United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Idaho Falls District Office
1405 Hollipark Drive
Idaho Falls, Idaho 83401
http://www.id.blm.gov

TAKE PRIDE IN AMERICA

Dear Reader:

Enclosed for your review is the Final Environmental Impact Statement (FEIS) for P4 Production, LLC's (P4) (a wholly owned subsidiary of Monsanto Company, Inc.) Blackfoot Bridge Mine. This FEIS was prepared by the Bureau of Land Management (BLM), with cooperation from U.S. Army Corps of Engineers, Idaho Department of Environmental Quality and Idaho Department of Lands. It analyzes the direct, indirect, and cumulative effects of mining operations for 17 years. The proposed Blackfoot Bridge Mine consists of three open pits, haul roads, water management structures, and overburden disposal areas located approximately 10 miles northeast of Soda Springs in Caribou County, Idaho. Public scoping meetings were held on February 28, 2006, and March 1, 2006. The Proposed Action, two different mining alternatives, and a No Action Alternative were analyzed, and fifteen other alternatives were considered but dismissed.

Public comment on the Draft EIS was extensive and in consideration of those comments and additional information, modifications were made and responses to comments were incorporated into this Final EIS. The Final EIS has been prepared as a complete full-text document, and is being distributed either as hard copy, compact disc, and is also posted at http://www.blm.gov/id/st/en/prog/0.html.

Concurrent with this distribution, the BLM filed the Final EIS with the U.S. Environmental Protection Agency (EPA). EPA will then publish a Notice of Availability (NOA) in the Federal Register. On the publication date of the EPA's NOA in the Federal Register, a 30-day availability period will commence. In addition to the EPA's NOA, BLM will publish a separate NOA with additional information in the Federal Register and in local newspapers. Following the close of the availability period, BLM will issue a Record of Decision (ROD). Copies of the ROD will be mailed to people and entities on the Blackfoot Bridge Mine mailing list. Notices of these decisions will be published in local newspapers. The ROD will have an appeal period before the decision becomes effective. The ROD will contain the appropriate instructions for appeal.

The Final EIS is a completed document. If you have information for agency consideration in making our decisions, it can be sent to the following address and must be received by the end of the availability period: Bureau of Land Management, Pocatello Field Office, Attention: Blackfoot Bridge EIS Project Manager, BLM Pocatello Field Office, 4350 Cliffs Drive, Pocatello ID 83204, e-mail address: Blackfoot.Bridge@arcadis-us.com.

If you would like further information on this project, questions can be directed to Kyle Free, EIS Project Manager, (208) 478-6368.

Sincerely,

Joe Kraayenbrink
BLM Idaho Falls District Manager

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FINAL

ENVIRONMENTAL IMPACT STATEMENT

BLACKFOOT BRIDGE MINE

LEAD AGENCY:	U.S. Department of the Interior Bureau of Land Management Idaho Falls District Pocatello Field Office
COOPERATING AGENCIES:	U.S. Army Corps of Engineers Idaho Department of Environmental Quality Idaho Department of Lands
PROJECT LOCATION:	Caribou County, Idaho
DATE FINAL EIS FILED WITH EPA:	March 2011
QUESTIONS ON THE FINAL EIS CAN BE DIRECTED TO:	Kyle Free EIS Project Manager BLM Pocatello Field Office 4350 Cliffs Drive Pocatello, Idaho 83204

ABSTRACT

This Final Environmental Impact Statement (FEIS) analyzes impacts related to mining phosphate ore at the Blackfoot Bridge Mine in Southeastern Idaho. The Proposed Action includes developing three mine pits, haul roads, water management structures, and overburden disposal areas. Use of existing mill facilities would continue in Soda Springs. Alternatives to the Proposed Action are also analyzed and site-specific mitigation measures developed. The BLM Preferred Alternative is Alternative 1A because the cover design and water management plan would reduce the impacts of the Proposed Action.

RESPONSIBLE OFFICIAL FOR FEIS:	Joe Kraayenbrink BLM Idaho Falls District Manager
EIS NUMBER:	ID-320-2006-EIS-1553

EXECUTIVE SUMMARY

The following information is provided as a summary of the analyses that have been conducted for the Blackfoot Bridge Mine Project. However, this summary is not a substitute for review of the complete Final Environmental Impact Statement (FEIS).

ES.1 PROPOSED ACTION

This FEIS was prepared by the Bureau of Land Management (BLM), Pocatello Field Office, in cooperation with the Idaho Department of Environmental Quality (IDEQ), Idaho Department of Lands (IDL) and the Walla Walla District of the U.S. Army Corps of Engineers (USACE) in response to the proposed *Mine and Reclamation Plan* submitted by P4 Production, LLC (P4) (a wholly owned subsidiary of Monsanto Company, Inc.). P4 submitted an initial *Mine and Reclamation Plan* to the BLM in November 2005. In October 2008, the BLM received the *Revised Blackfoot Bridge Mine and Reclamation Plan* (2008 Revised Mine Plan) from P4. The 2008 Revised Mine Plan (and subsequent modifications) includes details of operational and reclamation activities proposed for the Blackfoot Bridge property. The 2008 Revised Mine Plan proposes a new open pit phosphate mining operation on federal mineral leases that would include external overburden piles, a haul road, and a water management plan. Processing would be conducted off site. Mining would also employ best management practices (BMPs) for control and prevention of releases of sediment, dissolved constituents, and trace elements, such as selenium, to nearby surface water and groundwater. P4 has also applied for lease modifications to include portions of the phosphate deposit that lie outside the current I-05613 and I-013709 lease boundaries, and requested that additional acreage be added to the application for lease modification in May 2008. The proposed lease modification is addressed in the 2008 Revised Mine Plan, and P4 requested that the BLM include it in this environmental analysis.

The project area is located in Caribou County, approximately 10 miles northeast of Soda Springs, Idaho. The Proposed Action would occur on land with surface rights administered by the BLM and three private landowners. All phosphate mineral rights in the project area are administered by the BLM. The leases convey to P4 the exclusive right and privilege, subject to the terms and conditions of the lease, to explore and develop the federally owned mineral estate and to use the surface of federal lands for related mine activities.

Under the Proposed Action, phosphate ore would be mined and hauled approximately 8 miles to P4's Soda Springs elemental phosphorus plant for processing. No processing facilities other than typical crushing and screening operations would occur on the mine site. All chemical processing activities would occur at the Soda Springs plant. The ore to be mined under the Proposed Action is expected to be similar to that produced at other P4 mine properties in the area.

The Blackfoot Bridge Mine ore reserve would be developed using an open pit mining method on a series of bench cuts, using a combination of in-pit retreating ramps and backfill ramps. The primary equipment for ore and overburden mining would be a combination of trucks, track-mounted excavators, bulldozers, and front-end loaders. A track-hoe excavator would also be used to maximize recovery of ore in the bottom of the pit (pit crotch).

The Blackfoot Bridge Project would be mined in a phased approach with mining and reclamation activities continuing for 17 years. Ore would be recovered from three separate mine pits: North, Mid, and South Pits. Mining would begin in the Mid Pit, followed by the North Pit and South Pit. All overburden would either be backfilled into mined-out portions of the mine pits or placed in the external East Overburden Pile (EOP) or Northwest Overburden Pile (NWOP). Other mine-related facilities would include: (a) ore stockpile and tipple (truck loading area); (b) ore truck turnaround loop and equipment yard; (c) a water management system; (d) topsoil stockpiles; (e) roads; and (f) water control ponds. A water diversion ditch would be constructed from the unnamed tributary to Fish Pond at EP1 to the water management ponds; the water collected in this system would be surface water runoff (**Figure 2.3-1**).

Surface disturbance resulting from the Proposed Action would total approximately 739 acres, including 361.4 acres from pits, 185.8 acres from overburden piles, 86.8 acres from roads and related facilities, 66.9 acres from water control ponds, and 38 acres from topsoil stockpiles. Reclamation would take place over the life of the mine, with approximately 674 total acres eventually being reclaimed. The remaining 65 acres of highwalls and similar areas with steep slopes would be impractical to place soil and revegetate and, therefore, would not be reclaimed.

Detailed discussions of mine design, sequencing, and development and ancillary facilities development are discussed in detail in **Section 2.3** of this FEIS, as well as in P4's 2008 Revised Mine Plan. Cross-sections of the mine pits are also presented in the 2008 Revised Mine Plan.

Measures that would be employed to reduce environmental effects are described in detail in **Chapter 2** of this FEIS and would generally include: topsoil salvage and conservation; implementation of BMPs for control of releases of selenium and other constituents of potential concern (COPCs); implementation of a project-specific water management plan and stormwater pollution prevention plan (SWPPP) measures for runoff and sedimentation control; use of oil spill prevention control and countermeasures (SPCC); mitigation of wetland impacts; a Bald Eagle Management Plan; and covering segregated Meade Peak overburden in the EOP with a low-permeability cover system.

The Proposed Action would involve installation of the Simple 1 cover design to be used as a cover for the segregated Meade Peak overburden placed in the EOP (approximately 35 acres). The Simple 1 cover design consists of 18 inches of topsoil overlying 1 foot of weathered alluvium and 2 feet of run-of-mine (ROM) chert. The remaining disturbance areas would be covered using a base cover design consisting of at least 4 feet of chert or limestone, overlain by 18 inches of topsoil.

ES.2 ALTERNATIVES

Along with the Proposed Action, three alternatives were evaluated in the FEIS and are described in **Sections 2.4** and **2.5**. They include:

- Alternative 1A – geosynthetic clay laminate liner (GCLL) cover system over core materials in EOP and overburden in pits;
- Alternative 1B - GCLL over entire EOP and overburden in pits; and
- No Action Alternative.

Fifteen other alternatives were also considered and eliminated from further evaluation in this FEIS (**Section 2.7**).

ES.2.1 Alternatives 1A and 1B – Capping of Overburden and Backfilled Areas

Alternatives 1A and 1B were developed to address the issue of the potential for selenium to leach into the groundwater. These alternatives are essentially the same as the Proposed Action, except that P4 would construct a layer of impermeable material between the segregated Meade Peak overburden and the applied growth medium to eliminate potential effects of water infiltrating into the backfilled pits and external overburden piles. Alternatives 1A and 1B would also include a modified water management plan that differs in many details from the Proposed Action. The Blackfoot Bridge property for Alternatives 1A and 1B is slightly larger than the Proposed Action property boundary due to south end diversion ditches. This revised boundary encompasses 1,483 acres and includes 634 acres of Federal Phosphate Lease I-05613 and 80 acres on I-013709, covering subsurface mineral rights. There is approximately 1,074 acres of P4 owned land within the project boundary. Other private landowners hold 178 acres. The BLM administers 231 acres of public land within the project boundary.

The GCLL cover system design consists of (from surface to depth):

- 18 inches of topsoil;
- 1 foot of weathered alluvium cover material;
- 0 to 6+ inches of drainage layer (actual thickness dependent on slope and aspect);
- A GCLL layer (sodium bentonite encased between two geotextiles and a laminate layer);
- 6 inches of a protective subgrade layer (weathered alluvium or other earthen material); and
- ROM overburden.

Environmental mitigation measures and the Environmental Monitoring Plan (**Appendix A**) included for the Proposed Action would also apply to these alternatives.

ES.2.2 Alternative 1A – GCLL Cover System Over Core Materials in EOP and Overburden in Pits

Alternative 1A involves placing a combination of the GCLL cover system over 383 acres and the Simple 1 cover system over the remaining 99 acres of overburden pile. The 383 acres covered with the GCLL cover system design would include:

- 86 acres covering the 35 acres of segregated Meade Peak overburden core associated with the EOP;
- 63 acres of overburden associated with South Pit;
- 110 acres of overburden associated with Mid Pit; and
- 123 acres of overburden associated with North Pit.

The 99 acres covered with the Simple 1 cover system design consists of:

- 45 acres of external overburden associated with the NWOP; and
- 54 acres of external overburden associated with the EOP.

ES.2.3 Alternative 1B – GCLL over Entire EOP and Overburden in Pits

Alternative 1B involves placing the GCLL cover system over the entire 141 acres of the EOP, in addition to 296 acres of backfilled pits for a total of 437 acres. The GCLL cover system design would include:

- 141 acres external overburden associated with the EOP;
- 63 acres external overburden associated with the South Pit;
- 110 acres external overburden associated with the Mid Pit; and
- 123 acres external overburden associated with the North Pit.

The Simple 1 cover system design occupies 45 acres covered only within the NWOP.

ES.2.4 No Action Alternative

Under the No Action Alternative, the Blackfoot Bridge Mine would not be approved for mining or any associated development on the existing leases. Similarly, the lease modification request would not be approved. As a result, the No Action Alternative would not provide ore for P4's processing plant and would leave the mineral resource unmined. However, the No Action Alternative does not imply that the leases would never be developed, only that they would not be developed under this 2008 Revised Mine Plan. Another Mine and Reclamation Plan for these two leases could be submitted in the future.

ES.3 AGENCY PREFERRED ALTERNATIVE

The BLM, IDL, and the IDEQ prefer Alternative 1A as the Agency Preferred Alternative because it employs measures to satisfy regulatory requirements and reduce potential environmental impacts on regional water quality. The USACE is neither an opponent nor a proponent of the applicant's Proposed Action or alternatives.

ES.4 ENVIRONMENTAL EFFECTS

ES.4.1 Proposed Action and Alternatives

The environmental effects of the Proposed Action were evaluated and compared to the alternatives in **Chapter 4**. A summary of the primary environmental effects of the Proposed Action and Alternatives 1A and 1B is shown in **Table 2.8-1**. The environmental effects of the Proposed Action and alternatives are summarized in the following narrative.

ES.4.1.1 Geology, Minerals, and Paleontology

Removal of 91 million bank cubic yards (bcy) of overburden would be a long-term, major, local effect on these resources. All phosphate ore recovered from the project area would be transported to the tipple facility for shipment to P4's processing facilities at Soda Springs.

Under the Proposed Action, geologic and mineral resources in the North, Mid, and South Pit areas would be directly affected by the removal of phosphate ore and overburden. Mining would result in a long-term local effect on resources that could be affected by release of selenium and trace metals associated with mining and exposure of these materials to oxygen and precipitation. Construction of mining facilities, such as roads, topsoil stockpiles, and water control ponds, would have effects on the topography and stability of the landscape. The mining of ore and overburden under the Proposed Action would expose currently undisturbed and buried rock to weathering processes.

Existing topography would be affected under the Proposed Action by the removal of ore, relocation of overburden, and construction of ore staging areas. A total of 739 acres of existing topography would be modified under the Proposed Action including haul roads and topsoil stockpiles. Effects on topography would have major short-term effects and the 65 acres not reclaimed would represent long-term modification. A potential for minor instability of slopes due to the reclaimed landscape for roads, overburden piles, and mine pits may exist.

Removal of overburden and ore could affect paleontological resources. Damage to or destruction of paleontological resources would not be likely; however, appropriate requirements would be implemented as directed by agencies. The greatest potential for impact to surface and subsurface fossils would come from excavations of surface deposits or bedrock. Both surface and subsurface invertebrate fossils could be damaged or destroyed during ground-disturbing activities.

Expanded use of the GCLL and Simple 1 cover systems under Alternative 1A would require an increase of about 1 million bcy of cover material for construction compared to the Proposed Action. A total of 768 acres of existing topography would be modified under the Alternative 1A and 65 acres not reclaimed. The source of this additional material would be within the disturbance footprint of the proposed pits and overburden piles. Replacing the Simple 1 cover system with the GCLL cover system across the entire EOP under Alternative 1B would require the same volume of "weathered alluvium" for construction as under Alternative 1A. Effects to other geologic, mineral, topographic, and paleontological resources would be similar in scale and extent as under the Proposed Action.

Under the No Action Alternative, mining phosphate ore would not be approved under the 2008 Revised Mine Plan currently submitted by P4.

ES.4.1.2 Air Resources

The Proposed Action would result in effects to air quality during drilling, blasting, excavation, materials handling, ore crushing and screening, and vehicle operations. Design elements have been devised that would reduce impacts to air quality. Construction activities would result in short-term, minor effects to air quality. Minor annual fugitive dust emissions from mining operations are estimated at 138 tons/year, and minor gaseous emissions from fuel combustion

and explosives are expected due to vehicle traffic and material handling activities; however, these emissions would not be expected to increase over current emission levels associated with operations at the South Rasmussen Mine. As mining operations begin at the proposed Blackfoot Bridge Project, mining would cease at the South Rasmussen Mine.

Effects to air quality under Alternative 1A would be the same as Alternative 1B. Construction of cover materials would result in an increase in effects to air quality for all criteria pollutants due to increased vehicle traffic on unpaved roads and materials handling activities. Overall, effects to air quality under Alternatives 1A and 1B would be expected to have a minor increase compared to air quality under the Proposed Action.

Under the No Action Alternative, air emissions from the Proposed Action or alternatives would not occur. Additionally, the No Action Alternative would result in declining effects to regional air quality over time, as the South Rasmussen Mine would also be depleted and closed.

ES.4.1.3 Noise

Sensitive noise receptors include residential areas, schools, and hospitals. The nearest residences are located at a distance of approximately 1.5 miles from the project boundary. Other residences are located several miles south of the project area toward Soda Springs.

Minor noise levels would be below the Environmental Protection Agency (EPA) guideline of 55 decibels above reference noise, adjusted (dBA) for each source (except blasting) at nearest sensitive noise receptors. Noise from open pit mining is estimated to be below 55 dBA at a distance between 1,920 and 3,840 feet, and noise from haul traffic and a conveyor is estimated to be below 55 dBA at a distance between 480 and 960 feet.

Short-term blasting noise would exceed 55 dBA at nearest sensitive noise receptors. This does not account for natural attenuation of noise when blasting is occurring below grade in the pit and additional attenuation of noise due to natural topography and vegetation. Blasting is estimated to occur 120 times per year and only during daylight hours. Noise effects from blasting would be moderate.

Construction of cover materials under Alternatives 1A and 1B would result in a temporary increase in noise effects due to increased vehicle and materials handling activity. Overall, effects of noise under Alternatives 1A and 1B would have a minor increase compared to noise levels under the Proposed Action.

Under the No Action Alternative, noise in the project area would remain at background levels.

ES.4.1.4 Climate

The Proposed Action and alternatives related to mining activities would result in greenhouse gas emissions but would have a negligible contribution to climate change.

Under the No Action Alternative, generation of greenhouse gases associated with the Proposed Action would not occur.

ES.4.1.5 Water Resources

The Proposed Action would result in adverse impacts to surface water and groundwater during mining and after reclamation. The proposed mine pits, diversion ditches, and water control ponds would capture surface water runoff during mining. Backfilling of the pits would be concurrent with mining, and the area of the open pits that would capture runoff during any given year would be limited. Runoff from the disturbed areas, including the backfilled pits and external overburden piles, would be greater than for natural areas and result in a net increase in runoff reporting to the water control ponds and water management ponds.

The South Pit would be partially backfilled and would continue to capture runoff from an area of approximately 42 acres in the State Land Creek drainage after reclamation. The runoff area that would be removed from the drainage by the partially backfilled South Pit would represent about 1.5 percent of the total drainage area. The Mid Pit and the EOP would also affect the runoff characteristics of the unnamed tributary above Fish Pond during mining and after reclamation. Water from an area of about 153 acres above the EOP would be diverted north along the western edge of the overburden pile toward Fish Pond. Runoff from this area currently flows through Wetlands F, G, and H. The diversion would result in a 41 percent reduction in runoff flowing through the wetlands. The final reclaimed surface of the backfilled North Pit would alter the location of the drainage divide for the Beaver Pond drainage and would permanently add approximately 13 acres to the runoff area for the drainage.

Runoff from temporary and permanent overburden storage areas, pit backfills, haul roads, growth medium storage areas, and other disturbed areas would increase the potential for water erosion and subsequent sediment loading to State Land Creek, unnamed tributary to Fish Pond, unnamed tributary to Beaver Pond, and the Blackfoot River. In addition to naturally occurring soil and geologic materials, magnesium chloride used for dust suppression could be entrained, including eroded sediment from roads. However, disturbance areas would not cause increased sediment load in drainages of the Blackfoot River because of the application of water management structures and BMPs.

Excavation of the South Pit across the drainage above Wetland A could interrupt the shallow alluvial groundwater source for the wetland spring. Assuming that the flow from the spring is directly proportional to the source area of the water supply, the Proposed Action would result in a 94 percent decrease in alluvial groundwater to the wetland spring. Partial backfilling in the South Pit would restore surface water runoff in the drainage but would not restore shallow alluvial groundwater flow. It is possible that reduced groundwater availability could decrease the size of Wetland A or cause it to go dry. Upon completion of mining and backfilling using appropriate practices and materials, some or all flow to Wetland A may be restored.

The Proposed Action would affect springs and intermittent flows in the unnamed tributary to the Blackfoot River above Fish Pond during mining and after reclamation. Water control ponds EP1, EP2, EP3 and EP4; the diversion ditch; and rock fill would alter the natural surface water flow and wetland systems. Approximately 27,600 cubic feet of rock fill may be placed in the channel of the drainage to establish a drainage layer that would transmit water in the drainage and eliminate direct exposure of wildlife to the water source. The water in the drainage layer would report to either Fish Pond or CP1 during mining and to Fish Pond after reclamation. Accumulation of fine-grained sediment in the pore spaces of the fill is expected to decrease the

permeability of the drainage layer over time, and springs and wetlands may re-establish in the drainage at some point after reclamation.

The Proposed Action would result in reduced flow reporting to Fish Pond during mining and after reclamation. Excavation of the pit would capture a portion of the recharge that normally infiltrates to the shallow groundwater system. The captured recharge would infiltrate into the regional groundwater system in the Wells Formation and would not be available for groundwater or spring flow in the drainage. After reclamation, recharge to the shallow groundwater system in the drainage would be less than during the pre-mining condition because infiltrating precipitation from the backfilled Mid Pit would continue to report to the Wells Formation, and the cover system on the EOP would reduce infiltration over the footprint of the facility. Results from the groundwater model indicate that post-reclamation flow in the unnamed tributary would be about 23 percent lower than the baseline condition. A portion of the runoff from the area above the EOP could infiltrate along the western edge of the EOP where the surface flow is diverted to the north. Infiltrating water could discharge from seeps at the toe of the EOP.

Dewatering of the North Pit and Mid Pit to facilitate mining below the water table would temporarily reduce groundwater and spring flow to the Blackfoot River north of the project area. Pumping from the pits would occur for 0 to 96 days during any given year between years 5 and 13. The dewatering pumping rates would range from about 0.04 cubic feet per second (cfs) to 3.49 cfs. At the cessation of pumping, groundwater discharge to the Blackfoot River would return to the pre-mining level. Groundwater entering the pits would originate from the Wells Formation, and the reductions in groundwater discharge and spring flow would be primarily limited to the section of the river that crosses the Wells Formation outcrop directly north of the North Pit. The maximum reduction in groundwater to the Blackfoot River would be about 1.12 cfs. Spring flows from Woodall Spring and North Woodall Spring would be decreased by a maximum of 0.3 cfs by mine dewatering.

Precipitation that infiltrates into the backfilled Mid Pit and EOP would move downward through the material and potentially leach COPCs. The groundwater model indicates that seepage from the backfilled Mid Pit would report to the regional groundwater system in the Wells Formation and be transported north, parallel to the strike of bedding. Seepage from the EOP would report to the shallow groundwater system in the Dinwoody Formation, and alluvium and would move into the alluvial aquifer in the channel above Fish Pond. If water meets water quality standards, water in the channel would ultimately report to CP-1 where it would be discharged. If water does not meet standards, it would be pumped to the Water Management Ponds for evaporation.

Predicted selenium concentrations in groundwater discharging to the Blackfoot River under the Proposed Action would likely exceed the coldwater aquatic life criteria continuous concentration (CCC) standard of 0.005 milligrams per liter (mg/L), starting in year 9. Peak selenium concentrations and loading to the river are projected to occur approximately 100 years after the start of mining. Selenium concentrations in groundwater discharging to the river are projected to decrease rapidly after the peak but remain elevated above 0.005 mg/L at Reach 2 (see **Figure 4.3-10**) for the modeled period of 350 years. Selenium concentrations in groundwater discharge to Reach 2 would be higher than in groundwater discharge to Reach 1. Chemical loading to Reach 2 would originate mostly from the backfilled pits. Chemical loading to Reach 1 would be dominated by seepage from the NWOP. Modeling results indicate that concentrations for other

COPCs in groundwater discharge to the river are likely to meet applicable surface water quality standards during mining and after reclamation.

Pumping for pit dewatering under the Proposed Action would temporarily lower groundwater levels in the rocks adjacent to the pits. At the cessation of pumping, groundwater levels in the aquifer would quickly rebound to near their pre-pumping elevation. With the exception of the South Pit, construction and capping of the overburden piles and backfills would reduce the amount of recharge reporting to groundwater. Runoff from the exposed walls of the South Pit after reclamation would report to the bottom of the pit, where it would infiltrate and result in a net increase in recharge to the Wells Formation. Decreased recharge from the other facilities would have the largest affect on groundwater levels in the Dinwoody Formation near the EOP. The maximum long-term groundwater drawdown in the Dinwoody Formation below the EOP is projected to be about 25 feet. Long-term groundwater drawdown in areas outside of the footprint of the EOP are projected to be less than 5 feet. Increased recharge to the Wells Formation in the South Pit would result in locally increased groundwater levels in the regional aquifer. The potential rise in groundwater levels near the South Pit is projected to be less than 5 feet.

Under the Proposed Action, groundwater quality in the project area would be potentially impacted by seepage from the proposed overburden piles and backfilled pits. Seepage from the mine facilities would potentially result in increased loading of selenium, manganese, and other COPCs to groundwater. These constituents would be transported north, forming plumes with higher concentrations of COPCs than in unaffected groundwater. Increased loading of COPCs to groundwater is predicted to begin shortly after mining commences originating from disturbed areas and partially constructed overburden piles and backfills. Overburden and backfill would be capped and reclaimed concurrent to mining progress to limit exposure of reactive material to infiltrating precipitation.

