERMIT 00005

DRAFT ENVIRONMENTAL ASSESSMENT

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Prepared by

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CHAPTER 1
INTRODUCTION / PURPOSE AND NEED

1.1 INTRODUCTION

The Montana Department of Environmental Quality (DEQ) received an application in May 2003 from Luzenac America, Inc. (Luzenac) to amend Operating Permit 00005 at its existing Yellowstone Mine (Figure 1-1). The Application for the Mine Life Extension - Amendment to Operating Permit 00005 ("Amendment") describes a proposed extension of mining operations, including an expansion of an open pit and overburden (OB) piles (the Proposed Action) (Luzenac, 2003). The need for the Amendment is based on the ongoing demand for talc products and the identification of new mineable talc ore reserves. The mineable reserves identified to date would support an extended mine life of approximately 50 years, based on current ore production rates of about 300,000 tons of talc per year. The mine would operate 365 days per year. The existing and proposed facilities comprising the Yellowstone Mine are on private land entirely owned by Luzenac in Madison County, MT.

Mine permitting and compliance activities on private land within the State of Montana fall under the jurisdiction of DEQ, principally under the provisions of the Montana Metal Mine Reclamation Act (MMRA) and the Montana Environmental Policy Act (MEPA). Consequently, DEQ must review Luzenac's proposed application to extend the life of the Yellowstone Mine. This environmental assessment (EA) evaluates the potential impacts of the Proposed Action pursuant to MEPA.

This EA describes the proposed expansion of mining and overburden disposal operations and the extension of the Yellowstone Mine life and evaluates the environmental consequences of the Proposed Action. The EA also looks at the consequences of two alternatives to the Proposed Action: 1) a No Action Alternative, and 2) Agency Modifications to the Proposed Action Alternative. The No Action Alternative for this active mining operation would be to allow mining to continue under the conditions of the existing Operating Permit.

Chapter 1 describes the purpose of and need for this action, the role of DEQ, issues, and public participation in the EA process. Chapter 2 provides a historical perspective of talc mining at the mine site, description of existing mining operations, and description of the Proposed Action and alternatives. Chapter 3 describes the affected environment in the Yellowstone Mine area. Chapter 4 analyzes potential direct, indirect, and cumulative effects associated with the Proposed Action and the alternatives, and identifies possible mitigation measures that could be selected to minimize impacts. Chapter 5 identifies the consultation and coordination with state and federal agencies that occurred during preparation of this EA and contains a list of those who prepared the EA. Chapter 6 contains a list of references cited in developing the EA.

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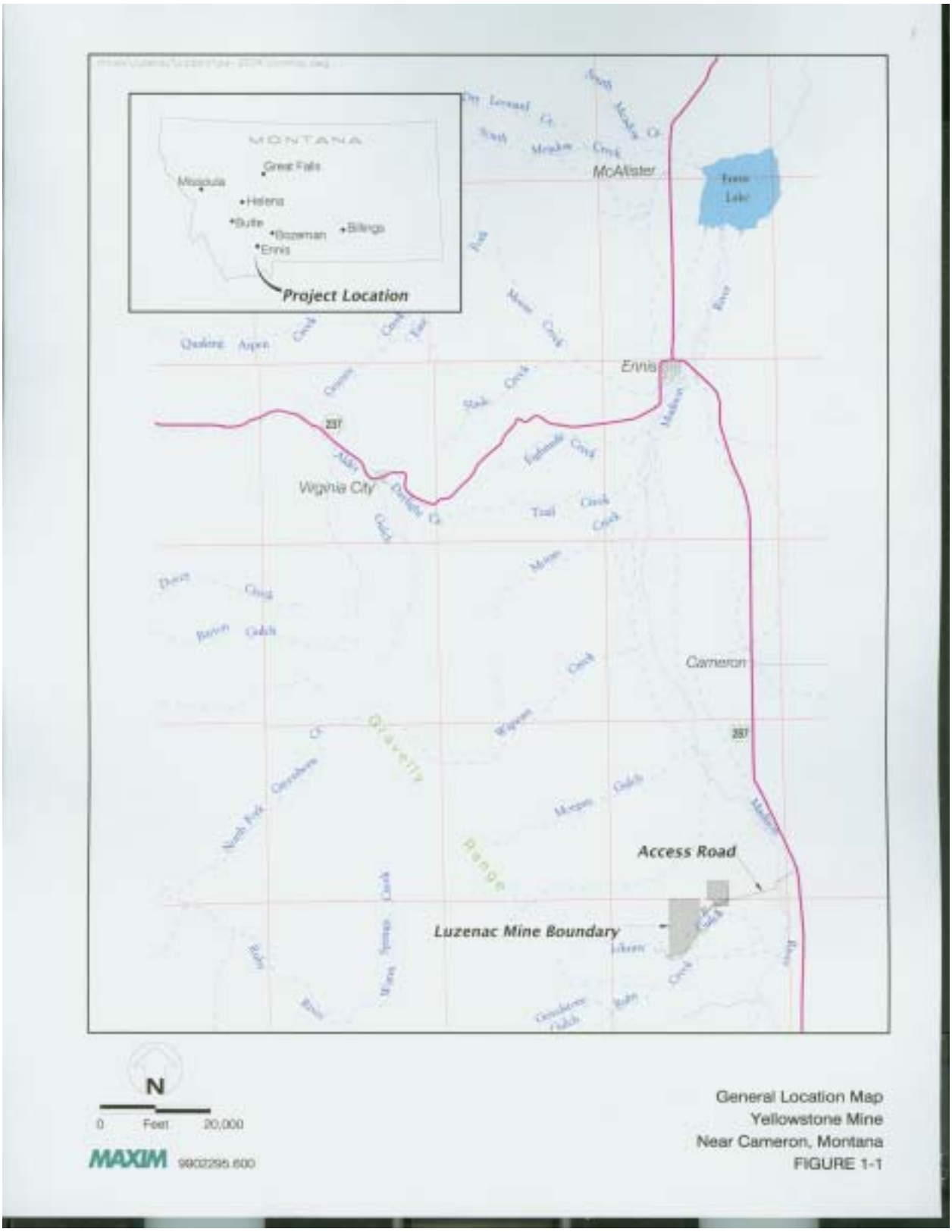

General Location Map
Yellowstone Mine
Near Cameron, Montana
FIGURE 1-1

1.2 PURPOSE OF AND NEED FOR ACTION

Luzenac proposes to extend the mine life of the currently operating Yellowstone Mine for approximately 50 years at the present production rate of about 300,000 tons of talc per year. This mine life extension is justified based on the need for Yellowstone Mine talc and the recent upgrading of approximately 17 million tons of talc to an ore-grade mineable reserve status. If the permit amendment were not approved, Luzenac would complete the operations identified under its existing Operating Permit 00005. This would allow approximately 8 years of future operations (mining talc reserves and overburden placement) at current production rates.

Talc is mined, milled, and marketed as a filler, coating, and extender for use in paper, paint, plastic, and rubber products. In the paper and cardboard recycling industry talc is used as an additive that absorbs unwanted ink, glue, soap, and pitch. It is also used by the agricultural and cosmetics industries. End products that use talc are commonly designed around talc of a particular composition, color or texture, and therefore, customers have an economic interest in obtaining talc from the same source over a long period of time. The rate at which talc is mined is primarily dependent on market demand. Mining production for Luzenac is, therefore, based on the demand created by the amount of paper, paint, plastics, etc. produced by its customers. Luzenac's customers have an ongoing need for talc obtained specifically from this mine.

1.3 AUTHORIZING ACTIONS

A mining proposal or amendment to an operating permit submitted to DEQ may be approved only after a review of the proposal with respect to the reclamation and closure plan as required by MMRA and after an environmental analysis is completed as required by MEPA. DEQ is also responsible for protecting air quality under the Clean Air Act of Montana and water quality under the Montana Water Quality Act. DEQ decision options upon completion of the EA include: denying the application, the No Action Alternative, if the proposed operation would violate MMRA, the Clean Air Act, or the Water Quality Act; approving Luzenac's Proposed Action as submitted; approving the Proposed Action with agency modifications or stipulations designed to mitigate environmental impacts identified; or requiring an environmental impact statement (EIS) be completed to disclose and analyze potentially significant impacts.

DEQ is responsible for calculating the amount of a performance bond for the Yellowstone Mine. The purpose of the bond is to ensure the fulfillment of obligations under the mining reclamation laws and to ensure the availability of funds in the event of a default by the operator. The posting of the performance bond payable to the State of Montana is a precondition to the issuing of a permit or approval of an amendment to an operating permit. The amount of the bond is based upon the estimated cost of restoring the disturbed land, abating pollution, and completing the work described in the reclamation plan (82-4-123, 223, 226, 332, 338 and 433, MCA; ARM 26.4.1102). DEQ is required to thoroughly review the bond every 5 years under MMRA (82-4-338, MCA).

Luzenac's bond for the Yellowstone Mine was reviewed in 2002 in conjunction with the approval of the Consolidated Operating Permit and currently stands at $12,311,426. DEQ is also required to conduct an annual bond oversight for each operating permit under MMRA (82-4-338, MCA).

In addition to DEQ, other federal, state, and local agencies may have jurisdiction over certain aspects of the Proposed Action. Table 1-1 provides a listing of agencies and their respective permit/authorizing responsibilities. The primary permits to be obtained by Luzenac from DEQ include an Amendment to its Operating Permit 00005, continuation or modification of Luzenac's Air Quality Permit #1648-10, and the Montana Pollutant Discharge Elimination System (MPDES) Permit MT0028584, if needed.

The Mine Safety and Health Administration (MSHA) is responsible for overseeing the regulation, monitoring, and compliance with respect to mineworkers' safety.

Some portions of the haul and access roads used by the Yellowstone Mine are under the jurisdiction of Madison County, MT, as is the noxious weed control program.

1.4 RELATIONSHIP TO DEQ POLICIES, PLANS, AND PROGRAMS

Luzenac's Proposed Action has been reviewed for compliance with DEQ policies, plans, and programs. The amendment application has been reviewed by DEQ for deficiencies and completeness, and the document has been deemed complete enough to begin the EA process. Through the EA process, the State of Montana and Madison County are evaluating the Proposed Action for conformance with existing land use restrictions.

1.5 ISSUES AND CONCERNS

1.5.1 ISSUES STUDIED IN DETAIL

DEQ conducted scoping to identify potential issues and other concerns with the proposed Amendment, as described in Section 5.2. A summary of these issues is provided in Table 1-2. This table also provides references to sections of this EA that respond to each issue raised.

TABLE 1-1
Regulatory Responsibilities
Amendment to Operating Permit 00005-EA

ACTION	REGULATORY AGENCY
Completeness Review of Permit Amendment Document	DEQ
Montana Environmental Policy Act	DEQ
Montana Metal Mine Reclamation Act	DEQ
Environmental Assessment	DEQ
Clean Water Act (Section 404)	U.S. Army Corps of Engineers (USACE)
High Explosive License/Permit	U.S. Bureau of Alcohol, Tobacco, & Firearms
Air Quality Permit	DEQ Air Resources Management Bureau
MPDES Waste Water Permit	DEQ Water Protection Bureau
Mine Operating Permit and Bonding	DEQ
Potable Water System Permit	DEQ
Sewer System Approvals	Madison County
County Road Construction, Maintenance, and Land Use	Madison County
Noxious Weeds	Madison County
Safety Plan	MSHA
Endangered Species Act of 1973	U.S. Fish & Wildlife Service (USFWS)

TABLE 1-2 Scoping Issues *Amendment to Operating Permit 00005 – EA*	
Scoping Issue	**Concern**
Socioeconomics	Examine the duration of the Proposed Action so that socioeconomic impacts on employment and taxes can be evaluated. See Sections 2.2.10, 2.3.10, and 4.1.
Pit Reclamation	Reclaim all pit acres. See Sections 2.2.11.4, 2.3.11.4, 2.4.1.2, and 4.2.
Water Quality	Evaluate impacts to surface water and groundwater quality and quantity, including a surface water drainage plan after mining. See Sections 2.2.8.2, 2.3.8.2, 2.4.1.3, 3.2.3, 4.3.
Visual Impacts	Reclaim overburden piles and pits to diminish visual impact. See Sections 2.5.1.1, 2.5.1.2, 3.2.4, and 4.4.

1.5.2 Issues Considered But Dismissed

DEQ has identified resources that would not be affected by the Proposed Action and issues that were considered and eliminated from further review.

1.5.2.1 Air Quality

Mining and ore processing at the Yellowstone Mine produce particulate and gaseous emissions. Most emissions from the mine are particulate matter (PM) resulting from road use, drilling, blasting, loading, and hauling of overburden and ore. Gaseous emissions of combustion by-products from diesel engines and blasting compounds are minor but contribute some sulfur dioxide, nitrogen dioxide, carbon monoxide, and volatile organic compounds.

Particulate matter emissions are controlled at the Yellowstone Mine by engineering and operating practices as described in Section 2.2.7.8. Luzenac monitors air quality at the Yellowstone Mine site as specified under the existing air quality permit. Two samplers, one located upwind and another downwind of the mine property monitor PM_{10}, particulate matter less than 10 microns in diameter. Data from PM_{10} samplers are collected every 6 days. Monitoring results are provided to DEQ on a quarterly basis.

Air quality impacts are evaluated using the state and federal standards for PM_{10} of 150 micrograms per cubic meter ($\mu g/m^3$) per 24-hour period or an annual average of 50 $\mu g/m^3$ (ARM 17.8.223). Ambient air monitoring conducted at the Yellowstone Mine indicates mine emissions have historically had little effect on regional air quality and visibility. Recent data from those PM_{10} stations indicate concentrations range from approximately 10 to 15 $\mu g/m^3$, with maximum concentrations typically 25 to 35 $\mu g/m^3$. The Yellowstone Mine has never exceeded state or federal air quality standards.

Particulate and gaseous emissions would not change appreciably as a result of the Proposed Action. Mining and ore processing methods and rates, the size of the fleet, and types of vehicles to be used would not change. Luzenac would continue air quality monitoring at the Yellowstone Mine site as specified under the existing air quality permit.

In addition to the Yellowstone Mine, other occasional local sources of air pollutants in the mine area include vehicle traffic on unpaved roads, logging operations, and wood-smoke from wildfires and slash burning.

1.5.2.2 Geologic Hazards

Geologic hazards could occur from implementation of the Proposed Action.

1.5.2.2.1 Area Seismicity

The Yellowstone Mine is located in a seismic zone 4, which has moderate to high earthquake activity. One of the largest earthquakes recorded for the area was the 1959 Hebgen Lake earthquake with a magnitude of 7.3. The historical earthquake record of 126 years for the Yellowstone Mine area lists 133 earthquakes of a magnitude greater than 4.0 on the Richter scale that have occurred within 200 kilometers of the mine site.

Based on the historical data, the maximum expected earthquake that might occur within the next 100 years is a magnitude 7.0+, which would have a horizontal peak particle acceleration of about 8 percent of gravity. Strong ground motions associated with a quake of this magnitude could be expected to last for about 15 seconds and have a predominant period of about 0.4 second.

The maximum credible acceleration for the mine site area would be from a magnitude 7.3 earthquake on the south-central segment of the Madison Valley fault lying directly across the valley about 11 miles from the mine site. An earthquake of this magnitude could be expected to produce horizontal peak particle acceleration of 16 to 44 percent of gravity, with an expected value of 26 percent of gravity. The duration of expected strong motion from such a quake would be approximately 15 seconds with a predominant period of about 0.4 seconds.

None of the fault structures mapped in the vicinity of the mine have been recently active as evidenced by the lack of fault scarps. An earthquake during mine life could cause

operational problems on site. No off-site impacts would occur because of the lack of large water-impounding structures. An earthquake after mining is completed would cause some settling in the overburden disposal areas (see Section 1.5.2.2.5) and some talus and rock raveling in the reclaimed pits.

1.5.2.2.2 Geochemistry

The rock stripped as overburden is composed primarily of gray dolomite (81.5 percent) with smaller amounts of red dolomite (13.7 percent), and volcanics (4.7 percent). The overburden rock in the area of proposed expansion would be the same as that which has been historically mined and is also composed primarily of gray dolomite with smaller amounts of red dolomite and volcanics.

The mineral goethite occurs as iron oxide coatings on fractures and inclusions associated with both talc ore and overburden materials. Talc and dolomite textural relationships reveal pyrite as the parent mineral of the iron oxide coatings and inclusions. Iron also substitutes for magnesium in the talc crystal structure at a rate of approximately 1 percent. This iron is in a reduced chemical state and is responsible for giving the talc its green color.

Elevated levels of fluorine in the analyses of talc reflect the substitution that takes place between hydroxyl groups and fluorine ions in the talc crystal lattice. Fluorine is considered non-extractable, because it is part of the chemical structure of the talc. Manganese oxides also occur in the crystal lattice and account for the anomalous levels of manganese in multi-element analyses. Water quality sampling to date has not revealed problems with fluorine, manganese, or other elements.

The geologic formations that would be mined are the same as have been mined throughout the mine's 50-year life. No geochemistry problems have ever been identified. This is not likely to change, if the Proposed Action is approved.

1.5.2.2.3 Acid Rock Drainage Potential and Metal Mobility

Potential acid rock drainage (ARD) impacts are evaluated through mineralogical and acid/base account analysis. Potential for acid generation and trace element release can also be evaluated through review of monitoring data from historically and currently mined areas. In addition to measured water quality, metal mobility testing can be used to evaluate the potential risk of groundwater contamination by metals dissolved from mined rock and transported in surface water or groundwater.

Special handling or selective placement of the overburden is not necessary, as mineralogic and geochemical analyses have indicated that reactive or otherwise problematic minerals are not present in either overburden rock or talc (Maxim, 2001; Luzenac, 2003).

An overburden geochemical characterization study was conducted to evaluate ARD potential and the potential for metal release (Maxim, 2001). Eight samples were collected of each of the volcanics, red and gray dolomite, and talc overburden for Acid/Base Accounting (ABA) using the Modified Sobek Method (Sobek et al., 1978) and Synthetic Precipitation Leachability Procedure (SPLP) (EPA Method 1312) analysis. This level of sampling represents approximately one analysis per 4.9 million tons of overburden material.

The ABA data for overburden samples suggest that low levels of sulfide occur in the volcanics, with little risk of ARD production as a result of the high inherent neutralization potential of the dolomite. In addition, pyrite is only reported in talc in localized zones, where oxidation has not occurred. In most cases, pyrite occurs in trace quantities, based on hand specimen descriptions.

Only two samples have an acid neutralization potential/acid generation potential (ANP/AGP) ratio of less than 3:1. These two samples contain no sulfide sulfur and have an AGP of zero (Maxim, 2001). Average net neutralization potentials (NNP) for the red and gray dolomites are 709 tons of $CaCO_3$/1,000 tons of rock and 815 tons of $CaCO_3$/1,000 tons of rock with little acid generation potential, showing the overburden to be net neutralizing. The average NNP for volcanics is lower, averaging 152 tons of $CaCO_3$/1,000 tons of rock. Talc has an average NNP of 230.3 tons of $CaCO_3$/1,000 tons of rock. A weighted average for the overburden, based on the predicted ratio of 81.5 percent gray dolomite, 13.7 percent red dolomite, and 4.7 percent volcanics results in a NNP of 769 tons of $CaCO_3$/1,000 tons of rock. These ABA test results indicate that there is little risk of acid generation within the overburden and ore. Water monitoring indicates pH ranging from 7.3 to 8.3 for all wells and surface water and storm water runoff (Tables 3-1 and 3-3).

The results of the SPLP extraction (digestion in a weak acid water representing an approximation of the acidity of natural rain water) show that metal mobility would be low, with minor release of aluminum, barium, cadmium, chromium, copper, and iron from the volcanics, as well as barium, strontium, and zinc release from both the dolomite and volcanics (Maxim, 2001). Review of the concentrations measured in SPLP extracts, as well as the blending ratio for the proposed operation, indicates that those metals that are dissolved from overburden would occur in concentrations well below Montana and federal water quality standards. These conclusions have been confirmed through an overburden and water verification sampling and analysis program conducted annually since 2001.

The results of the geochemical study and ongoing geochemical and water monitoring show that continued land disposal of overburden related to mining at the Yellowstone Mine would not adversely affect the environment with respect to acid rock drainage or dissolved metal mobility as measured by impacts to water quality. This would not be likely to change if the Proposed Action is approved.

1.5.2.2.4 Asbestiform Minerals

Asbestiform minerals could impact air quality and pose a human health risk. The geologic association of mafic intrusive dikes with dolomitic marbles at the Yellowstone Mine site is consistent with the possible occurrence of asbestiform minerals in intrusive contact zones. Asbestiform minerals have never been identified in ore or overburden at the Yellowstone Mine during routine mining or milling operations. Search for potential asbestiform rock (PAR) occurrence at the Yellowstone Mine was completed (Maxim, 2001). The report summarized the objectives, technical approach, and results of the asbestiform mineral assessment at the Yellowstone Mine and provided recommendations for operational monitoring during future operations.

No asbestiform minerals were identified at the Yellowstone Mine, based on Polarized Light Microscopy/Transmission Electron Microscopy (PLM/TEM) analysis of 108 samples collected from 20 map-transects specifically located in contact zones. No risk to human health or the environment was identified, and no further study apart from routine operational monitoring of contact zones was deemed warranted. An operational verification plan was defined. An operational rock monitoring sampling program has been implemented, and a management plan has been developed in the current mining permit, as contingencies to provide for environmental protection in the unlikely event that asbestiform minerals are identified during future operational monitoring.

1.5.2.2.5 Overburden Pile Stability

Overburden disposal (OB) areas were selected and designed for long-term stability. The sites chosen for overburden disposal are located in areas that provide a stable construction base without adverse planar features in the underlying bedrock, poor soil strength characteristics, or water saturation in underlying alluvial and colluvial materials.

Overburden disposal sites with exposed bedrock foundation materials include the South, East, and North OB piles. Bedrock at the North OB Pile location consists entirely of Archean dolomitic marble. Bedrock at the East and South OB piles consists mostly of dolomitic marble with lesser amounts of Archean phyllite, amphibolite, quartzite, and Tertiary rhyolitic tuff.

Approximately 75 percent of the proposed East OB Extension is underlain by bedrock. Luzenac conducted a stability analysis for the East OB Pile, because a colluvial mixture of rock fragments and clay forms about 25 percent of the foundation. This colluvium can be unstable if groundwater is present.

Seven rotary bore holes, spaced 60 to 70 feet apart in a row were drilled across the Johnny Gulch drainage at the toe of the proposed East OB Pile Extension to determine depth to bedrock, thickness of colluvium and saturated soil, and the presence of water. Two of these holes were completed as monitoring wells JG-1 and JG-2. The depth to bedrock is 100 to 120 feet at the northeast toe of the ultimate East OB Pile.

The first monitoring well (JG-1) was drilled in alluvium to the bedrock contact at 99 feet and was dry. The second well (JG-2) drilled to a total depth of 300 feet and completed in hornblende gneiss bedrock, had a static water level of 215 feet within bedrock. Based on this information, shear strengths of the soil and colluvium foundation material have not been compromised due to the presence of groundwater or saturated conditions. Since unsaturated conditions are anticipated in the colluvial materials, there would be no reduction in the stability of the east slope of the East OB Pile due to pore pressure buoyancy that would reduce the total resistance to movement from friction.

A stability analysis of the proposed East OB Pile Extension and the colluvial foundation material underlying a portion of the proposed overburden disposal area was performed using the modeling program XSTABL (Sharma, no date). Strength parameters of the colluvial foundation material and overburden material to be placed in the dump were compiled from Yellowstone Mine information and published average properties of soils (USDI, 1974).

Factor of Safety (FOS) is a numeric value calculated by the ratio of resisting force (resistance to movement) to driving force (force tending to drive the potential movement). When FOS is equal to 1.00, the resisting force equals the driving force. When FOS is less than 1.00, the driving force overcomes the resisting force, and failure or slip would likely occur. When FOS is greater than 1.00, resisting force is greater than the driving force, and failure would likely not occur. The larger the FOS is above 1.00 the less likely a failure is to occur.

Factors of safety were computed for possible failure surfaces using the Janbu (1973) method. Circular surface analyses with segment lengths greater than 50 feet generated a minimum FOS of 1.58, yet none of the failure surfaces was projected to extend into the foundation materials. The potential for deeper wedge-type failures was examined by forcing linear failure surfaces to be analyzed that passed through the foundation soils. A non-circular surface search with a segment length of 700 feet had to be used in order to generate a set of failure surfaces that passed into the colluvium. The minimum FOS for the non-circular search was 1.93 for 1,166 failure surfaces, well within an acceptable margin for overburden pile design.

Even an earthquake within the next 100 years with a peak acceleration of about 8 percent of gravity would have little impact on the stability of the overburden facilities. Ground accelerations of this magnitude generally reduce FOS by about 0.1 to 0.2. The minimum calculated static FOS for these slopes is about 1.58, so a pseudo-static analysis would likely yield a FOS in the 1.38 to 1.48 range. Liquefaction of the colluvial foundation materials by seismic events is not possible because the soil is not saturated. The maximum credible earthquake acceleration of 26 percent of gravity may be sufficient to cause slight movement of the reclaimed slopes. A major slope failure is not anticipated under the maximum credible earthquake acceleration.

Experience at the Yellowstone Mine indicates that the OB piles have been stable throughout the mine's 50-year life. The proposed extensions of several OB piles were reviewed, and DEQ has determined that OB pile stability would be unlikely to change.

1.5.2.3 Wildlife

Five threatened or endangered species may occur within the Yellowstone Mine region: two mammals, the grizzly bear and the gray wolf, and three birds, bald eagle, peregrine falcon, and whooping crane. Although grizzly bear may occasionally migrate through the area, the project area is outside of the Yellowstone Grizzly Bear Recovery area, and no important habitat has been identified (BLM, 2003). The area does not contain an endemic population.

The gray wolf is a protected species that has been recently introduced into the Yellowstone National Park area. Wolves may be attracted to large numbers of big game animals and livestock wintering in the region but in general only migrate through the Yellowstone Mine area. As many as five packs of wolves, including the Ennis Lake pack, and numerous individuals have occupied public lands in southwestern Montana, outside of Yellowstone National Park. USFWS, through various control actions, has eliminated all of the packs due to depredations on livestock (USFWS, 2004). Occurrences and sightings are likely to continue, as would wolf-livestock conflicts.

No areas of migratory bird use have been identified within the project area (Farmer, 1982). A search of the Natural Resource Information System database indicates that the Yellowstone Mine and adjacent area are not important habitat for migratory birds or other species (Maxim, 2004). Desirable habitat is present along the Madison River 1.7 miles east of the Yellowstone Mine. In general, the threatened or endangered bird species are found along the Madison and Big Hole River areas.

Mining operations would remain on private land owned by Luzenac. Grazing is the principal use of the mine area by wildlife; and hunting is not permitted. The Yellowstone Mine area was inventoried for wildlife in 1981 and 1982 (Westech, 1981; Farmer, 1982). Elk, moose, mule deer, white-tailed deer, antelope, black bear, and potential grizzly bear habitats were identified. These studies indicated that the mining operation had apparently not affected wildlife outside of the permit boundary area at that time. No important wildlife use areas were identified. An expansion of mining operations by 271 acres in a larger permit area would not likely have a major effect wildlife habitat.

The use of rangeland resources by wildlife in the vicinity of the Yellowstone Mine does occur, but is not extensive because the level of mining activity limits wildlife use. Wildlife rangeland is common in the area and includes the 7,067-acre Wall Creek State Wildlife Management Area immediately to the south and east of the mine site. This area was established in 1960 and is managed to provide elk winter range. Range resources removed from use in the areas of expansion under the Proposed Action would be reestablished under Luzenac's final reclamation program. In all, 271.3

additional acres would be removed from short-term use for wildlife grazing by the Proposed Action, and approximately 260.1 acres would eventually be returned to use for wildlife grazing in the future. Native communities would be replaced by less diverse reclaimed plant communities. The East OB Pile would expand in stages down Johnny Gulch over the next 50 years, such that not all of the potential rangeland would be lost from use at the same time. The only new loss of currently undisturbed wildlife grazing rangeland as the result of the Proposed Action would be 11.2 acres in the proposed pit expansion that would be reclaimed to rock faces and talus slopes (Figure 2-7). The 271 acres of additional disturbance and 50-year mine life would not likely have a major effect on wildlife over those observed in the past 50 years. Loss of wildlife habitat has never been an issue at the Yellowstone Mine.

1.5.2.4 Fisheries and Aquatics

The Proposed Action would not affect fisheries and aquatic resources. Only upper Johnny Gulch had any water flow during the baseline studies of the project area, and there are no fisheries in the Johnny Gulch drainage basin (Luzenac, 2002). There is no water flow in the drainage from the east project area boundary in Johnny Gulch to the Madison River (approximately 1.7 miles). Only the sedimentation pond at the west edge of Section 9 of upper Johnny Gulch was found to contain a macroinvertebrate community. This sedimentation pond would not be affected by the Proposed Action. Ruby Gulch, south of the project area, contains a diverse community of benthic macroinvertebrates, but this drainage basin is outside of the project area.

1.5.2.5 Soil

Luzenac proposes to disturb an additional 271.3 acres of soil. Soil would be salvaged and used in reclamation of the site. Approximately 301,000 cubic yards of soil have been salvaged from disturbed areas at the Yellowstone Mine to date and are stored in soil stockpiles. Soils were apparently not salvaged during early mining at the Yellowstone Mine. Luzenac has committed to resoil as many safely accessible acres as possible that were disturbed before passage of MMRA.

Vegetation, soil, and suitable volcanic and colluvial material would be stripped and stockpiled from each proposed facility expansion area prior to construction. All available soil would be salvaged from construction sites such that a minimum amount of soil would be lost in handling. Soil balance calculations (Section 2.3.11.3) indicate that the amount of soil salvaged would be more than adequate for placement of a minimum of 6-inch thickness of soil on all disturbed areas to ensure the return of the land to wildlife grazing. Soil development would begin again after replacement during reclamation.

1.5.2.6 Vegetation

Vegetation of the Yellowstone Mine area was studied and quantitatively sampled (ECON, 1982). Six vegetation types were identified. A list of vascular plant species

prepared for that report identified 145 taxa, including 18 perennial graminoids, 1 annual grass, 88 perennial forbs, 14 annual forbs, 20 shrubs, and 4 trees. Cordilleran flora dominate the list with some Great Basin and Great Plains flora represented. No rare plants were identified in the study area. Similar baseline vegetation information was collected for the Montana Talc Company's (MTC) Johnny Gulch Mine operating permit (Luzenac, 2002). Inventories of threatened and endangered and sensitive plant species were updated in 2004 (Maxim, 2004). No rare plant taxa were recorded in the study area (Maxim, 2004).