Modeling results indicate that, with the exception of selenium and manganese, groundwater plumes with COPC concentrations exceeding applicable standards would not be transported outside of the footprints of mine facilities. Limited areas of groundwater below the proposed pits and overburden piles would, however, have concentrations of cadmium, manganese, iron, sulfate, and zinc that are near or above their respective standards. Selenium and manganese concentrations in groundwater are projected to exceed applicable groundwater standards in areas outside of the mine facilities and project area.

Potential impacts to water quality under Alternative 1A would be similar to those under the Proposed Action, except that the potential for release of selenium and other COPCs would be lower due to the use of a different cover system and a modified water management system. Installation of a GCLL cover system under Alternative 1A would reduce infiltration of precipitation into the backfilled overburden and EOP. This reduction in infiltration would reduce the load and subsequently the concentration of selenium and COPCs in groundwater that discharges to the Blackfoot River to levels that meet State of Idaho water quality standards. Effects to water resources under Alternative 1B would be similar to those under Alternative 1A, except that use of the GCLL cover over a larger area on the EOP would further decrease potential for selenium and other COPCs to enter surface and groundwater.

Potential reduction in groundwater levels would be greater than that predicted under the Proposed Action due to implementation of Alternatives 1A and 1B. GCLL cover systems associated with these alternatives would further reduce the volume of precipitation that would infiltrate and recharge groundwater.

Implementation of the No Action Alternative would avoid water resource impacts described for the Proposed Action. Specifically, predicted impacts to runoff areas, groundwater discharge to streams and springs, groundwater recharge, and surface and groundwater quality would not occur.

ES.4.1.6 Soils

Direct disturbance of soils through mining operations and haul road construction would increase erosion and sediment transport rates. Straw wattles, dozer track planting, hydro-seeding, and other erosion control BMPs would be implemented under the Proposed Action. All reclaimed slopes would be dragged, fertilized, and seeded on the contour as much as practical. Reclaimed areas would be expected to achieve cover densities that would meet both federal and state vegetation and cover requirements. Excess sediment transport by runoff would be contained by water control and water management ponds until the establishment of vegetative controls is achieved.

The Proposed Action would include 739 acres of surface disturbance, of which 674 acres would be reclaimed. The additional 65 acres would consist of pit highwalls with steep slopes, where it would be impractical to reclaim. Approximately 1.6 million bcy of primary plant growth medium (PPGM) would be used to cover the proposed reclamation area of 674 acres with 18 inches of PPGM.

Three locations in the project area have been identified for storage of up to 2.1 million bcy of salvaged soil. PPGM/topsoil would be stored separately from marginal soils because mixing could greatly diminish soil productivity. In addition, surface soils in the project area represent a source of seed and plant propagules and microorganism inoculums. Seeds and microbial inoculums are typically contained in the upper 8 inches of growth medium. Root propagules are typically found within the top 2 feet of the soil profile. Stockpiling of these materials significantly reduces their viability over time. Therefore, direct placement (live-handling) of these soil components onto regraded surfaces would be the most efficient post-disturbance use of this resource.

Expanded use of the GCLL and Simple 1 cover systems under Alternative 1A would require an increase of about 1 million bcy of cover material for construction compared to the Proposed Action. A total of 768 acres of existing topography would be modified under the Alternative 1A and 65 acres not reclaimed. The source of this additional material would be within the disturbance footprint of the proposed pits and overburden piles. Replacing the Simple 1 cover system with the GCLL cover system across the entire EOP under Alternative 1B would require the same volume of "weathered alluvium" for construction as under Alternative 1A. The source of this additional material would be the disturbance footprint of the proposed pits and overburden piles.

Under the No Action Alternative, soil resources would remain in their existing condition.

ES.4.1.7 Vegetation, Riparian Areas, and Wetlands

Over the life of the mine, the Proposed Action would remove 725 acres of upland vegetation. There are about 5 acres of disturbed (i.e., barren) areas and about 9 acres of wetlands and waters that account for the remainder of the 739 total disturbed acreage. During the reclamation period, 674 acres would be re-seeded, but the resulting species composition and community structure would be different than prior to disturbance. The remaining 65 acres would be reclaimed as pit highwall, which would not receive PPGM or seeding. These acres would represent a loss until slope conditions of the highwall erode to a configuration that supports vegetation.

Under the Proposed Action, non-seleniferous chert would be placed at a depth of 1.5 feet throughout the reclaimed pits and overburden piles, with the exception of the segregated Meade Peak overburden in the EOP. The segregated Meade Peak overburden has the potential to contribute selenium for plant roots reaching this material. Therefore, the vegetation on this 35-acre area could exhibit elevated selenium concentrations, especially for deep-rooted selenium-accumulating plants included in the seed mix such as alfalfa. The resulting effects to vegetation would be local and long-term, and could include the proliferation of selenium-tolerant plant species.

The Proposed Action would result in the direct loss of 9.43 acres of wetlands and non-wetland waters of the U.S. in the project area (6.11 acres of wetlands and 3.32 acres of non-wetland waters of the U.S.). The level at which affected wetlands provide ecological functions was estimated by deriving a functional index that reflects wetland functional parameters compared to an ideal condition. New restored functional units for proposed wetland mitigation activities on P4's Fox Hills Ranch would be 3.26. This would compensate for the 3.21 functional units that would be lost for the 6.11 acres of wetlands potentially impacted by the Blackfoot Bridge Project. The proposed enhancement and fencing mitigation described above, totaling 5.5 acres, would be implemented using a single new fenced area located in the central part of the P4's Fox Hills Ranch.

In addition to the wetlands that would be directly affected under the Proposed Action, Wetland A may be indirectly affected by mining operations, resulting in a loss of 0.50 functional unit. Wetland A is not included in P4's Clean Water Act Section 404 Permit Application because it would not be dredged or filled as a consequence of the Proposed Action and therefore, is not subject to Clean Water Act Section 404 Permit requirements. Excavation of the South Pit across the drainage above Wetland A could interrupt approximately 94 percent of the shallow alluvial groundwater source for the wetland spring. It is possible that reduced groundwater availability could decrease the size of the Wetland A or cause it to go dry. Upon completion of mining and backfilling using appropriate practices and materials, some or all flow to Wetland A may be restored.

Selenium could accumulate in wetlands near the project area. Isolating and controlling the movement of water with culverts and water control ponds would reduce possible selenium uptake in vegetation and accumulation in wetland habitat. During construction, potential direct effects to water quality would not likely occur from sediment yield of the overburden piles and water management structures in the tributary drainage to State Land Creek because of the implementation of water control dams that would be used to control sediment on site and seepage from the EOP area.

The removal of native vegetation would increase the potential for expansion of non-native plants, including noxious weeds. Incorporation of BMPs into the project design and P4's commitment to control noxious weeds would minimize the potential for the establishment of noxious weeds and effects from noxious weeds would be short-term and minor.

Effects to vegetation under Alternative 1A would be similar to those under the Proposed Action, except that the potential for selenium accumulation by plants growing on the reclaimed areas would be lower due to use of a cover system. The types of plant species that would be selected for use in reclamation of backfilled pits and external overburden piles would include shallow-rooting species. Use of shallow-rooting species would reduce the potential for selenium uptake and root penetration of the GCLL cover system. The GCLL cover system includes an additional synthetic layer which strengthens the cover against penetration. The installation of a drain layer associated with Alternative 1A is specifically designed to transport water during high runoff periods. Animals are unlikely to burrow into seasonal water transport zones because doing so could affect the integrity of the burrow.

Effects to vegetation under Alternative 1B would be similar to those under Alternative 1A, except that the use of the GCLL liner over the entire EOP would decrease the potential for selenium to enter wetlands. As discussed under Alternative 1A, use of shallow-rooting plant species, placement of a drainage layer, and use of the GCLL cover with the additional synthetic layer are expected to result in limiting the penetration of plant roots and burrowing animals.

Under the No Action Alternative, the 725 acres of direct disturbance to existing upland vegetation would not occur, and the area would not be more susceptible to an increase of noxious weeds. Additionally, the potential for increased selenium accumulation in vegetation and wetlands would remain at existing levels. Direct disturbance to 9.43 acres of wetlands and non-wetland waters of the U.S. would not occur.

ES.4.1.8 Terrestrial Wildlife

The Proposed Action would result in the loss of 65 acres of existing wildlife habitat associated with pit highwalls. Ultimately, erosion of the highwall would reduce the configuration to conditions that would support vegetative growth. Approximately 674 acres of wildlife habitat would be resoiled and vegetated. Reclamation would result in a shift to communities dominated by perennial grasses. Indirect effects to wildlife from habitat alteration would be localized, long-term, and minor due to the small size of the disturbed area relative to the availability of the surrounding habitat.

Impacts to terrestrial wildlife may occur via selenium uptake in plant forage or water sources. Big game species are known to forage on vegetation in the project area. Other species, including upland game birds, songbirds, small mammals, reptiles, and amphibians, could also be affected. These species might be susceptible to selenium bioaccumulation if local populations spend a significant amount of time in the project area. However, big game and intermediate-sized species tend to range over large areas, and their behavior would tend to reduce risk of exposure. Overall effects to wildlife from selenium exposure would be localized, long-term, and negligible to major, depending on the mobility and susceptibility of the affected species.

Habitats adjacent to the project area could be used less by big game during mine operations. However, some individuals may become accustomed to mine activities and continue to use these areas. Construction and use of haul roads would result in increased traffic. Traffic would not likely result in any increase in wildlife mortalities and injuries, as wildlife usage of this area could already be reduced due to current mining activities. Although reclaimed areas would have a higher initial productivity, their long-term suitability for elk and mule deer forage would likely be reduced as forbs, shrubs, and trees became established.

The Proposed Action would directly disturb approximately 155 acres of elk and mule deer winter range. While the Proposed Action would result in direct and indirect long-term effects to the critical winter range of mule deer and elk, these effects are not expected to be significant when analyzed in the context of the entire critical winter range available in the area.

The Proposed Action would result in minimal effects to other local wildlife species. Effects on bats would be minimal due to the marginal bat habitat in the project area. Effects on species with large ranges, such as mountain lions, would likely be negligible because local prey populations are not expected to decrease in size or density. Local red fox populations could be directly affected because of their smaller ranges and burrowing behavior. The Proposed Action may result in some mortalities or displacement of local badger populations. Habitats affected by increased activity associated with construction and mining would also be used less by predators over the short-term.

Raptors could be directly disturbed by noise and activity from construction or mining operations. Indirect disturbances to raptors would include loss of foraging or nesting habitat and reduction in prey base. The Proposed Action would reduce habitat for a number of prey species. However, abundant foraging habitat exists adjacent to the project area, which would limit the effects of the Proposed Action.

The Proposed Action would leave a 375-foot buffer of forest between project activities and the closest bald eagle nesting tree. This buffer would minimize visual and auditory impacts to the bald eagles. An Eagle Management Plan would also be implemented that would minimize these effects. The bald eagles are, to a certain degree, accustomed to human activity in the area from the mine haul road and past exploration activities. Furthermore, the Blackfoot River provides essential habitat to the eagles that would likely keep them in the area. Impacts to bald eagles as a result of the Proposed Action would be local, short-term, and minor.

The Proposed Action would result in the loss of 65 acres of migratory bird habitat associated with pit highwalls. Primarily bird species associated with xeric big sagebrush habitat would be affected. Potential direct effects would include direct mortality, forced movement, and stress related to increased noise and human activity. Loss of habitat could indirectly result in changes in species composition and increased competition between displaced individuals and resident birds. Habitat availability may increase for species that prefer early successional habitats. Avian species that avoid edge habitat would lose more habitat than the project footprint. However, significant losses of avian habitat are not anticipated as a result of the Proposed Action due to the abundance of similar undisturbed habitat in the vicinity.

Habitat for the blue grouse and ruffed grouse would be disturbed under the Proposed Action. Indirect effects from loss of habitat for the blue and ruffed grouse would be long-term because final reclamation would establish perennial grasses. Baseline studies indicated that sage grouse could occur in the project area. Approximately 458 acres of mountain big sagebrush habitat would be lost under the Proposed Action. However, because the quality of this habitat was deemed marginal for sage grouse, the effects of habitat loss are not expected to be major.

If selenium were released into the environment as a result of the Proposed Action, water birds observed on the Blackfoot River in the project area would potentially be vulnerable to indirect mortality and reproductive effects associated with selenium toxicity. Because BMPs would minimize release of selenium into the environment and given the availability of alternate suitable habitat in the vicinity, effects to water birds as a result of the Proposed Action are expected to be minimal.

The Proposed Action would impact 3.27 acres of Wetland K, which is adjacent to Fish Pond. Direct mortalities to amphibians and reptiles may occur during reconstruction of the pond in this area. Increased sediment loads that could affect amphibians and reptiles are expected to be minimal due to the use of BMPs. Indirect effects on amphibians could include increased concentrations of selenium in surface water, water control ponds, seeps, and springs. BMPs to be implemented at the proposed mine site would minimize these potential effects. Impacts to amphibians and reptiles could be greater than water birds due to the relative immobility of reptiles and amphibians, and could have long term major impacts on local reptile and amphibian populations using waters and wetlands within that drainage.

Similar to the Proposed Action, Alternative 1A would result in the loss of 65 acres associated with pit highwalls. Approximately 703 acres of wildlife habitat would be resoiled and vegetated. Impacts to wildlife under Alternative 1A would be similar to those under the Proposed Action, except that the chance for selenium accumulation in the food chain would be lower due to the cover system design. Plants could still potentially accumulate selenium if their roots grow through the GCLL liner; however, use of a modified seed mix that would emphasize shallow-rooting species would reduce the potential for root penetration. Shallow-rooting plant species would reduce the potential selenium uptake by plants and thereby reduce the amount available for consumption by animals.

The GCLL cover system includes an additional synthetic layer which strengthens the cover against both root and animal penetration. The installation of a drain layer associated with the Alternative 1A GCLL cover is specifically designed to transport water during high runoff periods. Animals are unlikely to burrow into seasonal water transport zones because doing so could affect the integrity of the burrow.

Impacts to wildlife under Alternative 1B would be similar to those under Alternative 1A, except that the use of the GCLL liner over the entire EOP would decrease the potential for selenium to enter streams and wetlands. As described under Alternative 1A, the GCLL cover system, drainage system, and modified seed mix are designed to reduce the potential for plant root and burrowing animal penetration of the cover system.

The No Action Alternative would result in no effects in the project area and would maintain the current status of wildlife and wildlife populations in and around the project area. There would be no new impacts to terrestrial wildlife from selenium and assumed bioaccumulation of selenium in aquatic life and to terrestrial food chains would continue at the present rate for the foreseeable future.

ES.4.1.9 Fisheries and Aquatic Resources

The Proposed Action would result in the direct loss of 9.43 acres of wetlands and waters in the project area (6.11 acres of wetlands and 3.32 acres of non-wetland waters). Implementation of BMPs to control and capture sediment resulting from clearing of vegetation during construction would keep sediment from affecting local drainages thereby protecting fish and aquatic invertebrates. Due to the incorporation of BMPs into the design of the Proposed Action, indirect effects to water bodies and aquatic life from sedimentation are expected to be minimal and short-term in duration.

A potential adverse ecological effect could result if selenium bioaccumulated in the food chain of local aquatic communities. Yellowstone cutthroat trout, rainbow trout, cutbow trout (hybrid of cutthroat and rainbow trout), and northern leatherside chub inhabit the Blackfoot River. The baseline water quality data indicate that selenium concentrations in the Blackfoot River are cyclic and generally exceed the CCC aquatic life standard for a few days each spring before decreasing to below the standard during the remainder of the year. The small potential increases in selenium concentration that would result from the Proposed Action are not expected to alter this pattern. The negligible amount of selenium that would be released under the Proposed Action would not be expected to cause or accelerate a decline in aquatic populations.

Potential adverse effects to the fisheries and aquatic resources of the Blackfoot River and tributaries in the project area, as well as their related downstream waterbodies, could occur via indirect exposure to COPCs. Implementation of BMPs to control sediment associated with surface water runoff would limit transport of selenium-bearing sediment to streams. Selenium can reside in sediment and dissolve in the water column to be taken up by aquatic plants, plankton, aquatic insects, and fish. Bioaccumulation of these COPCs could result in minimal, long-term, indirect effects on aquatic populations.

Under Alternative 1A, the potential for selenium and other COPC accumulation in the food chain would be lower due to the use of the GCLL cover system. Installation of the GCLL cover would reduce the potential for selenium to enter streams and wetlands compared to the Proposed Action by reducing the volume of precipitation that infiltrates through overburden piles and backfilled pits and by incorporating features, such as an additional synthetic layer, a drainage layer, and a modified seed mix, to minimize the potential for both root and animal burrowing penetration. Effects to fisheries and aquatic resources under Alternative 1B would be similar to those under Alternative 1A, except that use of the GCLL on a larger area would decrease the potential for selenium and other COPCs to enter streams and wetlands.

There would be no potential for impacts to fisheries and aquatic resources from selenium or other COPCs if the No Action Alternative were selected. Existing concentrations of selenium in surface water seasonally exceed the state water quality standard for the protection of aquatic life.

Bioaccumulation of selenium from aquatic life through the food chains would continue at the present rate for the foreseeable future.

ES.4.1.10 Threatened, Endangered, and Special Status Species

The gray wolf is the only federally listed species with the potential to occur in the project area. Potential impacts to gray wolves would be negligible, due to the lack of wolf occurrences in the project area. The effect determination for gray wolves is that the project is "not likely to jeopardize the continued existence of the population."

Twenty-three BLM Special Status Species were either observed in the project vicinity during baseline studies or an occurrence of the species has been documented by the Idaho Department of Fish and Game (IDFG).

Reclaimed areas would represent a long-term change in habitat from forest and sagebrush communities to habitat dominated by perennial grasses. Habitat conversion would represent a long-term loss of foraging habitat for forest-dependent wildlife, such as flammulated owl, olive-sided flycatcher, and red-naped sapsucker, and sagebrush-dependent wildlife, such as greater sage-grouse and Brewer's sparrow.

The Proposed Action complies with the *Management Plan for Conservation of Yellowstone Cutthroat Trout in Idaho*. The proposed compensatory wetland mitigation, including improving riparian habitat along the Blackfoot River, would conform to the management priorities and actions for the Blackfoot River geographic management unit.

Northern leopard frogs inhabiting Fish Pond may receive direct impacts, including mortality, from disturbance of the Pond. Fish Pond is a component of the Water Management Plan and would collect runoff from the EOP. This water has the potential to have elevated selenium concentrations and, therefore, individual northern leopard frogs may be subject to the indirect effects of selenium.

While the Proposed Action may result in direct and indirect effects to individual BLM Special Status Species, these effects are not expected to lead to population-level reductions due to the small area of proposed disturbance compared with the regional availability of suitable habitat. The Proposed Action is not expected to elevate the status of these species to a federal listing.

Effects to BLM Special Status Species under Alternative 1A would be similar to those under the Proposed Action, except that the potential for selenium accumulation in the food chain would be lower due to the use of a different cover system. Also, the potential for selenium to enter streams and wetlands and to affect aquatic species and their predators would be reduced. Use of a modified seed mix that would emphasize shallow-rooting species would reduce the potential for root penetration of the GCLL cover. The reduced root penetration would result in less potential for selenium uptake by plants and therefore reduce uptake by animals consuming those plants. The GCLL cover design includes an additional synthetic layer that resists penetration by roots and burrowing animals. The drain layer associated with the GCLL cover is specifically designed to transport water during high runoff periods. Animals are unlikely to burrow into seasonal water transport zones because doing so could affect the integrity of the burrow.

Effects to BLM Special Status Species under Alternative 1B would be similar to those under Alternative 1A, except that the use of the GCLL would further decrease the potential for selenium to enter streams and wetlands.

The No Action Alternative would result in no additional effects in the project area and would maintain the status of threatened, endangered, and sensitive plant and wildlife populations in and around the study area. Existing concentrations of selenium in surface water seasonally exceed state chronic water quality standards and water consumption toxicity thresholds for aquatic life and terrestrial wildlife. Bioaccumulation of selenium from aquatic life through terrestrial food chains would continue at the present rate.

ES.4.1.11 Visual Resources

Short-term, localized effects to the visual character of the landscape would result from removal of vegetation and exposure of soils of contrasting color and texture during construction and mining associated with the Proposed Action. The effects to visual resources would occur at different locations within the mine site over the different ore recovery phases for each of the three mine pits. The effects would occur over a 3- to 5-year period for each phase of mining in the portion of the mine site that would be visible to the public.

Most of the mine site under the Proposed Action would be hidden by the surrounding landforms from any potential viewpoint, and would generally be unseen by public viewers. However, there is no intervening terrain between some proposed mine facilities and viewing areas to the west, northwest, and north of the mine site. Activities associated with the North Pit, located northwest of the haul road, and the north portion of the Mid Pit would be visible to the viewing public in the foreground-middleground (less than 3 miles away) to background (more than 3 miles from viewing area). The distance zone from key viewing areas includes a limited portion of State Highway 34, Blackfoot River Road, Kermit Park, and the China Hat geologic area. The potential viewers of the study area would be local ranchers, mine personnel, motorists on State Highway 34, and recreation users.

The project area contains public lands managed with the Visual Resource Management (VRM) Class IV objectives. The existing characteristic landscape would not be retained; however, Class IV provides for management activities that require major modification of the existing character of the landscape. The reclaimed landscape would mimic surrounding topography and vegetative cover; therefore, over the long-term, the existing character would be retained to the extent possible. Under the VRM Class IV objective, the level of change to the characteristic landscape can be high. The proposed project would meet Class IV objectives.

The effects to the scenic quality and characteristics of the existing landscape from implementation of Alternatives 1A and 1B would be essentially the same as the Proposed Action. There would be no discernible effect to visual resources from the use of either cover type relative to effects described for the Proposed Action. Any contrasts of color and texture associated with these cover types would be temporary and would endure only until alluvial material and topsoil had been placed on the liner materials. The alternatives would meet VRM Class IV objectives.

Under implementation of the No Action Alternative, there would be no mining or associated disturbance at Blackfoot Bridge on the existing leases. However, this does not preclude future development of the leases under a different mine plan.

ES.4.1.12 Land Use and Access

Effects to land use in the Blackfoot Bridge Mine area would occur from displacement of the existing land uses by mining-related facilities and activities over the 17-year life of the project. Most of these effects would be short-term. Reclamation of mined land would restore previous land uses.

Short-term effects to grazing management under the Proposed Action would include disturbance of 390 acres of land that is currently used for grazing, consisting of 76 acres of the BLM surface and 314 acres of private surface. All disturbed areas that are amenable to reclamation would be reclaimed and revegetated. Disturbed areas would be reclaimed using non-seleniferous overburden material and a seed mixture primarily of grasses and forbs. In the early stages of succession after reclamation, grasses would be dominant, and more forage may be available for livestock grazing than before mining.

Hunting is a major recreation use in the study area. Mining would disturb 76 acres of public land and would result in disruption of the presence and movement of game animals in these areas during mining and reclamation. In the early stages of reclamation, a predominance of grasses would provide good forage but little cover for large game animals. In the long-term, reclaimed areas would restore habitat for hunting.

Under the Proposed Action, public access and the volume of traffic on existing transportation facilities would increase on the haul road during mining. Traffic levels on the local transportation network would remain similar to the current conditions. Traffic would not increase on the gated private road that enters the project area from Blackfoot River Road. Additional opportunities for public access to the study area are unlikely to result from the Proposed Action.

The total surface disturbance and effects to grazing allotments, recreation, and land use, or to access and transportation associated with Alternative 1A and Alternative 1B would be 28.5 acres greater than the Proposed Action. Approximately 8.5 percent of the total disturbance associated with this alternative would not be reclaimed.

Under the No Action Alternative, the Blackfoot Bridge leases would not be mined and there would be no adverse effects to grazing allotments, recreation, and land use, or to access and transportation.

ES.4.1.13 Cultural Resources

The entire area of potential effects of the Proposed Action has been inventoried for the presence of cultural resources. Six cultural resources have been identified in the mine permit area. One cultural resource site (10CU260) has been identified as eligible for the National Register of Historic Places (NRHP) and is therefore considered a historic property. This site would not be affected by any of the currently proposed alternatives. However, mine-related activities may occur near the site. This site would be designated as a sensitive area and avoided by any ground-disturbing activities.

The nature of the short-term and long-term impacts under Alternatives 1A and 1B would be the same as under the Proposed Action. The extent, location of disturbance, and impacts under Alternatives 1A and 1B would be 28.5 acres greater than the Proposed Action.

Under the No Action Alternative, the Blackfoot Bridge leases would not be mined, and there would be no adverse effects to known eligible cultural resources.

ES.4.1.14 Tribal Treaty Rights and Concerns

There would be no changes in land status associated with the Proposed Action, and those portions of the project area that are currently unoccupied federal lands would retain that status. However, there would be substantial areas of disturbance on those federal lands. Although there would be a short-term loss of access during mining for the Shoshone and Bannock Tribes' access to the lands to exercise treaty rights and traditional uses, that access would be restored at the completion of mining. Other short-term effects would be associated with the disturbance or displacement of plant and wildlife species that are used for traditional purposes and subsistence.

Under Alternatives 1A and 1B, the nature and locations of disturbance would be the same under either alternative. The short-term and long-term impacts under Alternatives 1A and 1B would be 28.5 acres greater than the Proposed Action.

Under the No Action Alternative, the Blackfoot Bridge leases would not be mined, and there would be no adverse effects to known Tribal treaty rights and interests.

ES.4.1.15 Social and Economic Conditions

Implementation of the Proposed Action would result in beneficial long-term effects to the social and economic structure and community resources of Caribou County over the proposed project life of 17 years. The Caribou County economy depends on phosphate mining. Implementation of the Proposed Action would maintain mining employment opportunities in the analysis area, which consists of Caribou County and the surrounding counties that provide a portion of the labor force, including Bear Lake and Bannock Counties in Idaho, and Lincoln County in Wyoming. The Proposed Action would also enhance community stability and provide for continued payment of local, state, and federal taxes by P4 and its employees. Local government fiscal conditions depend on sustained economic activity and continued revenues from sales and use taxes and property taxes. It is anticipated that the transition from operations at the South Rasmussen Mine to the proposed Blackfoot Bridge Mine operations would allow uninterrupted continuation of these effects.

The Proposed Action would not cause adverse effects to the socioeconomic resources of the analysis area. The Proposed Action would not require an in-migrating workforce from outside the analysis area, and would generate only moderate tax revenues. Consequently, no increases in housing or community service demands would occur, and existing and planned facilities would not be adversely affected. Similarly, construction, operation, and maintenance of the project would not increase or decrease the need for police, fire, medical or other community services in the analysis area. Community effects on law enforcement, fire protection, medical facilities, schools, parks and recreation, or public libraries are not anticipated with implementation of the Proposed Action. The operation of the project would add revenue to the Caribou County tax

base. Economic benefits to the other counties of the analysis area would be limited to the circulation and recirculation of personal income earned as wages paid to employees.

Increases in existing levels of domestic water usage in analysis area counties are not expected, and no effects on existing domestic water facilities would occur. In addition, existing organized public water systems would not be used for any portion of mining operations. Therefore, no effect on domestic water systems would occur from mining operations. Wastewater disposal requirements in Caribou County or other analysis area counties are not anticipated to increase with implementation of other action alternatives. Similarly, no county-wide effects on solid waste collection or disposal are anticipated.

Short-term effects from construction activities would benefit the local economy. The initial development phases of the proposed project would require purchases of equipment and supplies; however, the economic benefits to the affected counties would be limited to the construction period of the project.

Royalties are paid on any production from a lease in accordance with the terms specified by the BLM, as included in the leases. Minimum royalty rates are not less than 5 percent of the gross value of production from leased deposits at the mine, or not less than 25 cents per ton, whichever is greater, for the right "to mine and dispose of all the phosphate rock and associated and related minerals hereafter referred to as leased deposits." Federal law requires royalties and other revenues collected from federal phosphate leases be split equally between the state where the activity occurs and the federal treasury. The state receives 50 percent of royalty revenues, placing the revenues in a general fund, and a special revenue fund for mineral impacts. Typically, Caribou County receives about 10 percent of the general fund revenues received by the state. The estimated total federal royalties could be $39 million over the 17-year life of the Blackfoot Bridge Mine. The state would receive an estimated average annual payment of $1.0 million, of which an average annual amount of $100,000 would be received by Caribou County.

Under Alternatives 1A and 1B, effects to the socioeconomic structure of Caribou County, as well as other analysis area counties, are the same as evaluated for the Proposed Action. The different cover systems and modified water management system proposed under Alternatives 1A and 1B would require additional expenditures for supplies and equipment, but any additional revenues realized from these purchases by vendors within the counties or the state would not differ greatly from purchases made for the Proposed Action.

Selection of the No Action Alternative would result in a decline in mining employment opportunities unless another reserve is permitted to take the place of Blackfoot Bridge. The required ore for P4's processing plant would not be produced at Blackfoot Bridge, which could reduce current employment levels at the plant or shorten the operating life of the plant, thereby eliminating jobs, tax revenues paid to the county, and revenues paid into the local economy through operating expenditures and payroll. The projected loss of employment could lead to negative effects on overall stability of the community. A substantial number of current P4 and contractor employees would become unemployed and might leave the area, resulting in a slight reduction in the overall county population.

The No Action Alternative would generally have no effect on existing public utilities and services. However, tax-based revenues and other sources of municipal funding related to mining

operations would be negatively affected if the Blackfoot Bridge Mine was not producing once current mining activities, such as South Rasmussen Mine ended and no other reserves were permitted. Subsequently, Caribou County's ability to fund certain utilities and services could be jeopardized.

Selection of the No Action Alternative would result in a reduction in sales, use, and property tax revenues generated by phosphate mining operations once existing operations at South Rasmussen Mine cease. There would be losses in revenues from taxes paid by P4 and its employees and by secondary businesses and their employees, resulting in a decrease in Caribou County's overall revenues, as well as revenues in other analysis area counties from the circulation of payroll dollars.

ES.4.1.16 Environmental Justice

The Proposed Action and alternatives include BLM lands and minerals, and would not affect any area of low-income housing or affect low-income populations.

The U.S. Census identified 714 residents, or 9.6 percent of the total population, who live below the poverty level in the urban areas of Caribou County. Residents who live below poverty level were not identified for rural areas between Soda Springs and the Blackfoot Bridge Mine. The project is on federal leases and is not located within the corporate limits of any urban community or in any populated rural area. The Proposed Action and alternative would not affect any area that contains populations living under the poverty level.

Selection of the No Action Alternative would result in a decline in mining and production plant employment opportunities. The socioeconomic effects of the No Action Alternative would be spread across all races, ages, and income levels, and would not result in any disproportionately high or adverse impacts to minority or low-income populations.

ES.4.1.17 Hazardous and Solid Wastes

An accidental spill of hazardous materials or wastes associated with the Proposed Action is unlikely to pose environmental or public health and safety risks. Most of the hazardous materials to be used for the Proposed Action would be stored in existing facilities at the Ballard and Enoch Valley Mine sites. The capacity of the existing secondary containment facilities is adequate to hold more than the entire contents of the largest tank within the storage areas including freeboard for precipitation. Fuel leaks from the truck filling area would be contained within the bermed areas. Less than 100 kilograms of hazardous waste (waste oils, solvents, and antifreeze) would be generated per month. Compliance with the procedures and training defined in the existing approved SWPPP would minimize the potential for spills or leaks of hazardous materials or wastes.

The Proposed Action is unlikely to pose safety hazards to the public related to the proposed route for transporting hazardous materials and wastes. Blackfoot Bridge Mine and the haul route for hazardous materials and wastes would be the same route that is currently used at the South Rasmussen Mine. The primary transportation route from Soda Springs to the existing mine area would be via State Highway 34, Blackfoot River Road, and the existing haul road to the mine site.

Potential risks associated the hazardous materials or wastes for Alternatives 1A and 1B would be the same as were analyzed for the Proposed Action. Under Alternatives 1A and 1B, the hazardous materials and wastes, quantities used and stored on site, and storage locations would be the same as were analyzed for the Proposed Action. Under Alternatives 1A and 1B, hazardous materials and wastes would continue to be transported along the same route that is currently used for the South Rasmussen Mine.

Under the No Action Alternative, there would be no mining or associated disturbance at the Blackfoot Bridge Mine. This alternative would involve continued mining at the South Rasmussen Mine until all ore was recovered. For the No Action Alternative, the hazardous materials and wastes, quantities used and stored on site, and storage locations would continue to be the same as are currently used at the South Rasmussen Mine.

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APPENDICES

Appendix A Final Environmental Monitoring Report
Appendix B Final Adaptive Management Plan
Appendix C DEIS Comments Report

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CHAPTER 1

INTRODUCTION/PURPOSE AND NEED

CHAPTER 1
INTRODUCTION/PURPOSE AND NEED

1.1 INTRODUCTION

This *Final Environmental Impact Statement* (FEIS) was prepared by the Bureau of Land Management (BLM), Pocatello Field Office, in cooperation with the Idaho Department of Environmental Quality (IDEQ), Idaho Department of Lands (IDL) and the Walla Walla District of the U.S. Army Corps of Engineers (USACE) in response to the proposed *Mine and Reclamation Plan* submitted by P4 Production, LLC (P4) (a wholly owned subsidiary of Monsanto Company, Inc.). P4 submitted an initial *Mine and Reclamation Plan* to the BLM in November 2005 (P4 2005). In October 2008, the BLM received the *Revised Blackfoot Bridge Mine and Reclamation Plan* (2008 Revised Mine Plan) from P4 (P4 2008a). The 2008 Revised Mine Plan (and subsequent modifications) includes details of operational and reclamation activities proposed for the Blackfoot Bridge property. The 2008 Revised Mine Plan proposes a new open pit phosphate mining operation on federal mineral leases that would include external overburden piles, a haul road, and a water management plan. Processing would be conducted off site. Mining would also employ best management practices (BMPs) for control and prevention of releases of sediment, dissolved constituents, and trace elements, such as selenium, to nearby surface water and groundwater.

The project area is located in Caribou County, approximately 10 miles northeast of Soda Springs, Idaho (**Figure 1.1-1**). The Proposed Action and alternatives would occur on land with surface rights administered by the BLM and three private landowners. All phosphate mineral rights in the project area are administered by the BLM. Mining is proposed for two Federal Phosphate Leases (I-05613 and I-013709). The leases convey to P4 the exclusive right and privilege, subject to the terms and conditions of the lease, to explore and develop the federally owned mineral estate and to use the surface of federal lands for related mine activities. The mineral leases and surface land ownership within the project boundary are shown on **Figure 1.1-2**. None of the federal surface or mineral rights within the project area are administered by the U.S. Forest Service (USFS) or are otherwise located near or within the Caribou-Targhee National Forest (CTNF), and none of the lands within the project area are classified as inventoried roadless areas (IRAs).

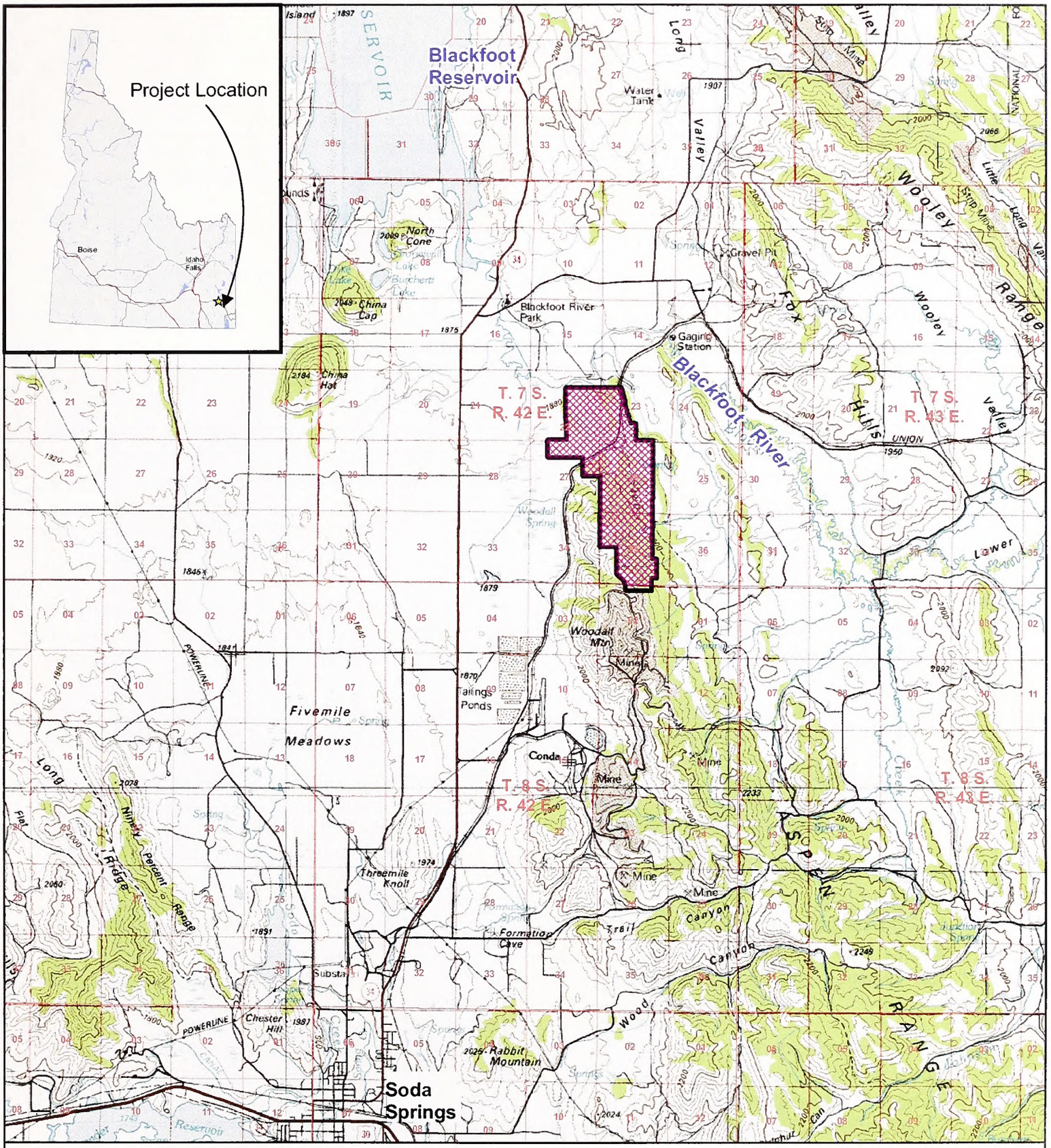
P4's Federal Phosphate Lease I-05613 was granted by the United States and issued in 1955, and Federal Phosphate Lease I-013709 was granted by the United States and issued in 1965. By regulation, phosphate leases are issued for an indefinite period. They exist as long as rentals and royalties are paid and as long as the terms and conditions of the lease are met. The lease terms and conditions are subject to reasonable readjustment every 20 years. Lessees may relinquish their leases at any time if they can show to the BLM's satisfaction that all terms and conditions of the lease, including reclamation, have been met, and that the public interest would not be impaired. Federal phosphate leases are not cancellable by the United States except by due process in the case where the lessee does not meet the terms and conditions of the lease. Leases typically can only be reacquired from a lessee by the United States via trade, purchase, or other compensation due to protections afforded by private parties, similar to the interests associated with leases. P4 also proposes to modify and enlarge the lease area.

As required by National Environmental Policy Act (NEPA), this FEIS describes the components of, reasonable alternatives to, and environmental consequences of recovery and reclamation of phosphate ore at the Blackfoot Bridge property. **Chapter 1** describes the purpose and need for the project, the role of the BLM and other regulatory agencies, summarizes public participation in the EIS process, and identifies those issues that would be addressed in this EIS. **Chapter 2** provides a complete description of the Proposed Action and alternatives to the Proposed Action, and describes proposed environmental control measures to reduce or minimize impacts. **Chapter 3** describes the existing environment at the Blackfoot Bridge property. **Chapter 4** describes the potential direct and indirect impacts associated with the Proposed Action and alternatives, and potential mitigation measures identified by the agencies. **Chapter 5** describes the potential cumulative impacts associated with the Proposed Action and alternatives. **Chapter 6** describes the public participation and input process, consultation and coordination with federal, state, and local agencies, as well as Native American consultation, and includes a list of preparers of this EIS. **Chapter 7** contains a list of references cited in developing this EIS, as well as an index, glossary, list of acronyms, and units of measure. **Appendix A** is the Environmental Monitoring Plan, **Appendix B** is the Adaptive Management Plan, and **Appendix C** contains identified issues derived from public and agency comments received after the release of the Draft Environmental Impact Statement (DEIS), and agency responses to those issues.

The BLM would use this EIS to determine whether or not the 2008 Revised Mine Plan would be approved and whether the lease(s) would be modified to include additional areas. The BLM is serving as lead agency in preparing this EIS for the proposed Blackfoot Bridge Mine. IDL, IDEQ, and the USACE are participating as cooperating agencies. This EIS follows regulations promulgated by the Council on Environmental Quality (CEQ) for implementing the procedural provisions of NEPA (Title 40 Code of Federal Regulations [CFR] 1500-1508), the U.S. Department of the Interior implementing regulations for NEPA for all of its bureaus including BLM found at 43 CFR Part 46, the U.S. Department of the Interior Departmental Manual and the BLM NEPA Handbook (H-1790-1), and the USACE regulations for implementing NEPA found at 33 CFR 325 Appendix B. The agencies would evaluate which appropriate alternative and mitigation measures would be applied to their respective decisions, and evaluate methods to reduce or eliminate release of potential constituents and trace elements from the proposed mining activities.

1.2 PURPOSE AND NEED

The purpose and need for the BLM is to evaluate and respond to the 2008 Revised Mine Plan (Proposed Action) from P4 that proposes the recovery of phosphate ore reserves contained within the Blackfoot Bridge Federal Phosphate Leases I-05613 and I-013709, as directed by the Mineral Leasing Act of 1920. The BLM is required to evaluate the 2008 Revised Mine Plan submitted by P4 and issue decisions related to development of the phosphate leases, including alternatives and decisions to modify or enlarge the existing leases, and otherwise authorize mining and related activity. The USACE is required to evaluate and respond to P4's application for a permit under Section 404 of the Clean Water Act that is needed to implement the 2008 Revised Mine Plan. This EIS provides the analysis upon which the BLM and other involved agencies can base such decisions.



Source: USGS 1:100,000 Soda Springs Quadrangle

LEGEND

Project Boundary: Proposed Action

Project Boundary: Alternatives 1A and 1B

NORTH

1 0.5 0 1 2

Miles

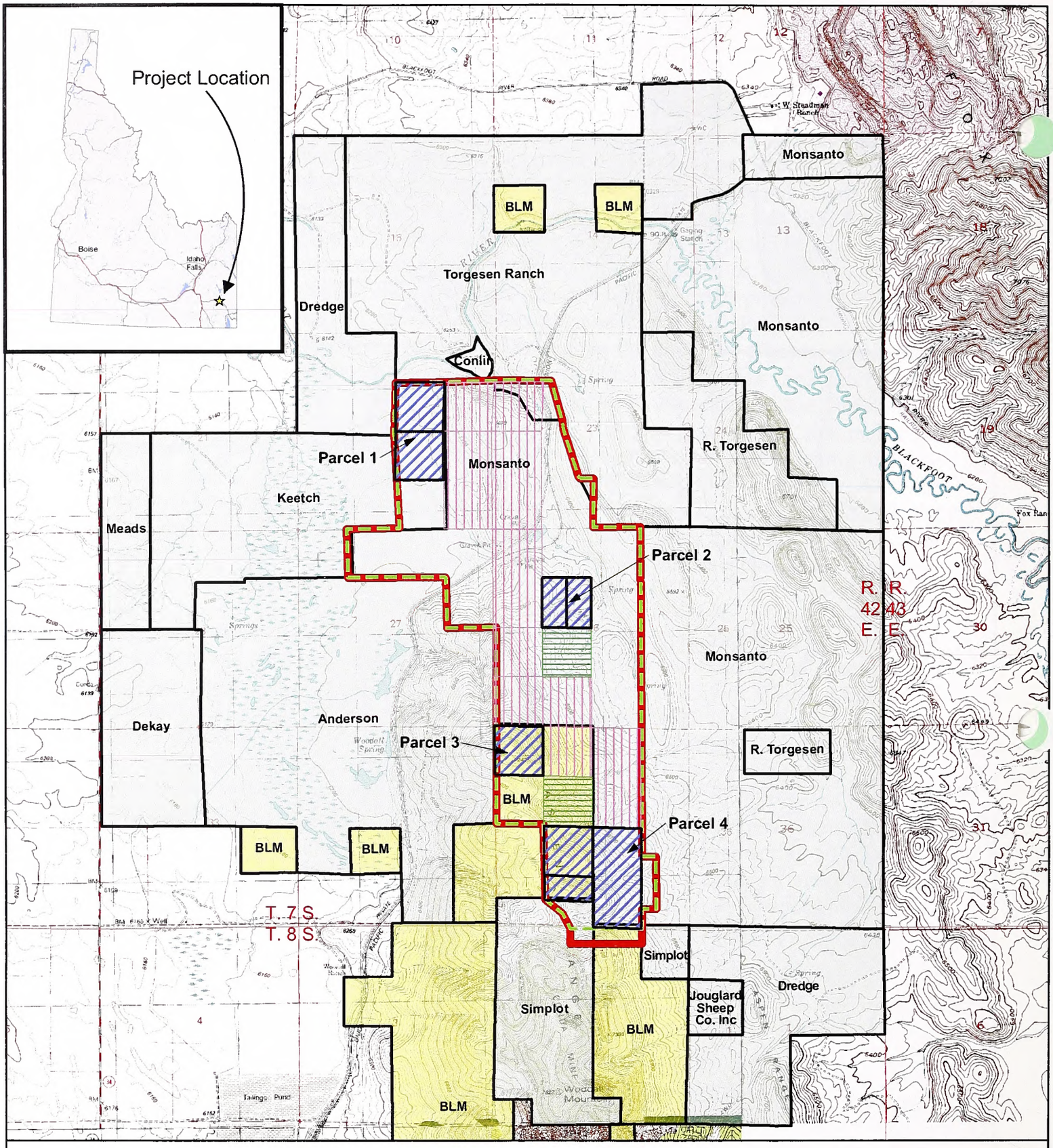
BLACKFOOT BRIDGE PROJECT EIS

FIGURE 1.1-1
Project Location

ANALYSIS AREA: Caribou County, Idaho

Date: 6/23/2010 | Prepared By: JC

File: K\1356\EIS2010\Fig1x_Alt1_ProjectLocation.mxd


Project Location
Boise
Idaho Falls
Monsanto
BLM
BLM
Torgesen Ranch
Dredge
Monsanto
Conlin
Parcel 1
Monsanto
R. Torgesen
Keetch
Meads
Parcel 2
R. 42 E.
R. 43 E.
Monsanto
Dekay
Anderson
Parcel 3
R. Torgesen
BLM
Parcel 4
BLM
BLM
T. 7 S.
T. 8 S.
Simplot
Dredge
Simplot
Jouglard Sheep Co. Inc
BLM
BLM
Source: USGS 1:100,000 Soda Springs Quadrangle
LEGEND
Lease Modification
I-013709
I-05613
Project Boundary: Proposed Action
Project Boundary: Alternatives 1A and 1B
BLM Land
Private Land
NORTH
0
0.5
1
Miles
BLACKFOOT BRIDGE PROJECT EIS
FIGURE 1.1-2
Mineral Lease Holdings and Modifications and Surface Land Ownership
ANALYSIS AREA: Caribou County, Idaho
Date: 06/23/2010
Prepared By: JC
File: K:\1356\EIS2010\Fig1x_Alt1_Lease.mxd

The Proposed Action is needed to ensure economically viable development of the phosphate resources, in accordance with federal law and the federal leases, and to allow the lessee to exercise its right to develop the leases mentioned above.

1.3 AUTHORIZING ACTIONS

1.3.1 Decisions to be Made

The BLM Idaho State Director (Director), or other authorized officer, is the official responsible for this EIS and all on-lease and other public lands and lease modifications, and would make the decision whether or not to issue the lease modifications and approve the 2008 Revised Mine Plan or an alternative to the 2008 Revised Mine Plan to authorize mining and related activity. The BLM would consider the following: comments and responses generated during the scoping and other opportunities for public comment; the proponent's rights to recover leased mineral resources; anticipated environmental and socioeconomic consequences discussed in this EIS; and applicable laws, regulations, and policies. The BLM would prepare and sign the Record of Decision (ROD) that would consider whether to approve the requested phosphate lease modifications and proposed 2008 Revised Mine Plan or alternatives.

A Section 404 Clean Water Act (33 United States Code [U.S.C.] 1344) permit would also be required by the USACE. A Joint Application for Permit was submitted to the USACE on December 22, 2008. The USACE would provide independent and separate decisions in response to the application. The USACE will issue a permit, issue a permit with required modifications, or deny the application for permit. Any decision to issue a permit will include measures to mitigate the impacts to affected waters of the U.S. including wetlands.

Enforcement of federal laws that protect listed wildlife and plant species and migratory birds is the responsibility of the U.S. Fish and Wildlife Service (USFWS).

1.3.2 Permits and Approvals

The proposed mining operations must comply with all laws and regulations for mining on public lands. In addition to the BLM, IDEQ, IDL, and USACE, other federal, state, and local agencies have independent and unique authorities over elements of the mining operations as well as over certain aspects of the Proposed Action and alternatives. **Table 1.3-1** lists the agencies and identifies their authorizing responsibilities.

P4 will be required to obtain the appropriate permit(s) for discharges of stormwater from the project. Discharge of stormwater requires the operator to obtain a permit under the National Pollution Discharge Elimination System (NPDES). In Idaho, the U.S. Environmental Protection Agency (EPA) is the permitting authority for NPDES permits. The Blackfoot Bridge site is currently authorized to discharge stormwater related to exploration and construction activities under the NPDES General Permit for Stormwater Discharges from Construction Activities. This Construction General Permit was issued in 2003, and continues to cover P4 for stormwater discharges related to exploration and construction activities at the project site. Stormwater discharges associated with mining level activity would require P4 to obtain an individual NPDES permit and/or a new general NPDES permit, identified as the NPDES Multi-Sector General Permit for Industrial Activities (MSGP). The MSGP became effective in Idaho on February 26, 2009.

Table 1.3-1 Major Permits, Approvals, and Authorizing Actions Potentially Required for the Blackfoot Bridge Mine

Issuing Agency Permit/Approval Name	Nature of Permit/Approval	Authority	Applicable Project Component	Timing of Submittal of Permit/Approval	Status of Permit/Approval
USACE					
Clean Water Act Section 404 Permit (Individual)	Authorizes placement of dredged or fill materials into waters of the United States, including adjacent wetlands	Section 404 of the Clean Water Act of 1972 (33 U.S.C. Part 1344)	Disturbances to waters of the United States including wetlands.	Permit must be obtained and approved prior to commencement of construction.	Pending. Application submitted to USACE on December 22, 2008.
U.S. Fish and Wildlife Service					
Endangered Species Act Compliance (Section 7)	Protects threatened and endangered species	Section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. et seq.)	Any activity, such as displacement or habitat disturbance, that may affect listed or proposed threatened and endangered species.	Federal agencies must ensure that actions will not jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat prior to commencement of construction.	There is one listed species that may occur in the vicinity of the project area, the gray wolf. The gray wolf is listed as a nonessential experimental population in the portion of Idaho south of Interstate 90. No other listed species or designated critical habitat is present in the project area. Analysis is presented in Chapters 3, 4, and 5, Wildlife.
Migratory Bird Treaty Act	Protects migratory birds	Migratory Bird Treaty Act (16 U.S.C. 703-711)	All surface-disturbing activities.	Impacts to migratory birds must be analyzed and, if applicable, mitigation measures developed prior to commencement of construction.	Analysis and mitigation measures presented in Chapters 3, 4, and 5, Wildlife.
Bald and Golden Eagle Protection Act	Protects bald and golden eagles	Bald and Golden Eagle Protection Act (16 U.S.C. 668)	All surface-disturbing activities.	Impacts to eagles must be analyzed and mitigation measures developed prior to commencement of construction.	Analysis and mitigation measures presented in Chapters 3, 4, and 5, Wildlife; Bald Eagle Management Plan has been submitted. P4 has submitted an application to the U.S. Fish and Wildlife Service, should a permit under the Bald and Golden Eagle Protection Act become necessary.