Noxious weeds present within the existing Yellowstone Mine permit boundary are spotted knapweed, henbane, hounds tongue, Canada thistle, musk thistle, and bull thistle. An updated weed map is included in each annual report that Yellowstone Mine submits to DEQ. These maps identify the area, size in acres, and type of infestation. These reports also discuss the method of control used for each species during the previous year.

The Yellowstone Mine area is not suited for cultivation; however, grazing is a historical land use. Range condition was qualitatively estimated as fair to excellent (ECON, 1982) depending on the specific location within the mine area. Grazing on the Yellowstone Mine site is at the discretion of Luzenac and has only been permitted at specific times in specific areas to control dense vegetation in revegetation areas.

Despite the proposal to disturb an additional 271.3 acres of vegetation, no important vegetation species or communities have been identified in the proposed expansion area (Maxim, 2004).

Vegetation production removed from the areas of expansion under the Proposed Action would be reestablished under Luzenac's reclamation program with species that support a similar use. Reclaimed vegetation communities would not be as diverse. Loss of vegetation has never been an issue at the Yellowstone Mine.

1.5.2.7 Other Potential Minerals

The Proposed Action would have no effect on other potential mineral resources. Occurrences of gold, manganese, and iron are within 2 miles of the Yellowstone Mine (Heinrich and Rabbitt, 1960). The Ruby Mine is located in Section 9, Township 9 South, Range1 West and produced minor amounts of gold between 1934 and 1936. Iron minerals occur in "banded iron formation" units just southeast of the Yellowstone Mine in Sections 9 and 10, T. 9 S., R. 1 W., and Section 33, T. 8 S., R. 1 W. Based on the resources present and the lack of major development, it is unlikely that these deposits would be developed in the future. Exploration and mining in the Yellowstone Mine area have determined that there are no known potential mineral resources other than talc in the permit area.

1.5.2.8 Paleontological Resources

It is unlikely that any important fossil resources are present in the vicinity of the Yellowstone Mine. Rocks of the Yellowstone Mine area are predominantly of Archean age (about 2.3 billion years old) and have been metamorphosed (altered at high temperatures and pressures) to marble, schist, and gneiss. Both the age and metamorphism of the rocks preclude major fossil occurrences. Younger rocks in the eastern portion of the mine area are Tertiary volcanics, a rock type that also generally precludes the occurrence of important fossils. Major fossil resources are generally considered to be vertebrate fossils that are of scientific interest from a variety of points of view. Cenozoic rocks of the age likely to contain these fossils are not present in the mine area. Exploration and mining in the Yellowstone Mine area for over 50 years have not identified any paleontological resources.

1.5.2.9 Wetlands

Luzenac previously submitted a wetlands delineation and functional analysis report and a draft Clean Water Act (CWA) 404 Permit Application to the U.S. Army Corps of Engineers (USACE) seeking authorization to place fill material (overburden) in a portion of Johnny Gulch. Based on the results of that report and a site visit, USACE determined that Johnny Gulch is “isolated” and therefore, not subject to USACE regulatory authorities, and concluded that no permit is required. No other wetland issues have been identified within the Yellowstone Mine permit area.

1.5.2.10 Noise

The Yellowstone Mine is located in a remote area, and mine-generated noise resulting from equipment operation, blasting, ore handling and processing, would not be expected to increase over existing levels permitted by the Operating Permit (Luzenac, 2002) as a result of the Proposed Action. The noise produced from these activities is limited outside of the permit area, and noise has never been an issue at the Yellowstone Mine.

1.5.2.11 Cultural Resources

Cultural resources for a 2,000-acre area surrounding the Yellowstone Mine have been inventoried (Hydrometrics, 1982; HRA, 1992). Seven sites were identified, two of which were determined to be significant. All sites were assessed and a narrative report prepared. The Proposed Action would not impact these sites.

1.5.2.12 Land Use and Access

The Proposed Action would not affect land use or access. The project area is entirely on private property controlled by Luzenac. Grazing of domestic livestock is permitted at the discretion of Luzenac and has been allowed only to control the development of tall, dense revegetation in reclaimed portions of the mine site.

The only public access is the Johnny Gulch Road, which would remain open under the Proposed Action. This road lies largely adjacent to the expanded permit area, although a few short segments occur within the permit boundary area but outside of proposed disturbance areas.

1.5.2.13 Recreation

The Proposed Action would not affect recreation. Recreational activities are not permitted within the permit area. Luzenac does not propose to open the Yellowstone Mine property to recreation after mine closure. The Johnny Gulch Road passes through a portion of the expanded permit area, although not in areas proposed for surface disturbances. The road would remain open for public access. Hauling of talc to the Three Forks and Sappington mills would have minimal impacts on recreational activities along the public access corridor as it has for 50 years.

CHAPTER 2
DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 INTRODUCTION

This chapter describes historical mining operations, Luzenac's existing operations in the Yellowstone Mine area (the No Action Alternative), and Luzenac's proposed Amendment. This chapter also describes an alternative that allows for Agency Modifications to the Proposed Action. The proposal to extend the mine life at the Yellowstone Mine is referred to as the Amendment or the Proposed Action throughout the remainder of this document.

Luzenac must secure an amendment to Operating Permit 00005 in order to extend the operating life of the Yellowstone Mine. Luzenac submitted an application in May 2003. The application underwent two completeness and deficiency reviews by DEQ (June and July 2003) and was revised and deemed complete enough to start the EA process (Luzenac, 2003). That document is the basis of the Proposed Action described in this chapter. If the Amendment is approved, the application would be revised to address the findings and recommendations of this EA and would be used to update the Operating Permit. This EA looks in some detail at all of the existing and proposed mining operations, major facilities, ancillary facilities and activities, resource monitoring, and reclamation and closure activities.

All of the components or elements described in Section 2.2 are permitted, approved, and bonded under the existing Operating Permit 00005. Major components of the proposed mine expansion and their respective functions, and potential environmental effects resulting from implementation of these activities, are considered in the development of alternatives. Other alternatives were considered in the review process, as discussed below in Section 2.5. These alternatives were eliminated because they provided no environmental advantage over the Proposed Action and selected alternatives.

2.2 PROJECT SETTING AND EXISTING OPERATIONS (NO ACTION ALTERNATIVE)

Under the No Action Alternative, the amendment would not be approved. Additional reserves of talc and stripped overburden would not be mined. The pit and overburden disposal areas would not be expanded, and ore processing facilities would not be moved.

Luzenac would complete the mining operations planned and approved under its existing Operating Permit 00005 (Luzenac, 2002). Ongoing, approved, and bonded work under this Operating Permit includes a minor layback of the north and northwest flanks of the South 40 Pit to access ore at depth beneath the northern end of the pit. These operations would require approximately 8 years of future mining operations at current

production rates and include mining talc reserves and overburden placement in existing approved facilities. Mining activity would be followed by implementation of the approved reclamation and closure plan.

2.2.1 Location and Land Use

The Yellowstone Mine is located on the eastern slope of the Gravelly Range in southwestern Montana, about 25 miles south of Ennis and 12 miles southwest of Cameron, Montana (Figure 1-1). The mine is located at an elevation of approximately 6,000 feet above mean sea level (amsl) and operates exclusively on private property located within Sections 3, 4, and 9; T. 9 S., R. 1 W. and Sections 33 and 34; T. 8 S., R. 1 W. (Figure 2-1).

Historic land uses of the south Madison Valley area include both commercial and non-commercial activities. Commercial uses include livestock grazing, hay and wheat production, mineral extraction, and timber production. Non-commercial uses include wildlife habitat, watershed, residential sites, and a variety of recreational activities. Figure 2-2 is a map showing major land uses in the vicinity of the Yellowstone Mine. Over the last 5 to 10 years, the Madison River Valley has experienced a trend toward subdivision for residential use of land that was historically used for grazing and other forms of agriculture.

Land ownership in the proximity of the mine includes both private land and public land. The 7,067-acre Wall Creek State Wildlife Management Area to the south and east of the mine provides elk winter range and is administered by Montana Fish, Wildlife and Parks. The U.S. Forest Service (USFS) manages a 12,600-acre grazing allotment on nearby National Forest System land and the U.S. Bureau of Land Management (BLM) administers the West Madison Recreation Area on the Madison River directly east of the mine as well as several other small grazing allotments (Figure 2-2).

2.2.2 Mineral and Surface Ownership

Although Luzenac has unpatented mining claims on federal lands adjacent to the mine site, all of the land within the existing permit boundary (Figure 2-1) is privately owned or controlled by Luzenac. The mineral and surface ownership for the Yellowstone Mine areas was described in detail in the Operating Permit (Luzenac, 2002: Appendix 1.3).

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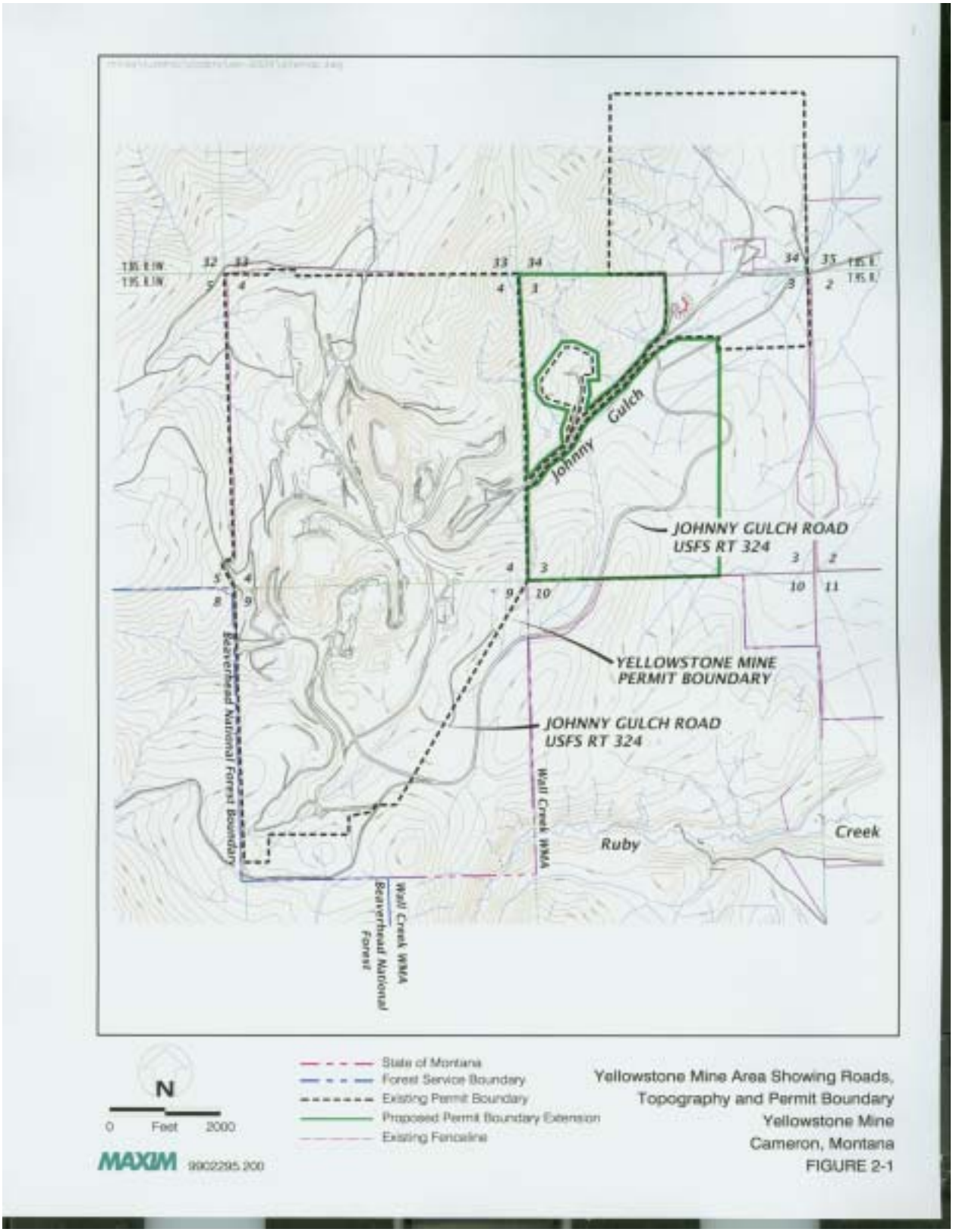
Johnny Gulch
JOHNNY GULCH ROAD
USFS RT 324
YELLOWSTONE MINE
PERMIT BOUNDARY
JOHNNY GULCH ROAD
USFS RT 324
Beaverhead National Forest Boundary
Wall Creek WMA
Ruby
Creek
Wall Creek WMA
Beaverhead National
Forest
N
0 Feet 2000
MAXIM 99C2295.200
State of Montana
Forest Service Boundary
Existing Permit Boundary
Proposed Permit Boundary Extension
Existing Fenceline
Yellowstone Mine Area Showing Roads,
Topography and Permit Boundary
Yellowstone Mine
Cameron, Montana
FIGURE 2-1

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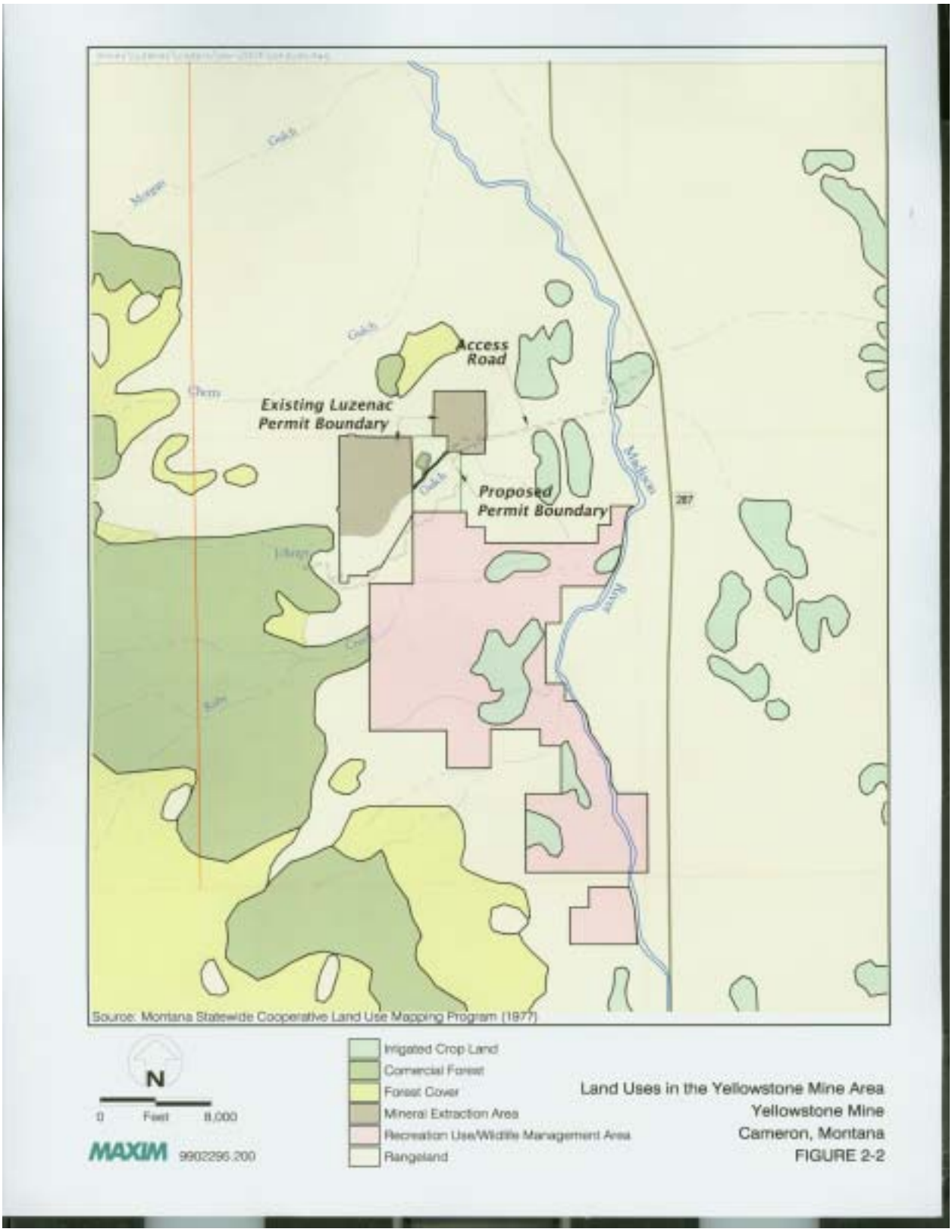
Access Road
Existing Luzenac Permit Boundary
Proposed Permit Boundary
Source: Montana Statewide Cooperative Land Use Mapping Program (1977)
N
0 Feet 8,000
MAXIM 9902296.200
Irrigated Crop Land
Commercial Forest
Forest Cover
Mineral Extraction Area
Recreation Use/Wildlife Management Area
Rangeland
Land Uses in the Yellowstone Mine Area
Yellowstone Mine
Cameron, Montana
FIGURE 2-2

2.2.3 MINE AND PERMIT HISTORY AND REQUIREMENTS

Talc was first produced from underground mining operations located in the vicinity of the present Yellowstone Mine beginning in 1942. The Yellowstone Mine has been in operation in Madison County since the early 1950s. Luzenac acquired the Yellowstone Mine from Cyprus Industrial Minerals Co. in July 1992. In April 1994, Luzenac purchased the MTC operations, including its adjacent Johnny Gulch Mine (Montana Talc Pit) and the Sappington Mill, about 7 miles southwest of Three Forks. To date, about 73 million tons of rock have been mined at the Yellowstone Mine site, including 6 million tons of talc and 67 million tons of overburden material.

The Yellowstone Mine has been operated under permit numbers 00005 and 0005A since 1971 and 1977, respectively. The Operating Permit 0005A has been modified by minor revisions and amendments many times over the life of the permit (see Luzenac, 2003: Table I-1, Appendix I). Each of these changes to the Operating Permit has required some level of environmental evaluation and approval by DEQ to proceed with the proposed actions (DSL, 1977, 1981, 1986a, 1986b, 1990, 1992). On March 28, 2002, the Consolidated Operating Permit 00005 was approved. This consolidated permit combined Operating Permits 00005 and 0005A into one updated document. The operation of the Sappington Mill remained under its original Operating Permit 00127.

2.2.4 PERMIT AREA AND EXISTING DISTURBANCES

The existing mine permit area (1,458 acres) and mine facilities layout (including the open pits, overburden disposal areas, ore-processing, and other miscellaneous facilities) are shown on Figure 2-3. Table 2-1 tabulates the existing disturbances at the Yellowstone Mine site. Figure 2-4 presents the names and shows the locations of historically mined pits at the Yellowstone Mine.

2.2.5 GEOLOGIC SETTING

Talc deposits of the Yellowstone Mine occur in an area of folded Precambrian (Archean) dolomitic marble, along the east limb of a large, southwest-plunging fold. The dolomitic marble occurs over a zone about 1.5 miles wide and 3.5 miles long (Figure 2-5). To the southeast and northwest these rocks are in contact with older folded metamorphic schist and gneiss, to the southwest the marble is in contact with younger Paleozoic sediments, and to the east the marble is unconformably overlain by Quaternary gravel. Tertiary volcanic rocks unconformably overlie the marble along the axes of structural grabens and elsewhere in paleo-topographic depressions (Figure 2-5).

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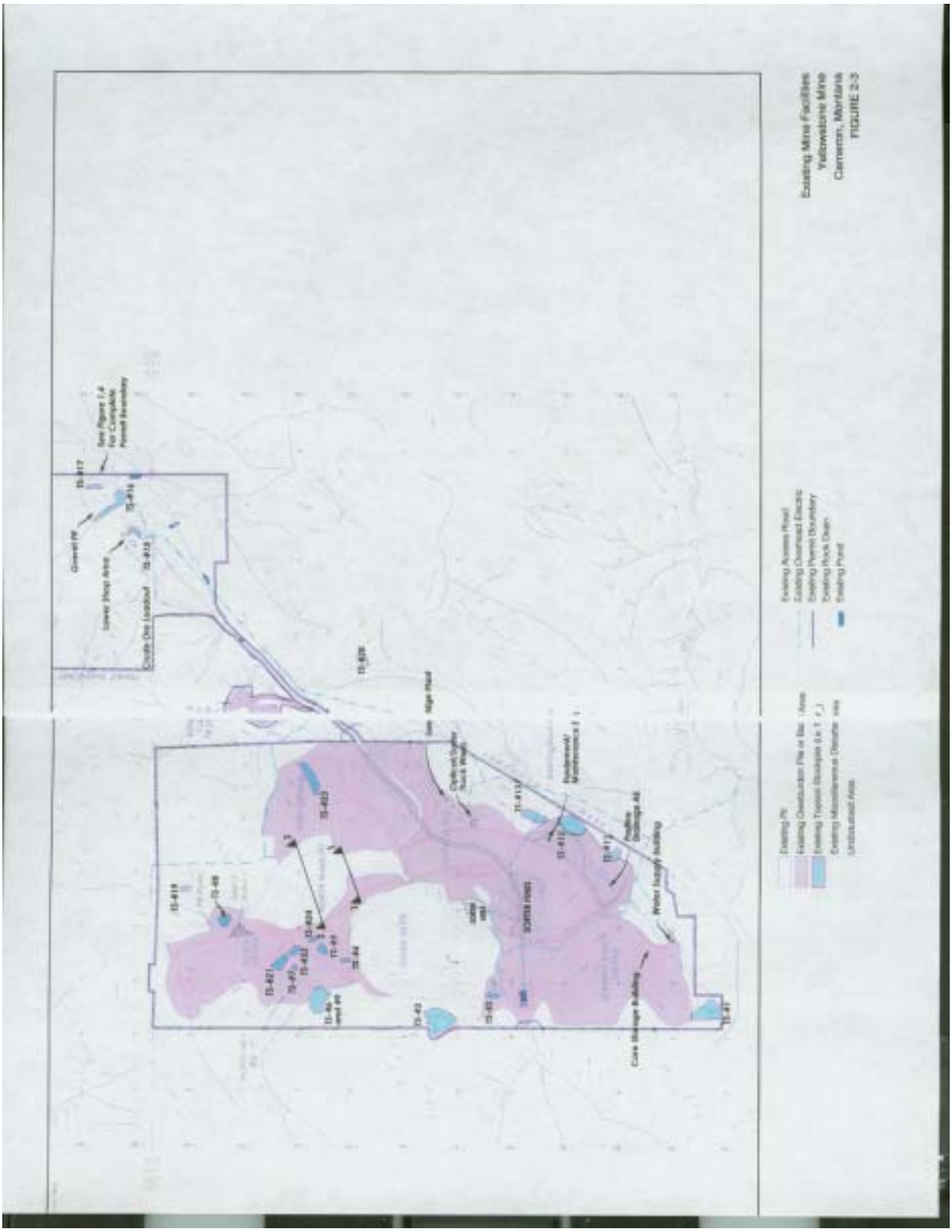
Existing Mine Facilities
Yellowstone Mine
Cameron, Montana
FIGURE 2-3

TABLE 2-1
Existing Disturbances at the Yellowstone Mine Site
Amendment to Operating Permit 00005 – EA

TYPE	NAME Facility	Existing Disturbance Acres	COMMENT
Existing Open Pits	North Main Pit	58.4	South Main Pit backfilled
	South 40 Pit	111.0	Includes Montana Talc Pit and Permitted 2A Pushback
	North 40 Pit	Backfilled	15.1 acres
	Cadillac Pit	Backfilled	9.9 acres
Total Existing Pits		169.4	
Existing Overburden	North OB Pile	122.8	Includes PB Fines (5.2) and soil stockpiles
	East OB Pile	123.0	
	Rock drain		6,027.5 feet long, underlies East OB pile
	South OB Pile	157.6	Includes sorter, sorter fines, low grade, Pos Drain AB
	Johnny Gulch OB	129.8	Many acres reclaimed but not yet released from bonding
Total Existing OB		533.2	
Other Existing	Soil Stockpiles (19)	15.2	
	Gravel Pit	9.9	
	Ponds	0.8	
	Facilities	19.1*	Included in South OB Pile
	Sorter Area	11.3*	Included in South OB Pile
	Roads	7.3*	Included in various OB piles above
	Sorter Fines	18.9*	Included in South OB Pile
	PB Fines	5.2*	Included in South OB Pile
	Positive Drain A+B	19.6*	Included in South OB Pile
Total Other		25.9	
Grand Total Disturbed		728.5	
Existing Permit Area		1458.0	

* Acres included in disturbed areas above

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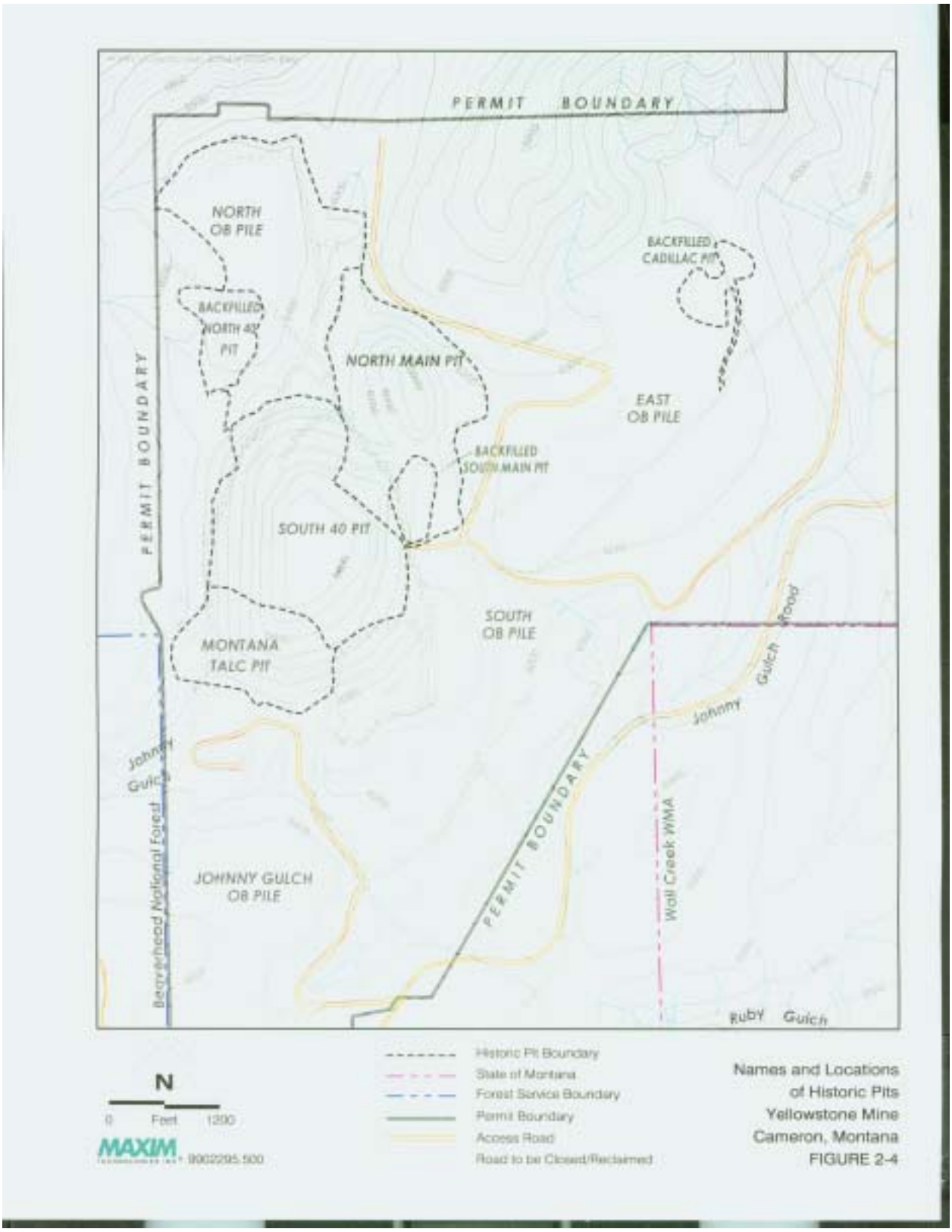
PERMIT BOUNDARY
NORTH OB PILE
BACKFILLED NORTH 40 PIT
NORTH MAIN PIT
BACKFILLED CADILLAC PIT
EAST OB PILE
BACKFILLED SOUTH MAIN PIT
SOUTH 40 PIT
SOUTH OB PILE
MONTANA TALC PIT
JOHNNY GULCH OB PILE
PERMIT BOUNDARY
PERMIT BOUNDARY
Johnny Gulch
Johnny Gulch Road
Wall Creek WMA
Beaverhead National Forest
Ruby Gulch
N
0 Feet 1200
MAXIM
9002295.500
Historic Pit Boundary
State of Montana
Forest Service Boundary
Permit Boundary
Access Road
Road to be Closed/Reclaimed
Names and Locations
of Historic Pits
Yellowstone Mine
Cameron, Montana
FIGURE 2-4

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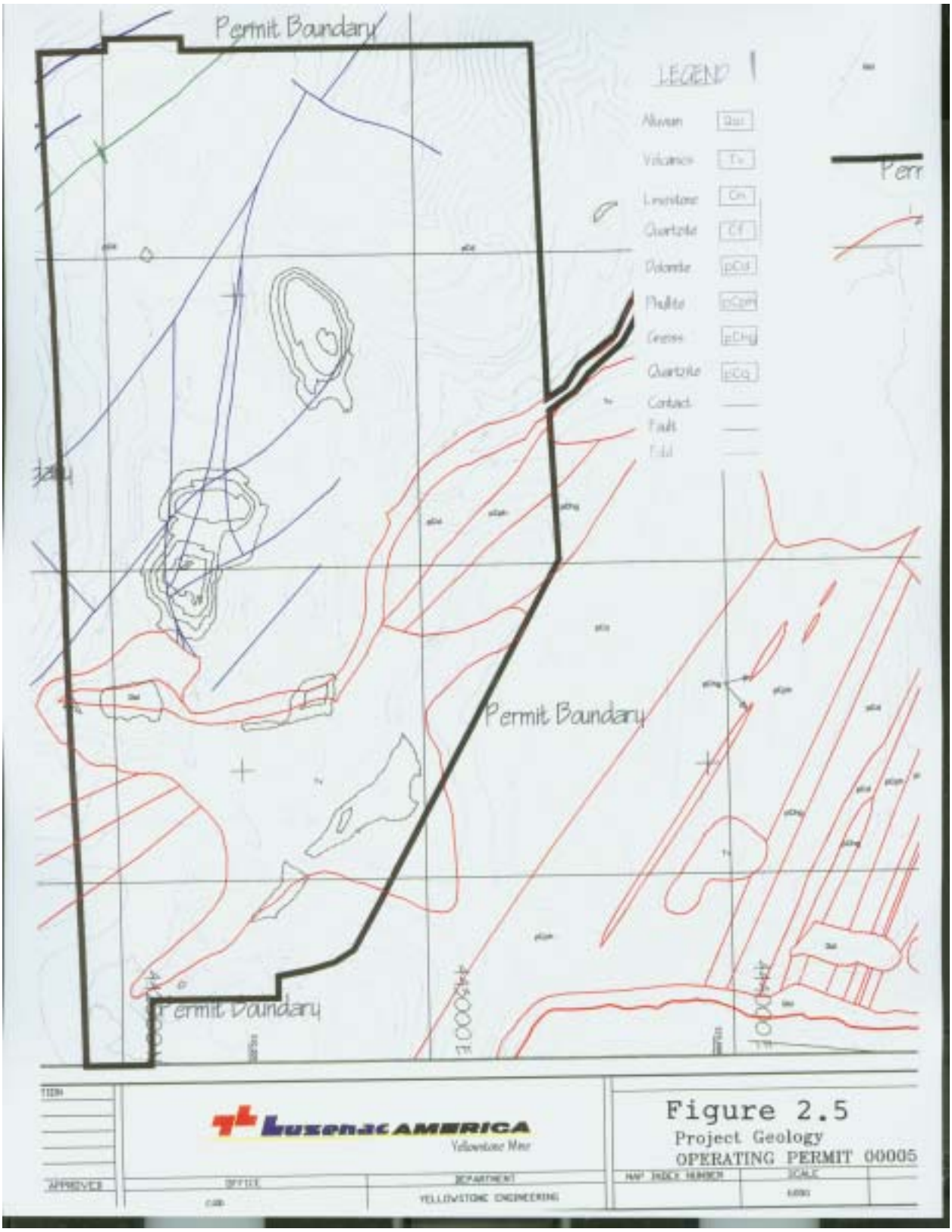
Permit Boundary
LEGEND
Alluvium
Volcanics
Limestone
Quartzite
Dolomite
Phyllite
Gneiss
Quartzite
Contact
Fault
Fold
Permit Boundary
Permit Boundary
LUZENAC AMERICA
Yellowstone Mine
Figure 2.5
Project Geology
OPERATING PERMIT 00005
APPROVED
OFFICE
DEPARTMENT
YELLOWSTONE ENGINEERING
MAP INDEX NUMBER
SCALE

The talc deposits at the Yellowstone Mine were formed in the early Proterozoic by hydrothermal alteration and replacement of the Archean dolomitic marble. The talc is massive and predominantly light green to light gray in color. Replacement of the dolomite by talc is complete; thus, the talc is easily separated from the host dolomite waste during ore sorting. The talc occurs mainly as tabular veins, but locally, pods and lenses are also found. Most talc veins are parallel or sub-parallel to the metamorphic structural foliation developed in the surrounding dolomite. This is because crosscutting foliation cleavage planes and nearly parallel fault zones provided pathways for silica-rich ore forming fluids to penetrate and interact with the carbonate host rock to produce the calc-silicate talc replacement deposits. The dominant structure associated with the deposit is a major north-south trending fault called the Growth Fault. This fault is over 100 feet wide in places and is locally associated with some karst features.

Yellowstone Mine talc is free of tremolite and other asbestiform minerals and contains only trace amounts of other impurities (iron and graphite). The talc ore bodies of the Yellowstone Mine are among the largest and mineralogically purest of their kind in the world. The presence of iron oxide impurities in a talc ore causes a yellow coloration or "warm" tints in the talc powder after milling. This affects optical properties by lowering the brightness and increasing the yellow index values. Both the brightness and yellow index are used as measurements of talc grade. It is because of these properties that Yellowstone Mine talc is used worldwide in processes designed to incorporate these unique characteristics.

2.2.6 Existing Facilities and Operations

2.2.6.1 Mining Operations

The Yellowstone Mine currently produces approximately 300,000 tons of talc to supply its markets and 2.5 million tons of overburden per year from an open pit mine. The rate at which talc is mined is primarily dependent on market demand.

Since about 1950, talc has been mined predominantly from open pits. Some pits are inactive and have been backfilled with overburden while other open pits have been mined such that they coalesced into larger pits (Figure 2-4).

Open pit operations at the Yellowstone Mine use conventional mining methods including drilling, blasting, and loading and hauling using trucks and shovels. Mining is based upon a standard height between benches of 25 feet. Benches vary from 15 to 50 feet in width (toe to crest) depending upon wall rock competency and requirements of future mining plans. Overburden consisting primarily of dolomite is drilled on a 15 by 15-foot grid to a depth of 28 feet and blasted using ANFO (a mixture of ammonium nitrate and fuel oil). The overall stripping ratio of overburden to ore is approximately 5:1. Overburden is loaded into trucks using hydraulic shovels and hauled to one of the permitted overburden disposal sites. Once exposed, most of the talc is mined using hydraulic shovels, with no blasting required. Run-of-mine talc ore is transported to the

ore sorting facility for processing. Haul roads within the pit are a minimum 60 feet wide with a 4-foot-high berm along the outside edge and a maximum grade of 10 percent.

Overburden stripping and talc mining is permitted for 7 days per week year-round operations, using one 10-hour shift per day. At the present time, mining operations are conducted 4 to 7 days per week, depending upon market demand.

The North Main Pit (Figures 2-3 and 2-4) occupies approximately 54.8 acres (May 2003) (Table 2-1) and has been excavated to an elevation 5,830 feet amsl. Through 2003, a total of approximately 37.3 million tons of overburden has been removed from the pit. At this time, no additional mining of the North Main Pit is proposed, although additional less economically desirable talc resources do extend below the current pit floor.

The South 40 Pit (Figures 2-3 and 2-4) currently covers approximately 111.0 acres (Table 2-1) and has been excavated to a level 5,950 feet amsl. A small area designated as the 2A Pushback has been approved for expansion along the north flank of the South 40 Pit (Luzenac, 2001). Mining of the 2A Pushback is currently underway.

The Montana Talc Pit is the southernmost pit on the Yellowstone Mine property (Figure 2-4). This pit was mined by the MTC and covers approximately 36.7 acres (Tables 2-1 and 2-8). The South 40 pit, as a result of more recent mining, has encroached on the footprint of the older Montana Talc Pit to produce a combined pit. Other open pits mined and now backfilled include the North 40 Pit, South Main Pit, and Cadillac Pit (Figure 2-4).

2.2.6.2 Overburden Disposal

Four overburden disposal areas have been constructed for use during historical and existing mining operations. These include the North OB Pile (122.8 acres), the East OB Pile (123 acres), the South OB Pile (157.6 acres), and the Johnny Gulch OB Pile (129.8 acres). The existing overburden pile locations are shown on Figure 2-3, and areas are listed on Table 2-1. These overburden piles have been constructed by end-dumping overburden over a bermed bank. The surfaces of the disposal areas are graded during construction to prevent ponding of rainfall and runoff over the face of the pile.

2.2.6.3 Ore Processing

Talc is visually graded at the mine face before being loaded onto trucks for transport to designated stockpiles adjacent to the processing facility. The existing ore processing facilities are located in the Sorter Area and in the Optical Sorter shown on Figure 2-3. Ore is sized and classified by passing it through an ore sorter that uses a friction technology to separate ore into four sizes: oversize, coarse, small particle, and fines. Oversize material is periodically crushed and reclassified for plant feed. Coarse feed, small particles, and fines are sampled and graded. In 1999, Luzenac constructed and began intermittent operation of a pilot plant-scale Optical Sorter. The feasibility of this

technology is currently being studied. Mechanical and visual sorting techniques account for approximately 70 percent of the marketable talc product processed. Sorted talc is graded and stockpiled for shipment either directly to customers or to an offsite mill facility. An additional 20 percent of the talc is stockpiled as low-grade talc, and the remaining material is discarded with the overburden.

2.2.6.4 Access, Haul Roads, and Traffic

The Yellowstone Mine is accessed by traveling approximately 26 miles south of Ennis, Montana, on U.S. Highway 287. Access from U.S. Highway 287 is on a Madison County road, the Johnny Gulch Road, to the east edge of Section 35, where the road enters private property but is under jurisdiction of the USFS (Forest Road No. 324) to the mine site (Figure 2-1). The Johnny Gulch Road continues on past the mine site to access public lands to the south and west. The Johnny Gulch Road is one of several roads accessing public land west of the Yellowstone Mine. It is the only public road that exists adjacent to the mine and in a few spots the road crosses onto Luzenac's property within the existing permit boundary. Traffic associated with the mine consists primarily of employees traveling to and from work and transport trucks hauling talc. Access to the Yellowstone Mine is shown on Figure 2-2.

Employees commute to the mine site in company vans and pickup trucks via U.S. Highway 287. Employees and vendors, excluding contract hauling, generate approximately 25 commuter trips per day over this route.

The access route for transporting talc product from the mine site to U.S. Highway 287 follows the commuter route described above. The haul route continues north on U.S. Highway 287 approximately 75 miles to the Three Forks Mill or alternatively about 54 miles to the Sappington Mill. Talc is transported from the Yellowstone Mine to the mills by 122,000-pound gross vehicle weight highway trucks (dump trucks with two pup trailers). These truck/trailer units haul approximately 40 tons of talc per load. At a projected production of 300,000 tons per year, an average of 625 round trips per month is required. Contract haulers operate 5 to 7 days per week (depending on weather and production scheduling). Two shifts (a total of 10 drivers, 5 drivers per shift) operate 5 trucks to complete 30 trips per day, or 5 trips per day per truck. During periods of increased production the number of haul truck trips may increase proportionately.

The main access route is also used by vendors to supply gasoline and diesel fuel every other week; provide explosives once a month; and remove used oil and other recyclables about every three months. Regulatory agency personnel, technical contractors, and visitors also use this route. Total mine-related traffic is approximately 30 trucks completing 55 to 60 cycles per day on the access route. Mine related traffic has been higher in the past, during periods of increased production and during periods of construction, with as many as 100 cycles per day along the access route.

Haul roads connecting the mine pit with overburden disposal areas and the plant site are constructed to a nominal width of 60 feet using overburden material. Haul roads are

designed not to exceed grades of 10 percent. Road locations within the pit and overburden dump areas are periodically modified as mining progresses. Haul roads are maintained with graders. Private vehicles are not allowed on pit haul roads without authorization.

2.2.7 ANCILLARY FACILITIES AND ACTIVITIES

2.2.7.1 Introduction

This section discusses ancillary facilities, miscellaneous ancillary activities, resource monitoring programs, and the reclamation plan.

2.2.7.2 Storm Water Handling Facilities

The storm water handling system at the Yellowstone Mine is designed to avoid mixing runon from undisturbed areas with runoff from disturbed areas, collect storm water runoff from disturbed areas, and contain sediment from storm water runoff events.

The storm water handling system is described in some detail in the Yellowstone Mine's Site-Wide Drainage Plan (CDM, 1997) and is included as Appendix 3.1.11 of the Operating Permit (Luzenac, 2002). The Site-Wide Drainage Plan provides large-scale maps showing the location of storm water control structures. These structures are monitored after all major storm events to ensure that sediment levels are not exceeding design capacity. Sediment control structures are cleaned periodically in order to maintain performance.

Ditches, temporary and permanent sediment basins, and storm water collection ponds are currently used to control runoff from disturbed areas. Best Management Practices (BMPs) to prevent or mitigate contamination of storm water from the mine are employed where appropriate, as well as to ensure control of runoff volume and velocities.

No storm water is discharged from the mine site. Runoff diversion ditches are used to channel surface water originating on undisturbed areas away from existing disturbed areas. Most diversion ditches are located upgradient of facilities and roadways in the project area. Diversion facilities are sized to accommodate flow from a 50-year, 24-hour storm event. For construction convenience, ditches have a minimum capacity of 5 cubic feet per second (cfs).

Luzenac would conduct periodic monitoring and documentation of the condition of erosion control and sediment collection structures and evaluate any effects of surface erosion. Annual monitoring would be conducted to observe and assess the function of erosion control mechanisms and structures that have been constructed, and the overall erosional stability of the area. Upon consultation with and approval by DEQ, appropriate measures would be taken to implement corrective action when required.

2.2.7.3 Hazardous Materials and Wastes

The Yellowstone Mine is a conditionally exempt small quantity generator of hazardous wastes. The term "hazardous materials" is defined in the Code of Federal Regulations (CFR) at 49 CFR 172.101. “Hazardous substances" are defined in 40 CFR 302.4 and the Superfund Amendments and Reauthorization Act Title 111. Luzenac has presented a detailed disclosure of all hazardous materials and substances used and stored at the mine site in the approved Operating Permit 00005 (Luzenac, 2002). Hazardous materials consist of gasoline, diesel fuel, new and used oil, propane, and explosives.

An approved contractor collects and transports accumulated hazardous wastes. The primary route for transporting hazardous materials to or from the Yellowstone Mine area is Johnny Gulch Road to U.S. Highway 287.

U.S. Department of Transportation (USDOT) regulated transporters are used for shipment, and USDOT approved containers for onsite storage and spill containment. Hazardous materials are stored in designated areas on private land.

Small quantities of hazardous materials less than the Threshold Planning Quantity are also managed at the Yellowstone Mine. These include auto and equipment maintenance products, office products, paint, drilling mud, cement, and batteries.

2.2.7.4 Spill Prevention, Control, and Countermeasure Plan

The mine accepts responsibility from suppliers once the product is delivered to bulk storage tanks on the property. The Yellowstone Mine and its product vendors have emergency response plans. The Yellowstone Mine revised its Spill Prevention, Control, and Countermeasure Plan (SPCC) in 2004, and a copy is on file with DEQ. The Operating Permit (Luzenac, 2002) and the SPCC require that all maintenance facilities and fueling vehicles are equipped with spill response materials. Earth-moving equipment is available from the mining operation for constructing dikes. Above ground tanks and piping associated with these facilities are commonly used. Any physical observation of a leak or release is reported according to the facility operating manual, and a response team is notified to inspect and respond to the leak or spill. Both the mine staff and DEQ conduct scheduled and impromptu inspections of all facilities. Conditions that could result in a leak or spill are presented in the SPCC.

Spill containment basins constructed of curbs/walls of concrete have been constructed around all fixed bulk storage tanks. These containment basins are constructed of materials designed to prevent or minimize spills from extending beyond the limits of the containment basin. The basins have a liner to prevent any spillage from impacting soil and water resources. Mobile or portable oil storage tanks use a combination of secondary containment, when-not-in-use practice (e.g., parking Lube Truck No. 1 in the Lower Shop which has the building floor for secondary containment), and/or physical isolation to prevent spilled oil from reaching surface water.

Yellowstone Mine personnel are trained to operate and maintain equipment to prevent unintentional discharge of fuel and oil. The SPCC provides response training to equipment operators. Known spills, malfunctioning components, and precautionary measures are discussed during routine safety briefings.

2.2.7.5 Support Facilities

Most mine support facilities are located on historically disturbed ground of the South OB Pile (Figure 2-3). These facilities include: Equipment Maintenance Shop, Optical Sorter/Truck Wash, Land Bridge Plant, Water Supply Building, Core Storage Building, and the Sorter Area. The Lower Shop Area, and Crude Ore Loadout are located near the gravel pit in the northeast corner of the permit area (Figure 2-3).

The Equipment Maintenance Shop is a three bay repair facility with a fuel bay for light duty vehicles. Used oil, antifreeze, and solvents are collected by DEQ-approved recyclers or returned to the vendor for disposal. The maintenance office is attached to the shop with several storage units located north of the shop. A water storage tank for controlling road dust is located adjacent to the shop. An ore storage loadout is situated near the over-the-road truck scale building.

The Optical Sorter (Figure 2-3) is located in the Land Bridge Plant and consists of a screening plant, feeders, conveyors, and a building housing the optical sorting machine. An employee lunchroom, storage building for surplus plant maintenance parts, and a ready line to plug in equipment during cold weather are also located in this area. Approximately 14,000 gallons of diesel fuel and ten 55-gallon drums of lubricants are stored in this area. The Truck Wash is also located in this area.

The Water Supply Building area includes a well, water hydrant, storage tanks, and a building which houses a truck for transporting water to cisterns at the pit and plant lunchrooms. North of the Water Supply Building is the exploration Core Storage Building.

The Sorter Area includes the ore sorting plant, maintenance shop, and an ambulance garage. Two storage buildings and a lunchroom in a mobile trailer are located in this area. The office building is a two-story structure with engineering offices and quality assurance (QA) lab on the first floor, and administrative offices on the second floor.

2.2.7.6 Energy Supply and Source

An existing 12.47 kilovolt transmission line from a substation in the Madison Valley supplies electrical power for the Yellowstone Mine. The locations of the power lines at the project site are shown in Figure 2-3.

2.2.7.7 Solid Waste Disposal

Solid waste generated at the Yellowstone Mine is placed in bins and transported to the Gallatin County landfill by an independent contractor. No hazardous or toxic materials are disposed of in the bins. Operations at the maintenance shops generate used tires, used oil, spent antifreeze, used solvents, and paper, steel, and wood refuse. Used oil, antifreeze, and solvents are collected by DEQ-approved recyclers or returned to the vendor for disposal. Steel, paper, and cardboard packaging are transported to a recycler or a licensed Class II solid waste landfill. Luzenac has received approval from DEQ for disposal of tires onsite as mining wastes to be placed within the overburden materials and covered with a minimum of 60 feet of overburden.

2.2.7.8 Dust and Emissions Control

Dust control is provided with water and chemical stabilizers. The Yellowstone Mine currently uses groundwater encountered in the mine pits for dust control. Magnesium chloride stabilizer is applied annually for dust control on approximately 5 miles of gravel road between U.S. Highway 287 and the mine entrance. Other operational air quality controls are discussed in Section 1.5.2.1.

2.2.7.9 Water Supply System

The Yellowstone Mine water supply system consists of water supply wells, runoff capture and containment in ponds, and excess water disposal through discharge of Johnny Gulch Pit water under the MPDES permit.

2.2.7.10 Snow Removal

Snow removal and disposal are performed on an as-needed basis. Luzenac has the following standard operating procedures with regard to snow removal:

- Snow is typically removed from the entire road surface including turnouts;
- All debris, snow, and ice removed from the access road surface are deposited away from the Madison River;
- During snow removal, banks are not undercut and surface material is not removed from the roadway;
- Snow berms are removed and/or drainage pathways are opened in them at the end of winter operations. Drainage pathways are spaced as necessary to obtain satisfactory surface drainage and to avoid runoff on easily eroded slopes;
- Ditches and culverts are maintained;

- Snow is removed promptly to ensure safe, efficient transportation; and
- Drift fences or snow berms may be used in areas susceptible to heavy drifting.

Snow melt water reports to a series of berms and storm water diversion ditches on its way to Johnny Gulch and must pass through a series of settling ponds before discharging to the ditch beyond the property boundary.

2.2.7.11 Public Safety and Mine Security

The Johnny Gulch Road is one of several roads accessing public land west of the Yellowstone Mine. It is the only public road that exists adjacent to the mine, and in a few spots the road crosses onto Luzenac's property within the existing permit area (Figure 2-1).

The Yellowstone Mine controls public access within the permit boundary through posting of signs, mandatory visitor check-in, and visitor escort procedures. Additionally, visitors and vendors are provided with hazard recognition training, personal protective equipment, and magnetically attached fluorescent vehicle cones, which serve as identification while traveling on mine property. Perimeter gates are locked to control access during non-operating hours.

2.2.7.12 Public Nuisance

In the event that a public nuisance develops, Luzenac would evaluate the situation and develop a program to abate or eliminate the nuisance.

2.2.7.13 Noise

The Yellowstone Mine is located in a remote area where noise resulting from equipment operation, blasting once a week, and ore handling and processing is limited outside of the permit area.

2.2.8 RESOURCE MONITORING

2.2.8.1 Air Quality

Operational air quality monitoring is described in Section 1.5.2.1.

2.2.8.2 Water Quality

Routine monitoring of surface water and groundwater is conducted to ensure that mine-related impacts are not adversely affecting water quality and/or quantity in the mine area (Figure 2-6).

2.2.8.2.1 Surface Water

Tables 2-2 and 2-3 describe operational monitoring schedules for surface water and groundwater, respectively. The chemical and physical parameters to be measured for water resource monitoring are listed in Table 2-4. Luzenac monitors water quality semi-annually, once under high flow conditions in April, May, or early June and once under low-flow conditions while access is still good with respect to snow and ice in October or November.

Operational surface water monitoring at the Yellowstone Mine focuses on the following areas:

- Mine Pits – Water that collects in the bottom of the mine pits is sampled on a semi-annual basis. If excess water must be pumped out of the mine pits, sampling is required according to the schedule outlined in the MPDES Permit for Outfall 001. No pit water has been discharged in years.

- Overburden Disposal Areas –Seeps that develop at the base of OB piles are sampled semi-annually. If more than one seep develops at each of the major overburden disposal areas, sampling occurs only at selected representative seeps. Overburden disposal area slopes are periodically inspected to determine if additional BMPs would be required to control erosion and sedimentation.

- Johnny Gulch – Water in Johnny Gulch is sampled periodically both upstream and downstream of the mine disturbance area. If flow is present, water is also sampled near the USFS boundary, but within the mine permit boundary (located where the stream crosses the east section line of Section 8 in T. 9 S., R. 1 W. and immediately south of Soil Stockpile #2 on Figure 2-3) and downstream at the rock drain discharge. In addition, if water discharges from the last sediment collection pond along Johnny Gulch near the northeastern property boundary, samples are collected according to the schedule outlined in the MPDES Permit for Outfall 002. This sample station also satisfies requirements to sample storm water that leaves the mine site.

Should asbestiform minerals be identified as the result of routine sampling of overburden rock as defined by Luzenac's Operational Verification Plan (Maxim, 2001; Luzenac, 2003: Appendix B), Luzenac proposes to filter water samples during operations for Phase Contrast Microscopy (PCM) and TEM analysis, to monitor for potential changes in asbestiform fiber content of water.

2.2.8.2.2 Groundwater

Groundwater quality is monitored at the Yellowstone Mine in accordance with the current operating permit, which has been modified by the addition of wells JG-1 and JG-2 to provide baseline information for the proposed expansion of the East OB Pile. All wells listed below are currently included in the monitoring plan. Groundwater wells

routinely monitored at the Yellowstone Mine are listed in Table 2-5 and shown on Figure 2-6. If the Proposed Action is approved JG-1 and JG-2 would continue to be sampled.

Operational groundwater monitoring (Table 2-3) is conducted in seven wells that are located throughout the project area (Figure 2-8). Two of the deeper wells (99-14 and 2001-01) are completed in talc and dolomite in the mine pit area (South 40 Pit and North Main Pit). Two other bedrock wells (SW-1 and JG-2) and one alluvial well (JG-1) are located downgradient (northeast) of the proposed active construction area in the Johnny Gulch drainage. The well completed in Johnny Gulch alluvium (JG-1) has been dry since its installation in September 2000. The final two monitoring wells (Water Barn and 2001-02) are located near the south and east sides of Johnny Gulch and South OB piles. Well 2001-02 may be used as a water supply well during mine expansion activities, if the Proposed Action is approved. There appears to be only one fracture controlled bedrock groundwater aquifer. Depth to water ranges from 130 to 520 feet below ground surface (bgs) and varies as a result of topography.

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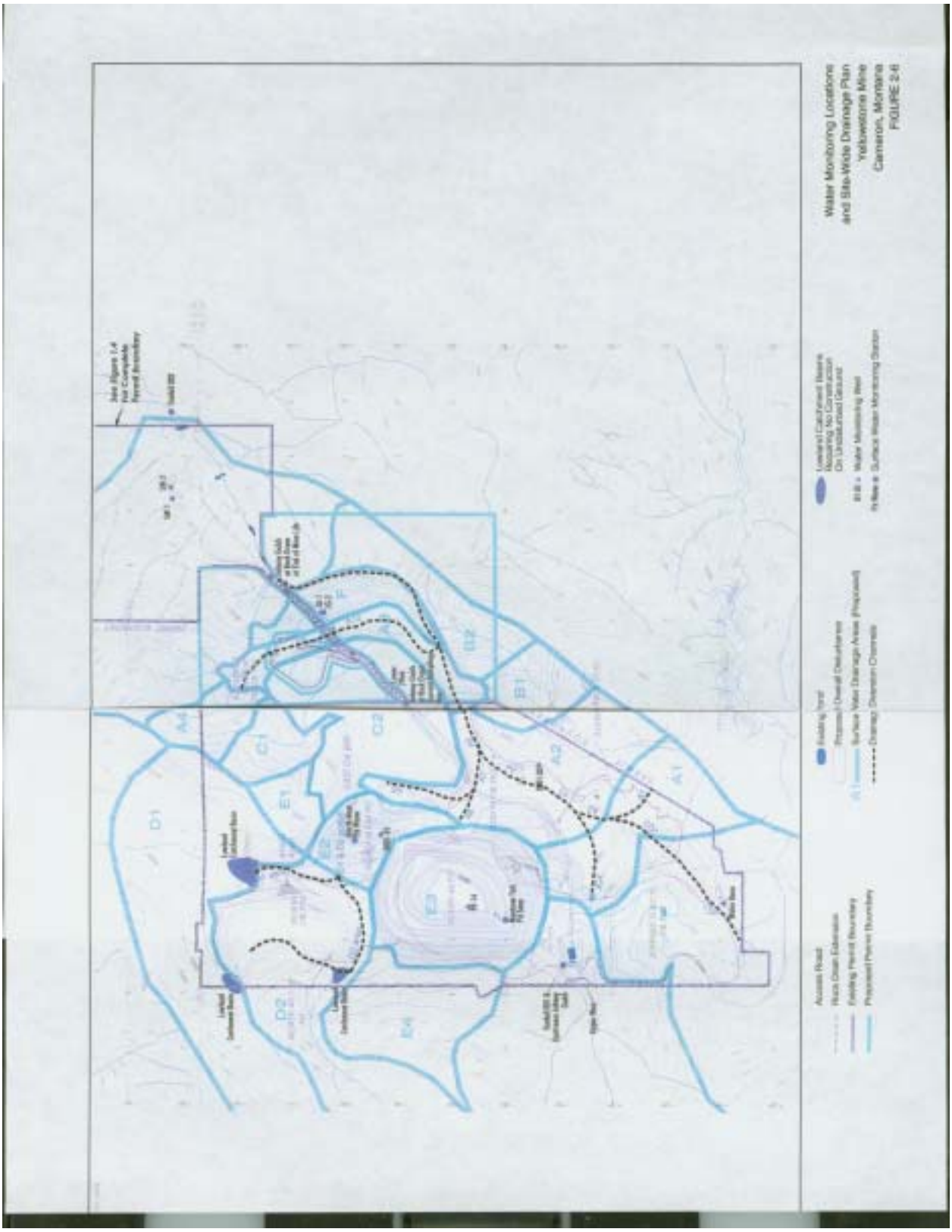
Water Monitoring Locations
and Site-Wide Drainage Plan
Yellowstone Mine
Cameron, Montana
FIGURE 2-8

TABLE 2-2 Operational Surface Water Monitoring Schedule *Amendment to Operating Permit 00005 – EA*			
Station ID	Location	Sample Frequency	Sample Parameters Total Recoverable (unfiltered)
Pit Water (North Main Pit and Montana Talc Pit Seeps)	Standing water in pit bottom from groundwater seepage and/or direct precipitation	Semi-Annually	Partial List
Outfall 001	Mine dewatering effluent prior to mixing with natural water in upper Johnny Gulch	Monthly During Discharge	Partial List
Outfall 002	Discharge from last sedimentation pond in Johnny Gulch prior to leaving the eastern property boundary	Monthly During Discharge	Partial List
Overburden Pile Seep	Water seeps that may develop at the toe of any overburden pile	Semi-Annually During Discharge	Complete List
Johnny Gulch Upstream	Streamflow in Johnny Gulch channel above mine site at USFS boundary	Quarterly	Partial List
Johnny Gulch at Rock Drain	Discharge from downstream end of rock drain in Johnny Gulch channel	Quarterly	Complete List

TABLE 2-3 Operational Groundwater Monitoring Schedule *Amendment to Operating Permit 00005 – EA*			
Well ID	Location	Sample Frequency	Sample Parameters Dissolved (filtered)
Well SW-1 (Maintenance Well)	Completed to depth of 277 feet in bedrock near NE side of permit boundary	Semi-Annually	Complete List
Water Supply Building Well	Completed to depth of 460 feet in bedrock near south end of Johnny Gulch OB Pile	Semi-Annually	Complete List
Well 99-14 (South 40 Pit PW-1)	Completed to depth of 640 feet in talc and dolomite in bottom of South 40 Mine Pit	Annually	Complete List
Well 2001-01 (North Main Pit)	Completed to depth of 420 feet in dolomite in bottom of North Main Pit	Annually	Complete List
Well 2001-02 (Land Bridge)	Completed to depth of 745 feet in metamorphic rocks near east side of South OB Pile	Semi-Annually	Complete List
Well JG-1* (Johnny Gulch MW-1)	Completed to depth of 120 feet in Johnny Gulch alluvium downstream from East OB Pile	Quarterly	Complete List
Well JG-2* (Johnny Gulch MW-2)	Completed to depth of 300 feet in metamorphic rocks in Johnny Gulch next to well JG-1 downstream from East OB Pile	Quarterly	Complete List

Note: See Figure 2-6 for monitor well locations.
* Wells only sampled if Proposed Action is approved.