Table 1.3-1 Major Permits, Approvals, and Authorizing Actions Potentially Required for the Blackfoot Bridge Mine

Issuing Agency Permit/Approval Name	Nature of Permit/Approval	Authority	Applicable Project Component	Timing of Submittal of Permit/Approval	Status of Permit/Approval
BLM					
Record of Decision	Compliance with National Environmental Policy Act	National Environmental Policy Act (42 U.S.C. 4321 et seq.)	Activities affecting federal lands and resources.	A ROD is required prior to commencement of construction.	Pending. Preparation of NEPA documentation is underway.
Mine and Reclamation Plan	Compliance with 43 CFR 3590.2(a), 3592.1(a); and the Pocatello BLM Resource Management Plan	43 CFR 3590.2(a), 3592.1(a)	Activities affecting federal leased mineral resources.	Required prior to beginning operations.	Pending after ROD on the Final EIS.
Lease Modification	Authorize expanding existing lease boundaries	Mineral Leasing Act of 1920 (30 U.S.C. 181 et seq); 43 CFR 3510	Expansion of existing Federal Phosphate Leases I-05613.	Approval must be obtained before commencement of mining activities on land covered by lease modification request.	Pending after ROD on the Final EIS.
Right-of-way or Phosphate Use Permit	Authorize construction off lease, but on BLM surface	Federal Land Policy and Management Act or Mineral Leasing Act of 1920 (30 U.S.C. 181 et seq); 43 CFR 3516	Run-on control ditches	Approval must be obtained before commencement of mining activities on off-lease BLM surface.	Pending after ROD on the Final EIS.
U.S. Environmental Protection Agency					
NPDES Permit	Authorize the discharge of stormwater	Section 402 of the Clean Water Act of 1972 (33 U.S.C. Part1342)	Exploration, construction, active mining, and reclamation activities.	Permit must be obtained and approved prior to discharge of stormwater.	Pending: P4 currently has coverage for discharges from exploration and construction activities at the project site under NPDES General Permit for Stormwater Discharges from Construction Activities – 2003. P4 intends to submit a Notice of Intent for MSGP 2008 Permit for Industrial Activity and/or apply for an individual NPDES permit, if required by EPA.
Spill Prevention Control and Countermeasures Plan (SPCC Plan)	Provides management direction for potential spills	SPCC Rule (40 CFR 112)	Bulk petroleum products storage.	Must be prepared and implemented prior to beginning operations.	Pending. SPCC Plan would be developed and implemented prior to commencement of operations.

Table 1.3-1 Major Permits, Approvals, and Authorizing Actions Potentially Required for the Blackfoot Bridge Mine

Issuing Agency Permit/Approval Name	Nature of Permit/Approval	Authority	Applicable Project Component	Timing of Submittal of Permit/Approval	Status of Permit/Approval
Bureau of Alcohol, Tobacco, & Firearms					
High Explosives Permit	Possession of Explosives	18 U.S.C. 40; 27 CFR 555	Blasting in open pits.	Must be obtained prior to acquiring explosives.	Pending. Required high explosives permit would be obtained prior to commencement of construction.
Mine Safety and Health Administration (MSHA)					
MSHA Registration Notice of Legal Identity Notice of Mine Opening or Closing MSHA Approval Mine Health & Safety Training Plan	Filings required	30 CFR Part 41; 30 CFR Part 46	Mine installation.	No formal permitting requirements, but: -notification required for legal identity and mine opening and closing. -notice must be filed within 30 days after mine opening. Development and approval of Mine Health and Safety Training Plan prior to operation. Mandatory federal regulations for work safety must also be met (assumes that the Revised Mine Plan is approved). Routine mine inspections.	Pending: MSHA notification for legal identity to be submitted to MSHA prior to commencement of construction. Mine opening notification would be made to MSHA prior to commencement of operations. Mine Health and Safety Training Plan to be developed and implemented prior to commencement of operations. Mandatory federal regulations for worker safety would be complied with during construction and operations.
IDEQ					
Air Quality Permit(s)	Controls release of air pollutants	Idaho Administrative Procedures Act (IDAPA) 58 – Department of Environmental Quality 58.01.01 - Rules for the Control of Air Pollution in Idaho	Elements that contribute to air quality issues such as blasting, hauling, or crushing.	Permit to construct must be obtained prior to commencement of construction, unless requirements of IDAPA 58.01.01 Section 213 are met. Tier I or Tier II Operating Permit may be required prior to beginning operations depending on emissions levels.	Pending. Required permits would be obtained prior to commencement of construction.

Table 1.3-1 Major Permits, Approvals, and Authorizing Actions Potentially Required for the Blackfoot Bridge Mine

Issuing Agency Permit/Approval Name	Nature of Permit/Approval	Authority	Applicable Project Component	Timing of Submittal of Permit/Approval	Status of Permit/Approval
Resource Conservation and Recovery Act program (adopted federal standards) Generator Status: Conditionally Exempt Small Quantity Generator	Management of hazardous waste	Idaho Hazardous Waste Management Act, Idaho Code Title 39 Chapter 44 (39-4401) and IDAPA 58.01.05, Rules and Standards for Hazardous Waste	Temporary storage and off-site disposal of hazardous wastes. No treatment, disposal, and storage facilities would be required.	Waste generator status must be determined prior to generation of hazardous wastes on site.	Pending. Waste generator status would be determined prior to generation of hazardous wastes.
Certification of Water Quality (Clean Water Act, Section 401)	Protects quality of navigable waters from discharges	Section 401 of the Clean Water Act of 1972; 33 U.S.C. Part 1341; Idaho Code Parts 39-101 et seq.; Idaho Code Parts 39-3601 et seq.	Required for any permit issued by a federal agency for any activity that may result in a discharge to navigable waters to ensure state water quality standards would be met.	Certification must be received prior to approval of a federal permit that may result in discharge to navigable waters. Federal permit and certification required prior to commencement of construction.	Pending. The Certification application would be issued prior to commencement of activities at the project site.
Groundwater Quality Rules	Protects quality of groundwater from contaminants	IDAPA 58.01.011 Groundwater Quality Rule	Potential infiltration of leachate products into groundwater.	No formal permitting requirements, but BMPs must be used throughout the life of the mine to avoid contamination of groundwater. P4 submitted an application to IDEQ requesting a points-of-compliance determination.	Pending. Develop and implement BMPs for groundwater protection prior to commencement of construction. Obtain compliance point determination from IDEQ.
Idaho Department of Water Resources					
Stream Channel Alteration Permit	Protection of perennial stream channels	Idaho Code Part 42-3803; IDAPA 37.03.07, Stream Channel Alteration Rules	Haul road crossings.	Permit application must be filed at least 60 days prior to commencement of construction and permit must be obtained prior to construction.	Pending. Required permits would be obtained prior to construction activities affecting perennial stream channels (e.g., haul roads).
Water Rights	Rights to surface water	Idaho Code Parts42-201 et seq.; IDAPA 37.03.08, Water Appropriation Rules	Mine dewatering and evaporation of impacted stormwater.	Water rights must be obtained prior to commencement of dewatering activities.	Pending. To be obtained prior to commencement of dewatering activities.

Table 1.3-1 Major Permits, Approvals, and Authorizing Actions Potentially Required for the Blackfoot Bridge Mine

Issuing Agency Permit/Approval Name	Nature of Permit/Approval	Authority	Applicable Project Component	Timing of Submittal of Permit/Approval	Status of Permit/Approval
Dam Construction Permit	Construction permit for dams	Idaho Administrative Code IDAPA 37.03.06, Department of Water Resources Safety of Dams Rules	Water Management Ponds (WMP-1, WMP-2) and Fish Pond.	Written approval required prior to construction.	To be submitted.
IDL					
Mine and Reclamation Plan Permit	Permit and bonding for reclamation	Idaho Code Parts 47-1501 et seq.	Mining and Reclamation Plan.	Reclamation Plan must be submitted and approved prior to beginning operations.	Pending. Approval would be obtained prior to commencement of mining activities.
Idaho State Historic Preservation Office					
National Historic Preservation Act Compliance Section 106	Protects cultural and historical resources	National Historic Preservation Act, Section 106; Idaho Code Parts 67-4113 et seq.; 36 CFR 800 Protection of Historic Properties	All ground-disturbing activities.	Consultation with State Historic preservation Office (SHPO) required prior to decision on the Revised Mine Plan.	Required consultation is complete.
Caribou County					
Conditional Use Permit	Approval of facilities within an approved land use	Caribou County Zoning Ordinance, Chapter 13	Required if landfill or petroleum remediation pad is constructed.	Permit must be obtained prior to commencement of construction.	Any required conditional use permit would be obtained prior to commencement of construction.

Note:
This list is intended to provide an overview of key regulatory requirements that would govern project implementation under any alternative. Additional approvals, permits, and authorizing actions could be necessary as the project develops.

P4 will need to secure proper water rights from the Idaho Department of Water Resources for dewatering the pits during mining and evaporation of impacted stormwater. P4 will be required to demonstrate that they have adequate water appropriation rights for the water that they intend to use.

If P4's Revised Mine Plan is approved, a reclamation performance bond would be required for the Blackfoot Bridge Mine prior to any land disturbance activities. The bond calculation would be based on the selected alternative as identified in the Final EIS and ROD. This estimate would be refined as a condition of the ROD when all conditions of approval are known. P4 would post an actual-cost bond to ensure compliance with reclamation requirements. The calculation would be based on acres of disturbance and adjusted annually, as needed, when mine disturbance areas increase. The status of planned and actual mining and reclamation would be formally reviewed by P4 and BLM on an annual basis. These reviews provide the information to BLM to revise the required reclamation bond amounts, if necessary. As reclaimed areas are approved for release by the BLM, a lower bond amount for these areas may be requested by P4. Thus, it is not necessary for the federal government to require a bond for the entire life-of-mine reclamation scope of work; rather, there should always be enough bond in place to cover the maximum reclamation liability at any point in time during the mine life.

The amount of money required to reclaim the Blackfoot Bridge Mine would vary during the life of the operations because the disturbance would be created in incremental phases and would also be reclaimed concurrently with mining. The cost estimate would be based on the current mine plan and mining schedule, which are subject to change based on conditions such as economic environment and ore quality. The largest costs relate to earthwork including recontouring and construction of the final cover. Labor rates for the reclamation crews would be based on current Davis-Bacon rates. Equipment efficiencies and rates would be based on current cost reference guides. Agency administrative costs would be based on standard BLM guidance for reclamation bond estimating. Reclamation bonding calculations would also take into consideration the operation and maintenance of the necessary components of the water management system and plan for the project. The BLM has received a submittal from P4 that provides a reclamation cost estimate for Alternative 1A.

1.4 RELATIONSHIP TO BLM AND NON-BLM POLICIES, PLANS, AND PROGRAMS

The Proposed Action has been reviewed for compliance with agency policies, plans, and programs. One federal land management plan guides land use developments and activities in the project area: the BLM Resource Management Plan (RMP) (BLM 1987), approved in 1988. The proposal conforms with decisions on minerals in the ROD issued for the RMP in 1988. A proposed resource management plan and environmental impact statement was released to the public on May 7, 2010. Until this RMP is approved, the currently approved 1988 RMP will determine compliance.

1.5 PUBLIC SCOPING

A preliminary Mine and Reclamation Plan was submitted to the BLM in November 2005 (P4 2005). To allow an early and open process for establishing the scope of substantive issues related

to the Proposed Action (40 CFR 1501.7), a public scoping period was provided by the BLM. A Notice of Intent (NOI) to prepare this EIS was published in the Federal Register on February 3, 2006. The NOI announced BLM's intent to conduct an environmental analysis of phosphate ore mining at the Blackfoot Bridge property. It also announced the dates of February 28 and March 1, 2006 for two public meetings to solicit and receive comments on the proposed project. Publication of the NOI in the Federal Register initiated a 56-day public scoping period for the Proposed Action that provided for acceptance of written comments. A public mailing list was compiled, and scoping letters were sent to federal, state, Tribal, and local government agencies and members of the interested public. Details of scoping are presented in **Chapter 6** of this EIS. Public comments were solicited and then compiled in the Scoping Summary (April 2006) to help determine the issues and alternatives for evaluation in the environment analysis.

Identified concerns included potential effects of the project on water resources; socioeconomic conditions; livestock grazing; reclamation and restoration; wildlife and vegetation; soils; threatened, endangered, and sensitive species; air quality; aesthetics; land use; scenic resources; hazardous and solid wastes; and cumulative effects as identified in more detail in **Section 1.7**.

1.6 TRIBAL TREATY RIGHTS AND NATIVE AMERICAN CONSULTATION

Federal agencies acknowledge the federal trust responsibility arising from treaties, statutes, executive orders, and the historical relations between the United States and American Indian Tribes. The federal government has a unique trust relationship with federally recognized American Indian Tribes, including the Shoshone-Bannock Tribes.

The Fort Bridger Treaty of 1868 between the United States and the Shoshone and Bannock Tribes reserves the Tribes' right to hunt, fish, gather, and exercise other traditional uses and practices on unoccupied federal lands. In addition to these rights, the Shoshone and Bannock Tribes have the right to graze Tribal livestock and cut timber for Tribal use on those lands of the original Fort Hall Reservation that were ceded to the federal government under the Agreement of February 5, 1898 (ratified by the Act of June 6, 1900).

The BLM and USACE have a responsibility and obligation to consider and consult on potential effects to Tribal rights, uses and interests. Government-to-government consultation with the Shoshone and Bannock Tribal Council is required on land management activities and land uses that could affect the exercise of these rights. A formal government-to-government consultation process is ongoing between the agencies and the Tribes. To ensure a thorough assessment of issues and potential impacts to American Indian tribal rights and interests, including reserved treaty rights, coordination with the Tribes will continue throughout the EIS process.

1.7 SCOPING ISSUES

The issues evaluated in this EIS are derived from the final Blackfoot Bridge Mine and Reclamation Plan Scoping Summary issued in April 2006. In that document, the comments received during scoping were summarized into categories, which became the basis for defining issues considered important to the public.

Public comments and agency direction concerning the scope of this EIS are grouped according to issues and summarized in **Table 1.7-1**. Some of these issues are mandatory topics that the agency must address based on regulatory requirements, and some were raised in comment letters from the public. This table also provides references to the sections of this EIS that respond to each issue raised in the comments.

Table 1.7-1 Issues Identified in Scoping

Issue	EIS Document Section(s)
Water Resources	
The potential effects of trace elements, including selenium, in the overburden to contaminate soil and surface water resources.	Chapters 4 and 5 Soil and Water Resources
The potential effects on groundwater and surface water quantity and quality.	Chapters 4 and 5 Water Resources
The potential effects of backfill or overburden material leaching contaminants into the groundwater.	Chapters 4 and 5 Water Resources
The potential effects of water and land contamination from trace elements in the overburden.	Chapters 4 and 5 Water Resources
The potential effects on streams and surface water bodies and the compliance with water quality standards and regulations.	Chapters 4 and 5 Water Resources
The potential effects of excavating below the water table and the proposal for dewatering the pits.	Chapter 2 Proposed Action and Chapters 4 and 5 Water Resources
The potential effects on the Blackfoot River by runoff from the mine.	Chapters 4 and 5 Water Resources
Proposed Action	
The energy options and conservation potential included as part of the Proposed Action.	Chapter 2 – Proposed Action
The Proposed Action should include development and implementation of BMPs.	Chapter 2 – Proposed Action
Soils and Geology	
The depletion of geologic (phosphate) resources.	Chapter 2 and Chapters 4 and 5 Geologic Resources
The potential effects on soil erosion and sedimentation of area streams.	Chapters 4 and 5 Soils
The potential effects on topography and paleontological resources.	Chapters 4 and 5 Soils
Air Quality	
The potential for emission of air pollutants including those associated with particulate matter.	Chapters 4 and 5 Air Quality
Social-Economics	
The potential effects on the short- and long-term regional economy.	Chapters 4 and 5 Social and Economic Resources
The potential effects on local economy including recreation, values associated with the ecosystem, and biodiversity.	Chapters 4 and 5 Social and Economic Resources Chapters 4 and 5 Biological Resources
The potential effects of the project on the rural/urban status of the local communities.	Chapters 4 and 5 Social and Economic Resources
Visual Resources	
The potential degradation of scenic quality for area receptors.	Chapters 4 and 5 Visual Resources

Table 1.7-1 Issues Identified in Scoping

Issue	EIS Document Section(s)
Environmental Justice	
The potential for disproportionately high and adverse human health or environmental effects on people of race, color, religion, or income.	Chapters 4 and 5 Environmental Justice
Wildlife, Vegetation, and Fisheries	
The potential effects of habitat loss on wildlife populations, both resident and migratory, including threatened or endangered species, bald eagle, elk, deer, and grouse.	Chapters 4 and 5 Terrestrial Wildlife and Threatened, Endangered, and Special Status Species
The potential effects on prime and unique agricultural lands.	Chapters 4 and 5 Vegetation
The potential effect on the spread or introduction of exotic plant species and noxious weeds.	Chapters 4 and 5 Vegetation
The potential for fragmentation of habitat and loss of biodiversity.	Chapters 4 and 5 Wildlife
The potential effect on fish populations and their habitat, and the potential habitat degradation of the Blackfoot River.	Chapters 4 and 5 Fisheries
Revegetation using species important to wildlife such as aspen and dark timber.	Chapters 2 Proposed Action and included BMPs
Wetlands And Floodplains	
The potential effects on wetlands and riparian habitat.	Chapters 4 and 5 Vegetation, Riparian Areas, and Wetlands
The potential effects on wetlands in State Lands Creek resulting from potential loss of subsurface water.	Chapters 4 and 5 Vegetation, Riparian Areas and Wetlands
Cultural Resources	
The potential effects on important scientific, archeological, and other cultural resources including historic properties listed or eligible for the National Register of Historic Places.	Chapters 4 and 5 Cultural Resources
Tribal Treaty Rights and Interests	
The potential effects on access relevant to Tribes exercising Treaty Rights and Interests.	Chapters 4 and 5 Tribal Treaty Rights and Interests
The potential effects on sacred sites and Indian Trust resources.	Chapters 4 and 5 Tribal Treaty Rights and Interests
The potential effects on resources associated with the exercise of treaty rights including wildlife populations and habitat, fisheries, water, vegetation, land use, hazardous materials, and public health and safety.	Chapters 4 and 5 in respective resource sections including: Water Resources; Vegetation, Riparian Area and Wetlands; Terrestrial Wildlife; Fisheries and Aquatic Resources; Threatened, Endangered and Special Status Species; and Land Use and Access.
Land Use	
The potential effects to and from livestock grazing, including the potential degradation of riparian vegetation and water quality, and the possibility of eliminating grazing during the project life.	Chapters 4 and 5 Land Use and Access
The potential effects of mining on current land use plans.	Chapters 4 and 5 Land Use and Access
The potential effects on the use of private lands.	Chapters 4 and 5 Land Use and Access
The proposed schedule for the lease modification and the potential effects to the environment.	Chapter 1 **Section 1.3.1** Decisions to be Made and Chapters 4 and 5
Hazardous and Solid Wastes	
The potential for hazardous materials entering the environment.	Chapters 4 and 5 Hazardous and Solid Wastes

Table 1.7-1 Issues Identified in Scoping

Issue	EIS Document Section(s)
The fate and transport of materials resulting from the mining process.	Chapters 4 and 5 Hazardous and Solid Wastes
The potential effects of mining activities contributing to hazardous materials entering the environment.	Chapters 2, 4, and 5 Description of Proposed Action and Hazardous Materials
Reclamation/Restoration	
The potential effects of mine disturbance on reclamation, closure, and restoration success.	Chapter 2 Description of Proposed Action
The potential effects of a complete or total backfill alternative on the area environment.	Chapter 2 Project Alternatives
The potential effects of a partial-backfill alternative on the area environment.	Chapter 2 Project Alternatives
The potential procedures and calculations for a reclamation bond.	Chapter 1 Authorizing Actions
Cumulative Effects	
The potential cumulative effects of phosphate mining and other land use activities on the area environment including logging, grazing, recreation, and road use.	Chapter 5 Cumulative Effects
The potential cumulative effects of active livestock grazing and the proposed project on riparian health.	Chapter 5 Cumulative Effects
Public Health and Safety	
The potential effects of selenium contamination in the human food supply.	Chapters 4 and 5 Water Resources
Wilderness and Ecologically Critical Areas	
The potential effects on wilderness values, ecologically critical areas, Wild and Scenic Rivers, or other unique natural resources.	Chapters 4 and 5 Land Use and Access

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CHAPTER 2

PROPOSED ACTION AND ALTERNATIVES

CHAPTER 2
PROPOSED ACTION AND ALTERNATIVES

This chapter describes and compares the Proposed Action and alternatives considered for the Blackfoot Bridge Mine Project. This chapter also presents the alternatives in comparative form, defining the differences among alternatives and providing a clear basis for choice among options by the decision-maker and the public. Comparison of the alternatives is based on the design of the alternative and the environmental, social, and economic effects of implementing each alternative. **Section 2.6** of this chapter presents the BLM's Preferred Alternative and the rationale used to select that alternative. Alternatives considered but eliminated from detailed study are also discussed.

Only reasonable alternatives need be considered in detail, as specified in 40 CFR 1502.14(a). Reasonable alternatives must be those that are feasible, and such feasibility must focus on the accomplishment of the underlying purpose and need (of the applicant or the public) that would be satisfied by the proposed federal action.

2.1 BACKGROUND

The Blackfoot Bridge Mine, an open pit phosphate mine, would be located in southeastern Idaho, approximately 10 miles northeast of Soda Springs, Idaho (**Figure 1.1-1**). The U.S. Geological Survey (USGS) excavated exploratory trenches for mineral resources on the property in the 1940s. Federal Phosphate Lease I-05613 was issued to Monsanto Chemical Company in June 1955. Subsequently, Federal Phosphate Lease I-013709 was issued to Monsanto Chemical Company as a result of a Preference Right Lease Application in December 1965. Both leases were transferred to P4 in 1997 including other leases, properties, and the Soda Springs Elemental Phosphorus Plant.

The Blackfoot Bridge property (1,469 acres) includes Federal Phosphate Leases I-05613 (634 acres) and I-013709 (80 acres), covering subsurface mineral rights. P4 is the largest private surface owner, with about 1,074 total acres within the project boundary. Other private landowners hold 174 acres. The BLM administers 221 acres of public land within the project boundary as shown on **Figure 1.1-2**. The estimated maximum surface disturbance area is shown in **Table 2.3-1**.

Mineral rights are held by the federal government under a variety of withdrawals dating back to before 1920. Those rights have been leased to P4 as previously outlined. Federal phosphate leases grant the leaseholder the right to use as much of the federal surface as is necessary for the development of the underlying mineral deposit. As such, no other BLM permits are necessary for use of the federal surface estate within the lease boundary.

Portions of the Blackfoot Bridge property were drilled to a relatively shallow depth during the 1950s. In 1984 and 1985, 25 core holes were drilled to obtain better information for mine planning. Information from those holes (totaling some 7,000 feet) was used in the development of a *Contingency Operating Plan* (contingency plan). The purpose of the independent contingency plan, covering portions of Federal Phosphate Lease I-05613, was to provide a continuous source of ore for the elemental phosphorus plant in the event that problems arise at P4's active mine site. The contingency plan covers mining of the ore body north and west of the haul road. The BLM completed an Environmental Assessment (EA), issued a Finding of No Significant Impact

(FONSI), and approved the contingency plan on January 19, 1988. The contingency plan has not been implemented, as potential approvals from other federal and state agencies have not been obtained.

In September 2003, P4 applied for lease modifications to include portions of the phosphate deposit that lie outside the current Federal Phosphate Lease I-05613 and I-013709 boundaries. An Exploration Plan for the lease areas and land covered by the Exploration License was submitted in September 2003. Following discussions with the BLM, application for an Exploration License was submitted in February 2004 so that necessary off-lease drilling could take place. The BLM conducted an EA (#ID-075-2004-06-EA), and issued a FONSI and Decision Record on April 26, 2004. The approved Exploration Plan became valid on May 29, 2004, and Exploration License I-34751 was issued to P4 on June 8, 2004. Execution of the Exploration Plan commenced during the summer of 2004. Exploration work was conducted in accord with the *License and Approved Exploration Plan* during the following years. Appropriate and required reclamation of roads, pads, and other facilities used during exploration has been completed, and the license has expired. To date, approximately 45,000 feet have been drilled, and 22 monitor wells were installed. Based on results of the exploration work of P4's summer 2007 exploration program, P4 requested that acreage be added to the application for lease modification in May 2008, and that the BLM evaluate its lease modification request in this EIS.

Mansfield and others conducted geologic mapping of the Blackfoot Bridge project lease area in 1912, 1914, and 1916. A geologic map (**Figure 3.1-1**) and a detailed discussion of the geologic setting are presented in **Chapter 3** of this EIS. This geologic map is a compilation of original USGS mapping by Mansfield with updates based on P4's exploration program over the past few field seasons.

The phosphate deposit at the Blackfoot Bridge Mine is located in a portion of the phosphate-rich Meade Peak Member of the Phosphoria Formation of Permian Age.