TABLE 2-4 Water Quality Monitoring Parameter List *Amendment to Operating Permit 00005 – EA*			
Field Parameters	**Common Ions**	**Metals**	**Others**
Complete List			
pH (s.u.)	Calcium (1.0)	Aluminum (0.10)	Hardness as $CaCO_3$ (1.0)
SC (μmhos/cm)	Magnesium (1.0)	Arsenic (0.003)	Alkalinity as $CaCO_3$ (1.0)
Temperature (C^o)	Sulfate (1.0)	Copper (0.001)	Nitrate+Nitrite as N (0.01)
Flow (gpm) [SW]	Carbonate (1.0)	Iron (0.01)	Total Dissolved Solids (1.0)
SWL (feet) [GW]	Bicarbonate (1.0)	Lead (0.003)	Total Suspended Solids (1.0)
Turbidity (NTU)		Manganese (0.005)	Ammonia as N (0.05)
		Zinc (0.01)	Oil & Grease (1.0)
Partial List			
pH (s.u.)	Sulfate (1.0)		Nitrate+Nitrite as N (0.01)
SC (μmhos/cm)			Total Dissolved Solids
Temperature (C^o)			Total Suspended Solids

[1] Numbers in parentheses are laboratory detection limits specified in Circular WQB-7: Montana Numeric Water Quality Standards in milligrams per liter (mg/l) unless otherwise noted. Metals are analyzed as total recoverable for surface water and as dissolved for groundwater.
[2] [SW] = surface water samples only; [GW] = groundwater samples only.
[3] s.u. = standard units; SC = specific conductance; μmhos/cm = micromhos per centimeter; C^0 = degrees Celsius; gpm = gallons per minute.

The Yellowstone Mine operation currently stores and uses groundwater encountered in the mine pits for dust control and as operational make-up water. After mining, this water would be allowed to evaporate or infiltrate, or would be consumed in evapotranspiration processes by vegetation on reclaimed pit floor sites.

Quality assurance and quality control (QA/QC) measures are used for all water-sampling activities. Sampling procedures follow standard operating protocols that are widely accepted for hydrologic studies. Instruments are properly calibrated and decontaminated as necessary for sample collection. Chain-of-custody procedures are used for the transfer of samples from the field to the laboratory. A state-certified laboratory with internal QA/QC procedures is used for sample analysis. Sample sets

typically include a duplicate and blank sample for QA/QC analysis. All water quality data are validated according to regulatory guidance.

TABLE 2-5
Groundwater Monitoring Locations
Amendment to Operating Permit 00005 – EA

Well Name	Location (T9S, R1W)	Completion Date	Well Depth (ft)	Screen Interval (ft)	Depth to Water (ft)	Water Elev. (ft)	Lithology
Maintenance Well (SW-1)	Sec. 34	4/82	277	217 – 277	161	5635	Bedrock
Maintenance Water Tank (SW-2)	Sec. 34	1980	190	Not Reported	135	5655	Bedrock
Water Supply Building	Sec. 9	8/93	460	350 – 450	207	6145	Bedrock
99-14 (S. 40 Pit PW-1)	Sec. 4	7/99	640	615 – 635	488	5490	Talc & Dolomite
2001-01 (North Main Pit)	Sec. 4	5/01	420	380 – 400	402	5468	Dolomite
2001-02 (Land Bridge)	Sec. 9	5/01	745	705 – 745	513	5691	Metamorphic
JG-1 (Johnny Gulch MW-1)	Sec. 3	9/00	120	77 – 97	Dry	<5734	Alluvium
JG-2 (Johnny Gulch MW-2)	Sec. 3	9/00	300	255 – 295	211	5646	Metamorphic

Note: See Figure 2-6 for well locations.

2.2.8.3 Reclamation

Luzenac would monitor reclamation success and BMPs, repair eroded areas, and control noxious weeds. DEQ would conduct regular field inspections throughout construction, operation, and reclamation activities. All field compliance inspections would be documented in the project file at DEQ's Helena Office.

2.2.8.4 Operational Rock Monitoring

Luzenac would continue to implement the operational rock monitoring sampling program and management plan as a contingency to provide for environmental protection in the event that asbestiform minerals or the potential for metals mobility are identified during future operational monitoring, as described in Section 1.5.2.2.4.

2.2.8.5 Cultural Resource

Historic and prehistoric cultural resources, if encountered during mining operations, are preserved or mitigated according to the applicable statutes, including Section 106 of the

National Historic Preservation Act. Preservation may include avoidance, or surveys and inventories, as necessary.

2.2.8.6 Paleontological Resource

In the event potentially important fossils are discovered within the Luzenac permit area during any type of activity, Luzenac would immediately notify the appropriate authorities. Activities that could be taken after notification include cessation of mining activities in the area of discovery, verification and documentation of discovery, and development and implementation of plans to avoid or recover the fossils.

2.2.9 HUMAN HEALTH AND SAFETY

MSHA regulates human health and safety at the Yellowstone Mine under the Federal Mine Safety and Health Act of 1977. The purpose of these standards is the protection of life, promotion of health and safety, and prevention of accidents. MSHA regulations are codified under 30 CFR Subchapter N, Part 56. Employees at the Yellowstone Mine are required to receive initial and annual training.

2.2.10 SOCIOECONOMICS

2.2.10.1 Duration of Mining

Under the current Operating Permit, Luzenac would continue to mine for about 8 years.

2.2.10.2 Employment

Employment at the Yellowstone Mine is approximately 44 people on a year-around basis. The Yellowstone Mine is permitted for as many as 100 employees, and that level of employment has occurred in the past.

2.2.10.3 Taxes

In 2003, the Yellowstone Mine paid approximately $97,500 in property tax, $513,400 in the net proceeds tax (based on production), and $64,100 in resource indemnity trust tax. In addition, the Three Forks Mill paid $282,300 in property tax, and the Sappington Mill paid $125,700 in property tax. These taxes would continue for another 8 years.

2.2.11 RECLAMATION

2.2.11.1Introduction

The Yellowstone Mine reclamation plan is developed to meet the requirements of MMRA and its implementing rules. The current reclamation plan is included as part of Operating Permit 00005 (Luzenac, 2002) and has been approved by DEQ. A

recalculation of the reclamation bond was also completed during the 2002 review of the Operating Permit. Specific long-term goals are to ensure public safety, stabilize the site, and establish a productive perennial noxious weed-free vegetation community consistent with possible future land uses of wildlife habitat, livestock grazing, and dispersed recreation. Short-term reclamation goals are to stabilize disturbed areas, as well as to protect disturbed and adjacent undisturbed areas from erosion.

The current reclamation plan would reclaim all 728.5 acres (Table 2-1) of existing disturbances (Figure 2-3), including those acres approved for short-term future disturbance. One hundred eighty-five acres have been revegetated to date. A total of 439.5 acres would be soiled and revegetated. Other areas in the pits would be reclaimed to rock faces and talus slopes. Some roads would be left in the permit area for use after mining.

Reclamation activities include:

- Portions of the mine pit highwalls would be reclaimed as rock faces and talus slopes. The pit bottom, pit roads, and accessible benches on slopes less than 2.5H:1V would be soiled and revegetated;
- Water well, piezometer, and drill hole abandonment;
- Regrading and revegetation of previously backfilled pits;
- Regrading and revegetation of the OB piles;
- Removal of structures after cessation of operations;
- Regrading of disturbed areas including roads and drainage diversions;
- Removal and regrading of stockpile areas;
- Replacement of salvaged soil;
- Revegetation of all disturbed areas except pit highwalls reclaimed as rock faces, talus slopes, and access roads needed after mining; and
- Reclamation monitoring and weed control.

The reclamation schedule would encompass the period between cessation of mining and successful revegetation. Reclamation is concurrent with operations where possible, particularly in the overburden disposal areas.

2.2.11.2General Grading of Disturbed Areas

Prior to replacing soil, facility sites and other disturbed areas would be graded to attain a stable configuration, to establish effective control drainage to minimize erosion, and to protect surface water resources. To the extent practicable, grading would blend disturbed areas with the surrounding terrain. Compacted areas would be ripped if needed.

2.2.11.3Soil Salvage

Approximately 301,000 cubic yards of vegetation, soil, and suitable colluvium and alluvium have been salvaged at the Yellowstone Mine to date and are stored in stockpiles, as shown on Figure 2-3. Soil balance calculations for existing disturbances at the mine indicate that there is adequate soil volume from existing stockpiles to place a minimum 6-inch-thick soil cap on all disturbed sites (Table 2-6).

TABLE 2-6
Soil Balance Calculations For Reclamation
Amendment to Operating Permit 00005 – EA

Area to Strip	Acres	Cubic Yards	Comment
Existing Stockpiles		301,000	21 existing piles
TOTAL		301,000	
Area to Cover	**Acres**	**Cubic Yards**	**Comment**
North OB Pile	122.8	81,392	Placing 6" soil cover over this area
North 40 Pit	15.1	9,988	Placing 6" soil cover over this area
Northeast OB Pile*	15.3	10,940	Placing 6" soil cover over this area
East OB Pile	123.0	81,360	Placing 6" soil cover over this area
South OB Pile	157.6	104,247	Placing 6" soil cover over this area
Johnny Gulch OB Pile**	5.7	3,370	Placing 6" soil cover over this area
TOTAL	439.5	291,297	
Excess cubic yards		9,703	3 percent

*40 acres of Northeast OB Pile have been reclaimed.
**145 acres of Johnny Gulch OB Pile have been reclaimed.

2.2.11.4Pit Reclamation

Pits previously backfilled with overburden material (North 40, South Main, and Cadillac pits, Figure 2-4) would be regraded, soiled, and revegetated along with the overburden disposal areas. The principal goal for reclamation of the North Main and South 40 pits would be to achieve long-term stability. Portions of the pit highwalls would be reclaimed as rock faces and talus slopes. Where it is safe and access is feasible, catch benches would be reclaimed. The pit bottom, select benches, and haul road slopes in the pit that

are 2.5H:1V or shallower would be ripped, if necessary, and soiled and seeded, where accessible. The areas would be seeded with the approved seed mix (Table 2-7).

Monitoring wells in the pit that are no longer needed would also be abandoned according to state regulations and their sites reclaimed.

2.2.11.5 Overburden Pile Reclamation

Figure 2-3 identifies the existing overburden disposal areas along with permitted footprints. During operations, the slopes of the overburden disposal areas are constructed to approximately 1.5H:1V or angle of repose (34°). The slopes would be reduced after mining to slopes ranging from 2.5H:1V (22°) to approximately 4.0H:1V (14°), depending on the area and requirements to blend in with surrounding topography. Luzenac has successfully reclaimed portions of two overburden piles on the Yellowstone Mine site on slopes up to 2H:1V. These include both the Johnny Gulch OB Pile (145 acres) (Figure 2-3) and 40 acres of the North OB pile.

The upper flat surface of the overburden disposal areas would be contoured to prevent ponding, maximize surface runoff, and divert runoff from overburden slopes. Drainage would be directed off the surface into lateral channels adjacent to the overburden disposal areas. The lateral channels would be designed to carry maximum 50-year, 24-hour flows to storm water settling ponds (CDM, 1997 as revised by Luzenac, 2002). All recontoured surfaces would be capped with soil, a minimum of 6 inches thick, seeded, and if necessary, fertilized to promote plant growth.

2.2.11.6 Ore Processing and Surface Support Facilities Reclamation

The ore processing areas include the Ore Sorter and related storage bins. Surface support facilities include ancillary structures such as maintenance shops, warehouses, and administrative buildings. At the end of active mining, all structures would be removed from the site. Buildings that cannot be salvaged or relocated would have the interiors scrapped, the shell removed, and the foundation reduced to rubble and buried. All conveyor systems would be salvaged and removed. All underground pipelines would be flushed, disconnected, and left in place.

The maintenance office building on the east property boundary would be maintained and staffed during working hours until the site has been deemed safe for access and vegetation in the reclaimed areas has become established. Gates to the property would be locked at the end of the work shift.

Once the structures are removed, the areas would be ripped and contoured to ensure drainage and capped with a minimum of 6 inches of soil, seeded and, if necessary, fertilized to promote plant growth.

TABLE 2-7
Approved Seed Mixture
Amendment to Operating Permit 00005 – EA

Grasses			
Species	Variety	Common Name	Pure Live Seed (lb. per acre)*
Agropyron dasystachyum	Critana	Thickspike Wheatgrass	2
Agropyron spicatum	Secar	Bluebunch Wheatgrass	3
Agropyron trachycaulum	Pryor	Slender Wheatgrass	2
Elymus cinereus	Magnar	Great Basin Wildrye	1
Festuca ovina	Covar	Sheep Fescue	1
Oryzopsis hymenoides	Nezpar	Indian Ricegrass	2
Poa ampla	Sherman	Big Bluegrass	0.5
Agropyron riparium	Sodar	Streambank Wheatgrass	2
Stipa viridula	Lodorm	Green Needlegrass	0.5
	Subtotal:		14
Forbs / Legumes			
Species	Variety	Common Name	Pure Live Seed (lb. per acre)*
Medicago sativa	Ladak	Alfalfa	2
Melilotus officinalis	Madrid	Yellow Sweetclover	2.5
Achillea millefolium		Western Yarrow	0.1
Astragalus cicer	Aski	Cicer Milkvetch	2
Linum lewisii	Appar	Blue Flax	2
	Subtotal:		8.6

* Application rate is doubled if broadcast or hydroseeding methods are used.

2.2.11.7 Access and Haul Roads

Luzenac has committed to meeting with DEQ at closure to make a final decision as to which roads would be left open for future work and reclamation monitoring. Access and haul roads no longer deemed necessary for mining-related activities would be ripped, contoured, capped with a minimum of 6 inches of soil, and vegetated with the recommended seed mixture. Slopes of all road cuts and fills would not exceed 2H:1V. Some roads would remain to provide access for monitoring and maintenance activities

and as access to public roads. These roads would be regraded to an approximate width of 10 to 15 feet and contoured to approximate existing topography (Luzenac, 2002: Figure 3.1.8).

2.2.11.8 Power and Utility Corridors

Power and utility corridors would be ripped, contoured, capped with a minimum of 6 inches of soil, and vegetated with the recommended seed mixture. Power transmission lines are the property of NorthWestern Energy, which has responsibility for reclamation.

2.2.11.9 Surface Water and Storm Water Drainage and Maintenance

Surface water runon from undisturbed areas would be channeled around mine pits, and diversions would be constructed up gradient of the overburden disposal area, where possible. Diversion channels are described in the Revised Site-Wide Drainage Plan (CDM, 1997 as revised by Luzenac, 2002). All temporary storm water management structures (ditches, ponds, energy reducing structures, etc.) described within the plan would be reclaimed. Slopes on the permanent drainage channels would be 2H:1V or less, which would reduce long-term maintenance.

2.2.11.10 Revegetation

2.2.11.10.1 Soil Placement

Compacted surfaces would be scarified or ripped prior to placement of soils. A minimum thickness of approximately 6 inches of soil would be redistributed over the disturbed area using scrapers, graders, and dozers. Dozers would provide grouser impressions to allow seed to be trapped. Soil placed for revegetation purposes would be seeded prior to the next growing season following placement. Luzenac would use soil amendments and stabilizers (e.g., fertilizer, lime, mulch, and jute netting) if these amendments were determined to be necessary for overall reclamation success.

2.2.11.10.2 Seeding

Seeding would be accomplished either by drill or broadcast methods depending on the steepness of slopes in the area. Luzenac would not hydroseed reclamation slopes less than 2.5H:1V. Seed application rates would be doubled if either broadcast or hydroseeding applications are used. Luzenac would not use mulch or tackifier unless initial revegetation efforts do not yield positive results. The approved seed mix is included in Table 2-7.

2.2.11.10.3 Fertilizer and Mulch

Soils analyzed to date on the project site contain between 1 percent and 6 percent organic material (average 2.5 percent), which precludes the need for use of organic

mulch. Fertilizer application rates would vary according to soil needs determined by nutrient analysis of random samples. Fertilizers and mulches would be applied by either broadcasting or hydromulching. If broadcast applications were used, the fertilizer would be harrowed into the soil.

2.2.11.10.4 Fencing

Following the cessation of mining, the property boundary fence would be maintained as long as the property is under Luzenac's control. The fence in the pit area would also be maintained, and signs would be posted to reduce trespassing and warn of open pit hazards. In addition to signs, Luzenac would construct 4- to 5-foot berms above highwall areas of the pit to minimize the potential for accidents and ensure public safety.

2.2.11.10.5 Reclamation Monitoring

Luzenac would continue to establish and monitor vegetation test plots to evaluate the success or failure of reclamation on varying aspects of exposure on disturbance areas. Evaluation for concurrent reclamation success would begin on an annual basis after plant establishment. The following criteria would apply for areas of disturbance, including pits, overburden disposal sites, ore processing areas, surface support facilities, power and utility corridors, and final surface water and storm water diversion structures:

- Sustainability of the vegetation;
- Survival of perennial vegetation species;
- Control of noxious weeds;
- Absence of excessive erosion as evidenced by active rilling and head-ward erosion; and
- Stability and utility of reclaimed areas for post-mining land use.

2.2.11.10.6 Concurrent Reclamation

Concurrent reclamation would occur as soon as possible after completion or abandonment of an affected facility or a large portion of the facility. To date, 185 acres have been reclaimed.

2.3 PROPOSED ACTION

2.3.1 INTRODUCTION

This section describes the proposed activities Luzenac seeks to permit, which are being evaluated by this EA as the Proposed Action. These activities include:

- Extension of the mine life by 50 years;
- Expansion of the permit area by 490.4 acres;

- Expansion of the existing South 40 Pit to mine an additional 17 million tons of talc ore;
- Extension of overburden piles to dispose of 127 million tons;
- Relocation of ore processing facilities;
- Revision of water quality monitoring and site-wide drainage plans; and
- Revision of the closure and reclamation plan to address the reclamation of all areas disturbed by mining activities.

Discussion of these major elements and other components of the Proposed Action in this section are considered within the framework of the existing Operating Permit (Luzenac, 2002). Only components that would require a change from the approved existing Operating Permit 00005 conditions are discussed in detail. Elements or components of the Proposed Action that require no change from the existing operating permit, or are unaffected by the Proposed Action, are only briefly described.

2.3.2 Permit Area Changes and Surface Disturbance Area

Luzenac proposes to modify the permit boundary as shown on Figure 2-7 in order to accommodate the expansion of existing facilities as required by the mine life extension. The total area included in the revised Yellowstone Mine permit area would be increased by 490 acres, from the existing 1,458 to 1,948 acres, of which a total of 999.8 acres would be permitted for surface disturbance (Table 2-8). This proposed surface disturbance area includes 728.5 acres of existing permitted disturbance associated with the current Operating Permit 00005 (Luzenac, 2002), and 271.3 acres of new disturbance under the Proposed Action (Table 2-8). All of the land within the permit boundary is privately owned.

Areas of new surface disturbance that would result from the Proposed Action are shown on Figure 2-7. The number of acres of proposed disturbances by facility is presented in Table 2-9.

TABLE 2-8
Comparison of Existing and Proposed Permit Areas with Surface Disturbances
Amendment to Operating Permit 00005 – EA

	Disturbed Acres	Undisturbed Acres	Total Acres
Existing Permit Area	728.5	729.5	1458
Proposed Expansions to Permit Area	271.3	219.1	490.4
Grand Total	999.8	948.6	1948.4

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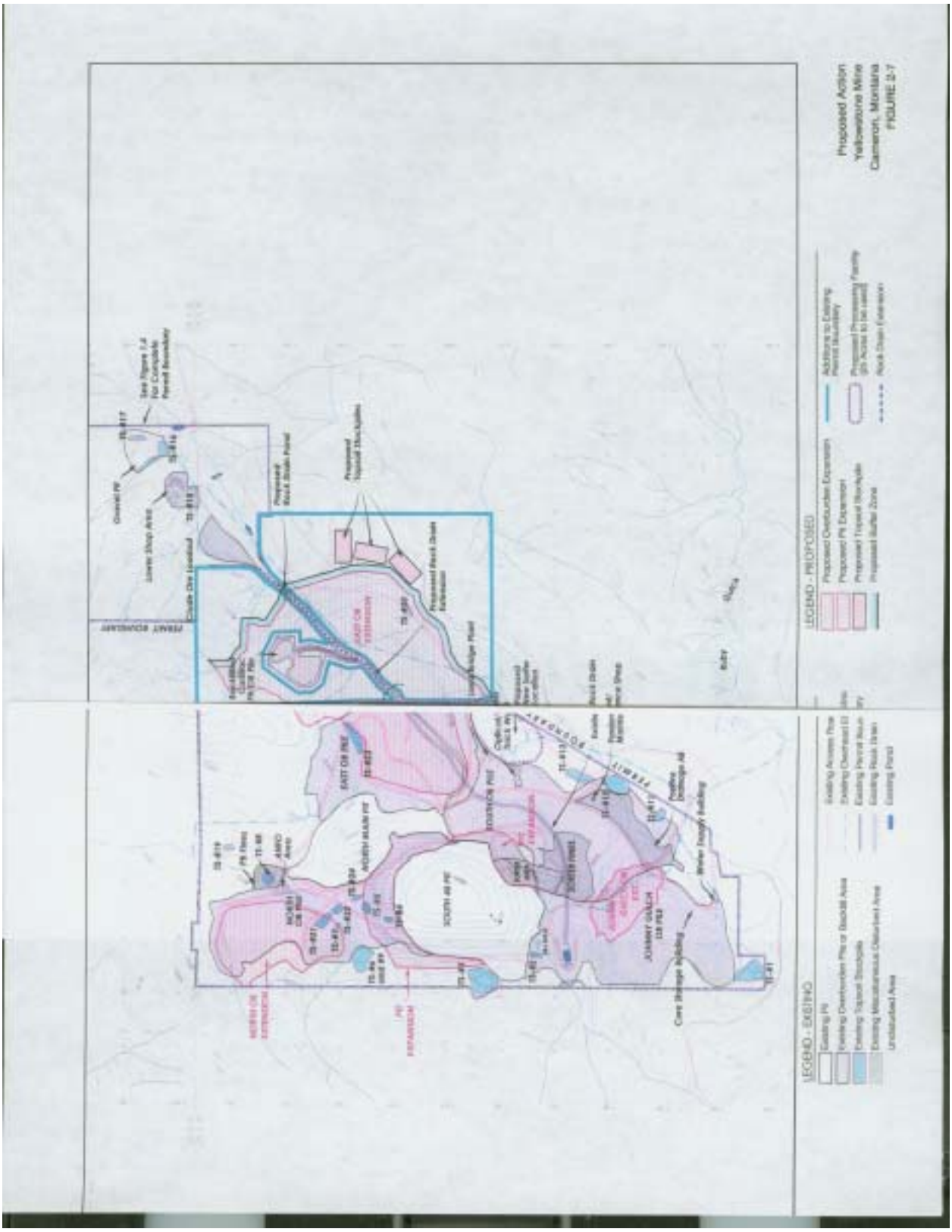

Proposed Action
Yellowstone Mine
Cameron, Montana
FIGURE 2-7
LEGEND - PROPOSED
LEGEND - EXISTING
EAST OX PIT
SOUTH AB PIT
JUMBO GULCH
OX PIT EXPANSION
PIT EXPANSION
Core Storage Building
Water Treatment Building
Gravel Pit
Lower Shop Area
Crude Ore Loadout
FRONT SCHMART
See Figure 1-4 For Complete Permit Boundary
Proposed Rock Drain Extension
Proposed Topsoil Stockpiles
Proposed Rock Drain Extension
Proposed Rock Drain
Existing Rock Drain
Existing Pond
Existing Access Road
Existing Permit Boundary
Existing Rock Drain
Existing Pond
Proposed Overburden Expansion
Proposed Pit Expansion
Proposed Topsoil Stockpile
Proposed Buffer Zone
Adjacent to Existing Permit Boundary
Proposed Processing Facility (25 Acres to be used)
Rock Drain Extension

2.3.3 MINING OPERATIONS

Luzenac proposes to mine ore and overburden from the South 40 Pit at the same rate as it is presently being extracted, approximately 300,000 tons of ore and 2.5 million tons of overburden per year. Luzenac also proposes to use the same mining methods, types of equipment, and number of employees currently in use and permitted under the Operating Permit (Luzenac, 2002). The pit slope angles and bench heights would remain the same, as described in Section 2.2.6.1.

The South 40 Pit would be enlarged and deepened. This proposed expansion of the South 40 Pit would produce a combined pit that includes portions of the North Main, South 40, and Montana Talc pits (Figures 2-7 and 2-8). This new combined pit would include 180.6 acres, of which 169.4 acres are currently disturbed and 11.2 acres would be newly disturbed (Table 2-8). Figures 2-7 and 2-8 show final topography in the vicinity of the pits. Figure 2-9 shows cross sections of the existing and final South 40 Pit. The South 40 Pit expansion would include about 9.8 acres along its western margin, 30 acres along its northern margin, and about 16.5 acres along its eastern margin (Figure 2-7) bringing the total proposed area of expansion of the pit by this amendment to 56.3 acres (Table 2-9). Most expansion of the South 40 Pit would be into previously disturbed areas that are presently covered by overburden. Once completed, the final South 40 Pit size would be 122.2 acres (Figure 2-8). The pit expansion and subsequent laybacks would accommodate mining to a total depth of 5,550 feet amsl. The final North Main cross sections are shown on Figure 2-10.

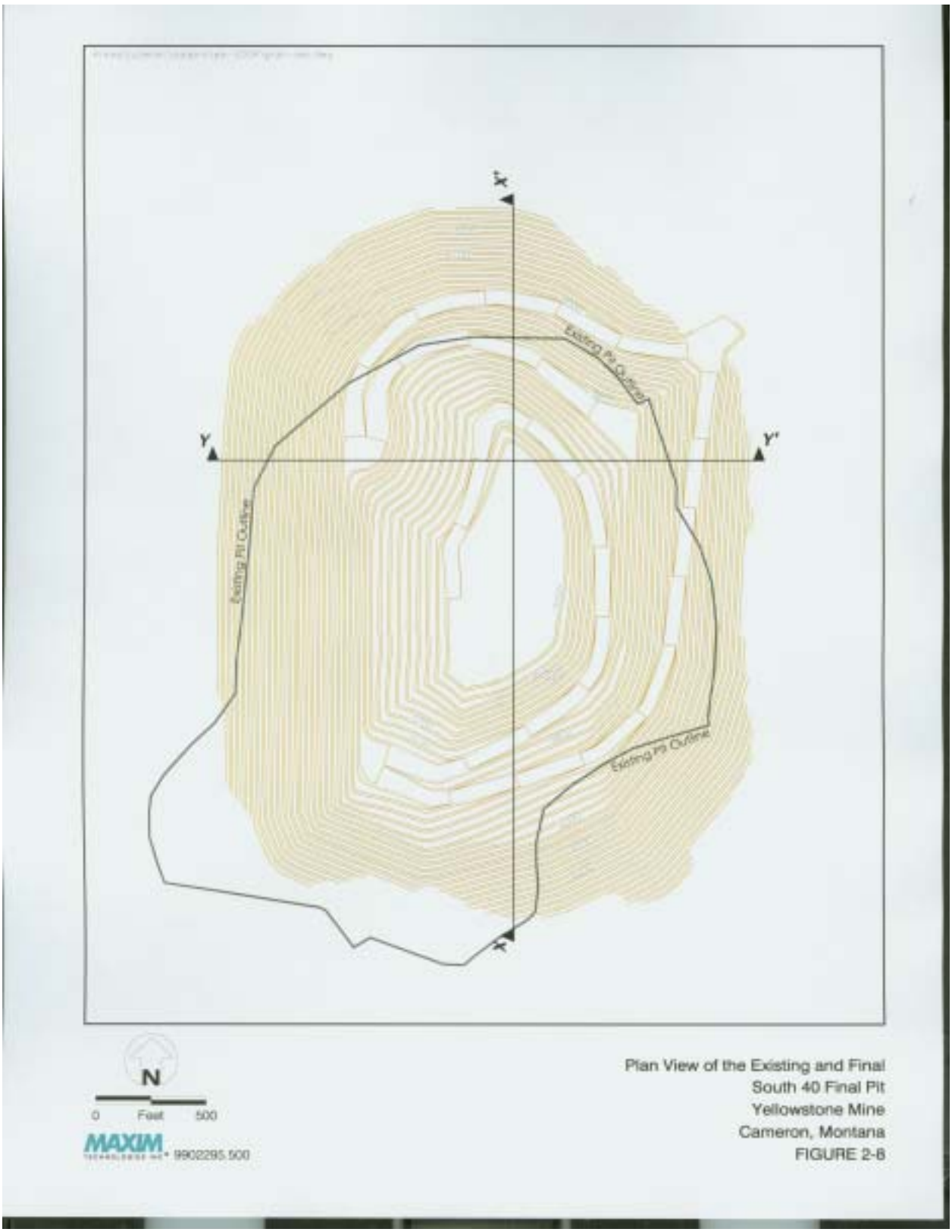
TABLE 2-9
Proposed Disturbances at the Yellowstone Mine[1]
Amendment to Operating Permit 00005 – EA

		SIZE IN ACRES						
		Acres Permitted for Disturbance	Change in Use of Existing Disturbances		Proposed Additions[2]	Additions[2] (Previously Undisturbed)	Total Proposed Disturbance	
TYPE	AREA		Subtractions	Additions				
Existing Open Pits	North Main Pit	58.4					58.4	
	South 40 Pit	111.0		45.1	56.3	11.2	122.2	Includes and perm
	North 40 Pit	Backfilled						Backfilled
	Cadillac Pit (9.9 acres)	Backfilled						Backfilled
Total Pits[3]		169.4			56.3	11.2	180.6	Combine
Existing Overburden	North OB Pile	122.8	30.0		10.1	10.1	132.9	Includes Soil Stoc
	East OB Pile	123.0			191.2	191.2	314.2	
	Buffer Zone				21.5	21.5	21.5	
	South OB Pile	157.6	8.2		0.0	0.0	157.6	Includes Grade St
	Johnny Gulch OB Pile	129.8			0.0	0.0	129.8	Includes
	OB Extensions							
	North OB Ext			47.1				No new a OB pile
	East OB Ext			152.1				No new a new OB p
	Johnny Gulch OB Ext			26.0				No new a OB pile
	Rock Drain	6027.5 ln ft			3688.4 ln ft	3688.4 ln ft	9715 ln ft	Lineal fe
Total Overburden		533.2			222.8	222.8	756.0	

TABLE 2-9 (continued)
Proposed Disturbances at the Yellowstone Mine[1]
Amendment to Operating Permit 00005 – EA

		SIZE IN ACRES						
		Acres Permitted for Disturbance	Change in Use of Existing Disturbances		Proposed Additions[2]	Additions[2] (Previously Undisturbed)	Total Proposed Disturbance	
TYPE	AREA		Subtractions	Additions				
Other Existing	Soil Stockpiles (24)	15.2			12.3	12.3	27.5	Include
	Gravel Pit	9.9					9.9	Include
	Ponds	0.8					0.8	Include
	New Ore Processing	na			25.0	25.0	25.0	
	Facilities	19.1 [4]						Include Optical Plant, Storag Mainte
	Sorter Area	11.3 [4]	6.9				0.0	Include
	Roads	7.3 [4]					0.0	Include
	Utilities	7.7 [4]					0.0	Include
	Sorter Fines	18.9 [4]					0.0	Include
	PB Fines	5.2 [4]					0.0	Include
	Positive Drain A+B	19.6 [4]					0.0	Include
Total Other		25.9			37.3	37.3	63.2	Include ponds
Grand Total Disturbed[3]		728.5			316.4	271.3	999.8	
Total Undisturbed		729.5					948.6	
Total Permit Area		1458.0	45.1	45.1	490.4		1948.4	

[1] Table 2-9 is based on measurements from Figure 2-7
[2] Differences in the numbers in the "Proposed Additions" and the "Additions (Previously Undisturbed)" columns reflect expansion of the pits into existing disturbance caused by existing overburden disposal areas
[3] Of the 56.3 acres of proposed South 40 Pit expansion, 45.1 (56.3-11.2) occur in an area of previously permitted disturbance
[4] Acres included in disturbed area above



Plan View of the Existing and Final
South 40 Final Pit
Yellowstone Mine
Cameron, Montana
FIGURE 2-8

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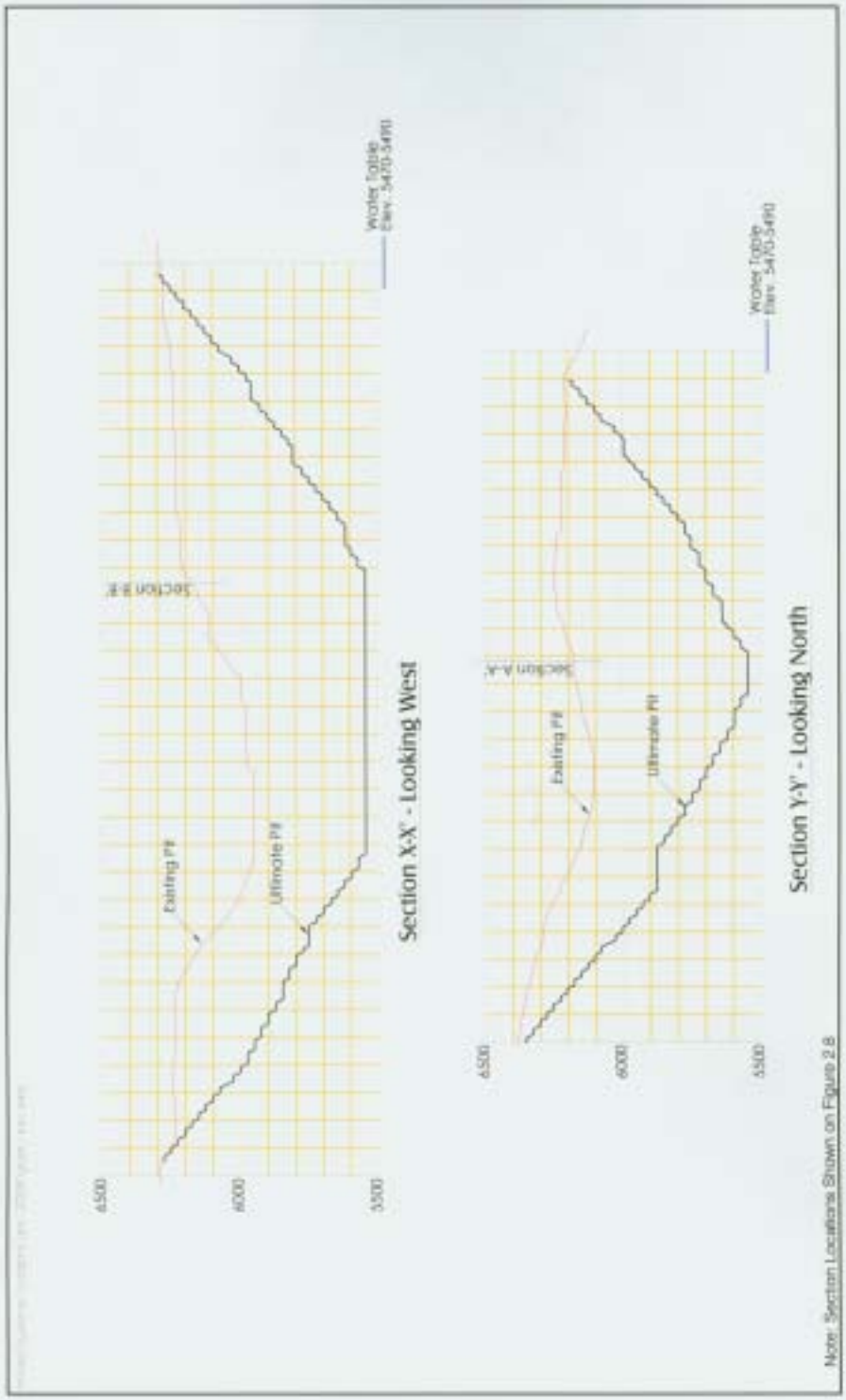

Cross Sections of the Existing and Final South 40 Pit
Yellowstone Mine
Carmeron, Montana
FIGURE 2-9

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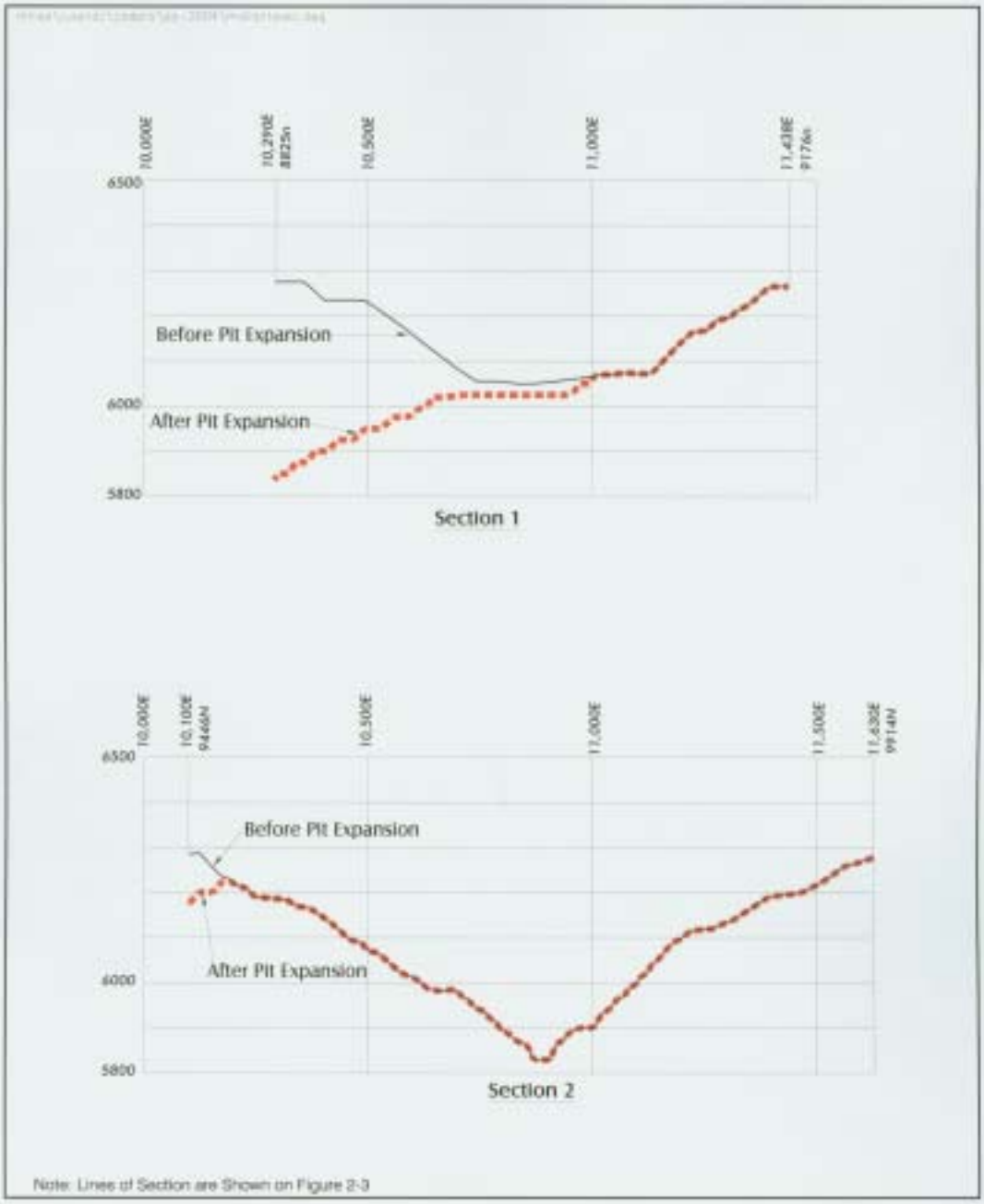

0 Feet 300

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Cross-Sections of the North Main Pit
Yellowstone Mine
Cameron, Montana
FIGURE 2-10

2.3.4 OVERBURDEN DISPOSAL

2.3.4.1 Introduction

Extending the mine life by 50 years at the Yellowstone Mine site under the Proposed Action would require expanded overburden disposal capacity, in order to accommodate the anticipated 127 million tons of overburden to be mined. Waste rock would be transported to existing overburden facilities, which would be expanded by increasing their height and/or enlarging their footprints.

Rock roll berms would be constructed at the base of the lower lift and the base of the upper lift of all OB piles to prevent rock rolling down the slopes and outside the permitted footprint of the facility.

A buffer disturbance area would be established around the proposed East OB Pile to cover miscellaneous disturbances like soil salvage and storage areas, haul roads, equipment staging areas, sediment and erosion control systems, rock roll berms, miscellaneous access and service roads needed to maintain these systems and to control weeds, etc., over the 50-year mine life.

The overburden disposal areas would be accessed by a main haul road from the pit, similar to the road that currently provides access to the existing part of each overburden disposal area. Short, temporary roads would be constructed from the main haul road to access the active part of each disposal area. These roads would be built within the footprint of the disposal areas. Overburden surfaces would be graded during construction to prevent ponding of rainfall, and final slope angles would be reduced from angle of repose to slopes of 2.5H:lV or less to facilitate reclamation and revegetation at closure. Overburden would be placed using haul trucks similar to those currently in use. Selection of the receiving disposal area would be based on proximity of the rock being mined to the disposal sites. Table 2-10 indicates the amount of additional material that is presently designated for storage in each overburden disposal area.

TABLE 2-10
Overburden Placement By Disposal Area
Amendment to Operating Permit 00005 – EA

	Johnny Gulch OB Extension	North OB Pile	North OB Extension	East OB Pile	East OB Extension	Total
Volume (LCY)*	2,481,867	5,237,676	2,876,980	56,920,217	16,110,626	81,145,498
Tons	3,884,662	8,198,101	4,503,099	89,092,513	25,216,632	127,010,345

*LCY= Loose Cubic Yards

A discussion of the overburden geochemistry can be found in Sections 1.5.2.2.2 and 1.5.2.2.3.

2.3.4.2 East OB Pile

Luzenac proposes an expansion of the East OB Pile further to the northeast down gradient in Johnny Gulch as shown in Figure 2-7. The proposed expansion would disturb approximately 191.2 acres of previously undisturbed ground (Figure 2-7 and Table 2-9). This disposal area would receive approximately 114.3 million tons of overburden material over the proposed mine life extension (Table 2-10). This represents about 90 percent of the total amount of overburden to be removed. The East OB Pile would be constructed in two lifts or layers (upper and lower) by either end-dumping overburden over a bermed bank or end-dumping on the overburden pile top and pushing overburden material over the angle-of-repose face of the pile. The overall average dimensions of the East OB Pile would be approximately 2,500 feet in width and 5,000 feet in length, with an ultimate height of 320 feet above the existing valley floor (Figures 2-11 and 2-12). The surface of the East OB Pile would be graded during construction to prevent ponding of rainfall, reclaimed concurrent with construction, and graded to reduce final slopes from angle of repose to 2.5H:lV or less to facilitate reclamation and revegetation at closure. A safety bench would be constructed on its sloping surfaces at distances of about 200 feet along the slope above the valley floor. This bench would provide a run-out area for material raveling off the slopes and a relatively safe place for work during reclamation and revegetation.

Prior to construction of the proposed East OB Pile Extension, an area of about 20 to 30 acres (equivalent to the storage needs of 5 years of overburden production) would be cleared. Soil and suitable colluvium and volcanic parent material, including existing vegetation, would be salvaged and hauled to the designated soil stockpile areas shown in Figure 2-7. Extension of the East OB Pile would occur in small increments of about 5 acres annually. This construction schedule would result in both a small amount of acreage being prepared to receive overburden at any one time and a slow advance of the overburden toe on a year-by-year basis.

2.3.4.3 North OB Pile

Luzenac proposes to construct a lift of overburden on top of a portion of the existing North OB Pile. The proposed extension would contain 8.2 million tons (5.2 million cubic yards) of overburden and would disturb approximately 10.1 acres of previously undisturbed ground over the life of the mine (Figure 2-7 and Table 2-9). The disposal area would be constructed by end-dumping overburden over a bermed bank. The overall footprint of the North OB Pile would average approximately 1,200 feet in width and 2,300 feet in length. The disposal area would extend to a height of 40 feet above the existing North OB Pile surface at final build-out (Figures 2-11 and 2-13).

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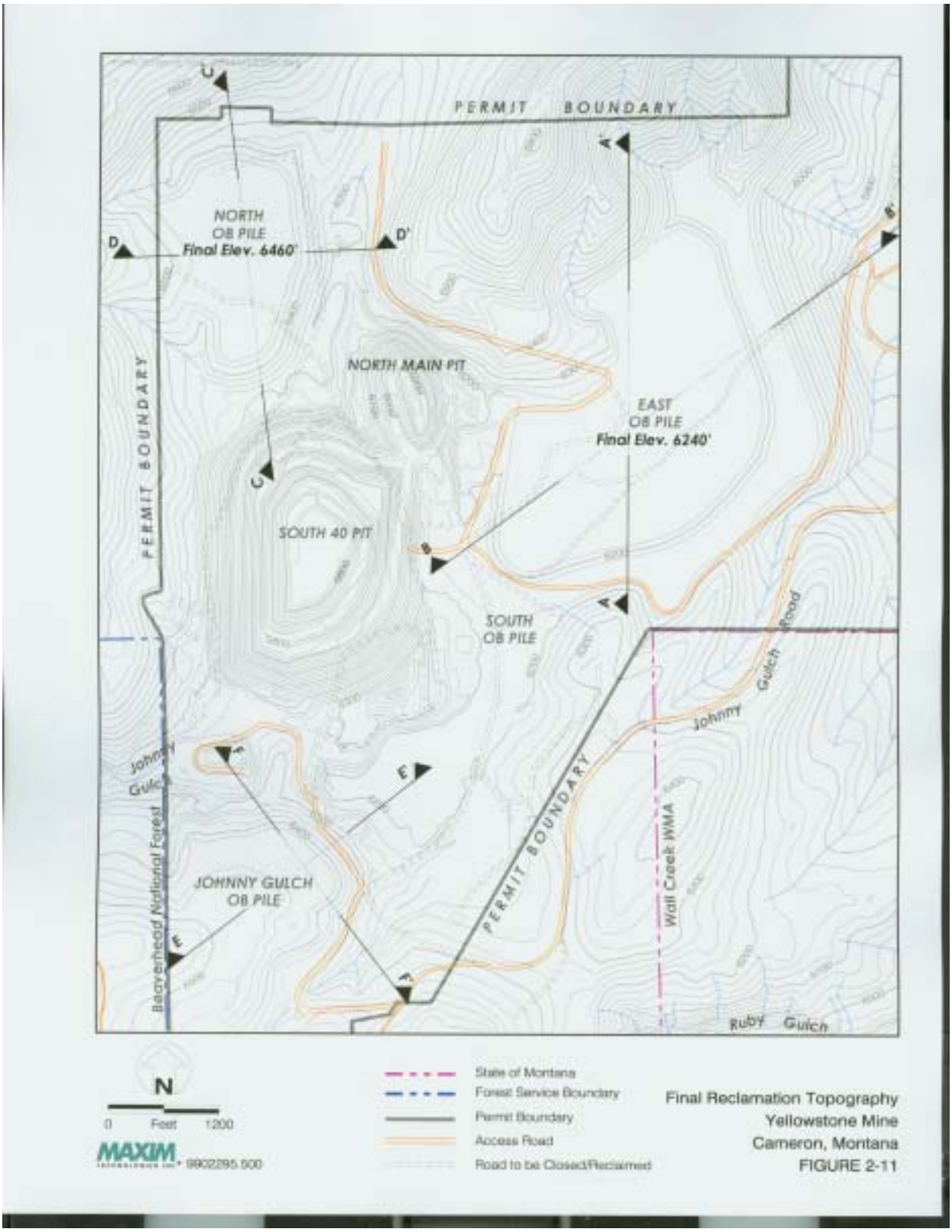
PERMIT BOUNDARY
NORTH OB PILE
Final Elev. 6460'
NORTH MAIN PIT
EAST OB PILE
Final Elev. 6240'
SOUTH 40 PIT
SOUTH OB PILE
JOHNNY GULCH OB PILE
PERMIT BOUNDARY
PERMIT BOUNDARY
Johnny Gulch Road
Johnny Gulch
Wall Creek WMA
Ruby Gulch
Bacyrehead National Forest
N
0 Feet 1200
MAXIM
9902295.500
State of Montana
Forest Service Boundary
Permit Boundary
Access Road
Road to be Closed/Reclaimed
Final Reclamation Topography
Yellowstone Mine
Cameron, Montana
FIGURE 2-11

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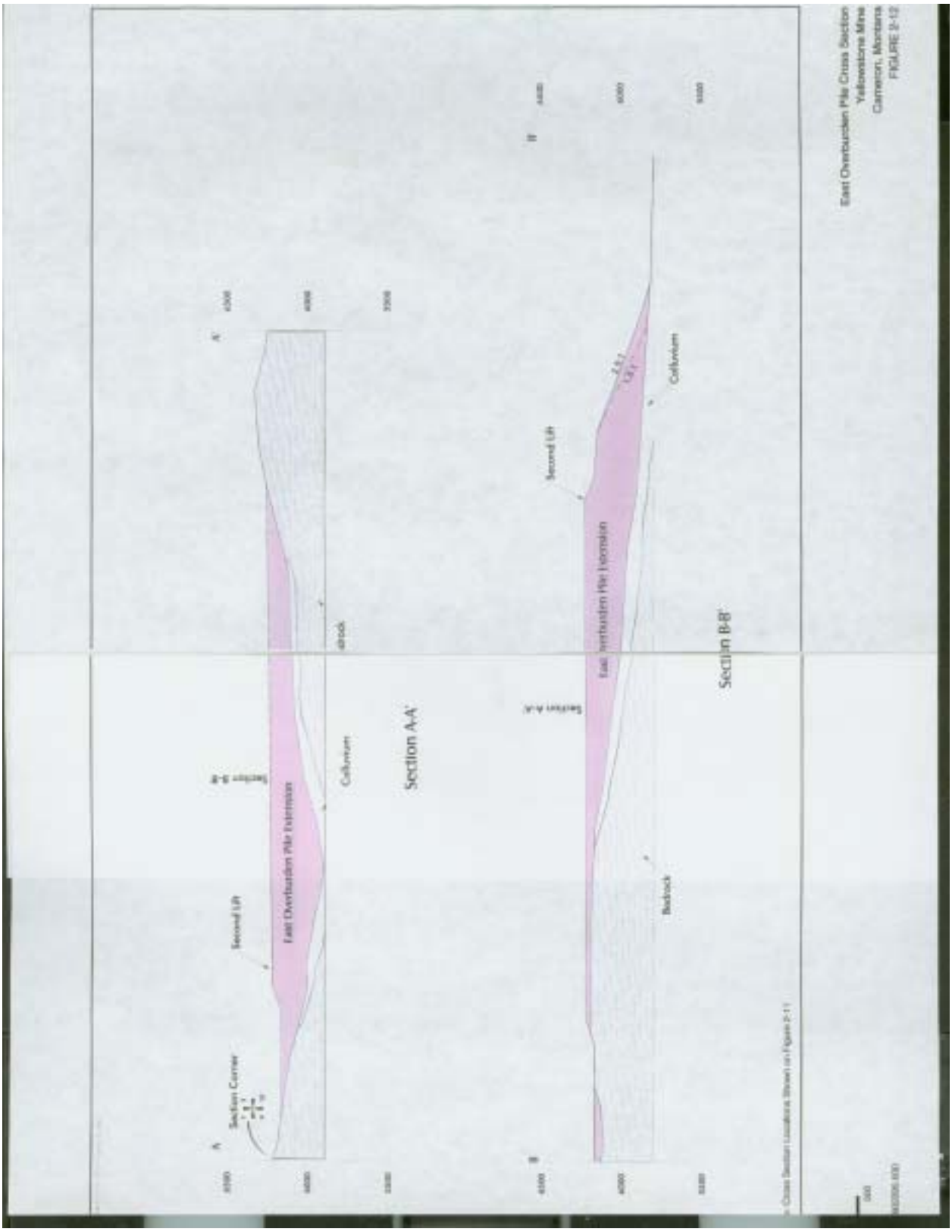
Section Corner
Second Lift
East Overburden Pile Extension
Colluvium
Section A-A'
Second Lift
Colluvium
Bedrock
Section B-B'
East Overburden Pile Cross Section
Yellowstone Mine
Cameron, Montana
FIGURE 2-12

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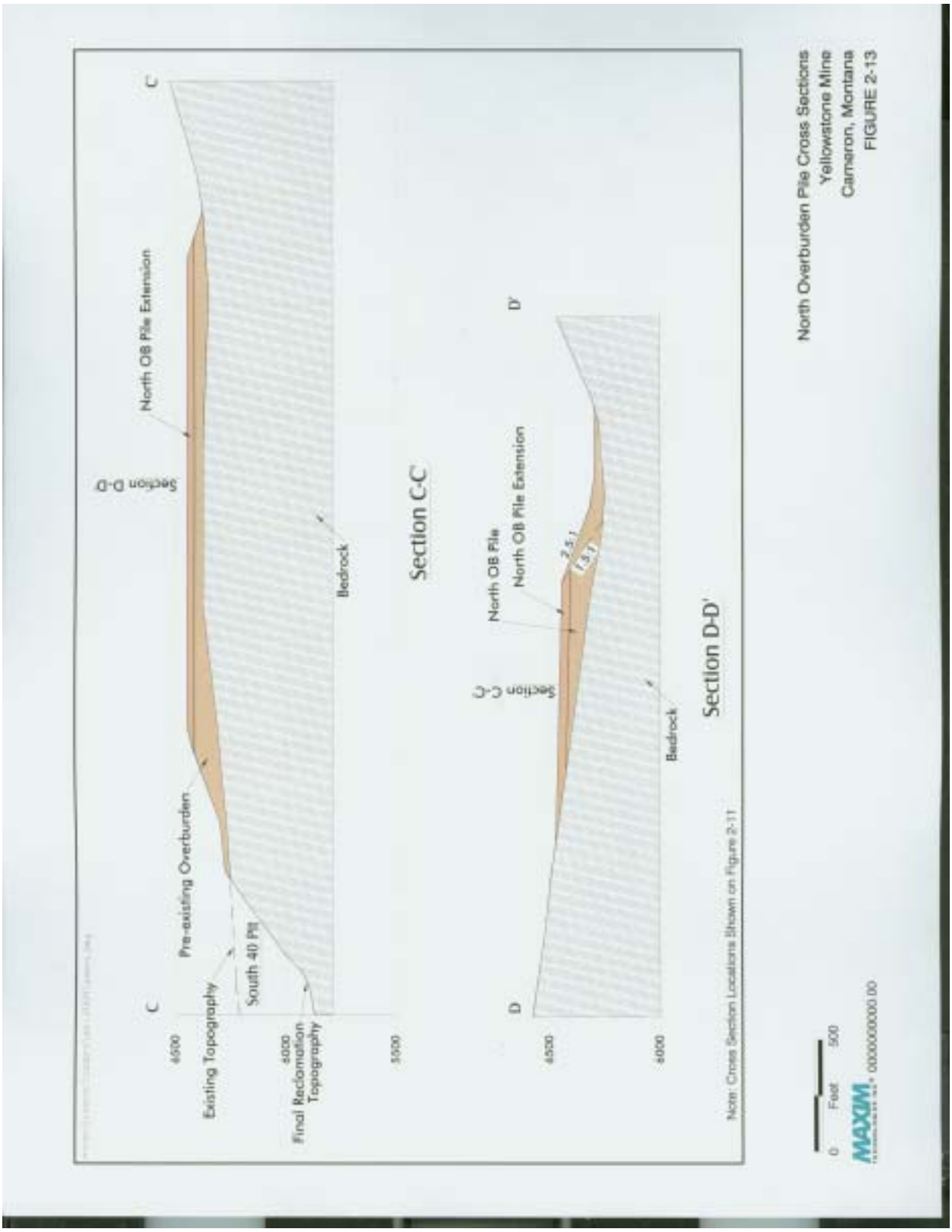
C
C'
Section D-D'
North OB Pile Extension
Pre-existing Overburden
Existing Topography
South 40 Pit
Final Reclamation Topography
Bedrock
Section C-C
D
D'
Section C-C'
North OB Pile
North OB Pile Extension
2.5:1
1.5:1
Bedrock
Section D-D'
Note: Cross Section Locations Shown on Figure 2-11
0 Feet 500
MAXIM
North Overburden Pile Cross Sections
Yellowstone Mine
Cameron, Montana
FIGURE 2-13

2.3.4.4 Johnny Gulch OB Pile

Luzenac proposes an extension of the Johnny Gulch OB Pile that would involve placing a lift over a small portion of the disposal area along its eastern margin (Figure 2-7). Extension of the Johnny Gulch OB Pile would contain 3.9 million tons (2.5 million cubic yards) of overburden and would cover approximately 26 acres of previously disturbed ground over the extended mine life (Figure 2-7 and Table 2-9). The disposal area would be constructed by end-dumping overburden over a bermed bank (Figures 2-11 and 2-14).

2.3.4.5 Concurrent Reclamation

Where possible, Luzenac proposes to reclaim portions of the overburden disposal areas concurrently. To date, Luzenac has reclaimed portions of two overburden piles on the Yellowstone Mine site. These include both the Johnny Gulch OB Pile (145 acres) (Figure 2-3) and the north portion of the East OB Pile (40 acres). Both of these areas currently support seasonal grazing.

2.3.5 ORE PROCESSING

Under the Proposed Action, Luzenac would use the same ore processing methodology and process ore at the same rate as it does under the existing Operating Permit 00005 (Luzenac, 2002).

With the expansion of the South 40 Pit, the pit highwall would encroach on the Sorter Area (Figures 2-3 and 2-7). Approximately midway through remaining mine life, Luzenac proposes to relocate the ore processing facilities. The area proposed for relocation of these facilities is shown on Figure 2-7. This proposed ore processing area would cover approximately 25 acres and lie on previously undisturbed ground along the power line corridor. Because of its location along the existing powerline, it should not be necessary to realign the power line or its corridor.

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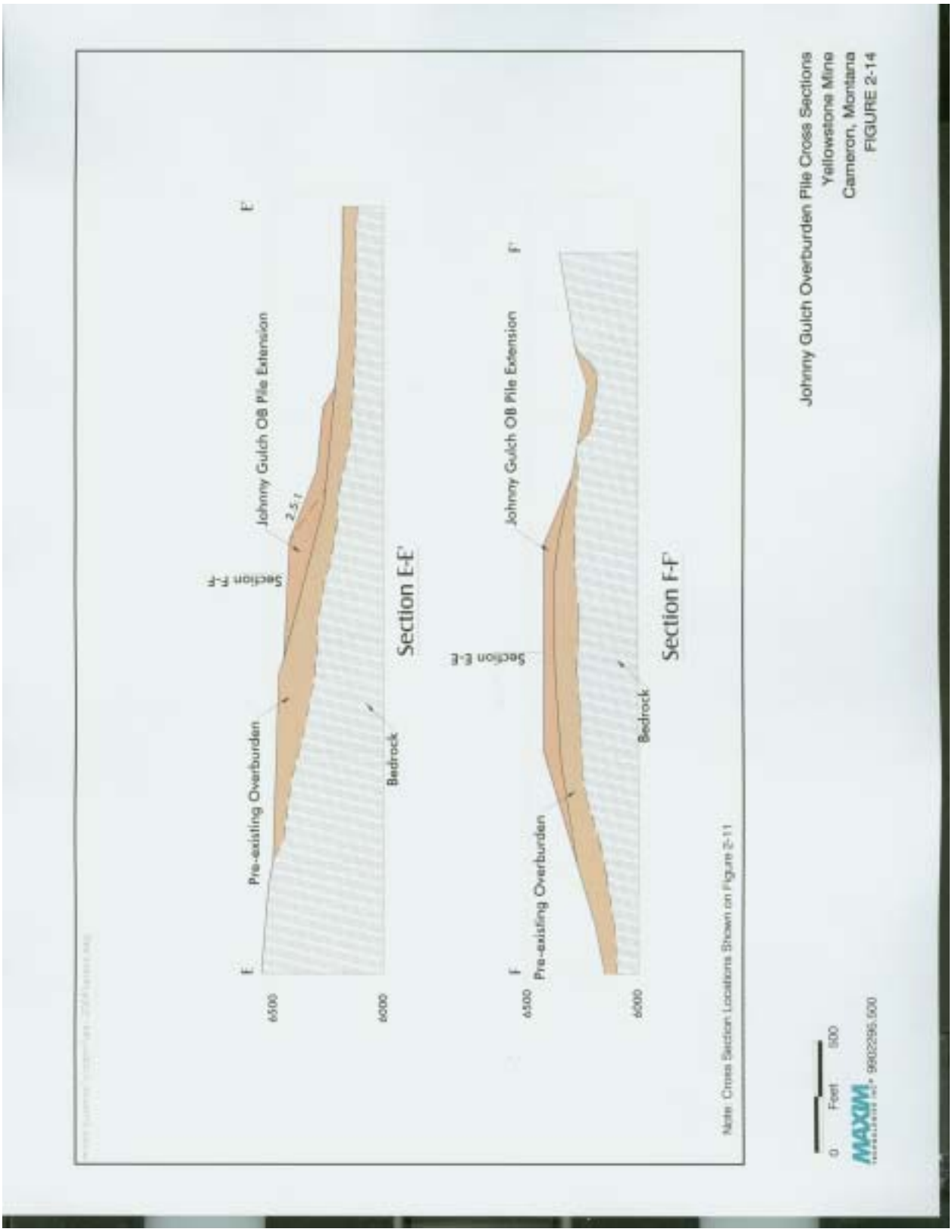

Johnny Gulch Overburden Pile Cross Sections
Yellowstone Mine
Cameron, Montana
FIGURE 2-14

2.3.6 ACCESS, HAUL ROADS, AND TRAFFIC

The Proposed Action would not require any changes to the access road system. Luzenac proposes to use existing roads to access the mine site and anticipates traffic patterns, vehicle types used, and frequency of use to remain at current levels (see Section 2.2.6.4). No changes in production levels, ore hauling, man-hours, or consumption of deliverable items are proposed or anticipated as a result of the Proposed Action. There are no changes to the alignment or use of the existing, approved and permitted access road system, other than a continuation of the same activities over a longer period of time.