2.2 EXISTING DISTURBANCE

The Blackfoot Bridge phosphate reserve has been subjected to several exploration drilling programs to determine the quality, quantity, and mineability of the ore. The first program was conducted in 1956 and included 58 drill holes throughout the property. A second exploration program was conducted in 1984 and 1985 and consisted of 15 and 10 holes, respectively. These two drilling programs resulted in development of the initial mine plan for the project. Subsequent drilling was conducted in 2004, 2005, 2006, 2007, and 2008, resulting in completion of a total of 119 holes to further define the reserve. These results formed the basis for the 2008 Revised Mine Plan submitted by P4. Total disturbance from this drilling activity comprises approximately 29 acres, of which about 10 acres have been reclaimed. The remaining 19 acres include access roads and monitoring wells throughout the property.

2.3 PROPOSED ACTION

2.3.1 Lease Modification

In September 2003, P4 applied for lease modifications to include portions of the phosphate deposit that lie outside the current Federal Phosphate Lease I-05613 and I-013709 boundaries. To

demonstrate the need for the lease modification, P4 obtained and exploration authorization from BLM to explore the proposed lease modification areas. Based on results of the exploration work, P4 requested that acreage be added to the application for lease modification in May 2008, and that the BLM evaluate its lease modification request in this EIS.

The Proposed Action includes a lease modification to Phosphate Lease I-05613. The amended lease modification areas occur in four separate parcels located on private and BLM surface. The lease modification allows for extending proposed mine facilities from the original lease areas into an additional 300 acres. The lease modifications include four distinct areas: Parcel 1 (80 acres NWOP area), Parcel 2 (40 acres north end of EOP area), Parcel 3 (40 acres of the Mid Pit area), and Parcel 4 (140 acres of the south half of the South Pit area) as shown on **Figure 1.1-2**.

2.3.2 Proposed Blackfoot Bridge Mine

The Proposed Action consists of P4's 2008 Revised Mine Plan, as amended (P4 2008a). Phosphate ore would be mined from three open pits and hauled via trucks about 8 miles to P4's Soda Springs elemental phosphorus plant for processing. Only crushing and screening operations would occur on the mine site. All chemical processing activities would occur at the Soda Springs plant. The ore to be mined under the Proposed Action is expected to be similar to that produced at other P4 mine properties in the area.

The Proposed Action would maximize the recovery of the ore resource. Ore mining involves the removal of the available ore down to an economically feasible limit. This economic limit is based on mining and processing costs, and generally coincides with a pit depth that is at or below the "alteration floor." The alteration floor is a leaching boundary that divides the altered "weathered" ore from the unaltered ore previously described. Below the depth of the alteration floor, the unaltered ore typically contains unavailable phosphate, the processing of which would result in higher plant processing costs.

P4's Proposed Action and associated mine pit sequencing have been developed based on updated geological data obtained during 2006 and 2007. This work improved the definition of the geologic formation on the west side of the North Pit area, added detail to the location and definition of the regional water table, and allowed for updated mine designs for the Mid and South Pit areas. The 2008 Revised Mine Plan outlines these changes and also presents a comprehensive Mine Water Management Plan (P4 2009a).

The disturbance area associated with the Proposed Action and presented in this EIS is shown in **Table 2.3-1**.

Table 2.3-1 Blackfoot Bridge Mine Proposed Action Surface Disturbance Area

Surface Ownership Description	Category Description	Disturbance Acres
Public	Overburden Pile	0.8
Public	Pit	74.2
Public	Road & Service	1.1
Public	Sediment Control Structures*	0.0
Public	Topsoil	0.0
	Subtotal	**76.1**
Private	Overburden Pile	185.0

Table 2.3-1 Blackfoot Bridge Mine Proposed Action Surface Disturbance Area

Surface Ownership Description	Category Description	Disturbance Acres
Private	Pit	287.2
Private	Road & Service	85.7
Private	Sediment Control Structures*	66.9
Private	Topsoil	38.0
	Subtotal	**662.8**
	Total	**738.9**

* Sediment control structures include channels, ditches, aboveground pipes, water management pond area, and wetlands.

2.3.3 Mining Operations

Under P4's Proposed Action, the Blackfoot Bridge Mine ore reserve would be developed using an open pit mining method on a series of bench cuts, using a combination of in-pit retreating ramps and backfill ramps. The primary equipment for ore and overburden mining would be a combination of trucks, track-mounted excavators, bulldozers, and front-end loaders. A track-hoe excavator would also be used to maximize recovery of ore in the bottom of the pit (pit crotch).

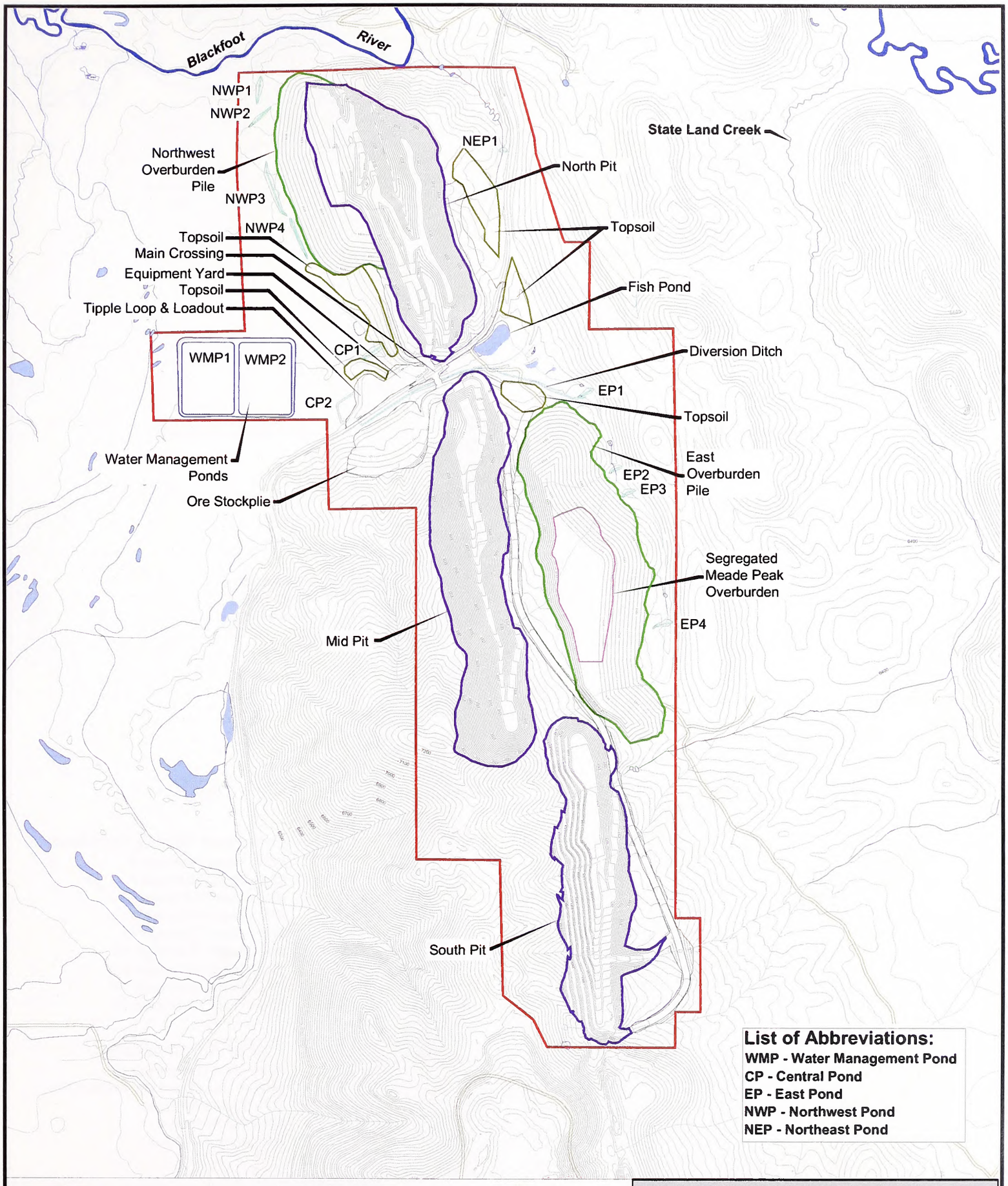
In general, the vegetation would be cleared from the disturbance area on an as-needed basis. After the vegetation is removed, available topsoil would be stripped to the stipulated limits and stockpiled in designated locations. This topsoil is sometimes immediately hauled to previously regraded mine disturbances and spread for reclamation. Topsoil stockpiles would be graded and seeded to reduce loss of the soil resource by erosion. Overburden (non-ore material) would then be stripped and hauled to the designated storage areas. Ore would then be mined and transported to the ore pad and loadout area. Blasting would be used at locations as necessary.

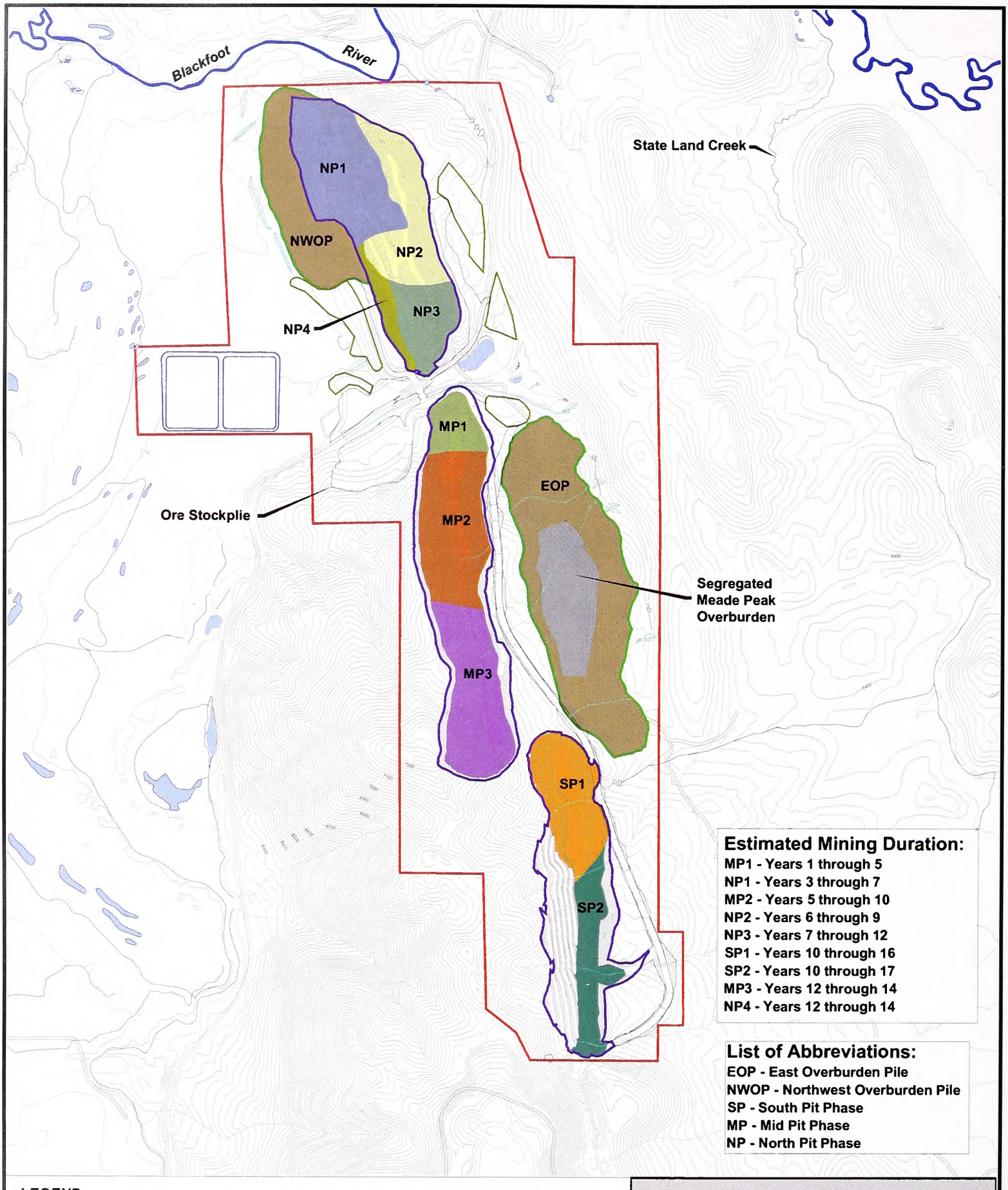
Ore would be recovered from three separate open mine pits: North, Mid, and South Pits (**Figure 2.3-1**). Mining would begin in the Mid Pit, followed by the North Pit and South Pit. All overburden would either be backfilled into mined-out portions of the mine pits or placed in the external East Overburden Pile (EOP) or Northwest Overburden Pile (NWOP). Other mine-related facilities would include: (a) ore pad and tipple (truck loading area), (b) ore truck turnaround loop and equipment yard, (c) two water management ponds (WMP1 and WMP2) and associated water control structures, (d) topsoil stockpiles, (e) water control ponds, and (f) roads. A water diversion ditch would be constructed from the unnamed tributary to Fish Pond at water control pond EP1 to water control pond CP2; the water collected in this system would be surface water runoff.

The progression of mine pit development is shown on **Figure 2.3-2**. **Figure 2.3-1** shows maximum disturbance (with contours) associated with full mine development for the project. In addition, contours of final reclamation of the project site are depicted on **Figure 2.3-3**. The locations of mine-related facilities are shown on **Figure 2.3-4**.

2.3.4 Overburden Handling and Management

The total external overburden pile disturbance is expected to be about 186 acres, while the extent of the backfilled pits is expected to occupy about 361 acres, as indicated in **Table 2.3-1**. The objective would be to maximize the in-pit backfill and minimize the external permanent

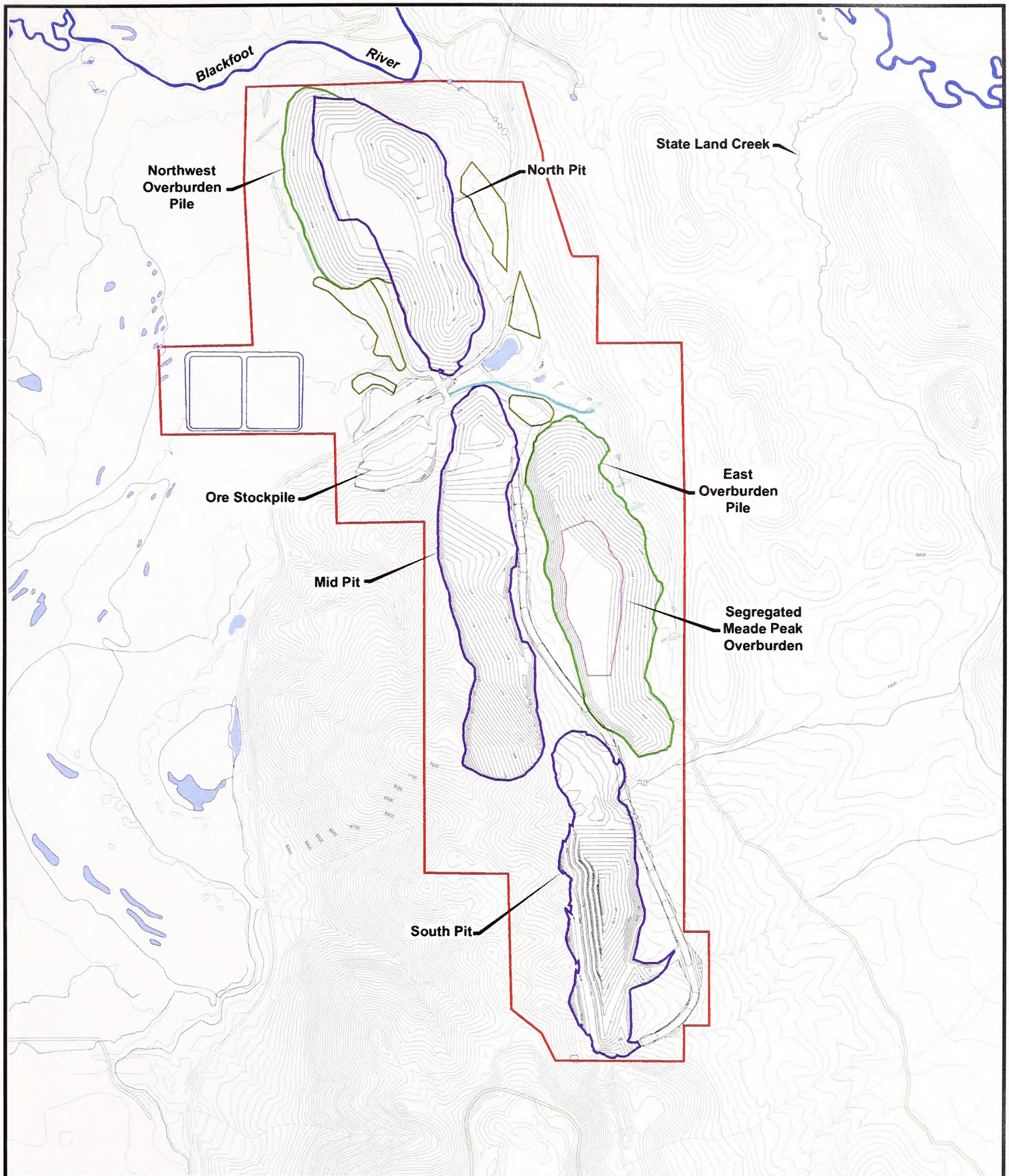

Blackfoot River
NWP1
NWP2
Northwest Overburden Pile
NWP3
NWP4
Topsoil
Main Crossing
Equipment Yard
Topsoil
Tipple Loop & Loadout
WMP1
WMP2
CP1
CP2
Water Management Ponds
Ore Stockplie
NEP1
North Pit
State Land Creek
Topsoil
Fish Pond
Diversion Ditch
EP1
Topsoil
East Overburden Pile
EP2
EP3
Segregated Meade Peak Overburden
EP4
Mid Pit
South Pit
List of Abbreviations:
WMP - Water Management Pond
CP - Central Pond
EP - East Pond
NWP - Northwest Pond
NEP - Northeast Pond
LEGEND
PROJECT BOUNDARY
PROPOSED OPEN PIT
PROPOSED OVERBURDEN PILE
PROPOSED WATER CONTROL POND / DITCH
PROPOSED TOPSOIL STORAGE AREA
PROPOSED WATER CONTROL POND
Contour Interval = 20 ft.
NORTH
1,000' 0' 1,000' 2,000'
BLACKFOOT BRIDGE PROJECT EIS
FIGURE 2.3-1
Facility Layout
ANALYSIS AREA: Caribou County, Idaho
Date: 09/24/10
File: BaseMap.dwg
Drawn By: EC
Layout: Facility Layout



BLACKFOOT BRIDGE PROJECT EIS

FIGURE 2.3-2
Mine Sequence

ANALYSIS AREA: Caribou County, Idaho	
Date: 09/24/10	File: BaseMap.dwg
Drawn By: EC	Layout: Mine Seq.



LEGEND

- PROJECT BOUNDARY
- PROPOSED OPEN PIT
- PROPOSED OVERBURDEN PILE
- PROPOSED WATER CONTROL POND / DITCH / PIPELINE
- PROPOSED TOPSOIL STORAGE AREA
- PROPOSED WATER CONTROL POND

Contour Interval = 20 ft.

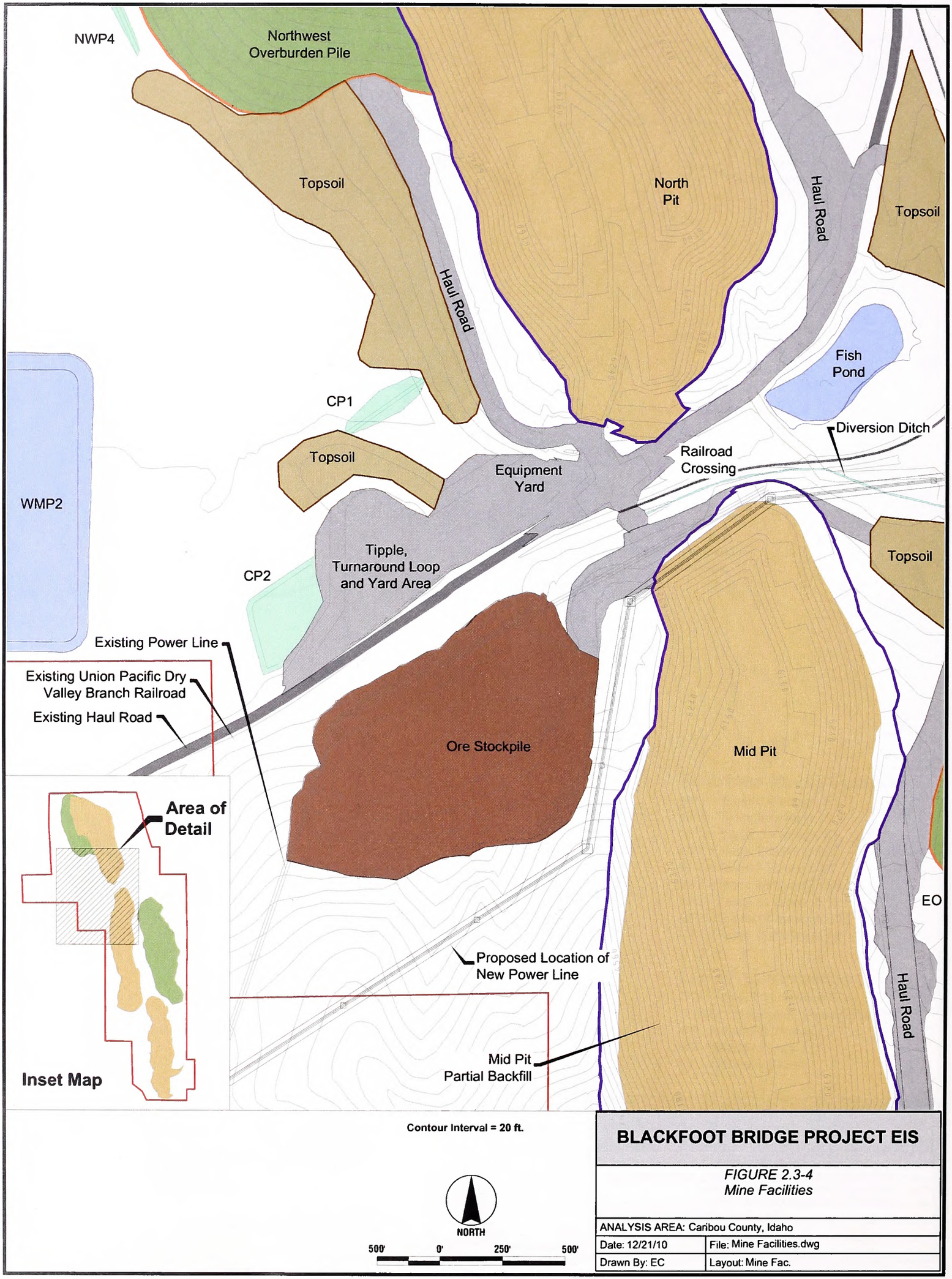
NORTH

1,000' 0' 1,000' 2,000'

BLACKFOOT BRIDGE PROJECT EIS

FIGURE 2.3-3
Final Reclamation

ANALYSIS AREA: Caribou County, Idaho	
Date: 09/25/10	File: Reclamation.dwg
Drawn By: EC	Layout: Final Reclamtion


NWP4
Northwest Overburden Pile
Topsoil
North Pit
Haul Road
Topsoil
Haul Road
Fish Pond
CP1
Diversion Ditch
Topsoil
Railroad Crossing
Equipment Yard
WMP2
Tipple, Turnaround Loop and Yard Area
Topsoil
CP2
Existing Power Line
Existing Union Pacific Dry Valley Branch Railroad
Existing Haul Road
Ore Stockpile
Mid Pit
Area of Detail
Inset Map
EO
Proposed Location of New Power Line
Haul Road
Mid Pit Partial Backfill
Contour Interval = 20 ft.
NORTH
500' 0' 250' 500'
BLACKFOOT BRIDGE PROJECT EIS
FIGURE 2.3-4
Mine Facilities
ANALYSIS AREA: Caribou County, Idaho
Date: 12/21/10
File: Mine Facilities.dwg
Drawn By: EC
Layout: Mine Fac.

overburden placement. Overburden piles would be constructed with slopes of 3H:1V or flatter. Efforts would be made to minimize the ultimate disturbance at any one time and keep the backfill as close as practical to the active pit area to minimize the haul distance. External overburden piles are built in relatively short lifts from the toe up, and material placed in the piles would consist of chert and limestone verified as having low selenium content by sampling and testing while mining occurs. Limestone and chert overburden in the external overburden piles would be managed to contain less than 13 parts per million [ppm] selenium, in accordance with USFS soil salvage guidelines for material that is suitable for surface placement (USFS 2003a). The single exception to this limitation is the approximate 5.7 million cubic yards of segregated Meade Peak overburden proposed for placement in the EOP (this material would contain selenium concentrations higher than 13 ppm). This exception is necessary to provide a destination for materials from the initial pit excavations before the in-pit backfill sequence can begin. The segregated material would include center shale, hanging wall mud, footwall mud, and various ore partings. The EOP has a total capacity of more than 20 million bank cubic yards (bcy), allowing for a swell factor of 20 percent. The segregated Meade Peak overburden would be placed in an isolated cell covering about 35 acres within the larger pile. This material would be capped using the Simple 1"store and release" cover design as described in **Section 2.3.4.1**.

Construction of the EOP would use methods and practices to minimize the infiltration of precipitation into the segregated Meade Peak overburden. As with other areas, erosion control measures would be installed prior to other surface-disturbing activities. Topsoil would then be removed and stockpiled. The base of this "cell" would be placed on an under layer of limestone, alluvial, or volcanic materials. These materials would provide a drainage pathway for precipitation that may infiltrate through non-Meade Peak overburden located upgradient of the cell and travel beneath the overburden material, moving at the interface between overburden pile base and original ground surface. The precipitation would ultimately be collected and controlled through the use of appropriate BMPs. This under layer would be thickened in topographic low areas and likewise thinned in topographic highs. Consistent with past practices at P4's South Rasmussen Mine, this thickness of under layer would range from between 10 to 20 feet. Once the under layer has been installed, the segregated Meade Peak overburden would be placed in short lifts (5 to 10 feet), leveled with a dozer, and then compacted by placement of each succeeding layer. Compaction is achieved with haul truck traffic by splitting tracks left by the previous haul trucks. This practice would maximize compaction while minimizing material segregation that occurs when dumping from higher dump lifts (typically more than 50 vertical feet). The overall objective of these practices would be to minimize infiltration of precipitation and the chance of creating preferential pathways for this water to follow. This cell area would be capped utilizing the Simple 1 "store and release" cover layer discussed in Section 2.3.4.1.