Luzenac proposes to use and extend existing haul roads from the South 40 Pit to the overburden disposal facilities. Haul roads currently exist to each of the three current overburden disposal areas that are proposed for expansion. Roads to the Johnny Gulch OB Pile would not change except for minor alignment changes at the actual point of end dumping onto the expanded disposal sites. The haul road to the East OB Pile would require extending the main haul road across overburden as the pile expands, with haul roads developed to the active point of overburden end-dumping. At the end of mine life, the main haul road across the upper surface of the East OB Pile would have been extended some 3,500 feet to the northeast. This amounts to an average advance of about 70 feet per year. Luzenac proposes to construct its own haul road off the upper surface of the East OB Pile and down to the Crude Ore Loadout to avoid placing haul traffic on the Johnny Gulch Road (Figure 2-7). The haul roads are all considered temporary, would be developed on previously deposited overburden materials, and would be reclaimed.

2.3.7 ANCILLARY FACILITIES AND ACTIVITIES

2.3.7.1 Introduction

This section discusses ancillary facilities, miscellaneous ancillary activities, resource monitoring programs, and the reclamation plan associated with the Proposed Action.

2.3.7.2 Storm Water Handling Facilities

As with the existing storm water handling system, ditches, temporary and permanent sediment basins, and storm water collection ponds would be used to control runoff from disturbed areas. New portions of the storm water handling system would be designed and constructed in a manner similar to that used for the existing system. BMPs to prevent or mitigate contamination of storm water from the mine would be employed where appropriate. No storm water would be discharged from the mine site.

A revised site-wide drainage plan for the mine site has been prepared for the Proposed Action under the conditions of maximum build-out (Figure 2-6) and is described in detail in the amendment application (Luzenac, 2003). Luzenac would modify the existing

storm water handling systems to accommodate the changing conditions resulting from expanding mine facilities. New diversion channels and sediment ponds would be added to the existing system to control runoff and runon from expanded overburden disposal areas and from the relocated ore processing facilities. A field review of the storm water collection system would be performed periodically by Luzenac to identify additional sediment control system and BMP requirements for the evolving mine site and its facilities. Storm water collection and diversion structures would be monitored after all major storm events to ensure that sediment levels are not exceeding design capacity. Sediment control structures would be cleaned periodically in order to maintain performance. These inspection and cleaning schedules would be applied to storm water control structures that result from expanded facilities (pits and overburden disposal areas) proposed under this amendment. Should areas of the site require additional BMPs, Luzenac would install the necessary control systems.

2.3.7.3 Hazardous Materials and Wastes

Under the conditions described in the Proposed Action, Luzenac does not anticipate any changes in the types or quantities of hazardous materials or substances currently used or stored at the Yellowstone Mine site. All hazardous material or substances, currently in use at the mine are disclosed in the approved Operating Permit 00005 (Luzenac, 2002). The fleet size and type of equipment designated for use under the Proposed Action is similar to that currently in use. The transportation and onsite storage of hazardous materials are regulated by the USDOT. USDOT certified hazardous material contractors are responsible for the transport of hazardous material both on and off the mine site. In addition, Luzenac has an SPCC in place in the event of any accidental release. There are no changes between the Proposed Action and the existing approved Operating Permit with respect to hazardous materials. The handling and storage of hazardous materials would continue to be regulated by the USDOT.

2.3.7.4 Spill Prevention, Control, and Countermeasure Plan

Under the Proposed Action, both the Emergency Response Plan and the SPCC plan would remain in place and be revised as needed.

2.3.7.5 Support Facilities

The support facilities described in Section 2.2.7.5 would continue to be used under the Proposed Action and require no change from the existing condition.

Midway through the proposed mine-life extension, the Sorter Area would be moved to a new location, as described in Section 2.3.5 and shown as the Proposed Processing Facility in Figure 2-7.

2.3.7.6 Energy Supply and Source

No changes in energy sources or supplies would be required under the Proposed Action. Luzenac does not anticipate an increase in consumption of electrical power nor does Luzenac propose to increase the number of onsite generators to provide backup power for any part of its operations. Power line corridors would not need to be relocated as a result of relocating the Sorter Area to a new site, as the power line runs through the proposed site.

2.3.7.7 Solid Waste Disposal

No changes to the solid waste disposal handling would be required. The volume of waste generated by the Yellowstone Mine is not expected to increase appreciably on an annual basis as a result of the Proposed Action.

2.3.7.8 Dust and Emissions Control

Particulate and gaseous emissions would not change appreciably as a result of Proposed Action. Mining and ore processing methods and rates would not change. Vehicle emissions would not change as a result of the Proposed Action, as the size of the fleet and types of vehicles to be used would be similar to those currently in use.

Air quality emission controls and dust abatement would be addressed during construction and operation of all modified facilities anticipated by the Proposed Action, especially the expanded overburden disposal areas. Air quality pre-construction permits would be obtained as needed. Required dust control would be addressed through engineering or management controls based on observed air quality conditions and monitoring results. Luzenac would continue to conduct air quality monitoring in accordance with the existing air quality permit and would implement corrective action as necessary to maintain compliance.

2.3.7.9 Water Supply System

The Proposed Action would require no changes to the existing water supply systems. These systems have functioned well in the past to meet the water needs of the Yellowstone Mine. Luzenac is confident the proposed amendment would not increase demand for water beyond the ability of the existing systems to provide it.

2.3.7.10Snow Removal

The Proposed Action would require no changes to the existing snow removal practices. These procedures have been used successfully in the past on existing mine roads and operating areas. Luzenac would continue these snow removal practices as necessary on all facilities constructed as part of the Proposed Action.

2.3.7.11Public Safety and Mine Security

The Proposed Action would require no changes to the existing public safety and mine security practices. Public safety and mine security practices following mine closure and reclamation described in the Proposed Action are currently employed at other access points on Luzenac's property. The haul road would be modified to avoid haul traffic on the access road, as described in Section 2.3.6.

Under the conditions of the Proposed Action, soil stockpiles and the East OB Pile Extension would lie adjacent to this road. Luzenac would promote public safety along this segment of the existing Johnny Gulch road and would agree not to cross this road for soil salvage operations or ore hauling. Luzenac would use permanent cautionary signs advising of possible mine traffic along this segment of road and supplement this with temporary signs, detours, and flagmen as necessary during potentially hazardous mine activities on or near the Johnny Gulch Road. On its own mine roads, Luzenac would provide signs governing speed, right of way, direction of movement, and use of headlights and would inform operators and drivers of these requirements.

2.3.7.12Public Nuisance

The Proposed Action would follow current operational and reclamation procedures approved by DEQ to alleviate public nuisance issues. The Proposed Action would require no changes to the existing practices.

2.3.7.13Noise

The Yellowstone Mine is located in a remote area. Mine-generated noise resulting from equipment operation, blasting, ore handling, and processing under the Proposed Action would not be expected to increase over existing levels.

2.3.8 RESOURCE MONITORING

2.3.8.1 Air Quality

No changes to the air quality monitoring program would be required as a result of the Proposed Action. Luzenac would continue air quality monitoring at the Yellowstone Mine site as specified under the existing air quality permit. DEQ would inspect for fugitive dust. Luzenac would continue to use the existing dust management practices.

2.3.8.2 Water Quality

Routine monitoring of surface water and groundwater in the Yellowstone Mine area would continue under the Proposed Action.

2.3.8.2.1 Surface Water

Only one minor change in the surface water quality monitoring program would be required as a result of the Proposed Action. The actual sampling location at the downstream end of the rock drain beneath the East OB Pile in Johnny Gulch would necessarily move downstream as the toe of the waste rock facility extends downstream during construction. Table 2-2 describes the proposed operational monitoring schedule for surface water. The chemical and physical parameters to be measured for water resource monitoring are listed in Table 2-4. The schedule and scope of monitoring would not change under the Proposed Action and is described in Section 2.2.8.2.

2.3.8.2.2 Groundwater

No changes to the groundwater quality monitoring program would be required as a result of the Proposed Action. Groundwater quality monitoring would continue at the Yellowstone Mine in accordance with the current Operating Permit described in Section 2.2.8.2. New monitoring wells JG-1 and JG-2 would continue to be monitored if the Proposed Action is approved.

2.3.8.3 Reclamation

Luzenac and DEQ would continue reclamation monitoring, as described in Section 2.2.8.3.

2.3.8.4 Operational Rock Monitoring

Luzenac would continue to implement the operational rock monitoring sampling program described in Section 2.2.8.4.

2.3.8.5 Cultural Resource

No changes to the cultural resource monitoring program would be required as a result of the Proposed Action.

2.3.8.6 Paleontological Resource

No changes to the paleontological resource monitoring program would be required as a result of the Proposed Action.

2.3.9 HUMAN HEALTH AND SAFETY

Human health and safety at the Yellowstone Mine would continue to be regulated under MSHA.

2.3.10 SOCIOECONOMICS

2.3.10.1 Duration of Mining

Under the operating plans and projections of the Proposed Action, Luzenac anticipates the Mine Life Extension if approved would extend mine life by 50 years at current production rates.

2.3.10.2 Employment

Employment at the Yellowstone Mine would remain at approximately 44 people on a year-around basis for up to another 50 years.

2.3.10.3 Taxes

Taxes paid to the state and Madison County would remain as described in Section 2.2.11 for another 50 years.

2.3.11 RECLAMATION

2.3.11.1 Introduction

The Proposed Action reclamation plan would reclaim all existing and proposed disturbances (999.8 acres in Tables 2-8 and 2-9). Figure 2-15 shows the various final landscapes proposed for disturbed areas within the permit boundaries.

Reclamation activities would include reclamation of mine pits, including rock faces, talus slopes, and revegetation of the pit bottom, pit roads, and accessible benches; water well and drill hole abandonment (e.g. water wells, piezometers, etc.); regrading and revegetation of previously backfilled pits; regrading and revegetation of the overburden disposal areas; removal of structures after cessation of operations; regrading of disturbed areas (including roads); drainage control; removal and regrading of stockpile areas; replacement of salvaged soil; revegetation; and reclamation monitoring. The reclamation schedule would encompass the period from cessation of mining through successful revegetation. Reclamation would be concurrent with operations where possible, particularly in the overburden disposal areas. The proposed reclamation topography for the Yellowstone Mine is shown in Figure 2-15. Cross sections through selected portions of the mine pits and reclaimed areas are presented in Figures 2-8, 2-9, 2-10, 2-11, 2-12, 2-13, and 2-14.

2.3.11.2 General Grading of Disturbed Areas

Compacted surfaces would be scarified or ripped before soil placement. No changes to the general grading of disturbed areas would be required as a result of the Proposed Action.

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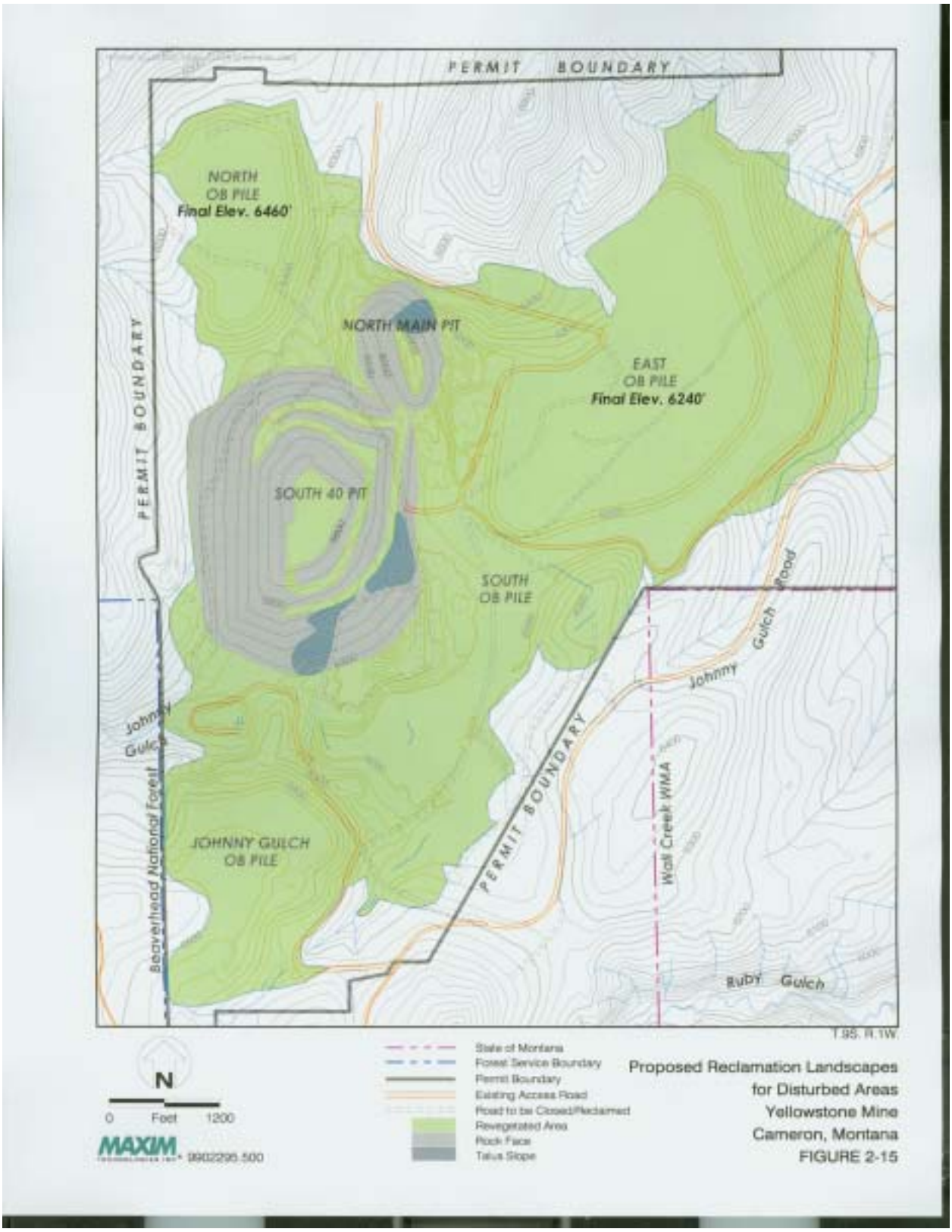
PERMIT BOUNDARY
NORTH OB PILE
Final Elev. 6460'
NORTH MAIN PIT
EAST OB PILE
Final Elev. 6240'
PERMIT BOUNDARY
SOUTH 40 PIT
SOUTH OB PILE
Johnny Gulch Road
Johnny Gulch
Beaverhead National Forest
JOHNNY GULCH OB PILE
PERMIT BOUNDARY
Wall Creek WMA
RUBY Gulch
T.9S. R.1W.
N
0 Feet 1200
MAXIM
9902295.500
State of Montana
Forest Service Boundary
Permit Boundary
Existing Access Road
Road to be Closed/Reclaimed
Revegetated Area
Rock Face
Talus Slope
Proposed Reclamation Landscapes
for Disturbed Areas
Yellowstone Mine
Cameron, Montana
FIGURE 2-15

2.3.11.3 Soil Salvage

Prior to creating any new mining disturbance under the Proposed Action, Luzenac would strip and stockpile vegetation and soil and suitable colluvium and volcanic parent material for future use in reclamation. Soil from all areas with slopes of less than 2:1 would be salvaged. The upper foot of soil would be stockpiled separately from subsoil. Soil would be salvaged and transported to stockpiles (Figure 2-7) using scrapers, wheel and track dozers, haul trucks, and loaders. Soil stockpiles would be seeded to provide vegetation that would protect soil stockpiles from wind and water erosion. This material would be used to provide a minimum of 6 inches of soil and subsoil over mine-related disturbances.

Soil balance calculations for the entire mine site including both existing and proposed disturbances are presented in Table 2-11. These calculations indicate that there would be more than adequate soil volume from existing and proposed soil salvage to place a minimum 6-inch-thick soil cap on all disturbed sites. Based on these calculations there would be an excess of 152,329 cubic yards or about 22 percent more soil available than is needed. This may permit a thicker soil cover to be placed over some disturbed areas during final reclamation.

2.3.11.4 Pit Reclamation

Portions of the previously backfilled South Main Pit would be redisturbed by South 40 Pit expansion. Pits previously backfilled (North 40 and Cadillac pits, Figure 2-4) would be regraded, soiled, and revegetated along with the overburden disposal areas that expand over them. Reclamation of the North Main and South 40 pits would achieve long-term stability. Portions of the pits in solid rock would be reclaimed as rock faces and talus slopes (Figure 2-15). Where it is safe and access is feasible, catch benches would be soiled and revegetated. The pit bottom, select benches, and haul road slopes in the pit that are 2.5H:1V or shallower would be ripped, if necessary, and soiled and seeded, where accessible. The ultimate pit bottom of the North Main Pit would be 5,850 feet amsl (Figure 2-10). The ultimate pit bottom of the South 40 Pit would be approximately 5,510 feet amsl (Figure 2-9). The bottoms of these pits would be approximately 50 feet above groundwater. Pit floor surfaces would be ripped, recontoured, and capped with soil a minimum of 6 inches thick. The areas would be seeded (Table 2-7). The final configuration of the South 40 Pit is shown in plan view (Figure 2-8) and in cross section in Figure 2-9. Figure 2-15 is a plan view of final reclamation topography.

Monitoring wells in the pit, no longer needed, would also be abandoned and reclaimed according to state regulations (Figure 2-6). In addition, some roads would be left at closure for future access (Figure 2-15).

TABLE 2-11
Soil Balance Calculations For Existing and Proposed Reclamation
Amendment to Operating Permit 00005 – EA

Area to Strip	Acres	Cubic Yards	Comment
Existing Stockpiles		301,000	21 existing piles
West Pit Expansion	9.8	15,811	Stripping 1 foot from this area
East Pit Extension	1.4	2,259	Stripping 1 foot from this area
North OB Extension	10.1	16,295	Stripping 1 foot from this area
East OB Extension	191.2	308,469	Stripping 1 foot from this area
Johnny Gulch Extension	26.0	41,947	Stripping 1 foot from this area
TOTAL	238.5	685,780	
Area to Cover	**Acres**	**Cubic Yards**	**Comment**
North 40 Pit	15.1	12,181	Placing 6" soil cover over this area
North OB Pile	122.8	99,059	Placing 6" soil cover over this area
North OB Extension	10.1	8,147	Placing 6" soil cover over this area
Northeast OB Pile*	15.3	12,342	Placing 6" soil cover over this area
East OB Pile	123.0	99,220	Placing 6" soil cover over this area
East OB Extension	191.2	154,235	Placing 6" soil cover over this area
South OB Pile	157.6	127,131	Placing 6" soil cover over this area
Johnny Gulch OB Pile Extension**	5.7	4,598	Placing 6" soil cover over this area
Pit Acres	20.5	16,538	Placing 6” soil cover over this area
TOTAL	661.3	533,451	
Excess cubic yards		152,329	22 percent

*40 acres of north portion of East OB Pile have been reclaimed.
**135 acres of Johnny Gulch OB Pile have been reclaimed.

2.3.11.5 Overburden Pile Reclamation

Figure 2-7 identifies the existing overburden disposal areas along with proposed extension footprints. During operations, the slopes of the overburden piles would be constructed to approximately 1.5H:1V or angle of repose (34°). Luzenac would reduce

the slopes after mining to slopes ranging from 2.5H:1V (22°) to approximately 4.0H:1V (14°), depending on the area and requirements to blend in with surrounding topography. Figures 2-12 to 2-15 depict the final reclamation topography of overburden disposal areas in plan and cross-section views.

Benches would be constructed on the reclaimed overburden slope faces as necessary to reduce uninterrupted slope lengths to less than 200 feet. The benches would be approximately 12 feet wide and would slope inward to minimize erosion. Benches and runon/runoff diversion channels would be graded at a maximum of 2 percent to minimize erosion. Armoring would include jute netting and vegetation. The channel sizes would be based upon the area of the contributing watershed and designed to contain a 50-year, 24-hour storm event. Major diversion structures are shown on the site-wide drainage plan Figure 2-6. Dozer gouges and dozer tracking of the slopes would typically be used to break up the surface and minimize erosion, especially on slopes that approach 2.5H:1V. All recontoured surfaces would be capped with soil, a minimum of 6 inches thick, seeded, and if necessary, fertilized to promote plant growth.

The upper flat surface of the overburden disposal areas would be contoured to prevent ponding, maximize surface runoff, and divert runoff from overburden slopes. Drainage would be directed off the top surface into lateral channels adjacent to the overburden disposal areas and would be designed to carry maximum 50-year, 24-hour flows to storm water settling ponds. Because there are no reactive materials in the overburden, Luzenac is proposing to place soil at a minimum depth of 6 inches over the overburden disposal sites. This cap thickness would allow proposed seed mixes a minimal rooting zone and would provide evapotranspiration, resulting in reduced seepage rates through the overburden piles. Reclamation to date on overburden piles has shown this soil depth provides adequate revegetation.

2.3.11.6 Ore Processing and Surface Support Facilities Reclamation

No changes would be required to the reclamation plan for ore processing areas and surface support facilities as a result of the Proposed Action. Once the Ore Sorter is moved midway through the mine life, the old site outside of pit encroachment would be reclaimed. The new site would be reclaimed with other facilities at mine closure.

2.3.11.7 Access and Haul Roads

No changes would be required to the reclamation plan for access and haul roads as a result of the Proposed Action. Luzenac has committed to meeting with DEQ at closure to make a final decision as to which roads would be left open for future work and reclamation monitoring access. Figure 2-11 shows final reclamation topography and 12.2 acres of conceptual access roads that are likely to remain open.

2.3.11.8 Power and Utility Corridors

No changes would be required to the reclamation plan for power and utility corridors as a result of the Proposed Action.

2.3.11.9 Surface Water and Storm Water Drainage and Maintenance

Changes are proposed to the plan for surface water and storm water drainage and maintenance as a result of the Proposed Action. The surface water and storm water control plan would prevent surface water from leaving the Yellowstone Mine site. Plans are just amendments of the 1997 CDM plan approved in 2002.

2.3.11.10 Revegetation

2.3.11.10.1 Soil Placement, Seeding, Fertilizing, and Fencing

No changes in the plans for soil placement, seeding, fertilizing, or fencing would result from the Proposed Action.

2.3.11.10.2 Organic Matter Amendment

Luzenac would place soil with a minimum of 1 percent organic matter content on disturbed areas. Soils analyzed to date on the project site contain 1 to 6 percent organic matter (average 2.5 percent). If the organic matter content remains this high in soils stripped off of the expansion sites, it may preclude the need for use of organic matter amendment. Luzenac would provide recommendations for weed-free organic matter additions, if any were required, to DEQ prior to actual soil placement.

2.3.11.10.3 Reclamation Monitoring

No changes would be required to the plans for reclamation monitoring as a result of the Proposed Action. Luzenac would continue to establish and monitor vegetation test plots to evaluate the success or failure of reclamation on varying aspects of exposure on disturbance areas.

2.3.11.10.4 Concurrent Reclamation

Concurrent reclamation would continue at the Yellowstone Mine throughout the active mine life. Luzenac would commit to starting concurrent reclamation activities as soon as possible after completion of a large enough portion or abandonment of an affected facility.

Cuts and fills associated with new road construction would be seeded to stabilize soil. Cut and fill slopes associated with the Sorter Area would be removed during the pit

layback. Other areas no longer needed for the active mining operation would be reclaimed as soon as possible as part of on-going operations.

Reclaimed overburden disposal sites would be stabilized with vegetation and any excessive rilling or erosion would be corrected to reduce impacts to air and water quality. As the active face moves from year to year, the areas that formed the previous year's upper working surface would become available for reclamation. Placement of soil and subsequent introduction of vegetation on the overburden surfaces would reduce infiltration and increase evapotranspiration from the surface of the site, thereby reducing seepage. Seepage reduction through the disposal area would minimize the risk to water quality of the receiving surface water or groundwater resource. In addition, revegetation would reduce blowing dust on the overburden sites.

2.4.1 AGENCY MODIFICATIONS TO THE PROPOSED ACTION ALTERNATIVE

2.4.1.1 Introduction

The Agency Modifications to the Proposed Action Alternative considered in this EA is based on issues identified by DEQ. Agency Modifications are developed in response to substantive issues and concerns identified during scoping and review of the permit application and are intended to eliminate or minimize potential impacts associated with the Proposed Action.

This section lists and describes recommended Agency Modifications to the Proposed Action. Under this alternative, DEQ would approve Luzenac's proposal as modified by the proposed Agency Modifications.

2.4.1.2 Pit Reclamation

The proposed reclamation of the pit is shown in Figure 2-15. Luzenac would soil and revegetate all safely accessible slopes in the pits that are less than 2H:1V to reduce visual impacts. Overall slope angles of the South 40 Pit highwall in stable dolomitic marble would be left as 30-degree rock faces, as proposed by Luzenac. Luzenac would be required to reduce pit slopes in volcanics by cast blasting or backfilling to 2H:1V. The reduced slopes would be graded, soiled, and revegetated to increase the number of revegetated acres and reduce any potential for continued instability. This would produce a stable pit and eliminate any major failure that could be a threat to public safety and the environment after mining.

2.4.1.3 Water Quality

2.4.1.3.1 Overburden Pile Drainage Systems

All drainage systems would be modified to function more naturally using fluvial geomorphic principles. The channels would be constructed around, and as lined and

armored (if needed) channels over, the surface of the existing and proposed expansion of the overburden piles. The drainage systems would provide for controlled surface water flow during storm events or when the ground is frozen and provide habitat similar to that associated with natural ephemeral drainages. The drainage systems would be accessible to maintenance and repair of damage from storm water impacts. The drainage systems would be constructed in addition to the continued use of the existing underdrain and the proposed underdrain extension beneath the overburden piles. The runoff from lined surface water channels would minimize seepage through the overburden piles and enhance plant and wildlife habitat on the reclaimed overburden piles.

Luzenac would be required to regrade all OB pile slopes in a dendritic pattern without benches to reduce the engineered appearance and produce a more natural looking drainage system and slopes as viewed from U.S. Highway 287. The crest elevation of the overburden piles would be varied at closure to create a more natural looking topography. Present closure grading of the overburden piles calls for a flat top. This surface should be regraded to provide irregular topography and break up the linear character of the surface.

2.4.1.3.2 Sediment Pond at Toe of East OB Pile

A sediment pond would be installed below the ultimate toe of the East OB Pile to produce a contingency for collecting underdrain seepage if nitrate (measured as nitrate + nitrite) exceeds 7.5 mg/l. The pond could be used to collect sediment and seepage emanating from the toe of the East OB Pile. Sediment could be excavated and disposed of onsite, and seepage could be collected for sampling and storage prior to discharge, infiltration, or treatment in a LAD system if necessary at some point in the future.

2.4.1.3.3 Reclamation of Lowland Catchment Basins

Lowland catchment basins that collect seasonal runoff water from drainages D-1 and D-2 near the North OB Pile would be left at closure (Figure 2-6). Nitrate in water routed into these basins would be attenuated by vegetation growing in the pond area. The catchment basins should be constructed to provide seasonal water supply and habitat for upland wildlife.

2.4.1.3.4 LAD Pond for Underdrain Seepage and LAD Trigger Value

Luzenac would be required to initiate LAD of underdrain seepage if nitrate exceeds 7.5 mg/l. Luzenac would also build a lined storage pond on an OB pile to store underdrain seepage during the winter until it can be land applied. This would ensure that the groundwater quality standard would not be exceeded.

2.4.1.4 Visuals

The two stipulations discussed below in Sections 2.5.1.1 and 2.5.1.2 address visual mitigations to the Proposed Action.

2.5 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER STUDY

Two alternatives were considered during the amendment review process. These alternatives included complete pit backfilling and alternative overburden disposal site locations. Luzenac reviewed and discussed these alternatives in the Amendment application (Luzenac, 2003). These alternatives are discussed below as alternatives considered for this EA but eliminated from further study.

2.5.1 PIT BACKFILLING

DEQ evaluated pit backfilling alternatives to comply with MMRA requirements for reclamation of open pits.
Subsection 82-4-336(9) of MMRA provides that:

> "(c) The use of backfilling as a reclamation measure is neither required nor prohibited in all cases. A department decision to require any backfill measure must be based on whether and to what extent the backfilling is appropriate under the site-specific circumstances and conditions in order to achieve the standards described in subsection (9)(b)."

Subsection 82-4-336(9)(b) provides that the highwall and pit must be reclaimed to a condition:

> (i) of stability structurally competent to withstand geologic and climatic conditions without significant failure that would be a threat to public safety and the environment;
> (ii) that affords some utility to humans or the environment;
> (iii) that mitigates post-reclamation visual contrasts between reclamation lands and adjacent lands; and,
> (iv) that mitigates or prevents undesirable offsite environmental impacts.

2.5.1.1 Pit Stability

Luzenac has backfilled pits with overburden during past operations. These pits include the North 40, Cadillac, South Main, and part of the Montana Talc pits (Figure 2-4). In total, some 25 acres of open pit have been backfilled (Table 2-9). Backfilling of the open pits reduces the volume in the overburden disposal piles and would increase the amount of wildlife habitat.

Luzenac proposes to expand the pits from 169.4 acres to 180.6 acres. Luzenac does not propose to backfill the expanded South 40 and North Main pits because of potential mineable resources.

Luzenac reviewed South 40 Pit stability and completed a study to address unstable conditions on the east pit highwall near the Ore Sorter (Call and Nicholas, 1999). Call and Nicholas made three recommendations to enhance pit highwall stability in this area. Luzenac has committed to implementing these recommendations in the development of the expanded South 40 Pit for all areas of the pit. The Ore Sorter would be relocated to avoid any potential highwall failure during operations.

The proposed reclamation of the pit is shown in Figure 2-15. Overall slope angles of the South 40 Pit highwall in stable dolomitic marble would be left as 30-degree rock faces, as recommended. DEQ would stipulate that pit slopes in volcanics would be cast blasted to reduce slopes to 2H:1V. The volcanic slopes would be soiled and revegetated to increase the number of revegetated acres and reduce any potential for continued instability. This would promote stability and protection against a major failure that would be a threat to public safety and the environment.

2.5.1.2 Pit Utility

Luzenac has proposed to reclaim the mine pits. Out of 180.6 acres, 20.5 acres would be soiled and revegetated. In the South 40 Pit, Luzenac proposes to reclaim 152.9 acres to rock faces and 12.9 acres to talus slopes (Figure 2-15).

Luzenac would be required to soil and revegetate any safely accessible slopes less than 2H:1V rather than the proposed 2.5H:1V. Luzenac would also be required to reduce volcanic slopes in the pit to 2H:1V. This would increase the number of revegetated acres in the pit.

DEQ believes these measures would increase the revegetated acres by at least 10 percent. This would afford some utility to humans and the environment after mining.

2.5.1.3 Pit Visual Contrast

The two stipulations described in Section 2.5.1.1 and 2.5.1.2 would mitigate the visual contrast of reclaimed pits with adjacent lands

2.5.1.4 Potential Offsite Environmental Impacts

Pit stability was addressed in Section 2.5.1.1. No offsite impacts are anticipated from the reclaimed pit.

2.5.1.5 Other Considerations

Backfilling the expanded South 40 Pit would limit future talc resource accessibility, may affect groundwater quality, and have potential economic impacts on future mining. Concurrent backfill of the South 40 Pit would reduce the proposed mine life substantially. Backfilling at closure would increase the cost of future mining by increasing the overburden to ore strip ratio. It would take 136 million cubic yards to backfill the South 40 and North Main pits.

Talc ore reserves lie along mineralized structures to the northeast of the existing pit area; and the ore is expected to occur over elevation ranges similar to those mined in the past as well as deeper. Just as enlarging the pits for this proposed mine expansion requires laying back the sides of the pit in order to go deeper, the same would apply to developing future ore reserves. The overburden material used for backfill would need to be removed before mining could begin again. Only about 62.5 percent of the volume of rock would fit back in the pit.

The main risk to water quality at the Yellowstone Mine site is from nitrate leaching from mined overburden material into groundwater. Nitrates are derived from explosive residue left on mined overburden and pit highwalls. Elevated nitrate is already observed in groundwater beneath the pit at levels of about 3 to 4 mg/l, which is below the standard of 10 mg/l. Backfilling the pits would place nitrate-bearing rock back into the pit where nitrate could be leached by water infiltrating the backfill material and transported to the underlying groundwater system, where it could migrate as a contaminated plume down gradient of the pit. Nitrates would flush out of the backfill over a period of years, and nitrate concentrations could exceed groundwater standards. Once nitrate has migrated to the groundwater system, it would be difficult to remove without an extensive pumping and treatment system. Keeping the overburden in piles enhances seepage collection in the underdrain system.

The advantage to land use that would result from backfilling the pits would be that 180.6 acres currently occupied by the pits would be returned to use as wildlife habitat, rather than 20.5 acres. Because Luzenac privately owns this land, Luzenac only allows domestic livestock grazing to occur at its own discretion. Wildlife could also use this reclaimed rangeland after mine closure, but rangeland for wildlife use is common in the Yellowstone Mine area. A 7,076-acre wildlife management area occurs adjacent to the mine property (Figure 2-2).

2.5.2 ALTERNATIVE OB PILE LOCATIONS

Luzenac evaluated several potential overburden disposal site alternatives that might be used at the Yellowstone Mine site (Luzenac, 2003: Appendix A). One alternative was backfilling the pits as described above, which was dismissed.

The future mining of 17 million tons of talc ore would generate approximately 127 million tons of dolomite overburden that would need to be placed in overburden disposal areas.

Three alternatives were reviewed. Each of the three alternatives has three overburden disposal areas in common. These include the East OB Pile Extension, North OB Pile Extension, and the Johnny Gulch OB Pile Extension (Table 2-13; Luzenac, 2003: Appendix A). The alternatives vary in the siting of various satellite overburden disposal areas. These satellite areas include the North Lift Extension #2, MTC South Extension, and the MTC South Lift (Luzenac, 2003: Appendix A figures).

The criteria used to compare overburden disposal area alternatives are presented below. The alternatives are numbered from most favorable to least favorable (Alternative #1 to Alternative #3) based on the analysis presented. The three overburden disposal areas common to all of the alternatives were not analyzed separately in this comparison because their combined storage capacity is required to meet the minimum overburden disposal needs. The analysis required that each alternative reviewed had to meet the minimum storage requirement (127 million tons), and the overburden storage site had to lie on ground owned or controlled by Luzenac.

- Area of New Disturbance: This criterion considers the amount of newly disturbed ground required by the alternative, and does not include reclaimed surfaces with unreleased bond or existing public roads. It does not consider existing disturbances. A difference of 4 acres between Alternative #1 and #2 makes these two very similar (Table 2-13).

- Storage Efficiency: This is a calculated value that compares the alternatives by the number of cubic yards of overburden that can be stored for each new acre of ground disturbance. Alternative #1 would have the highest storage efficiency.

- Haul Economics: The horizontal and vertical distances from the pit exit to each dump centroid, plus the tonnage capacity in each dump, were used to compute a weighted average of slope distance and grade for each alternative. The product of grade and slope distance was used to indicate the relative economics of each alternative. Alternative #2 would have the best economics, followed by Alternative #1.

- Air Quality Impacts: The haul distance for each alternative was used to rank potential impacts to air quality because road length is proportional to the amount of dust created by haul trucks. This alternative analysis assumes that dust prevention mitigations are applied equally to each roadway. Alternative #3 would have the lowest impact followed by Alternative #1.

- Energy Impacts: This criterion evaluates the relative efficiency of hauling wastes to the various alternative sites in terms of energy consumption. Alternative #2 would have the lowest energy consumption, followed by Alternative #1.

- Reclamation Surface Area: The total surface area of the various overburden storage areas was computed for each alternative. All three alternatives would be similar in area, with Alternative #2 the lowest followed by Alternative #1.

- Visual Impacts: Since all three alternatives include the large East OB Pile in Johnny Gulch, which has the most important visual impact, there would be no major difference in visual impact between the alternatives evaluated.

- Water Quality Impacts: Surface runoff, runon, and infiltration are known to increase or decrease as a function of overall surface area. Therefore, for this criterion, overburden disposal surface area is used as a measure of potential relative impacts to water quality. Little if any impact to water quality is likely, however, except from nitrate.

- Access to Future Talc Resources: This criterion evaluates the potential for overburden placement to limit access to future mineral resources. Alternative #1 would have the lowest impact. The other two alternatives both include the North Lift Extension #2, which would place overburden over the area of projected strike extension of structures known to control talc mineralization.

- Wildlife Impacts: This criterion evaluates the impacts of overburden placement to areas known to have the most wildlife use. Alternative #1 would have the lowest relative impact. The other two alternatives would have overburden piles located in areas with more wildlife use. These locations include the North Lift Extension #2 (Alternatives #2 and #3), and the MTC South Extension and MTC South Lift to the Johnny Gulch OB Pile (Alternative #3).

Table 2-13 evaluates the criteria by alternative. Based on this analysis, Luzenac chose Alternative #1 for the location of overburden storage areas for the amendment to its Operating Permit 00005.

Table 2-13
Overburden Storage Alternatives Comparison
Amendment to Operating Permit 00005 – EA

	Common Locations[1]	Satellite Locations only			
Criteria	East OB Pile Extension, North OB Pile Extension, Johnny Gulch OB Pile Extension	Alternative #1	Alternative #2	Alternative #3	Comments
Area of New Disturbance (acres)	225	65	61	94	New disturbance acreage only.
Volume (lcy)	76,438,264	11,624,287	10,346,208	13,397,566	Loose cubic yards of overburden storage
Storage Efficiency (cy/acre)	339,726	178,835	169,610	142,527	Per total footprint
Storage (tons)	119,657,588	7,427,659	6,610,995	8,560,745	Each alternative meets minimum storage required
Haul Economics Avg weighted grade (%) Avg weighted haul dist (ft) Product of grade and distance		 3.5% 4004 140	 3.3% 4017 131	 3.6% 3947 144	
Air Quality Impacts		Moderate	Highest	Lowest	Based on haul distance
Energy Impacts		Moderate	Lowest	Highest	Based on grade and haul distance
Reclamation Surface Area (acres)		432	420	439	Includes common dump locations

Table 2-13 (continued) Overburden Storage Alternatives Comparison *Amendment to Operating Permit 00005 – EA*					
	Common Locations[1]	Satellite Locations only			
Criteria	East OB Pile Extension, North OB Pile Extension, Johnny Gulch OB Pile Extension	Alternative #1	Alternative #2	Alternative #3	Comments
Visual Impacts		Moderate	Lowest	Highest	Based on reclamation surface areas
Water Quality Impacts		Moderate	Lowest	Highest	Based on reclamation surface areas
Access to Future Talc Resources		Lowest	Moderate	Moderate	North Lift Extension #2 covers projection of ore
Wildlife Impacts		Lowest	Moderate	Highest	North Lift Extension #2, MTC South Extension, and MTC South Lift would have negative impacts to wildlife

[1]Since the East OB Pile Extension, North OB Pile Extension, and Johnny Gulch OB Pile Extension are common in all three alternatives, the comparison includes the satellite locations only. See Figure 2-7 for the common OB pile locations. See Luzenac, 2003, Appendix A for satellite OB pile locations.

CHAPTER 3
AFFECTED ENVIRONMENT

3.1 INTRODUCTION

Chapter 3 describes resources that could be affected by the Proposed Action. Other resources that either would not be affected by the Proposed Action or are not present in the Yellowstone Mine area are dismissed in Section 1.5.2.

3.2 POTENTIALLY AFFECTED RESOURCES

The Proposed Action could affect socioeconomics, pit reclamation, water quality, and visuals.

3.2.1 SOCIOECONOMIC RESOURCES

Current employment and taxes paid by Luzenac are described in Section 2.2.10.

3.2.2 PIT RECLAMATION

The approved pit reclamation plan is described in Section 2.2.11 especially Section 2.2.11.4.

3.2.3 WATER QUALITY

The Yellowstone Mine is located in the Johnny Gulch drainage. Johnny Gulch is a west- to east-trending drainage basin on the east flank of the Gravelly Range. Johnny Gulch flows year round upstream of a point about one mile above the Yellowstone Mine site. Downstream of this location, where the stream channel flows over dolomite, the stream is ephemeral (flows only in response to major rain events and snowmelt). This flow condition is typical of many mountain streams where the source of stream flow occurs at the higher elevations from snowmelt and springs/seeps, with flow declining at lower elevations where the water infiltrates into a greater thickness of alluvium in the valley bottom or on a bedrock contact of dolomite or limestone.

Flow in Johnny Gulch was monitored in two flumes located upstream and downstream of the mine site as part of baseline studies in 1981 and part of 1982. At the upper flume, flow occurred during the entire period of record, ranging from 250 gpm in May-June to 50 gpm in August-September. At the lower flume, the highest flow recorded was 60 gpm in May, with no flow occurring from July through November. In 1999, two weirs were installed for water quality monitoring purposes, one upstream and another downstream of the mine site. Neither weir sampling site reported any large amount of water quality or flow data because of a lack of flow.

Quality of surface water in the Yellowstone Mine area has been characterized by samples collected and analyzed from various locations along Johnny Gulch and from several ponds in the project area. The latter include two ponds located along Johnny Gulch above the mine site and five ponds located downstream of the mine site (Figure 2.3). Luzenac holds an MPDES permit for mine dewatering effluent at Outfall 001 prior to mixing with natural water in the Johnny Gulch pond and discharge from the last sedimentation pond in Johnny Gulch at Outfall 002 (Figure 2-6) prior to leaving the eastern property boundary. All surface water within the permit area reports to Johnny Gulch. In addition, infiltration through the OB piles reports to Johnny Gulch upgradient of the rock drain outlet and sediment ponds.

Surface water in Johnny Gulch is a calcium bicarbonate, non-saline type water with neutral pH and low concentrations of metals. Elevated nitrate levels have been detected in samples from lower Johnny Gulch, especially from the rock drain that transports water beneath the East OB Pile. Nitrate concentrations generally decrease from the rock drain site to the sedimentation pond located downstream of the rock drain. The rock drain outlet and the downgradient ponds provide a central site to which all surface and underdrain water reports. In the unlikely event that elevated nitrate concentrations exceeding the standards occur in surface water, this site can provide a central collection point at which waters could be collected and treated if necessary. Surface water quality data are summarized in Table 3-1.

Water that collects in the North Main Pit from a seep (Figure 2-6) has been periodically sampled and analyzed. Typical concentrations of selected parameters measured in water samples from the mine pit during the period 1992 to 2000 are presented in Table 3-1. A complete set of available surface water quality data was presented in Appendix J of the permit amendment document (Luzenac, 2003).

TABLE 3-1
Surface Water Quality
Amendment to Operating Permit 00005 – EA

Location	Date	TDS mg/l	pH s.u.	Nitrate+ Nitrite mg/l	Nitrate mg/l	Ammonia mg/l	Nitrite mg/l	TSS mg/l
Upper Johnny Gulch	1981	261	7.8	<0.05	--	--	--	9
	2000	87	7.8	1.43	--	<0.1	<0.05	10
Lower Johnny Gulch Rock Drain	1/97	--	--	5.65	--	--	--	--
	3/98	--	--	5.16	--	--	--	--
	5/98	--	--	1.25	--	--	--	--
	6/99	--	--	1.46	--	--	--	--
	2000	306	8.0	10.1 rerun = 7.0	--	<0.1	<0.05	<10
	4/2002	--	8.2	6.91	--	--	--	28
North Main Pit Seep	1992	239	8.0	3.76	--	--	--	<10
North Main Pit Seep	2000	304	8.3	6.37	--	--	--	11
South 40 Pit Seep	6/98	--	8.1	4.74	--	--	--	--
	8/02	--	8.2	3.24	--	--	--	--

Surface water sampled at the lower Johnny Gulch rock drain within the permit area has nitrate concentrations that are higher than surface water sampled at the upper Johnny Gulch station. Nitrate concentrations have not exceeded drinking water standards with exception of the lower Johnny Gulch rock drain station yielding a concentration of 10.1 mg/l in the year 2000. A repeat of this sample provided an analytical result of 7.0 mg/l.

There is little near-surface groundwater in the vicinity of the Yellowstone Mine, and no important porous aquifer has been identified. The occurrence and distribution of near-

surface groundwater in this area is controlled by the local geology. Alluvium derived from weathering of volcanic rock along Johnny Gulch and the small ephemeral tributary in T. 9 S., R. 1 W., Section 9, comprises the uppermost aquifer and is known to locally contain groundwater in small quantities. Surface water from Johnny Gulch seeps into the volcanic-rich alluvium and is locally perched upon underlying impermeable volcanic clay layers. Most deeper bedrock-hosted groundwater is contained in fracture and fault systems associated with altered Precambrian dolomitic marble.

TABLE 3-2
Groundwater Monitoring Locations
Amendment to Operating Permit 00005 – EA

Well Name	Location (T9S, R1W)	Completion Date	Well Depth (ft)	Screen Interval (ft)	Depth to Water (ft)	Water Elev. (ft)	Lithology
Maintenance Well (SW-1)	Sec. 34	4/82	277	217 – 277	161	5635	Bedrock
Maintenance Water Tank (SW-2)	Sec. 34	1980	190	Not Reported	135	5655	Bedrock
Water Barn	Sec. 9	8/93	460	350 – 450	207	6145	Bedrock
99-14 (S. 40 Pit PW-1)	Sec. 4	7/99	640	615 – 635	488	5490	Talc & Dolomite
2001-01 (North Main Pit)	Sec. 4	5/01	420	380 – 400	402	5468	Dolomite
2001-02 (Land Bridge)	Sec. 9	5/01	745	705 – 745	513	5691	Metamorphic
JG-1 (Johnny Gulch MW-1)	Sec. 3	9/00	120	77 – 97	Dry	<5734	Alluvium
JG-2 (Johnny Gulch MW-2)	Sec. 3	9/00	300	255 – 295	211	5646	Metamorphic

Note: See Figure 2-6 for well locations.

To the northeast of the mine site, dolomitic marble is in contact with alluvium in the Madison River Valley. The elevation of the water table in dolomitic marble near the mine pits is about 5,470 to 5,490 feet based on data from two monitoring wells (99-14 and 2001-01) located in the pits (Figure 2-6 and Table 3-2). The elevation of the Madison River near the mine site is about 5,445 feet. Assuming that the elevation of

groundwater intersects the elevation of the Madison River, the difference in elevation between the river level and groundwater at the mine site is about 25 to 45 feet, resulting in a relatively flat water table gradient of approximately 0.2 percent (lateral distance of about 3.8 miles between river and mine pits). This suggests that a hydrologic connection may exist between groundwater in dolomitic marble at the mine site and water in the Madison River valley bottom.

Exploration drilling in both the North Main and South 40 pits has failed to intercept a definitive groundwater table. A monitoring well (Well 99-14) constructed in the South 40 Pit established a water elevation of 5,490 feet. In the North Main Pit, monitoring well 2001-01 has a static water elevation of 5,468 feet. That is approximately 20 feet lower than groundwater in Well 99-14. A review of water levels measured by the Montana Bureau of Mines and Geology over the past 10 years in three bedrock wells located in the Madison River Valley shows that water table fluctuations during the period were a maximum of about 10 feet (MBMG Groundwater Information Center website). Completion data for groundwater monitoring wells are presented in the permit amendment document (Luzenac, 2003).

During a pumping test of Well 99-14 (South 40 Pit Area) in December 2000, a water sample was collected and submitted for laboratory analysis of common ions, nutrients, and metals (Table 3-3). Results show water with a near-neutral pH (7.3 standard units), total dissolved solids (TDS) of 250 mg/l, hardness of 186 mg/l, sulfate at 60 mg/l, total suspended solids of 406 mg/l, and turbidity of 195 nephelometric turbidity units (NTU). With respect to nutrients, the nitrate + nitrite concentration was 2.94 mg/l and total nitrogen was 3.5 mg/l. The total nitrogen is elevated and appears to indicate ammonium nitrate, which is a blasting residue.

A water sample collected from Well 2001-01 in July 2001 indicates that groundwater beneath the North Main Pit is similar to water in the South 40 Pit area. This water is characterized by an alkaline pH (7.8 standard units), TDS of 228 mg/l, and comparatively higher hardness (512 mg/l) and lower sulfate (15 mg/l) concentrations than from Well 99-14. Concentrations of nitrate + nitrite (2.42 mg/l) and total nitrogen (3.0 mg/l) are similar to Well 99-14 (Table 3-3). The total nitrogen is elevated and appears to indicate ammonium nitrate.

Water quality data for metals have been collected from Wells 99-14, 2001-01, 2001-02, and JG-2 at the Yellowstone Mine site. Tabulated data for all metals from 2001 and 2002 are presented in Appendix J of the permit amendment document (Luzenac, 2003). Primary maximum contaminant levels (MCLs) were not exceeded, with one exception. One sample from well JG-2 collected during 2001 had a zinc value of 4.14 mg/l, which exceeds the primary MCL and human health standards as specified in Montana's Numeric Water Quality Standards (DEQ, 2004). All other zinc concentrations were in the range of 0.08 to 0.12 mg/l in samples collected from the wells. It is not known if the well JG-2 zinc concentration was an analytical error. Secondary MCLs were exceeded

Table 3-3
Groundwater Quality Data from the Pit Area
Amendment to Operating Permit 00005 – EA

	South 40 Pit Well 99-14	North Main Pit Well 2001-01	South 40 Pit Groundwater Seep	South 40 Pit Groundwater Seep	South 40 Pit Groundwater Seep
	December 2000*	July 2001**	March 1998	April 2000***	April 2002
pH (standard units)	7.3	7.8	7.9	8.0	8.3
TDS (mg/l)	250	228		262	
Hardness (mg/l)	186	512			
Sulfate (mg/l)	60	15			
TSS (mg/l)	406			<10	
Turbidity (NTU)	195				
Nitrate+nitrite (mg/l)	2.94	2.42	3.61	4.14	3.21
Ammonia (mg/l)				<0.1	
Nitrite (mg/l)				<0.05	
Nitrogen (mg/l)	3.5	3.0			
Aluminum (mg/l)	4.4	14.8	0.2		
Arsenic (mg/l)		0.011	0.004		
Barium (mg/l)		0.20	0.11		
Beryllium (mg/l)		0.001	<0.001		
Cadmium (mg/l)		0.0005	<0.0001		
Chromium (mg/l)	0.009	0.016	<0.001		
Copper (mg/l)	0.042	0.169	0.02		
Iron (mg/l)	28.2	23.9	0.12		
Lead (mg/l)		0.014	<0.003		
Manganese (mg/l)	0.97	3.32	0.02		
Molybdenum (mg/l)		0.007			
Nickel (mg/l)		0.03			
Zinc (mg/l)	0.08	0.12	0.02		

*All other metals analyzed (antimony, arsenic, barium, beryllium, boron, cadmium, lead, lithium, mercury, molybdenum, nickel, selenium, silver, and thallium) were below laboratory detection limits
** All other metals analyzed (antimony, boron, lithium, mercury, selenium, silver, and thallium) were below laboratory detection limits.

*** Other samples collected from the mine pit bottom show similar quality characteristics, including low or non-detectable concentrations of metals.

for iron and manganese in all samples (Luzenac, 2003: Appendix J). Secondary standards are based on aesthetic properties only and not on risk to human health.

Shallow perched groundwater has been intercepted by the South 40 Pit (old Montana Talc Pit seep) as a seep in the pit highwall at the contact of a clay zone that was formed from alteration of volcanics. Total steady-state flow rate from the seep is 1 to 2 gpm or less. This water typically collects in one or more small depressions in the pit bottom and either evaporates or infiltrates. Samples of this water have been collected and analyzed several times between 1992 and 2002. Analytical results of the most recent sample collected from the seep (April 2002) had a pH of 8.3 and a nitrate + nitrite concentration of 3.21 mg/l. A sample collected in April 2000 showed the following analytical results: TDS was 262 mg/l; pH was 8.0 standard units; nitrate + nitrite was 4.14 mg/l; ammonia was <0.1 mg/l; nitrite was <0.05 mg/l; and TSS was <10 mg/l (Table 3-3). Other samples collected from the North Main Pit bottom show similar water quality characteristics for pH and nitrate + nitrite (Table 3-1).

Groundwater quality data indicate that, with the exception of one zinc analysis for one event and iron and manganese secondary MCLs, no other groundwater quality standards are exceeded by groundwater in the vicinity of historic and active workings in the Yellowstone Mine. Nitrate + nitrite levels are elevated in groundwater beneath the South 40 and North Main Pits at levels between about 3 and 4.14 mg/l, again below the water quality standards.

An aquifer test was conducted at Well 99-14 in 2000, to estimate several hydraulic properties of the aquifer: (1) transmissivity or hydraulic conductivity; (2) rate of water level decline and recovery during pumping; and (3) final elevation of static water level after the test relative to the pretest static level. The well was initially pumped at a rate of 32 gpm; however, the water level declined about 100 feet in the first 6 minutes, and the pumping rate declined rapidly. Therefore, another test was conducted at a rate ranging from about 3 to 6 gpm for a total period of 40 minutes.

Using an average pumping rate of 4 gpm for the second pumping period of 40 minutes, a transmissivity range of about 3 to 7 feet^2/day was calculated, with a resultant hydraulic conductivity range of 0.1 to 0.3 feet/day. These values are representative of the talc because Well 99-14 is perforated primarily in the talc zone. Based on the rapid draw down rate during the first pumping period (i.e., average of about 17 feet/minute), it is evident that overall permeability is low. The water level in Well 99-14 recovered to its initial static position within a day, indicating that the pretest water level is representative of the local water table surface in the carbonate/talc ore zone.

The Yellowstone Mine has water rights for groundwater use (Luzenac, 2002: Appendix 2.2.2.1). The water is appropriated for sorting, dust control, potable water system, and fugitive dust emissions.

3.2.4 VISUALS

The Yellowstone Mine is located on a terrace in the foothills of the Gravelly Range in a sparsely populated segment of the Madison River Valley. Line-of-sight distance between the mine and Highway 287 is approximately 3 miles at the closest point. Mine overburden storage sites, particularly the East OB Pile, can be distinguished from the surrounding grass-covered hillsides because the overburden storage areas are lighter colored. This color difference is less distinct in the late summer, fall, and winter, when the grasses are dormant.

When traveling south on U.S. Highway 287, the mine site is first visible approximately 1.5 miles north of the mine access road. The mine can be seen from there to a point approximately 2 miles south of the access road. To the north and south of that 3.5-mile segment of highway, the mine cannot be seen because other natural topographic features block it. The closest view of the Yellowstone Mine area that is most heavily traveled by the public is the view seen from U.S. Highway 287, approximately 3 miles to the east (see key observation point (KOP1) in Figure 1-1 and Figure 4-1, upper). There are no destination communities located along this section of the highway. There are rural residential subdivisions in the area. Visuals have not been a major issue. The mine is visible from the Johnny Gulch Road.

CHAPTER 4
CONSEQUENCES OF PROPOSED ACTION AND ALTERNATIVES

Consequences of the No Action Alternative, Proposed Action, and the Agency Modifications of the Proposed Action Alternative are identified, described, and analyzed in this chapter. Mitigation measures addressing the Proposed Action have been identified by DEQ in Section 2.4 for the potentially impacted resources described in this chapter.

The permit area would be expanded by 490 acres from 1,458 to 1,948 acres. The South 40 Pit would only increase by about 56 acres; however, much of that expansion would occur on previously disturbed ground (overburden piles) such that the disturbed area of the pit would expand by about 11 acres from 170 to 181 acres (Figure 2-7 and Table 2-9). Figure 2-7 shows the area and Figure 2-9 shows the cross section of the proposed pit expansion. Pit expansion would require the relocation of the ore processing facility about midway through the extended mine life. This facility would be relocated along the existing powerline on undisturbed ground within the existing permit area (Figure 2-7). This proposed ore processing area would cover approximately 25 acres.

The Proposed Action also includes expanding the existing East OB Pile down Johnny Gulch and adding lifts to the existing Johnny Gulch, North, and East OB piles. Areas of proposed extensions to overburden piles are shown by horizontal red hatching on Figure 2-7. OB piles would increase by a total of about 223 acres from 533 to 756 acres. Overall, over the next 50 years, the total amount of disturbed ground would increase by 271.3 acres, from 728.5 to 999.8 acres. All existing and proposed disturbance would be reclaimed under the reclamation plan discussed in Section 2.3.11.

4.1 SOCIOECONOMICS

4.1.1 NO ACTION ALTERNATIVE

Existing employment and taxes paid by Luzenac are described in Section 2.3.10. Negative impacts under the No Action Alternative would include increased unemployment, reduced wages spent in the local economy, decreased revenues to local and state jurisdictions, increased stress on public assistance programs, and decreased quality-of-life of some residents. None of these things would change for at least 8 years.

4.1.2 PROPOSED ACTION ALTERNATIVE

Impacts to socioeconomic resources occur if a large number of workers and their families move into an area as a result of jobs either directly or indirectly created by mine development and operations.

Luzenac anticipates no increase in the mine-related work force or secondary jobs with suppliers of material or services to result from the Proposed Action. The Proposed Action would continue to provide employment in the mining industry and secondary jobs in retail and service sectors. Payment of property and net proceeds taxes to state and local jurisdictions would continue for up to another 50 years.

4.1.3 AGENCY MODIFICATIONS TO THE PROPOSED ACTION ALTERNATIVE

No modifications to the Proposed Action are required.

4.2 PIT RECLAMATION

4.2.1 NO ACTION ALTERNATIVE

Luzenac has backfilled pits with overburden during past operations. These pits include the North 40, Cadillac, South Main, and part of the Montana Talc pits (Figure 2-4). In total, some 25 acres of open pit have been backfilled (Table 2-9). Backfilling of the open pits reduces the volume of the overburden piles and increases wildlife habitat.

The operational pit highwall design for the shallow, near-surface volcanic units in the South 40 Pit accommodates the lower strength of certain ash and clay layers that are part of the volcanic sequence. The pit highwall stability study described in Section 2.5.1.1 concluded that based on the available data, the risk of a large-scale pit slope failure appeared to be low (Call and Nicholas, 1999).

A conventional slope stability analysis was also conducted for the upper slope pit highwalls comprised of the volcanic units (Call and Nicholas, 1999). Call and Nicholas recommended taking steps to reduce the potential for a progressive series of minor failures that could develop near the crest of the pit. Each of these three recommendations by Call and Nicholas has been and would continue to be employed in pit highwall development in the east highwall area of the South 40 Pit.

The risk of an overall slope failure developing from the bottom of the pit through the talc and dolomite, and undercutting the volcanics at the top of the slope, is low. The scope of the Call and Nicholas study focused on the stability of the ground in the vicinity of the Ore Sorter and the adjacent pit slopes along the east highwall. Call and Nicholas recommend maximum 30-degree slope angles for highwalls composed of talc on the east side of the pit. In spite of the limited area proposed for application of this design criterion, their recommendations have been applied consistently for all areas and for all pit slopes in the existing mining design. Reclamation of the pit would be as described in Section 2.11, especially Section 2.2.11.4.

There is little potential risk to human life and infrastructure. Call and Nicholas concluded that there was no indication that the mine is at risk for an overall pit slope failure.