The other external overburden placement proposed by P4 would occur west of the North Pit area and is referred to as the NWOP. The NWOP would be constructed entirely during year 7. This overburden pile is planned to contain non-Meade Peak overburden and would be capped with the base cover under the Proposed Action.

All overburden from the pits would either be backfilled into mined-out portions of the pits or placed in the external EOP or NWOP. The Blackfoot Bridge project would be mined in a phased approach. A description of the different mining phase areas and the timeframe associated with each area is included in **Table 2.3-2**.

Table 2.3-2 Mining Phase Areas and Timeframes

Mine Phase Area	Estimated Mining Duration (Years)
Mid Pit Phase 1 (MP1)	1 to 5
North Pit Phase 1 (NP1)	3 to 7
Mid Pit Phase 2 (MP2)	5 to 10
North Pit Phase 2 (NP2)	6 to 9
North Pit Phase 3 (NP3)	7 to 12
South Pit Phase 1 (SP1)	10 to 16
South Pit Phase 2 (SP2)	10 to 17
Mid Pit Phase 3 (MP3)	12 to 14
North Pit Phase 4 (NP4)	12 to 14

Figure 2.3-5 illustrates a flow diagram that summarizes the mine sequencing through the life of the project and how the overburden handling would be managed. Additional information about the year-by-year mine sequence details are contained in the Revised Mine Plan (P4 2008a).

In addition to the overburden handling and management, mining would take place below the regional water table requiring mine dewatering activities (**Figure 2.3-5**). The water management system and mine dewatering are described in **Sections 2.3.6.1** and **2.3.6.2**. To avoid development of a pit lake in the South Pit, approximately 1.2 million yards of re-handled limestone and chert would be placed into the bottom of the South Pit. The fill would be sloped to direct runoff and precipitation across the top of the segregated Meade Peak overburden areas to the Wells Limestone, where it would infiltrate without contacting potential constituents of concern.

Current ore reserves at P4's South Rasmussen Mine would be depleted during 2013. Because of operating requirements at P4's Soda Springs processing plant, it is necessary that mine development at Blackfoot Bridge can commence in early summer of 2011. In years 1 through 4, it is anticipated that a blend of ores from both South Rasmussen Mine and Blackfoot Bridge Mine would be required to meet plant requirements.

2.3.4.1 Cover Design

A "store and release" cover system design was developed for capping of segregated Meade Peak overburden areas of the EOP and other areas of the site. Cover or capping systems are designed to control infiltration of precipitation, provide growth medium to support revegetation of disturbed areas, and limit infiltration that could affect groundwater beneath reclaimed areas. Cover systems are generally preferable to liners for this type of application because they reduce the amount of seepage that could become contaminated by contact with the overburden. In contrast, liners function by limiting the migration of previously contaminated seepage to groundwater. The use of liners below overburden facilities would require the installation of drainage systems to reduce water buildup on top of the liner and prevent the formation of toe springs. Water from the drainage systems could be contaminated and could potentially require treatment. For these reasons, cover systems are considered to offer more mitigative value than liners as a strategy to protect water resources and reduce seepage from proposed overburden disposal facilities.

The term "store and release" refers to a cover design concept that uses a topsoil layer underlain by a relatively fine-grained material (generally alluvial or colluvial clay materials) immediately

MP1
Years 1 through 5

- Located south of the railroad
- Remove ridge end and develop project facilities such as ore turnaround loop, yard area, ore stockpile, railroad crossing and connecting mine roads
- Construction of water diversion ditch or pipe to route water from EOP to water management ponds
- During Years 2 through 5, overburden would be hauled to EOP
- Bottomed out in approximately Year 5 and filled with materials from NP1
- Mining below the regional water table estimated in Year 5; dewatering at 6,160 feet for up to 2 weeks (see Section 2.3-4)
- Ultimate depth reached during Year 4

NP1
Years 3 through 7

- Development of access road in Years 3 through 5
- During Years 3 through 4, overburden would be hauled to EOP
- Materials sent to MP1 in Year 5
- Mining below the regional water table estimated in Year 5; dewatering at 6,160 feet for up to 2 weeks in MP1 (see Section 2.3-4)
- Ultimate depth with mining below the water table expected in Year 7 in NP1 (see Section 2.3-4)
- Overburden backfill to begin in Year 7 and occur in the NWOP and in the NP1 backfill

MP2
Years 5 through 10

- In Year 6, initially overburden would be hauled to the EOP
- In Year 7, overburden would be placed in NWOP and in the NP1 backfill
- In Year 9, mining below the water table would occur for as much as 2 months in NP2 (see Section 2.3-4)
- Also in Year 9, MP2 would be mined to ultimate depth
- In Year 10, MP2 would be completed and provide disposal for high elevation overburden
- In Years 11 and 12, MP3 and SP1 areas overburden would be placed in MP2 backfill

NP2
Years 6 through 9

- In Year 7, overburden would be placed in NWOP and in the NP1 backfill
- In Year 8, mining one lift below the regional water table for as long as 1 month in NP2 (see Section 2.3-4)
- In Year 9, NP2 would be mined to ultimate depth
- Mining below the water table would occur for as much as 2 months as NP2 area is completed (see Section 2.3-4)
- In Year 10, overburden being placed in NP2 area from NP3 area

NP3
Years 7 through 12

- In Year 7, overburden during this period would occur in the NWOP and in the NP1 backfill
- In Year 10, limited mining to NP3 area and the overburden being placed in the NP2 backfill
- In Year 11, mining would continue in NP3 and SP1 and overburden being placed in the MP2 backfill
- In Year 12, more than a month of operations is expected to be beneath the regional water table in NP3 (see Section 2.3-4)
- Mining completed in Year 12 in the NP3 area

SP1
Years 10 through 16

- In Years 10 and 11, overburden being placed in the MP2 backfill
- In Year 14, overburden from SP1 would be placed in MP3
- In Year 15, mining would occur solely in the South Pit from SP1 and SP2 and material would be placed in MP3
- In Years 16 and 17, all mining would be completed in the South Pit area
- SP1 would reach ultimate depth during Year 16 with overburden from SP2 being placed there until it is completed

SP2
Years 10 through 17

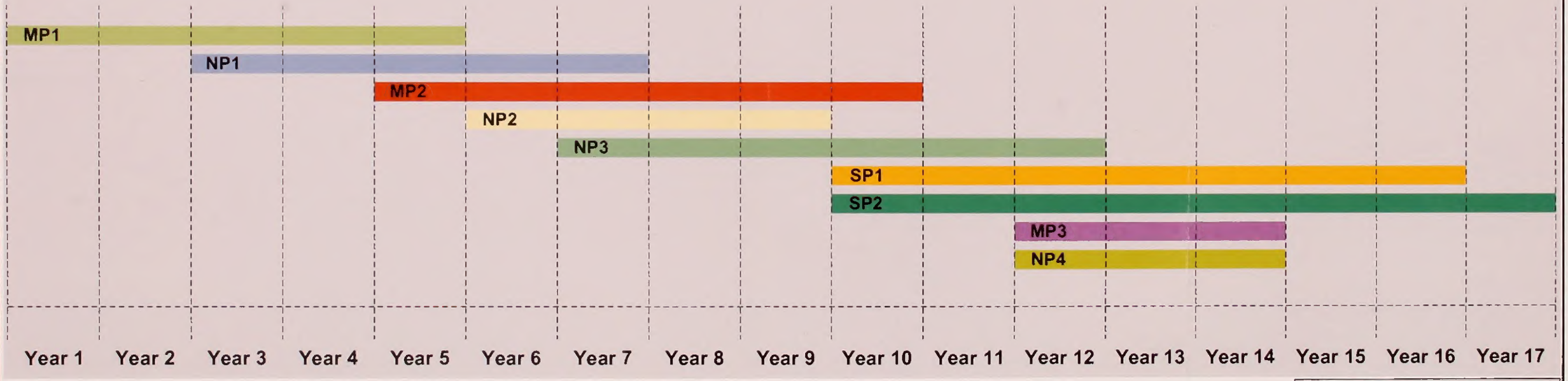
- In Year 15, mining would occur solely in the South Pit from SP1 and SP2 and material would be placed in MP3
- In Year 16, overburden would be placed in SP1 until completion
- In Year 17, the last of the SP2 area would be mined with all overburden being placed in the SP1 area

MP3
Years 12 through 14

- In Year 12, mining would occur with overburden being placed in MP2 backfill
- Backfilling would occur in Year 13
- In Year 14, overburden from SP1 would be placed in MP3
- Also in Year 14, mining at Mid Pit would be completed as MP3 is mined out and overburden would be placed in the NP4 backfill
- In Year 15, overburden from both SP1 and SP2 would be placed in MP3

NP4
Years 12 through 14

- In Year 12, mining would occur below the regional water table for about 3 months (see Section 2.3-4)
- In Year 13, this would be the last mine dewatering year encountered during the project and backfilling would occur
- In Year 14, overburden would be placed in the NP4 backfill



Note:
For additional information about the year-by-year mine sequence details refer the Mine and Reclamation Plan (P4 2008).

For a map illustrating these areas see **Figure 2.3-2** of the document.

BLACKFOOT BRIDGE PROJECT EIS

FIGURE 2.3-5
Mine Sequence Flow Diagram

ANALYSIS AREA: Caribou County, Idaho	
Date: 08/05/10	File: Mine Squence Flow Chart.dwg
Drawn By: EC	Layout: 001

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overlying a layer of coarse-sized material. This differential of material grain sizes and permeability causes moisture to be retained in the finer-grained materials. The net result is that precipitation penetrates and partially saturates the topsoil. Moisture then is drawn down and stored in the fine-grained clay material layer. As drying conditions increase during summer, this stored moisture is wicked upward through evaporation and plant transpiration. The net result is that only a portion of the infiltrating water would migrate through the entire cover profile.

To assist in evaluating potential cover designs, a program was initiated to collect and analyze soil samples from 29 backhoe test pits located in the North and Mid Pit areas. From these test pits, 58 alluvium samples were collected at approximate 3-foot intervals to a nominal depth of 12 to15 feet. In addition to the interval sampling, a composite sample was taken from each pit. The samples were collected in 5-gallon pails and sent to Strata Geotechnical Laboratories in Pocatello, Idaho, for analysis of particle size distribution and Atterberg limits.

P4 compared the particle size distribution of the test pit samples to the in-house soil database of O'Kane Consultants Inc. (O'Kane), to gain an understanding for anticipated hydraulic properties of the potential cover materials. The database results showed that the samples fell within six categories of materials (**Table 2.3-3**) (O'Kane 2009a).

Table 2.3-3 Summary of Average Particle Size Distribution from the Six Blackfoot Bridge Mine Alluvium Groupings

Soil Group	Number of Samples per Group	Percent Coarse	Percent Sand	Percent Silt and Clay
Group 1	9	57	24	19
Group 2	7	39	25	36
Group 3	9	6	40	54
Group 4	11	18	14	68
Group 5	10	0	10	90
Group 6	12	3	10	87

Source: O'Kane 2009a

Golder and Associates (Golder) geotechnical laboratory in Saskatoon, Saskatchewan, Canada, performed moisture retention curves (MRC), saturated hydraulic conductivity (k_{sat}), specific gravity (G_s), and standard Proctor compaction curve testing on the above-referenced 2007 samples. The results of these tests were used to develop the material properties for the cover system.

Six cover system designs were modeled for this project. As part of the modeling effort, both on-site and surrounding locally available weather data were analyzed to develop a 100-year climate database. This database was used in subsequent cover modeling simulations to evaluate cover performance over time, considering the effects of multiple and subsequent low and high moisture years (O'Kane 2009a).

The results of the cover modeling were considered in the design of the cover system alternatives. The Proposed Action would involve installation of the Simple 1 cover design to be used as a cover for the segregated Meade Peak overburden placed in the EOP (approximately 35 acres). The

Simple 1 cover design consists of 18 inches of topsoil overlying 1 foot of weathered alluvium and 2 feet of run-of-mine (ROM) chert. The remaining disturbance areas would be covered using a base cover design consisting of at least 4 feet of chert or limestone, overlain by 18 inches of topsoil as shown on **Figure 2.3-6**. The areas of the proposed mine development that would be covered on the basis of the Proposed Action are shown on **Figure 2.3-7**.

Weathering of the alluvium to be used for cover material tends to result in dense clay soils because of the shaley source rocks. For this reason, weathered alluvium is used for low permeable caps. Increased weathering of the material is not expected to result in rapid degradation of the effectiveness of the material as a barrier. The caps would be constructed in an environment similar to that from which the weathered alluvium was derived, and the material is expected to be chemically stable, as it has equilibrated to the environment over geologic timeframes.

2.3.5 Surface Water Hydrology

As shown on **Figure 2.3-8,** the project area for the Proposed Action is located immediately south of the Blackfoot River and is bisected by the existing paved ore haul road for P4's South Rasmussen Mine. The Blackfoot River and the creek in the Beaver Pond drainage are the primary perennial drainages in the project area. Three ephemeral or intermittent drainages are located in the southern part of the project area. These drainages are tributary to State Land Creek. The unnamed tributary to Fish Pond extends along the east side of the proposed EOP and discharges to Fish Pond. This drainage has intermittent flow and continues downstream from Fish Pond and into a wetland area west of the North Pit and the NWOP (**Figure 2.3-8**). Other surface water features include springs and wetlands.

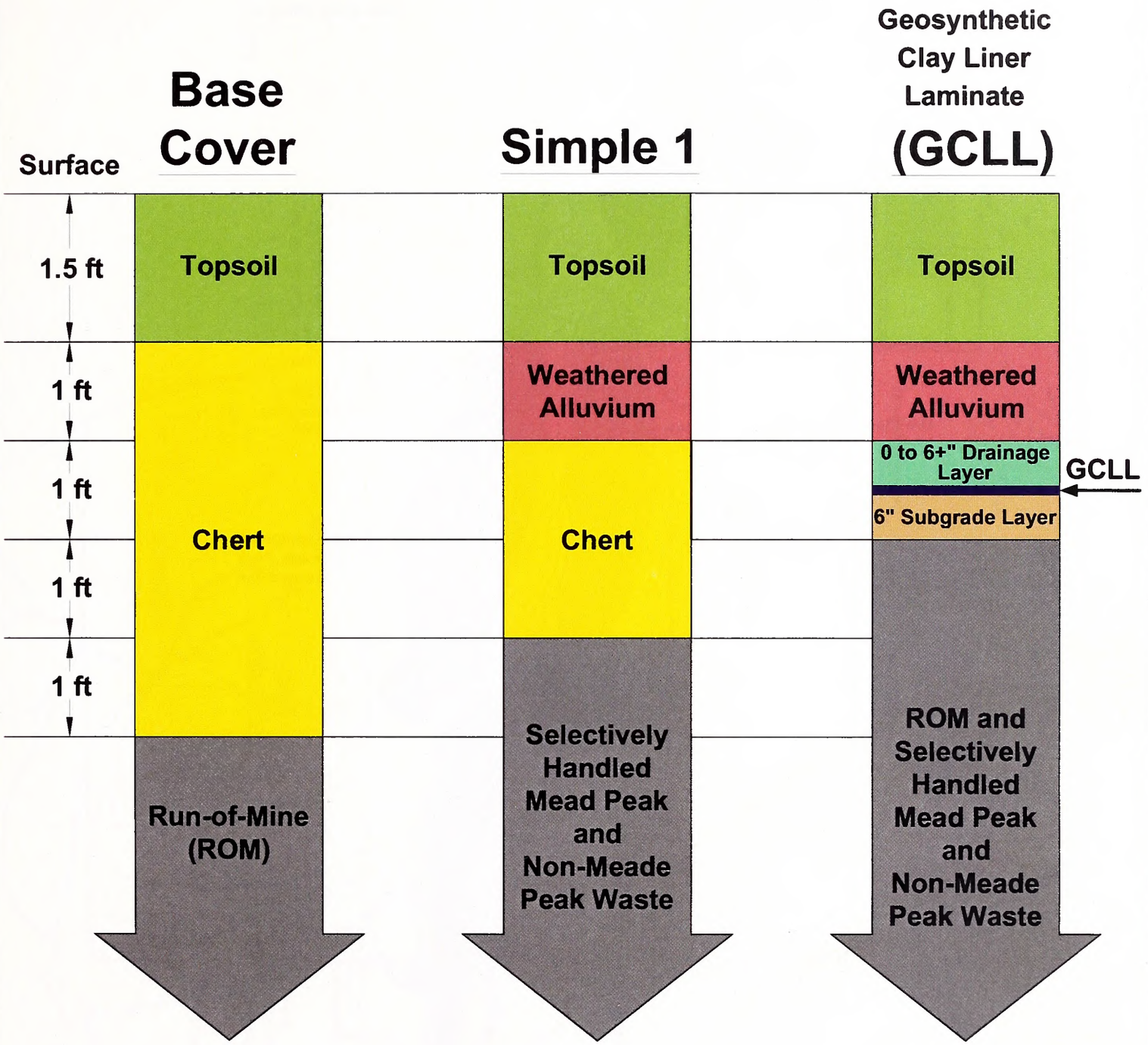
As discussed in **Section 2.3.6.8**, a water balance was prepared (Revised Mine Water Management Plan, P4 2009a) to design the capacity of the proposed water management system for the Proposed Action. Two water management ponds (WMP1 and WMP2) would be constructed to store groundwater from pit dewatering and stormwater runoff that does not meet surface water quality criteria. The capacity of the water management ponds was based on worst-case conditions. This worst-case scenario assumes that all stormwater runoff from the central portion of the project area that includes the EOP, portions of the Mid and South Pits, and the ore pad (**Figure 2.3-8**) would be routed to ponds WMP1 and WMP2 for the duration of mining activities. The surface water hydrology discussion in the following sections focuses primarily on the central portion of the project area.

2.3.5.1 Drainage Basin Descriptions

The drainage basins in the area surrounding the project site for the Proposed Action are described in the following sections and shown on **Figure 2.3-8**. For the design of the water management system, catchment basins have been defined to define the drainage areas and associated run-off volume calculations.

2.3.5.1.1 State Land Creek Drainage

The southern portion of the mine area (approximately 238 acres), including the majority of the South Pit and a small portion of the Mid Pit, is located in the State Land Creek Drainage (**Figure 2.3-8**). State Land Creek is a perennial stream located approximately 4,000 feet east of the project



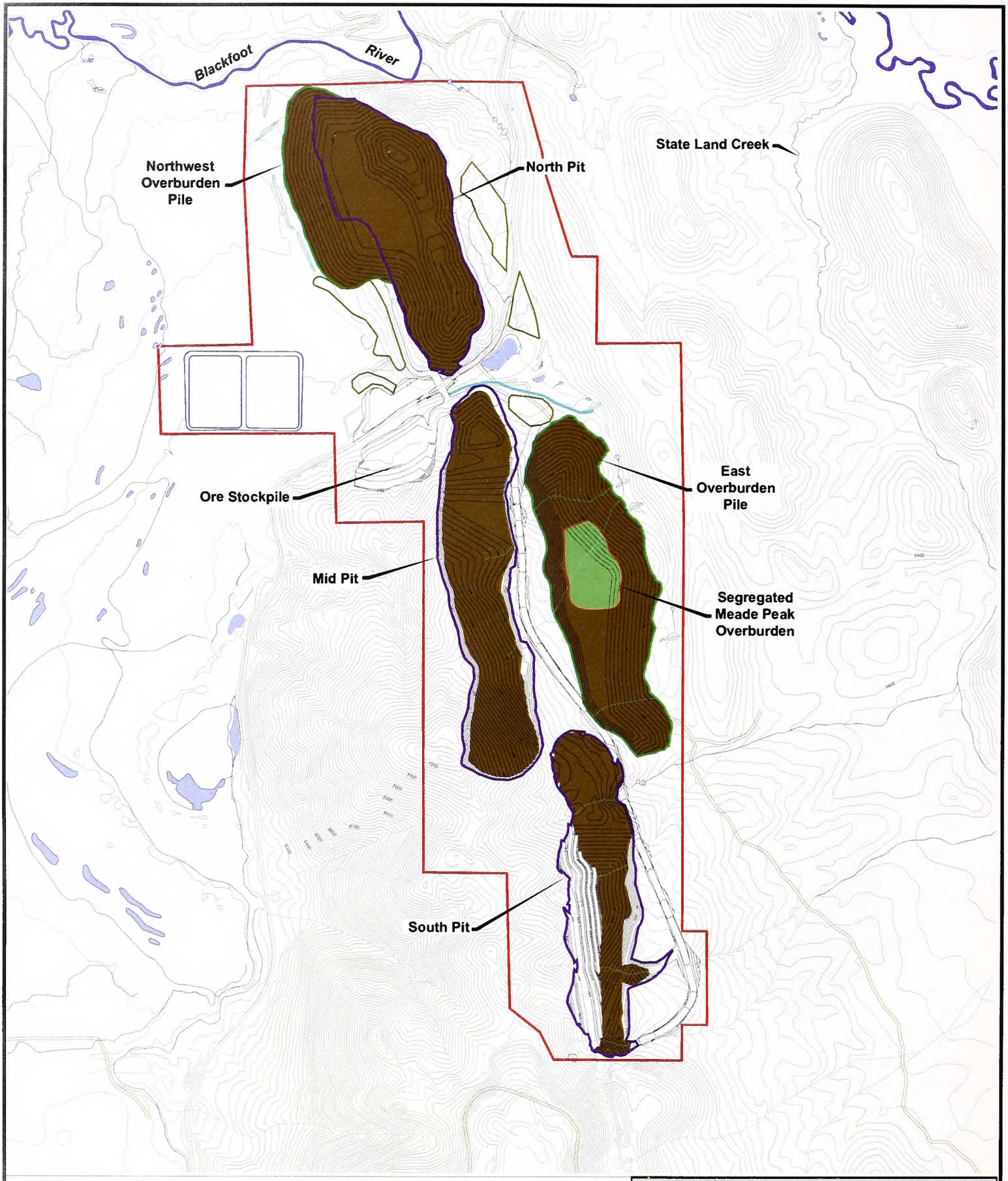
Note:
Drainage layer consists of coarse sand to fine gravel material. The subgrade layer consists of soils that range between fines and 1 inch. All protrusions extending more than 0.5 inch from the subgrade surface would be removed, crushed, or pushed into the surface with a smooth-drum compactor.

Source: (O'Kane 2009a)

BLACKFOOT BRIDGE PROJECT EIS

FIGURE 2.3-6
Cover System Designs

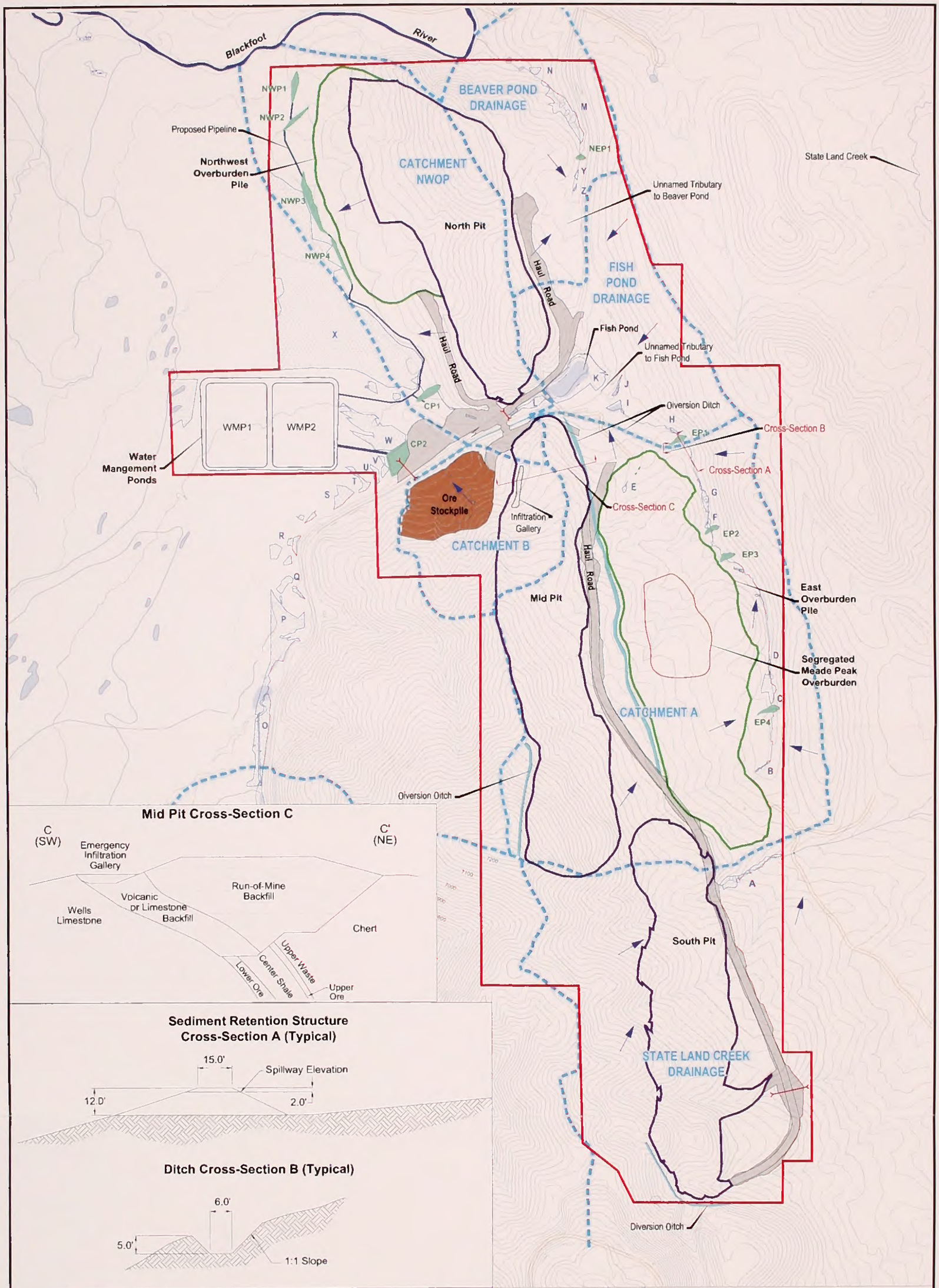
ANALYSIS AREA: Caribou County, Idaho	
Date: 12/21/10	File: Cover System Designs.dwg
Drawn By: EC	Layout: 1



BLACKFOOT BRIDGE PROJECT EIS

FIGURE 2.3-7
Proposed Action Cover Scenario

ANALYSIS AREA: Caribou County, Idaho	
Date: 06/16/09	File: Cover Scenarios_ProposedAction.dwg
Drawn By: EC	Layout: Proposed Action



BLACKFOOT BRIDGE PROJECT EIS

FIGURE 2.3-8
Water Management

ANALYSIS AREA: Caribou County, Idaho	
Date: 06/15/09	File: WaterManagement.dwg
Drawn By: EC	Layout: Water Management System_fmt

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area that flows east-northeast from the east side of the Aspen Range to its confluence with the Blackfoot River northeast of the project area. State Land Creek is not located on the Blackfoot Bridge property; however, the western tributaries of State Land Creek are on the property.