4.2.2 PROPOSED ACTION

Luzenac proposes to expand the pits from 169.4 acres to 180.6 acres. Luzenac does not propose to backfill the expanded South 40 and North Main pits because of potential mineable resources at greater depth.

Luzenac has proposed to reclaim the mine pits. Of the 180.6 acres, 20.5 acres would be soiled and revegetated. In the South 40 Pit, Luzenac proposes to reclaim 152.9 acres to rock faces and 12.9 acres to talus slopes.

The recommendations of Call and Nicholas would be applied to the mine design for the Proposed Action (Figures 4-1 and 4-2). Deepening the pit by 200 feet, as in the Proposed Action, should not affect operational stability as long as the same design criteria continue to be employed, which Luzenac has proposed to do. However, Luzenac has not proposed to modify the approved pit reclamation plan to enhance pit reclamation and improve long-term stability of the volcanic units.

4.2.3 AGENCY MODIFICATIONS TO THE PROPOSED ACTION ALTERNATIVE

To increase the amount of pit reclamation, Luzenac would soil and revegetate all safely accessible slopes in the pits that are less than 2H:1V to reduce visual impacts. Overall slope angles of the South 40 Pit highwall in stable dolomitic marble would be left as 30-degree rock faces, as proposed by Luzenac. Luzenac would be required to reduce pit slopes in volcanics by cast blasting or backfilling to 2H:1V (Figure 4-2). The reduced slopes would be graded, soiled, and revegetated to increase the number of revegetated acres and reduce any potential for continued instability of the volcanic slopes. This would promote stability and protection against a major failure that could be a threat to public safety and the environment after mining. This would increase the number of revegetated acres in the pit. DEQ believes this measure would increase the revegetated acres by at least 10 percent. This would afford some utility to humans and the environment after mining.

4.3 WATER QUALITY

4.3.1 NO ACTION ALTERNATIVE

The Yellowstone Mine is located in an area of ephemeral drainages. These drainages are tributary to Johnny Gulch. In addition, these drainages, including Johnny Gulch, flow only as a result of major precipitation events or snow melt, which produces sufficient water to accumulate and flow down the relatively small channels. Surface water flow, when it occurs, exits the Johnny Gulch underdrain system and collects in a series of ponds located downstream of the East OB Pile in Johnny Gulch. Water from these ponds infiltrates, and there is no flow of surface water from the Yellowstone Mine site.

Elevated nitrate levels in surface water and groundwater resources have been associated with past mining activity at the Yellowstone Mine (Section 3.2.3). Nitrogen-bearing compounds are residues from explosive materials used in blasting from the mining of ore and waste. The residues are found on the pit highwalls and on the surfaces of overburden material. They can be concentrated in seepage through overburden piles into receiving surface water or groundwater. Water that comes in contact with either overburden material or rock exposed in the open pit(s) could also contain nitrate levels elevated above background levels.

Impacts to water quality are compared with the State of Montana's Numeric Water Quality Standards (Circular WQB-7, January 2004). Surface water sampled at the Lower Johnny Gulch Rock Drain within the permit area has nitrate concentrations that are higher than surface water sampled in Johnny Gulch upstream of mine site. Nitrate concentrations in the Lower Johnny Gulch Rock Drain have not exceeded drinking water standards, with the exception of one event in 2000. A laboratory rerun of this sample indicated a concentration below the standard (Table 3-6).

Surface water that has come in contact with mine overburden or pit highwalls does not leave the permit area. Concentrations of regulated constituents above pertinent standards have not been observed in association with past mining of the Yellowstone Mine talc deposits.

The North Mine Pit Seep has also been sampled, and nitrate concentrations have not exceeded drinking water standards. Perched and deep groundwater monitoring in the area of the South 40 and North Main pits indicates the occurrence of nitrate in groundwater, although these concentrations also have not exceeded the drinking water standard of 10 mg/l.

Under the No Action Alternative, the amendment would not be approved. Ore and overburden mining would continue for approximately the next 8 years at the same rate as currently permitted under Operating Permit 00005. Water would continue to infiltrate through existing pit highwalls and benches and through overburden materials and produce seepage that reports to the Johnny Gulch underdrain or infiltrates into bedrock. Monitoring of groundwater quality would continue. When the mining permitted under the Operating Permit 00005 ceases, the existing approved reclamation and mine closure plan would be implemented.

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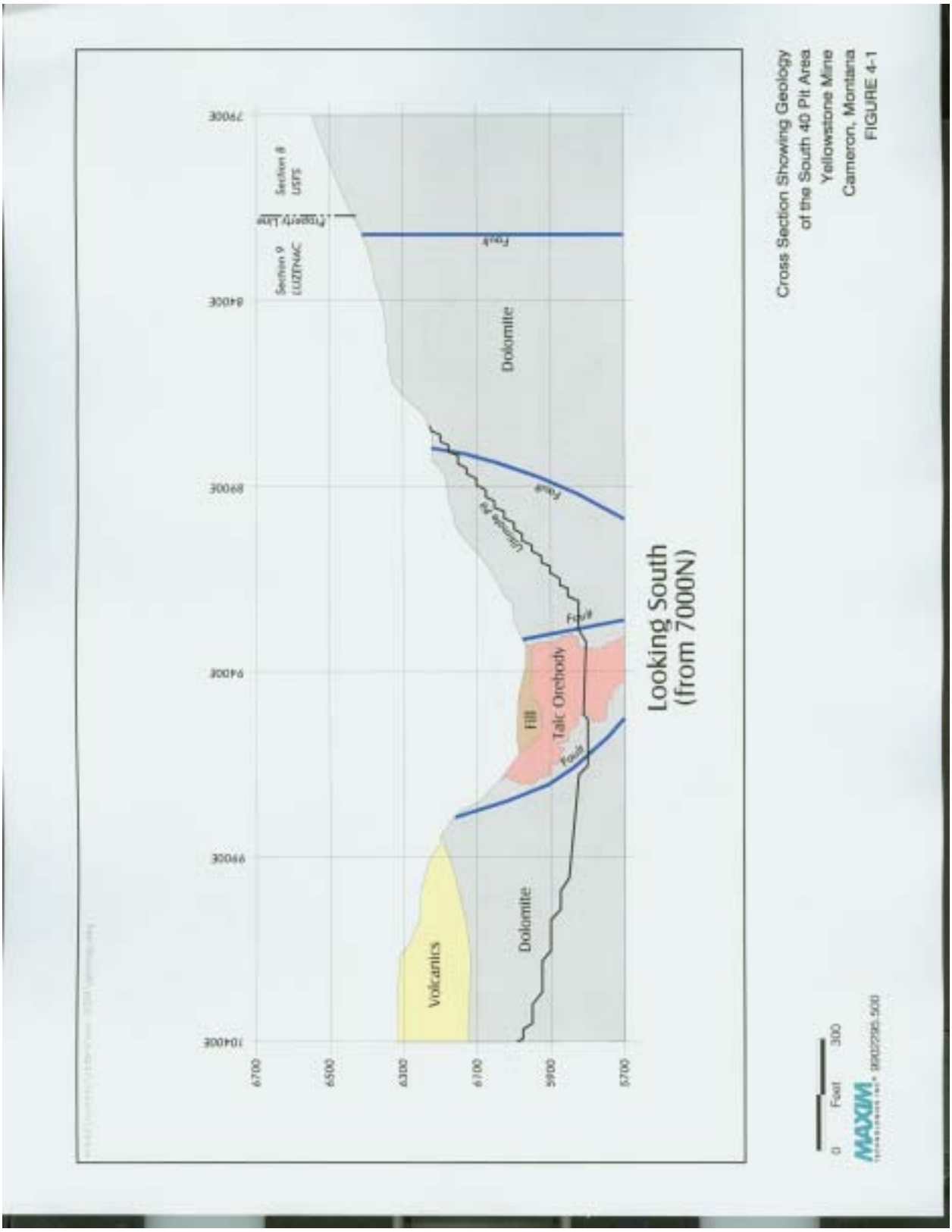

Cross Section Showing Geology
of the South 40 Pit Area
Yellowstone Mine
Cameron, Montana
FIGURE 4-1

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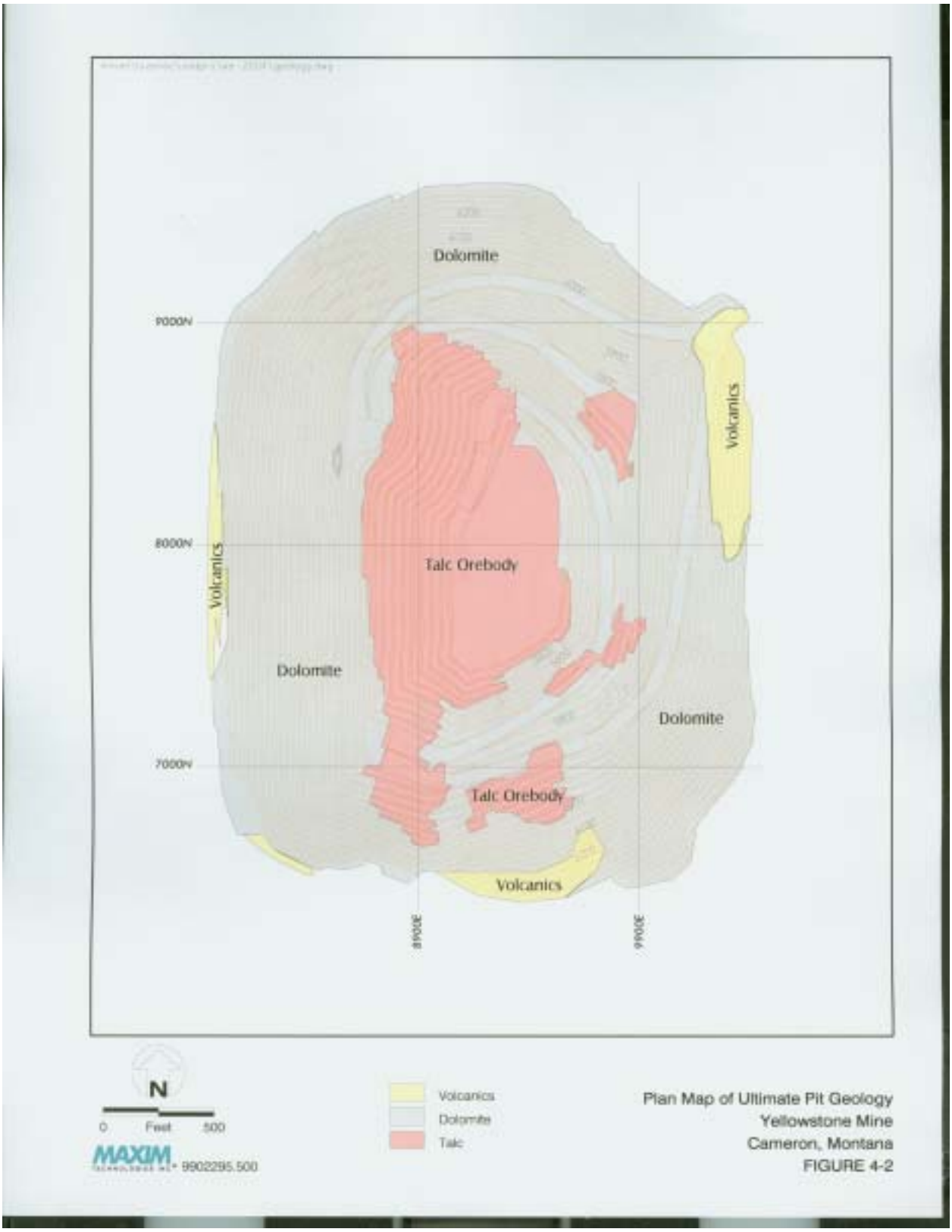
Dolomite
9000N
8000N
7000N
Volcanics
Volcanics
Talc Orebody
Dolomite
Dolomite
Talc Orebody
Volcanics
N
0 Feet 500
MAXIM
9902295.500
Volcanics
Dolomite
Talc
Plan Map of Ultimate Pit Geology
Yellowstone Mine
Cameron, Montana
FIGURE 4-2

4.3.2 PROPOSED ACTION ALTERNATIVE

The Proposed Action would increase the surface area and volume of material exposed to precipitation and resultant seepage in both the expanded pit and expanded overburden piles. The area of the pit would be increased by 11.2 acres (from 169.4 to 180.6 acres), and the area of the overburden facilities would be increased by 222.8 acres (from 533.2 to 756.0 acres). An additional 127 million tons of overburden would be added to the overburden disposal facilities over the proposed expanded life of the mine.

Under the Proposed Action, Luzenac would continue to mine and process ore, and dispose of overburden at the same rates as it has in the past. Most of the overburden mined would be placed in the East OB Pile in Johnny Gulch. Operational water quality monitoring would be continued under the Proposed Action. The purpose of this monitoring would be to determine if mining-related impacts of the Proposed Action are adversely affecting water quality in the mine area. The chemical and physical parameters to be measured for water resource monitoring on a semi-annual basis are listed in Table 2-4. Monitoring sites for surface water are shown on Figure 2-6.

The limited annual rainfall of 11.3 inches and the establishment of a stable, graded, and revegetated surface would limit runoff and increase evapotranspiration, which would limit seepage from the overburden and pit areas after reclamation. Seepage rates for the East OB Pile have been calculated (Luzenac, 2003: Appendix C) using a historic precipitation rate of 11.3 inches that was increased by 25 percent to 14.13 inches. Under these conditions, seepage is calculated to be about 0.17 gpm operationally and about 1.5 gpm 100 years after closure. Similarly, calculations were made for the effect of the overburden lift being placed on the North OB Pile, with the results being about 0.22 gpm seepage operationally and about 2.4 gpm 100 years after closure. These relatively low seepage rates suggest that much of the water flowing periodically through the underdrain system is surface water diverted through the underdrain. Based on historic data and low seepage rates, groundwater quality with respect to nitrates is not expected to exceed water quality standards.

Direct and indirect impacts on water resources would result from the Proposed Action. These impacts would be associated primarily with disturbance to natural drainage channels due to the expansion of the open pit and overburden disposal facilities, and with nitrate loading to groundwater and surface water.

Should water quality standards for nitrate be exceeded, a contingency plan exists for treating the surface water that is captured from the entire site and collected in the rock drain beneath the East OB Pile and in ponds in lower Johnny Gulch. Water would be pumped from the underdrain and/or ponds and treated using a LAD system. Land application can only occur during the growing season. Currently, Luzenac does not have enough storage capacity for the amount of water expected during the winter.

Mine pits at the Yellowstone Mine have historically remained dry, except for intermittent pooling from snowmelt and two small seeps that pool water in the pit bottoms. Exploration drilling in both the North Main and South 40 pits has not intercepted a definitive groundwater table. However, groundwater elevations in monitoring wells within and in the vicinity of the pits indicate that a post-mine pit lake would not form in the ultimate pit described in the Proposed Action (i.e., groundwater level would be 60 to 80 feet below the proposed ultimate pit floor). Reviews of water levels measured by the Montana Bureau of Mines and Geology over the past 10 years in three bedrock wells located in the Madison River Valley indicate that water table fluctuations during the period were a maximum of about 10 feet (MBMG Groundwater Information Center website).

Placement of a second lift or tier of overburden materials on the North OB Pile would require changes to surface water drainage channels in that area. At the present time, water draining from sub-basins D-1 and D-2 on Figure 2-6 flows into lowland areas where the existing drainage pathways are blocked by overburden materials. Flow of surface or storm water into these lowland areas was intended to provide a temporary area to pond excess water during periods of high runoff. As a result of the Proposed Action, runoff from the east side of the North OB Pile (adjacent to the North Main pit highwall) would be routed into engineered surface water diversion channels and discharged into two natural lowland catchment basins at the north and south ends of the overburden pile that would act as natural sediment ponds (Figure 2-6). Water draining the area to the north and west of the North OB Pile would also report to these (and one additional) lowland catchment basins (Figure 2-6). Outflows, if any, from these lowland catchment basins would be monitored to determine if armored overflow spillway channels need to be constructed either operationally or in preparation for closure.

Portions of Johnny Gulch in the South and East OB piles currently have a rock drain constructed beneath them along the buried channel of Johnny Gulch. The existing buried rock drain is approximately 6,027.5 feet in length. An additional 3,688.4 feet of the Johnny Gulch drainage channel is proposed within the expanded footprint of the East OB Pile (Figure 2-7). Although the hydrology and water quality studies conducted to date suggest that no new ponds are needed, Luzenac would commit to constructing a sediment pond in Johnny Gulch at or immediately below the outlet for the rock drain and downgradient from the ultimate toe of the East OB Pile, should a pond be deemed desirable or necessary. A conceptual pond is shown on Figure 2-7. The final design and size of the pond would need to be determined. No acres have been added to Table 2-8 for this disturbance; however, the pond would be small enough to be included as a miscellaneous or ancillary disturbance at the toe of the east face of the East OB Pile (at full build-out).

Surface water runon would be controlled by a permanent diversion ditch constructed upgradient, along the southeast edge of the active East OB Pile.

Best Management Practices (BMPs) would continue to be employed to prevent runon of surface water into the open pits and onto overburden disposal facilities. It is expected

that some erosion of the pit slopes and material stockpiles would occur. Sediment may accumulate in the pit bottoms and adjacent to any berms or stockpiles. Sediment transport from mined areas and overburden disposal facilities would be controlled through use of BMPs (e.g., erosion prevention measures and revegetation) during mining, reclamation, and after reclamation.

4.3.3 AGENCY MODIFICATIONS TO THE PROPOSED ACTION

Luzenac would modify the Proposed Action to minimize the risk of water quality impacts by modifying overburden pile drainage systems, constructing a sediment pond at the toe to the East OB Pile, modifying reclamation of lowland catchment basins, constructing a LAD storage pond to capture underdrain seepage, and implementing the LAD if nitrate values exceed 7.5 mg/l.

4.3.3.1 Overburden Pile Drainage Systems

All drainage systems would be modified to be more natural using fluvial geomorphic principles. The channels would be constructed around, and as lined and armored (if needed) channels over, the surface of the existing and proposed expansion of the overburden piles. The drainage systems would provide for controlled surface water flow during storm events or when the ground is frozen and provide habitat similar to that associated with natural ephemeral drainages. The drainage systems would be accessible to maintenance and repair of damage from storm water impacts. The drainage systems would be constructed in addition to the continued use of the existing underdrain and the proposed underdrain extension beneath the overburden piles. The runoff from lined surface water channels would minimize seepage through the overburden piles and enhance plant and wildlife habitat on the reclaimed overburden piles.

Luzenac would be required to regrade all OB pile slopes in a dendritic pattern without benches to reduce the engineered appearance and produce a more natural looking drainage system and slopes as viewed from U.S. Highway 287. The crest elevation of the overburden piles would be varied at closure to create a more natural looking topography. Present closure grading of the overburden piles calls for a flat top. This surface should be regraded to provide irregular topography and break up the linear character of the surface.

4.3.3.2 Sediment Pond at Toe of East OB Pile

A sediment pond would be installed below the ultimate toe of the East OB Pile to provide a contingency for collecting underdrain seepage if nitrate exceeds 7.5 mg/l. The pond could be used to collect sediment and seepage emanating from the toe of the East OB Pile. Sediment could be excavated and disposed of onsite, and seepage could be collected for sampling and storage prior to discharge, infiltration, or treatment in a LAD system if necessary at some point in the future.

4.3.3.3 Reclamation of Lowland Catchment Basins

Lowland catchment basins that collect seasonal runoff water from drainages D-1 and D-2 near the North OB Pile would be left at closure (Figure 2-6). Nitrate in water routed into these basins would be attenuated by vegetation growing in the pond area. The catchment basins should be constructed to provide seasonal water supply and habitat for upland wildlife.

4.3.3.4 LAD Pond for Underdrain Seepage and LAD Trigger Value

Luzenac would be required to initiate LAD of underdrain seepage if nitrates exceed 7.5 mg/l. Luzenac would also build a lined storage pond on an OB pile to store underdrain seepage during the winter until it can be land applied. This would ensure that the groundwater quality standard would not be exceeded.

4.4 VISUALS

Visual impacts have been evaluated using procedures set forth in the Visual Resource Contrast Rating Handbook (BLM, 1986). This method looks at changes to the landscape that in this case would principally result from the expansion in size and increased visibility of the overburden piles. The proposed changes are compared with the characteristic landscape of the Yellowstone Mine site to determine the degree of contrast in form, line, color, and texture.

4.4.1 NO ACTION ALTERNATIVE

Additional minor visual impacts would result from the No Action Alternative, as mining would continue for another 8 years under the current Operating Permit 00005. Additions would include a small expansion of the northwestern portion of the South 40 Pit with all of the overburden material scheduled for placement in the East OB Pile. The East OB Pile would extend an additional 100 to 200 feet downstream along Johnny Gulch from its present location but remain within the disturbed footprint.

Major portions of the pit highwalls would be reclaimed to 30-degree rock faces and talus slopes, as described in Section 2.2.11.4, which would increase the visual contrast with surrounding lands.

Luzenac would reclaim the existing overburden piles with flat surfaces and 2.5H:1V slopes, as described in Section 2.2.11.5. The 2.5H:1V slopes would incorporate a bench as a slope break to limit slope length and control runoff. The relatively straight lines of the overburden pile crests would contrast with the irregular land forms in the surrounding area.

4.4.2 PROPOSED ACTION

The proposed expansion of the overburden piles would be the only obvious visual change seen from U.S. Highway 287. The principal impact or consequence of the Proposed Action with respect to visual resources would be the large landform resulting from construction of the East OB Pile within Johnny Gulch. The shape of the advancing slope would appear linear in the view from the highway and would therefore contrast with the irregular features of the surrounding landscape (Figure 4-3, middle). Color of the overburden material would range from medium-tan or beige, to flat white and would vary through this color range as the slope advances with the placement of new overburden material. A computer-generated view of the mine site from the east (KOP-1, Figure 4-3) at maximum build-out, prior to full reclamation, is shown on Figure 4-3 (middle).

The upper surface of the East OB Pile would be regraded, soiled, and revegetated as the construction face advances. Figure 2-11 shows the final reclamation topography. Revegetation of this upper surface would provide some operational mitigation of visual impacts, and the reclaimed and revegetated surfaces would gradually acquire the color and texture of the surrounding landscape. During final reclamation, the angle of repose slopes of the advancing face of the East OB Pile would be regraded to a slope of 2.5H:1V or less, and the surface covered with soil and revegetated. Slope lengths longer than 200 feet would be broken up with a wide bench during regrading to reduce slope length and control runoff. The relatively straight lines of the overburden pile crests and benches would contrast with the irregular land forms in the surrounding area. A computer-generated view of the reclaimed mine site from the east at closure is shown in Figure 4-3 (bottom).

Other mine facilities, including overburden disposal facilities, open pit(s), and support facilities, would also be seen from off-road sites and secondary roads by a small number of area residents and recreationists. Visual impacts would be mitigated through reclamation to include grading, application of soil, and revegetation of all mine related facilities. Reclamation would result in the color and texture of the reclaimed sites blending in with the color and texture of the surrounding landscape. The reclaimed mine site would continue to appear as a man-made feature.

4.4.3 AGENCY MODIFICATIONS TO THE PROPOSED ACTION ALTERNATIVE

Luzenac would modify the Proposed Action to minimize visual impacts. The crest elevation of the overburden piles would be varied at closure to create a more natural looking topography. Present closure grading of the overburden piles calls for a flat top. This surface should be regraded to provide irregular topography and break up the linear character of the surface. This would be done as part of constructing the overburden piles and natural drainage systems as described in Section 4.3.3.1. This would reduce the visual impacts of overburden piles from U.S. Highway 287 and the Johnny Gulch Road.

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Existing

Proposed

Reclaimed

Visual simulation of Yellowstone Mine from KOP 1,
approximately 1.5 miles south of access road on Highway 287
Luzenac Yellowstone Mine
FIGURE 4-3

Luzenac would be required to regrade all OB pile slopes in a dendritic pattern without benches to reduce the engineered appearance and produce a more natural looking drainage system and slopes, as viewed from U.S. Highway 287. The crest elevation of the overburden piles would be varied at closure to create a more natural looking topography. Present closure grading of the overburden piles calls for a flat top. This surface should be regraded to provide irregular topography and break up the linear character of the surface.

4.5 REGULATORY RESTRICTIONS ANALYSIS

MEPA, as amended, requires state agencies to evaluate any regulatory restrictions they propose on the use of an applicant's private property (75-1-201 (1)(b)(iv)(D), MCA). Actions proposed by the applicant and alternatives and mitigation measures designed to make the project meet the minimum requirements of state laws and regulations are excluded from evaluation.

Selection of the No Action Alternative would impose restrictions on Luzenac's use of its private property with respect to future mining operations. The Proposed Action contains measures imposed by DEQ that were not agreed to by Luzenac during the deficiency review process. The changes to the Proposed Action included in the Agency Modifications are needed to ensure that the Proposed Action would comply with state statutes and rules.

4.6 CUMULATIVE IMPACTS

Cumulative impacts are the effects of the Proposed Action added to the impacts of past and present activities in the area along with the potential impacts of actions under consideration by the state. Cumulative impact analyses help to determine whether an action would result in significant impacts when added to other activities.

The Yellowstone Mine is the only mine in the immediate area, and no other large or medium scale commercial enterprises exist within the area. Evaluation of the area's economic geology and the absence of other known resources in the area suggest that it is unlikely that other mines or major commercial undertakings would be developed in the area.

Historic land uses of the south Madison Valley cumulative impact area include both commercial and non-commercial activities (Figure 2-2). Commercial uses include livestock grazing, hay and wheat production, mineral extraction, and timber production. Non-commercial uses include wildlife habitat, watershed, residential sites, and a variety of recreational activities. Over the last 5 to 10 years, the Madison River Valley has experienced a trend toward subdivision for residential use of land that was historically used for grazing and other forms of agriculture.

Cumulative impacts from the Proposed Action would be negligible for all resources except visual resources (described above in Section 4.4).

The subdivision of land and selling of individual residential sites is likely to continue in the Madison Valley area. Transmission line and substation construction, access roads, and home sites may become more important in the future as a result of the development of residential properties. These developments would also impact visual resources and would probably impact water quality, by nitrate loading to groundwater from septic systems, and wildlife habitat resources as residential development increases in density in the future.

4.7 UNAVOIDABLE ADVERSE EFFECTS

Residual impact from the Proposed Action would include irreversible commitments of privately owned land resources. Developed soil would be lost from 271.3 acres. Soil would be salvaged and replaced, but thousands of years of development would have to begin again.

Plant communities dominated by native plants would be replaced by less diverse reclaimed plant communities on 271.3 acres. Noxious weeds would increase. Wildlife habitat on the 271.3 acres would be replaced with less diverse reclaimed habitat.

The reclaimed mine site would continue to appear as a man-made feature.

Talc would be removed from the geologic resource under the Proposed Action. Some portions of the mine pits and future access roads that are not revegetated during reclamation (160 acres) would represent a loss of vegetation and wildlife habitat. The landscape characteristics would change as a result of the Proposed Action (pits and overburden disposal deposits) and reclamation activities. Although the disturbed areas would be reclaimed, reseeded, revegetated, and a program implemented to inventory and treat noxious weeds, weeds would increase as is occurring across Montana. Some sediment control structures would remain.

Talc mining from open pits at the Yellowstone Mine began in about 1950 and has been continuous at different annual production rates since that time. Mining to date has generated approximately 72 million tons of overburden material from six pits (Figure 2-4) three of which have been backfilled. The three unreclaimed pits (North Main, South 40, and Montana Talc pits) are somewhat overlapping and contain about 170 acres of disturbed ground. Four overburden disposal areas (Figure 2-3) currently cover about 533 acres of ground within the existing permit area of 1,458 acres.

Under the Proposed Action ore and overburden would continue to be extracted from an expanded South 40 Pit (Figure 2-7) over the next 50 years. The total tonnage mined would be 144 million tons including 17 million tons of talc and 127 million tons of overburden. Therefore, production over the next 50 years would be approximately twice the amount of overburden and about three times the amount of talc as has been mined in the last 50 years.

Drilling has indicated that talc ore continues below the ultimate pit level of the Proposed Action as well as along trend to the north and northeast of the existing South 40 and North Main pits. Therefore, the known talc resource would not be entirely removed under the Proposed Action, and there is the potential for future mining to expand into these areas. No other substantial geologic mineral resources of any kind have been identified in the vicinity of the Yellowstone Mine site.

CHAPTER 5
CONSULTATION AND COORDINATION

5.1 PREPARERS

DEQ staff members involved in the preparation of this EA are listed in Table 5-1.

Table 5-1
List of Preparers
Amendment to Operating Permit 00005 – EA

Name	Responsibility	Credentials	Years Experience
Patrick Plantenberg	Vegetation Soils Reclamation	BS, Agricultural Science/Recreation Area Management MS, Range Science/Reclamation	25
Charles Freshman	Engineering	BA, Geology BS, Civil/Environmental Engineering MS, Mining/Geological Engineering	20
Greg Hallsten	Coordination	BS, Wildlife Biology BS & MS, Range Management	25
Warren McCullough	Reviewer	BA, Anthropology MS, Economic Geology	28
George Furniss	Hydrology	BS & MS, Geology PhD, Hydrogeology (pending)	25

5.2 OTHER AGENCIES CONTACTED

Other agencies contacted for information for, or review of, this EIS are:

3.2.2 5.2.1 STATE AGENCIES

Montana Fish, Wildlife and Parks – Wall Creek Wildlife Management Area
Montana Department of Natural Resources and Conservation, Water Resources Division
Montana State Historic Preservation Office – Cultural resources

3.2.3 FEDERAL AGENCIES

U.S. Army Corps of Engineers – Wetlands issues
U. S. Fish and Wildlife Service – Winter Range

5.2 PUBLIC INVOLVEMENT

DEQ published a statement acknowledging the receipt of the amendment application in May 2002. Later, in January 2004, DEQ issued a press release stating its intent to prepare an EA under MEPA and asking the public to provide issues or concerns about the proposal in order to guide the EA process. DEQ indicated it would accept public comments through February 23, 2004. Copies of the amendment application were placed at DEQ's office in Helena, MT, and in the Ennis Public Library in Ennis, MT. No public scoping meeting was held.

Two public comments were received, one from the Ennis Chamber of Commerce and one from Representative Diane Rice, House District #33. Both were in support of the amendment and raised no substantive issues.

CHAPTER 6
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