2.3.5.1.2 Fish Pond Drainage (Catchment A and Catchment NWOP)

The central portion of the project area (approximately 697 acres) is located within the unnamed tributary to Fish Pond that drains north from the southeast side of the proposed EOP to Fish Pond, and then to Wetland X south of the Blackfoot River (**Figure 2.3-8**). This entire unnamed drainage is a tributary of the Blackfoot River. This drainage normally flows only during spring runoff and large precipitation events, but portions of the drainage remain wet year round (Whetstone 2008). As shown on **Figure 2.3-8**, P4 proposes to construct a diversion ditch to allow stormwater runoff to be routed from proposed water control pond EP1 (immediately north of Wetland H) to pond CP2, which would be constructed adjacent to the equipment yard and loadout area. The diversion ditch would separate surface flow in the upper portion of the drainage that contains the EOP and portions of the Mid Pit and South Pit from the lower portion of the drainage. For the purposes of this EIS, the upper part of the unnamed tributary to Fish Pond north of the proposed diversion ditch (approximately 446 acres) has been designated Catchment A. The portion of the unnamed tributary to Fish Pond below the diversion ditch (approximately 258 acres) that includes the NWOP and a portion of the North Pit, is designated Catchment NWOP (P4 2009a).

Currently, stormwater runoff from an approximate 117-acre area northeast of the proposed diversion ditch flows to the unnamed tributary to Fish Pond in Catchment A and to Fish Pond. As shown on **Figure 2.3-8**, construction of the diversion ditch would isolate this area from Catchment A. Runoff from the area north of the ditch (Fish Pond Drainage) would continue to drain to Fish Pond.

2.3.5.1.3 Catchment B

As shown on **Figure 2.3-8**, an approximate 70-acre area around the proposed ore pad would drain to the proposed diversion ditch, then to pond CP2.

2.3.5.1.4 Unnamed Tributary to Beaver Pond

The remainder of the northern project area (approximately 123 acres) lies within the unnamed tributary to Beaver Pond (**Figure 2.3-8**). Beaver Pond drainage channel is a perennial stream that flows north from Wetland M to the Blackfoot River (Whetstone 2008). A portion of the North Pit is located within this drainage (P4 2009a).

2.3.5.2 Soil and Surface Cover Conditions

Based on the soil survey results, soil within the project area was determined to fall within the Natural Resources Conservation Service (NRCS) hydrologic soil group C (soil with low infiltration rates when wetted thoroughly) for the purpose of stormwater runoff calculations (**Section 2.3.5.4**).

Vegetative/land cover within the project area falls into the following three general classifications:

- **Non-Forested Land:** Vegetative cover includes bitterbrush, mountain big sagebrush, and silver sage;

- **Forest Uplands:** Vegetative cover includes aspen, Douglas-fir, and mixed needleleaf/broadleaf forest vegetation; and
- **Riparian and Wetland Areas:** Vegetative cover includes graminoid and forb-dominated riparian, shrub-dominated riparian, mixed non-forest riparian, and shallow marsh vegetation (Greystone 2006a).

Surface cover conditions would change considerably throughout the duration of the project, which would affect the runoff potential for each catchment within the project area. Precipitation that falls into the pits is assumed to evaporate or infiltrate into the subsurface and not flow to the water management systems. Therefore, the area of the pits was subtracted from the drainage areas for the purpose of stormwater runoff calculations (**Section 2.3.5.4**). Initial cover conditions for each catchment area were based on visual field observations and review of aerial photographs for the project area (P4 2009a).

2.3.5.3 Precipitation and Design Storm Events

The project area is located in a semi-arid region with precipitation patterns that are influenced by prominent geographic features including the Aspen and Wooley Mountain Ranges (Whetstone 2008). Elevations at the site range from a low of 6,160 feet above mean sea level (amsl) near the Blackfoot River to a high of 7,240 feet amsl along the ridgeline adjacent to Mid Pit (crest of the Aspen Range). The estimated average annual precipitation for the project area is 17.2 inches (Whetstone 2008).

The stormwater management system was designed based on stormwater runoff volumes and peak flows associated with a NRCS Type 11, 100-year, 24-hour storm event. Based on a review of precipitation frequency maps for Idaho, 3.2 inches of precipitation would fall within the project area during a 100-year, 24-hour storm event (NOAA 1973).

2.3.5.4 Stormwater Runoff Volumes

As discussed in **Section 2.3.5.2**, surface cover conditions would change throughout the duration of the project, which would affect runoff potential for each catchment within the project area for the Proposed Action. Calculated runoff volumes from the design storm event were based on worst-case cover conditions. Peak flows were determined using the U.S. Department of Agriculture software program WinTR-55, which is based on the NRCS TR-55 graphical method. The following peak runoff flows were estimated for a 100-year, 24-hour storm event.

- **Catchment A**: 263 cubic feet per second (cfs)
- **Catchment B**: 118 cfs
- **Fish Pond Drainage**: 116 cfs
- **Beaver Pond Drainage**: 96 cfs
- **Catchment NWOP**: 105 cfs

All stormwater catchments within the project area are currently ungauged. Runoff volumes for the estimated average precipitation were calculated for each month using the NRCS curve number method to estimate the volume of water that may drain to the water management system annually.

This method provides a reasonable estimate of the total volume of runoff that may occur over the year, but may over- or underestimate runoff from individual precipitation and spring runoff events because it assumes that all precipitation in a given month occurs during a single event. Total annual runoff volumes were calculated for each year of the project under the Proposed Action to account for changes in runoff volumes due to changing surface cover conditions.

2.3.6 Water Management

The proposed water management system for the Proposed Action, as set forth in the Revised Mine Water Management Plan (P4 2009a), is described in the following sections.

2.3.6.1 Water Management System Overview

The mine is being designed with the capacity to prevent the discharge of contaminated stormwater to the Blackfoot River in the event surface water quality criteria are not met. Stormwater runoff that meets surface water quality criteria, however, may be discharged in accordance with requirements of an NPDES permit issued by the EPA (**Section 1.3.2**). Potential runoff that does not meet surface water quality criteria and other water that is not eligible for discharge under the NPDES would be stored and managed on site. Run-on diversion ditches would be used to intercept and divert runoff from undisturbed areas to reduce the volume of water that may contact mining disturbances.

A conceptual layout of water management system proposed for the project is presented on **Figure 2.3-8**. Components of the proposed water management system include two water management ponds (WMP1 and WMP2) to be constructed in the flat area west of the equipment yard and loadout area. The water management system would also include diversion ditches and pump/piping systems. The volume of water in the ponds WMP1 and WMP2 may be managed through the use of evaporative sprayers and pumping the water on an emergency basis to a portion of the Mid Pit that would be backfilled with non-segregated overburden (e.g., volcanics and limestone).

A total of 11 water control ponds and associated sediment control dams would be constructed in drainages immediately adjacent to proposed disturbance areas. Four water control ponds (EP1 through EP4) would be constructed along the unnamed tributary to Fish Pond to the east of the EOP (Catchment A). Four more water control ponds (NW1 through NW4) would be constructed along the west side of the NWOP (Catchment NWOP) (**Figure 2.3-8**).

Water control pond NEP1 would be constructed on the east side of the North Pit upstream of Wetland M. The final two water control ponds (CP1 and CP2) would be constructed in the vicinity of the proposed equipment yard and loadout area. CP1 would be constructed in the unnamed tributary to Fish Pond downstream from Fish Pond and the ore haul road, and would be the farthest downstream structure that would capture runoff and sediment from the central portion of the project area. CP1 would be designed to prevent the release of water downstream to Wetland X, if necessary, to ensure compliance with water quality standards. The capacity of Fish Pond (a manmade impoundment) would be increased by enlarging the pond and raising the elevation of the spillway by 5 feet. Fish Pond would be upgraded to more effectively hold stormwater as part of the water management system. Pond upgrade would involve raising and sealing the dam and adding

clay or other liner materials to the pond bottom to increase capacity and decrease infiltration. Capacities of the ponds are provided in **Table 2.3-4**.

Table 2.3-4 Water Management and Control Pond Capacities and Descriptions for the Proposed Action

Pond	Description	Capacity		
		Million Gallons	Volume (acre-feet)	Surface Area (acres)
WMP1	Located farthest west of ore loadout facility. Water management pond for pit dewatering. May also receive runoff from Catchments A and B.	104.9	322	19.37
WMP2	Located west of ore loadout facility. Water management pond for pit dewatering. May also receive runoff from Catchments A and B.	104.9	322	19.51
CP1	Located north of ore loadout facility. Water control pond for equipment yard and loadout area. May also receive runoff from upper unnamed tributary to Fish Pond including Fish Pond.	3.1	9.4	.69
CP2	Located west, adjacent to truck turnaround. Water control pond for ore pad, tipple loop and loadout, and equipment yard. Would receive runoff from Catchments A and B.	3.2	9.7	1.87
EP1	Lowest pond in EOP drainage above Fish Pond. Water control pond in Catchment A.	2.9	8.8	0.32
EP2	Just south of EP1. Water control pond in Catchment A (above Fish Pond).	1.3	4.0	0.27
EP3	Just south of EP2. Water control pond in Catchment A (above Fish Pond).	0.8	2.5	0.34
EP4	Just south of EP3. Water control pond in Catchment A (above Fish Pond).	1.1	3.3	0.42
NWP1	Northwest corner of project area. Water control pond in Catchment NWOP.	3.0	9.1	0.60
NWP2	Just south of NWP1. Water control pond in Catchment NWOP.	1.4	4.4	0.43
NWP3	Just south of NWP2. Water control pond in Catchment NWOP.	5.8	17.9	1.39
NWP4	Just south of NWP3. Water control pond in Catchment NWOP.	0.8	2.6	0.61
NEP1	Located in the northwest region of the project area. Water control pond in unnamed tributary to Beaver Pond.	2.1	6.4	0.17
Fish Pond[1]	Existing manmade pond. Would receive runoff from drainage north of diversion ditch. May also receive runoff from all of Catchment A.	7.1	21.8	2.83

[1] Capacity of Fish Pond if spillway elevation is raised by 5 feet.
Source: P4 2008a

P4 would fence the project area to control general access of unauthorized vehicles and neighboring livestock. P4 would also inspect and observe wildlife interaction at the proposed water management facilities.

Impacts to waters of the U.S. would require a USACE Section 404 Clean Water Act permit; P4 has submitted a permit application (P4 2008b). These impacts are described in **Chapter 4** and include the construction of water management ponds, placement of rock fill in the unnamed tributary to Fish Pond east of the EOP, alteration of Fish Pond, and the construction of mine facilities (e.g., ore truck turnaround loop and equipment yard). These impacts to waters of the U.S. would be offset with aquatic habitat mitigation as described in **Chapter 4**. Other necessary approvals, such as Dam Safety Permits, would be obtained from the Idaho Department of Water Resources (IDWR).

2.3.6.2 Mine Dewatering

In P4's proposal, mining would occur below the water table in the Mid Pit in year 5, in the North Pit in years 6 through 9, and again in years 12 and 13. The Mid and North Pits would be dewatered using a series of sumps excavated one to two levels below the ore being mined (P4 2008a). **Table 2.3-5** summarizes the estimated volumes of water that would be pumped from the pits during these periods to WMP1 and WMP2 (ARCADIS 2010).

Table 2.3-5 Expected Duration of Mining below Water Table and Maximum Water Volumes Produced

Year	Mining Location	Total Days of Pumping	Pumping Rate (cfs)	Volume Pumped (acre-feet)
5	Mid Pit	22	1.02	44.5
6	North Pit 1	69	2.8	383
7	North Pit 1	50	3.0	298
8	North Pit 2	49	0.5	48.6
9	North Pit 2	71	0.9	127
12	North Pit 3	54	0.05	5.4
13	North Pit 4	96	3.61	687

Note: Average pumping rates provided by ARCADIS (2010) and calculated from the groundwater model for the project area.

2.3.6.3 Water Management – North Pit Area

Stormwater runoff on the west side of the North Pit area, including the NWOP, would flow to the west toward the wetland complex that includes Wetland X (JBR 2003, 2006). A ridge separates the north end of the North Pit from the river. Any precipitation that falls within the perimeter of the North Pit would be contained by the pit and would not drain to the water management system. Four water control ponds (NWP1 through NWP4) with a combined capacity of 34 acre-feet would be constructed to reduce sediment load in runoff from the NWOP (**Figure 2.3-8**). A berm would be constructed along the toe of the topsoil pile south of the NWOP to capture runoff from the pile. In addition, BMPs such as silt fences would also be employed in the drainage to protect surface water quality. The NWOP would contain non-Meade Peak overburden (i.e., materials containing less than 13 ppm selenium) as determined through sampling described in the Environmental Monitoring Plan (P4 2010a) in **Appendix A**. Runoff that does not exceed surface water quality criteria would be allowed to discharge from the water control ponds to the wetland complex in accordance with the Stormwater MSGP (or individual NPDES permit). In the event that runoff in water control ponds NWP1 through NWP4 does not meet surface water quality criteria, the water would be pumped to ponds WMP1 and WMP2.

Runoff from the southern half of the Beaver Pond drainage (on the east side of the North Pit area) would drain to the east toward NEP1 (**Figure 2.3-8**). In the event that runoff from this area does not meet surface water quality criteria, it would be pumped from pond NEP1 to one of the other water control ponds and ultimately routed to WMP1 or WMP2. The specific water control pond(s) that would receive water from NEP1 would be determined based on the mining activities occurring at the time of pumping and the water levels in individual water control ponds. Runoff from the northern portion of the Beaver Pond drainage (north of pond NEP1) would flow to a series of small riparian areas that drain north to the Blackfoot River. This area would be undisturbed, and runoff would be unaffected by mining activities. BMPs (e.g., silt fences) would be constructed as necessary to control runoff from this area.

As shown on **Figure 2.3-8**, the North Pit would terminate along the south side of a ridge approximately 655 feet from the Blackfoot River. The area north of the above-referenced ridge line would be undisturbed. Runoff from this area would be unaffected by mining activities and would drain to the Blackfoot River.

As discussed in **Section 2.3.6.2**, groundwater would be encountered in the North Pit in years 6 through 9 and again in years 12 through 13. The groundwater flow model developed for this EIS estimates that a total of approximately 1,550 acre-feet of groundwater would be pumped from sumps in the North Pit to ponds WMP1 and WMP2 during these periods (ARCADIS 2010). As discussed in **Sections 2.3.6.6** and **2.3.6.7**, the volume of water in ponds WMP1 and WMP2 would be managed through the use of evaporative sprayers. Water may also be pumped from the ponds to Mid Pit backfill on an emergency basis.

2.3.6.4 Water Management – Mid Pit and Facilities Area

As shown on **Figure 2.3-8**, stormwater runoff from the central portion of the project area that includes the EOP would flow to the unnamed tributary to Fish Pond east of the EOP (designated Catchment A). This drainage has intermittent flow, primarily during spring runoff and precipitation events. P4 proposed to construct four water control ponds (EP1 through EP4) with a total combined capacity of 18.6 acre-feet. The purpose of the ponds is to capture sediment load associated with runoff. BMPs, such as silt fences, would also be employed in the drainage to protect surface water quality. Stormwater runoff that reaches pond EP1 would be allowed to discharge via its spillway to Fish Pond if this water meets appropriate surface water quality criteria. From Fish Pond, the water may be allowed to flow through a 24-inch culvert under the haul road to pond CP1, where it may ultimately be discharged to the wetland complex downstream of CP1. In the event runoff that collects in EP1 does not meet surface water quality criteria, it would flow in a diversion ditch to pond CP2, where it would be pumped to ponds WMP1 and WMP2.

Construction of the diversion ditch between ponds EP1 and CP2 would isolate all of Catchment A. This portion of the project area would be predominantly undisturbed by mining activities. Following construction of the diversion ditch, runoff north of the ditch would drain to Fish Pond. Water in Fish Pond that meets surface water quality criteria would be allowed to flow to pond CP1, and ultimately may be discharged to the wetland complex downstream of CP1.

Stormwater runoff from the area around the ore pad (designated Catchment B) would flow to the diversion ditch constructed between ponds EP1 and CP2. Runoff from the equipment yard and

loadout area would also flow to pond CP2. Based on surface water quality, water in pond CP2 may be pumped to other water control ponds for discharge in accordance with the applicable NPDES permit. In the event that water in pond CP2 does not meet surface water quality criteria, it would be pumped to ponds WMP1 and WMP2.

As discussed in **Section 2.3.6.2**, groundwater would be initially encountered in the Mid Pit in year 5. Based on the groundwater flow model developed for this EIS, it is estimated that approximately 44.5 acre-feet of groundwater would be pumped from sumps to ponds WMP1 and WMP2 while mining occurs below the groundwater in the Mid Pit (ARCADIS 2010). The volume of water in ponds WMP1 and WMP2 would be managed through the use of evaporative sprayers. Water may also be pumped from the ponds to Mid Pit backfill on an emergency basis.

2.3.6.5 Water Management – South Pit Area

Stormwater runoff from the area that surrounds the South Pit is tributary to State Land Creek and generally flows east and north (**Figure 2.3-8**). The north end of the South Pit would be mined across the drainage above Wetland A (JBR 2003, 2006) (**Figure 2.3-8**). Wetland A contains a flowing spring, which is fed by perched groundwater originating in colluvial deposits in the drainage to the west and is tributary to State Land Creek. Prior to mining this area, P4 would conduct a subsurface investigation to identify the source of the spring. The backfill design for the South Pit would be modified as necessary based on the results of the investigation to prevent the groundwater source of the spring from coming in contact with segregated Meade Peak overburden. In the event that mining reduces flow to the spring, a water right would be obtained or purchased, if necessary, and wetland losses replaced by planned mitigation discussed in **Chapter 4**.

Construction of a haul road prior to the start of mining activities in the South Pit area would provide a downgradient barrier to stormwater runoff originating from the mine development. The east side of the haul road would be graded to direct runoff from the road away from Wetland A. In addition, BMPs (such as silt fencing) would be employed to control stormwater runoff, reduce the sediment load, and protect Wetland A and State Land Creek. In addition, the haul road would act as a barrier for stormwater runoff in the area between the pit and the road.

Stormwater outfalls in the South Pit area would include a 24-inch culvert that would be installed along the haul road near the southern end of the South Pit (**Figure 2.3-8**) and a run-on diversion ditch that would be constructed around the southwest end of the South Pit.

2.3.6.6 Water Management Ponds

P4 proposes to construct two water management ponds (WMP1 and WMP 2) with a combined capacity of approximately 644 acre-feet to contain pit water and stormwater runoff from drainage within the project area, as discussed above. The conceptual design of the ponds defines dimensions of approximately 850 feet by 1,140 feet, with an embankment height of approximately 20 feet above natural ground surface (including freeboard). The ponds would be excavated into the existing surface to achieve additional storage volume. Borrow material for construction of the WMP1 and WMP2 would consist of limestone materials from either an area located just west of the south end of the North Pit (where the topsoil pile and haul road would be located) or from the southern portion of the Mid Pit. Pond embankments would be constructed with side slopes of 3:1 (horizontal to vertical, H:V) and pond bottoms sloped to one corner of each pond, where a reclaim

system would be positioned. The water management ponds would be lined with a high-density polyethylene (HDPE) geomembrane.

Monitoring wells would be installed at selected locations around the perimeter of the pond. These wells would be positioned both upgradient and downgradient of the ponds to monitor groundwater elevations and quality.

2.3.6.7 Evaporative Sprayers

Based on the water balance for the Proposed Action (**Section 2.3.6.8**), up to 12 evaporative sprayers may be employed to control the volume of water in WMP1 and WMP2. The sprayers would be operated seasonally between June and September, when climatic conditions are optimal for evaporation. Based on pan evaporation rates for the climate station at Blackfoot Dam, each sprayer would be capable of evaporating approximately 12.6 acre-feet of water during this 4-month period (P4 2009a). Use of the sprayers is not anticipated until mining begins below the water table in year 5 (if at all), depending on the volume of stormwater routed to WMP1 and WMP 2 and the volume of groundwater pumped from the pits.

2.3.6.8 Water Balance

A water balance was prepared to design the capacity of the proposed water management system under the Proposed Action. **Table 2.3-6** summarizes this water balance for WMP1 and WMP 2. As discussed in **Section 2.3.6.1**, stormwater runoff would only be routed to the water management ponds if it exceeds surface water quality criteria and cannot be discharged under the NPDES permit. The capacities of WMP1 and WMP2 were designed to store all stormwater runoff from Catchments A and B for the duration of mining activities. Estimated annual runoff volumes from these catchments (refer to **Section 2.3.5.4** for details) were used for the water balance. The combined estimated annual runoff from Catchments A and B is up to 90 percent greater (depending on surface cover conditions) than the combined flows from the Beaver Pond drainage and Catchment NWOP.

Table 2.3-6 Water Management Ponds Water Balance for the Proposed Action

Year	Starting Volume in WMPs (AF)	Pit Dewatering Volume (AF)	Runoff (AF)	Net WMP Evaporation (AF)	Dust Suppression (AF) WMP	Spray Evaporation (AF)	Ending Volume (AF)
1	0	0	31.1	31.1	0	0	0
2	0	0	61.3	35.4	25.9	0	0
3	0	0	85.3	35.4	30	0	19.9
4	19.9	0	80.8	35.4	30	0	35.3
5	35.3	44.5	90.7	35.4	30	105.2	0
6	0	383	65.5	35.4	30	151	232
7	232	298	61.5	35.4	30	151	375
8	375	48.6	61.0	35.4	30	151	268
9	268	127	59.5	35.4	30	151	238
10	238	0	59.5	35.4	30	151	81.1
11	81.1	0	65.2	35.4	30	0	80.8
12	80.8	5.4	69.3	35.4	30	90.1	0

Table 2.3-6 Water Management Ponds Water Balance for the Proposed Action

Year	Starting Volume in WMPs (AF)	Pit Dewatering Volume (AF)	Runoff (AF)	Net WMP Evaporation (AF)	Dust Suppression (AF) WMP	Spray Evaporation (AF)	Ending Volume (AF)
13	0	687	59.9	35.4	30	151	531
14	531	0	59.9	35.4	30	151	375
15	375	0	59.5	35.4	30	151	218
16	218	0	80.2	35.4	30	151	81.8
17	81.8	0	70.6	35.4	30	0	87.0

1) Runoff volumes include evaporation losses from Ponds EP1 through EP4 and CP2 (7.08 acre-ft/yr).
2) Storage volumes of ponds EP1 through EP4 and CP2 (28.3 acre-ft) subtracted from year 1 runoff volumes.
3) All runoff that flows to EP1 and CP2 is assumed to be routed to the water management ponds.
4) Seepage from the lined diversion ditch was estimated to be less than 0.001 percent of the total flow from the design storm event, and therefore, was not considered in the water balance for the Proposed Action.

AF = acre-feet WMP = water management ponds.
Source: P4 2009a

As shown in **Table 2.3-4**, the combined capacity of WMP1 and WMP 2 would be approximately 644 acre-feet (not including freeboard). Under the maximum runoff scenario presented in **Table 2.3-6**, the volume of water that would be stored in the ponds would not exceed 90 percent of their capacity.

2.3.6.9 Contingency Pumping to Backfill

As discussed in **Section 2.3.6.1**, water may be pumped from ponds WMP1 and WMP2 on an emergency, short-term basis to a portion of the Mid Pit that would be backfilled with selectively handled overburden (e.g., volcanics and limestone). The location and conceptual design of the Mid Pit emergency infiltration gallery is shown on **Figure 2.3-8**. Water pumped to the Mid Pit infiltration gallery is expected to infiltrate into the Wells Limestone that would be present below the proposed infiltration gallery (**Figure 2.3-8**). Emergency pumping from the water management ponds may be initiated if the volume of water in the ponds exceeds 90 percent of their design capacity (580 acre-feet). This would provide 64 acre-feet of additional storage capacity in the ponds to handle incoming stormwater/pit dewatering flows while emergency pumping is initiated.

It is anticipated that WMP1 and WMP 2 would be filled to their highest level in year 13, when an estimated 687 acre-feet of water would be pumped from the North Pit to the ponds over a 96-day period. Therefore, the greatest potential for emergency pumping would occur in year 13.

The emergency pump and piping system would have the capacity to pump the entire volume of runoff associated with the design storm event from Catchments A and B (approximately 40.8 acre-feet) over a 24-hour period from the ponds to the Mid Pit backfill infiltration gallery. This would result in a peak pumping rate of approximately 1,580 gallons per minute (gpm). Pumping would continue until the volume of water in the water management ponds is below 90 percent of their design capacity (580 acre-feet).

2.3.6.10 Diversion Ditch System

The conceptual design of the diversion ditch between EP1 and CP2 is a trapezoidal open channel measuring 6 feet wide at the base, with side slopes of 1:1 (H:V) and a minimum depth of 5 feet (**Figure 2.3-8**). The depth of the ditch immediately upgradient of the culverts beneath the mine truck-railroad crossing and beneath the haul road to pond CP2 would be a minimum of 8 feet to accommodate the headwater associated with a 100-year, 24-hour storm event. The gradient for the majority of the channel would range from 1 to 4 percent.

In areas where the gradient exceeds 2 percent, the ditch would also be lined with rip–rap material or geotextile fabric to prevent erosion. Total length of the ditch is approximately 2,200 feet. Based on this design, it is estimated that the ditch can handle flows of approximately 458 cfs before over-topping. During the period of peak flow from the 100-year, 24-hour storm event, the ditch would be at approximately 60 percent capacity (279 cfs) under the water balance for the Proposed Action. As shown on **Figure 2.3-8**, water in the diversion ditch would flow through an approximate 1,200-foot section to a 72-inch diameter culvert from the main haul road crossing to Pond CP2.

The total length of the open diversion ditch would be lined to reduce seepage loss. The ditch would be lined with a layer of compacted low permeability soil (i.e., fine-grained silt and clay with a maximum hydraulic conductivity of 1x10-6 cm/sec) with a minimum thickness of 1 foot if a suitable source of material is identified on site. In the event that a source of suitable low permeability material is not identified on site, the ditch would be lined with a Geosynthetic Clay Liner (GCL).

A run-on diversion ditch would be constructed along the southwest edge of the Mid Pit to divert stormwater runoff away from the pit (**Figure 2.3-8**). The conceptual design of the ditch calls for a capacity of approximately 100 cfs. The area that would contribute surface runoff to the ditch would be undisturbed by mining activities. Therefore, the ditch would discharge to a drainage west of the Mid Pit and would not be routed to the water management system. Rock check dams or silt fencing would be used to reduce the sediment load in the discharge and reduce the velocity of the discharge to prevent erosion. The ditch would be lined with rip-rap or otherwise protected to prevent channel erosion.

A run-on diversion ditch would also be constructed along the western toe of the EOP to divert runoff from upgradient areas away from the EOP (**Figure 2.3-8**). The ditch would also collect runoff from the western side of the EOP. The capacity of the ditch would be approximately 240 cfs. During the period of peak flow from the design storm event, the ditch would be at approximately 55 percent capacity (132 cfs) under the water balance for the Proposed Action. The ditch would be lined with rip-rap or otherwise protected to prevent channel erosion.

2.3.6.11 Culverts

Culverts would be installed at two locations in the diversion ditch beneath the mine truck-railroad crossing and beneath the haul road to pond CP2 (**Figure 2.3-8**). Peak flows in the diversion ditch from the design storm event at these locations are estimated to be 263 and 279 cfs, respectively under the water balance for the Proposed Action. Two 48- to 54-inch diameter culverts or an equivalent capacity single culvert would be required at each location to handle the stormwater

flows associated with the design storm event. In addition, a 24-inch diameter culvert would be installed along the haul road near the southern edge of the South Pit.

2.3.6.12 Water Management – Post Mine Phase

The water management system at the mine would continue to be maintained and operated in place following the completion of mining activities until reclaimed areas have stabilized (i.e., vegetation is fully established). Surface water monitoring would continue as described in **Appendix A** until it is demonstrated that runoff from the reclaimed project area meets surface water quality standards. Portions of the water management system, including the water management ponds and the diversion ditch between ponds EP1 and CP2, would then be removed. Sediment in the water management ponds would be removed, sampled, and used as growth medium on site if it meets suitability requirements (i.e., contains selenium at concentrations below 13 mg/kg or less than 0.1 mg/L extractable selenium). Sediment that does not meet suitability criteria would be managed as seleniferous material and would be placed as backfill in the South Pit. The HDPE pond liner would be transported off site for disposal in accordance with applicable state and federal regulations. The pond embankments would be leveled and contoured to create a slightly mounded area that would then be covered with growth medium and reclaimed following procedures provided in the Revised Mine Plan (P4 2008a). The run-on diversion ditches around the Mid Pit and EOP (**Figure 2.3-8**) would remain in place.

Sediment that collects behind the sediment control dams would also be removed, sampled, and used as growth medium on site if it meets suitability requirements (contains selenium at concentrations below 13 mg/kg or less than 0.1 mg/L extractable selenium). Sediment that is not suitable for use as growth medium would be placed as backfill in the South Pit and managed as seleniferous material. The sediment control dams would be breached and contoured to allow stormwater runoff to flow through the pond areas unimpeded.

Following removal of components of the water management system, runoff patterns in the project area drainages would be similar to current (pre-mining) conditions. The unnamed tributary to Fish Pond that extends along the east side of the proposed EOP (**Figure 2.3-8**) would flow to Fish Pond and then to the wetland area along the west side of the NWOP. The Beaver Pond drainage would continue to drain to Wetland M and then north to the Blackfoot River. Surface runoff from the southern portion of the project area would flow to tributary drainages of State Land Creek.

As discussed in the Revised Mine Plan, the Mid Pit and North Pit would be backfilled to resemble pre-mining slopes and contours. Surface runoff would flow over the reclaimed pits to downgradient drainages. Upon completion of mining, the South Pit would be partially backfilled with non-segregated overburden from the EOP. The northern portion of the pit would be backfilled and graded to direct surface runoff to flow over the cover toward Wetland A and unnamed tributary to Fish Pond along the east side of the EOP. The backfill in the southern portion of the pit would be graded to capture surface water and snow melt flowing over the cover to infiltrate into the Wells Formation (P4 2008a). In addition, a run-on diversion ditch would be constructed around the southwest end of the South Pit to direct surface water runoff from undisturbed upgradient areas away from the pit as shown on **Figure 2.3-8**.

2.3.7 Ancillary Facilities

Because of the project location, infrastructure development at Blackfoot Bridge Mine would require the development of certain ancillary facilities. Selected project details associated with these items are discussed below. Facilities and construction that would occur include:

- Modify a portion of a main power line around project facilities;
- Construct a mine haul truck-railroad crossing;
- Construct an ore pad, tipple, and associated conveyance system;
- Construct the ore turnaround loop and yard area; and
- Construct water management facilities.

Existing maintenance and fueling facilities at Enoch Valley and Ballard would continue to be used for major and routine maintenance and necessary office support activities. Fuel consumption associated with the Proposed Action would include the following:

- Diesel fuel – 1.2 million gallons per year; and
- Gasoline fuel – 24,000 gallons per year.

Mining equipment currently employed at P4's South Rasmussen Mine would be reassigned to the Blackfoot Bridge Mine as operations at South Rasmussen cease. With the exception of a transition period between closure of South Rasmussen and initiation of activities at Blackfoot Bridge Mine, the volume of diesel and gasoline consumed by mining operations would not change from current levels. P4 would maintain existing fuel storage facilities at Enoch Valley and use fuel delivery trucks to service the equipment fleet at the Blackfoot Bridge Mine.

The following sections detail the project development infrastructure.

2.3.7.1 Power Line Modification and Relocation

Development of this project would require modification of an existing 4,160-volt transmission line owned by Rocky Mountain Power. This line currently runs through the project area and provides power to neighboring mines and other residential customers (**Figure 2.3-4**). In addition, Lower Valley Energy, under a separate action, has been granted a right-of-way to install a 115 kilovolt (kV) line to move power from a substation near P4's Soda Springs plant to the Jackson Hole area. The existing 4,160-volt line, owned by Rocky Mountain Power, would be the source of power for the project and would be modified and attached to the Lower Valley Energy line structures within the project area. P4 would enter into a Memorandum of Understanding (MOU) with both power companies to allow operation and maintenance of both lines. Design configuration of the proposed power lines would be developed in agreement with Lower Valley Energy and Rocky Mountain Power and would implement BMPs to protect raptors and migratory birds.

2.3.7.2 Mine Truck-Railroad Crossing

A mine truck-railroad crossing would be constructed (**Figure 2.3-4**) to allow ore and overburden to be moved to opposite sides of the railroad tracks. The crossing would require approximately 57,000 cubic yards of non-Meade Peak overburden for construction. The majority of this fill

would be placed across the drainage between the existing haul road and the railroad. Some fill would extend from south of the railroad to the hillside. The crossing would have a top width of 100 feet at an average elevation of about 6,268 feet. As designed, the crossing at the railroad would consist of a series of pre-fabricated concrete panels anchored together as a single 100-foot-wide pad. Construction of the crossing would impact about 0.14 acre of delineated wetlands in Wetland L.

Dual 48- to 54-inch culverts or an equivalent capacity single culvert would be installed through the crossing on the south side of the existing railroad bed (P4 2009a). The culverts would receive diverted runoff from the diversion ditch transporting water that originates in the EOP drainage at pond EP1. In addition, the 24-inch culvert under the existing haul road would be extended. Polyethylene corrugated pipe would be used for the culverts.

2.3.7.3 Ore Stockpile Pad and Tipple

The ore stockpile pad would be constructed on the south side of the rail and haul roads (**Figure 2.3-4**). Ore would be dumped from a level cut into the hill approximately 60 feet above the stockpile site. The entire pad area and associated features (hoppers, feeders, screening and crushing plant, tipple and truck loading areas) is expected to encompass approximately 22 acres. The footprint of the ore stockpile would cover approximately 6 acres and would provide capacity for some 800,000 tons of phosphate ore. At the base of this 60-foot-high ore pile would be a single concrete ore hopper (35 feet by 50 feet) containing a single feeder. This feeder would provide ore to conveyors that feed a screening and crushing plant that would reduce the ore to a 2-inch minus product. Ore would then be transported across the railroad and the existing haul road, approximately 200 feet, to a tipple facility which would employ a 400+ ton single ore bin used to load the triple-trailer ore haulers.

2.3.7.4 Ore Truck Turnaround Loop and Yard Area

A turnaround loop and yard area would be constructed north of the existing paved haul road (**Figure 2.3-4**). This loop and yard area would be constructed on approximately 11 acres. The main purpose of the loop is for truck loadout, but it would also provide a staging area where various maintenance activities for both ore haul and mine equipment could be performed. Construction of the facilities would require about 260,000 cubic yards of non-Meade Peak overburden fill material and would require an extension of the culvert described in **Section 2.3.7.2**. Extension of the culvert would affect an additional 0.08 acre of wetlands in Wetland BB.

2.3.7.5 Mine Design

The ultimate pit at Blackfoot Bridge Mine has a total length of about 14,800 feet and varies in width from 800 to 1,700 feet. The northwest end of the North Pit is particularly wide due to multiple ore sections resulting from a number of north-south parallel to strike faults. Total pit surface disturbance is estimated at 361 acres.

The mine design proposed by P4 uses two different design approaches. The majority of the property has been drilled in detail, which includes the North Pit, South Pit, and north end of the Mid Pit. The parameters generally include:

- For footwall designs, (limestone) with dip angles less than the angle of repose, approximately 37 degrees - dip slope mining would occur without benches;
- For footwall designs, (limestone) between 37 degrees and 75 degrees, 40H feet by 80V feet benches with face angles attempting to be cut on the respective dip angles;
- For footwall designs, (limestone) steeper than 75 degrees, up to and including overturned, a face angle of 60 degrees would be used;
- For hanging wall designs in chert, a nominal 45- to 55-degree angle, based on chert joint set angles;
- Alluvial slopes are 26 to 37 degrees; and
- Endwall slopes are typically 60 degrees.

For the south end of Mid Pit, a more generalized approach has been proposed that includes forty-degree overall slopes for both the hanging wall (chert) and footwall (limestone) sides of the pit. All mine areas would use nominal 10 percent ramps and 80-foot-wide roads.

2.3.7.6 Topsoil Handling

Recovery of topsoil and growth medium is a key aspect of proper mine plan execution. Topsoil depth varies, but for planning purposes, approximately 18 inches of topsoil recovery on most slopes, and about 3 feet of soil on most flat areas have been proposed. As indicated on **Figure 2.3-1**, five locations have been identified for topsoil storage, predominantly located in the northern third of the project area. As designed, these locations would provide space for more than 2.1 million bcy of soil, an excess of 300,000 bcy over the estimated total soil storage needs for the entire project. In addition, the EOP has sufficient area to provide for temporary stockpiles of topsoil within its footprint. The preferred method of operation would be to place topsoil from areas being stripped directly onto finished backfill or external overburden pile slopes. In general, topsoil and growth medium would be applied to sloped areas and incorporated into the proposed cover designs at a nominal thickness of 18 inches.

2.3.7.7 Haulage

Mined ore would be hauled to the stockpile located south and west of the main crossing. An exception to this may be during the initial transition years (years 1 to 4) from South Rasmussen to Blackfoot Bridge. During this period, ore may be stockpiled at the equipment yard area or turnaround loop and loaded into trucks utilizing a temporary screening plant or conventional loading equipment. The existing ore haul road from South Rasmussen would continue to be used during years 1 to 4.

After on-site infrastructure is complete, all ore would be hauled to the permanent ore pad, which has the capacity to store more than 800,000 tons of ore. Ore from the pad would be conveyed across the haul road and railroad to the tipple facility, which would be used to load the same triple-trailer ore trucks currently in use, and then transported via the existing P4 haul road to the Soda Springs Plant.

Overburden haulage during the project would use two main external roads. The haul road on the west side of the North Pit would be about 2,500 to 3,000 feet long and would connect the main haul road railroad crossing with the NWOP/NP1 mine area. This road would have a running width of 80

feet and would be constructed with appropriate berms and ditches. Water from this road would be controlled with various sediment-controlled structures (**Figure 2.3-1**) located in this area of the project. Once mining progresses to the south side of the railroad, a single road system using a through pit and an outside road, located east of the Mid and South Pits, would be used for material transportation. The total length of this road would be approximately 11,000 feet linking the ore crossing and the extreme south ramp entrance of the South Pit. This road would be built as the project advances and would not achieve its ultimate length until near the end of the project. As with other roads, water would be controlled with appropriate BMPs including culverts, berms, ditches, and slope stability measures.

2.3.7.8 Snow Removal

Snow that accumulates on project roads and facilities area would generally be plowed and stored in areas upgradient from various installed BMPs, including, but not limited to, yard areas, silt fences, and sediment retention structures, ensuring that surface runoff is kept within acceptable standards for sediments. Project areas identified as sensitive (e.g., near wetlands) may be subject to special snow hauling and handling practices. Where snow removal involves hauling and storage of the snow, piles of snow would be placed within bermed areas to reduce sediment load to surface water runoff from melting snow.

2.3.8 Reclamation Plan

Reclamation of disturbed areas at the Blackfoot Bridge Mine would be an ongoing process, concurrent with mining, and would continue in a similar manner for the Proposed Action. P4 would confirm that the site is safe and meets revegetation standards as set by the BLM, USACE, IDL, and the respective private landowners. Soils and vegetation on overburden piles and backfilled pits would be sampled to confirm that they meet applicable standards. Flowing streams or springs and standing ponds would also be sampled to confirm that they meet appropriate water quality standards. In addition to erosion protection, reclamation is intended to meet the final multiple land use goals of wildlife habitat, recreation, hunting, and grazing.

Mining disturbances would be kept to a minimum to ensure that overburden placement and pit backfill advancing in concert with mining would keep the timeframe for exposure of disturbed areas to wind and water as short as practical. Both external overburden piles and in-pit backfill would be shaped to blend with adjacent undisturbed slopes and topography. The mine operator would implement appropriate BMPs on a site-specific basis to limit soil erosion and loss. The seed mix that would be used to achieve the post-mining land uses is presented in **Table 2.3-7**.

After an area has been rough-shaped by mine equipment and the appropriate cover system has been installed, the topsoil and other growth medium would then be added. The topsoil would then be final-shaped by dragging the area with a large length of dozer track. The drag, which is pulled perpendicular to and behind a bulldozer, would be used to level the ground surface. The dozer would also move larger rocks downslope to provide a smoother surface for fertilizing and seeding. After the area being reclaimed has been dragged, it would be fertilized with approximately 300 pounds per acre of a urea blend fertilizer consisting of about 75 units of nitrogen, 45 units of phosphate, 20 units of potash, and 10 units of sulfur (75-45-20-10). After fertilizer application, the area would be seeded using the approved seed mix at a rate of approximately 35 pounds per acre (**Table 2.3-7**).

Table 2.3-7 Typical Seed Mix with Inoculum

Percent per Pound	Name	Scientific Name	Variety	Seeds per Pound	Seeds in Mix per Pound	Percent of Total Seeds per Pound
53.33	Mycorrihzal Inoculum					
4.67	Great Basin Wildrye	*Elymus cinereus*	Magnar	130,000	6,067	**10.88**
3.50	Bluebunch Wheatgrass	*Pseudoroegneria spicata ssp spicata*	Goldar	140,000	4,900	**8.79**
4.20	Western Wheatgrass	*Pascopyrum smithii*	Rosanna	110,000	4,620	**8.28**
4.67	Mountain Bromegrass	*Bromus marginatus*	Bromar	90,000	4,200	**7.53**
0.70	Rocky Mtn Penstemon	*Penstemon strictus*	Bandera	592,000	4,144	**7.43**
1.63	Alfalfa	*Medicago sativa*	Ladak	210,000	3,430	**6.15**
1.17	Lewis Blue Flax	*Linum lewisii*	Appar	293,000	3,419	**6.13**
0.47	Orchardgrass	*Dactylis glomerata*	Paiute	654,000	3,052	**5.47**
0.23	Timothy	*Phleum pretense*	Climax	1,300,000	3,034	**5.44**
2.80	Pubescent Wheatgrass	*Elytrigia intermedia ssp trichophorum*	Greenleaf	100,000	2,800	**5.02**
4.67	Small Burnet	*Sanguisorba minor*	Delar	55,000	2,567	**4.60**
0.12	Kentucky Bluegrass	*Poa pratensis*	Ginger	2,177,000	2,540	**4.55**
0.23	Mountain Phlox	*Leptosiphon grandiflorus*		907,000	2,116	**3.79**
0.23	Big Bluegrass	*Poa ampla*	Sherman	882,000	2,058	**3.69**
4.90	Sainfoin	*Onobrychis viciaefolia*	Eski	30,000	1,470	**2.64**
0.12	Showy Goldeneye	*Viguiera multiflora*		1,055,000	1,231	**2.21**
0.32	Wax Currant	*Ribes cereum*		350,000	1,111	**1.99**
5.13	Antelope Bitterbrush	*Purshia tridentata*		15,000	770	**1.38**
1.52	Woods Rose	*Rosa woodsii*		45,300	687	**1.23**
0.23	Strawberry Clover	*Trifolium fragiferum*	Palestine	300,000	700	**1.26**
4.70	Quickguard	*Sterile Triticale Cover Crop*	CMS 154E	13,000	611	**1.10**
0.47	Sticky Purple Geranium	*Geranium viscosissimum*		52,000	243	**0.44**
46.67					55,770	**100.00**

Note:
Seed to be distributed at 35 pounds per acre and inoculum to be distributed at 40 pounds per acre. If Brillion seeder is set to lay down 75 pounds per acre, the above amounts would meet the seed and inoculum quotas.
Source: P4 2008a

A hydro-seeder is used to seed areas with slopes greater than 3H:1V (i.e., haul road cut areas). Application rates for fertilizer and seed would be similar to or greater than those used with conventional planting.

All areas being reclaimed would be assessed for slope, aspect, and erosion potential. BMPs would be applied to appropriate areas, as needed, and may consist of, but are not limited to, straw wattles, dozer track planting, hydro-seeding, and other erosion control practices. All slopes would be dragged, fertilized, and seeded on the contour as much as practical. Reclaimed areas are expected to achieve cover densities that would exceed both federal and state vegetation and cover requirements. **Table 2.3-8** shows the disturbed and reclaimed acres by year. Approximately 739 acres are expected to be disturbed over the life of the project, with about 674 acres planned to be revegetated, the remaining non-vegetated acreage (approximately 65 acres) generally consists of steep rock highwalls that are impractical to seed.

2.3.8.1 Proposed Method of Abandonment

Prior to applying for bond release and lease relinquishment, P4 would confirm that the site is safe and meets reclamation standards as set by the BLM, USACE, IDL, and the respective private landowners. Soils and vegetation on overburden piles and backfilled pits would be sampled to confirm that they meet applicable standards. Flowing streams or springs and standing ponds would also be sampled to confirm that they meet appropriate water quality standards. As discussed previously, the bottom of the final mining pit (South Pit) would be covered with overburden to cover the exposed sections of the Phosphoria Formation. This fill would be sloped to minimize potential for ponding, covered with topsoil, and revegetated. Additional reclamation standards, such as recontouring, slope stability, erosion control, and revegetation functionality, would also be addressed in this analysis.

Safety zones consisting of cleared vegetation extending 50 feet from the crests of pit highwalls would be constructed with the exception of the North Pit north rim within the 660-foot eagle management zone as discussed in **Section 2.3.9.4**. Signs would be placed at intervals along the safety zone to warn people of the hazard. Access would be restricted in all mine areas, and roadways entering the mining area would be gated and signed. With the agreement of the respective landowners or surface management agencies, appropriate fences would be built and maintained throughout the life of the mine. The locations and condition of fences existing at the end of mining would be reviewed with the landowners and surface management. 3At that time, fences would be relocated and other appropriate measures taken to confirm that all fences meet landowner needs.

Tipple hoppers and conveyors would be dismantled and removed from the site. Cleared areas would be covered with soil or growth medium and planted. Cement feeder boxes, bulkheads, or retaining walls would be covered with soil, shaped, and seeded to blend the site with undisturbed adjacent areas. All non-permanent roads would be ripped, scarified, and planted.

Table 2.3-8 Annual Disturbance and Reclamation Acres

Year	Disturbed Acres							Reclaimed Acres						
	Road and Service	Overburden Pile	Pit	Topsoil	Sediment Control Structures	Total Acres	Cumulative Total Acres	Road and Service Areas	Overburden Pile	Pit	Topsoil	Sediment Control Structures	Total Acres	Cumulative Total Acres
1	41.4	29.0	9.3	8.0	66.9	154.7	154.7						0	0
2	4.4	13.6	10.1			28.1	182.8		11.2				11.2	11.2
3		77.3	28.3	11.8		117.4	300.2		10.9				10.9	22.1
4		9.5	10.1			19.6	319.8		24.3				24.3	46.4
5	24.2	8.1	62.0	12.4		106.6	426.4		17.9	13.8			31.7	78.1
6		3.0	58.5			61.5	487.9		72.1				72.1	150.2
7		45.3	12.1	5.7		63.1	551.0		18.0				18.0	168.2
8			39.4			39.4	590.4		14.6	8.3			22.9	191.1
9			4.6			4.6	595.0			12.9			12.9	204.0
10			42.7			42.7	637.7			24.4	12.4		36.8	240.8
11			24.3			24.3	662.0			47.8			47.8	288.6
12			14.5			14.5	676.5						0	288.6
13			12.3			12.3	688.8	8.0		16.1	7.9		32.0	320.6
14			5.0			5.0	693.8		12.6	26.1			38.7	359.3
15			20.2			20.2	714.0			77.7	6.6		84.3	443.6
16	16.8		8.0			24.9	738.9			33.8			33.8	477.4
17						0	738.9	76.2	6.4		13.3	100.6	196.6	674.0
Total	**86.8**	**185.8**	**361.4**	**38.0**	**66.9**	**738.9**	**738.9**	**84.2**	**188.0**	**260.8***	**40.2**	**100.6**	**674.0**	**674.0**

Note:

* Does not include 27 acres of rehandle pit bottom cover place post mining in year 16 to 17.

Source: P4 2008a, ARCADIS 2010

2.3.9 Environmental Control Measures

The following sections summarize the environmental monitoring, BMPs, and reclamation plans that have been developed as part of the Proposed Action. **Appendix A** provides the Environmental Monitoring Plan that would be implemented for the Proposed Action. **Sections 3.1.12 and 3.1.13** of the Environmental Monitoring Program also include features unique to Alternatives 1A and 1B.

2.3.9.1 Water Management Control Measures

P4 intends to apply for coverage under the Storm Water MSGP issued by EPA, or an individual NPDES permit if required by EPA. A stormwater pollution prevention plan (SWPPP) would be prepared in accordance with the MSGP to identify and guide the implementation and operation of stormwater management controls and practices for the project area covered by the permit. The SWPPP would include detailed descriptions of the BMPs that would be used to protect the quality of surface water in and adjacent to the project area. BMPs that may be employed at the site include, but are not limited to, the following: Construction and capping of the EOP to prevent the infiltration of surface and subsurface water through the segregated Meade Peak overburden:

- Placement of only non-Meade Peak overburden in the NWOP;
- Placement of backfill in the South Pit to cover the Phosphoria outcrop in the pit and direct runoff to the Wells Formation where it is expected to infiltrate;
- Construction of 11 water control ponds in drainages immediately adjacent to proposed disturbance areas;
- Operation of the water management system, including the water control ponds and the diversion ditch between ponds EP1 and CP2, to allow all runoff that does not meet surface water quality criteria to be retained and managed on site;
- Construction of run-on diversion ditches to direct runoff from undisturbed areas away from areas disturbed by mine activities;
- Reclamation of disturbed areas as quickly as practical;
- Placement of perimeter dikes or swales at the toes of topsoil piles to capture runoff from the piles;
- Construction of shallow periodic depressions along roadways to reduce sediment in runoff flowing in roadside ditches;
- Seeding topsoil piles to reduce the sediment load in runoff from the piles;
- Construction of haul roads to control erosion, sedimentation, small-scale trans-basin diversions;
- Installation of rock-check dams and silt fencing to reduce the sediment load in runoff;
- Use of straw wattles to capture and retain sediment on newly constructed or reclaimed slopes;
- Construction of berms along haul roads to direct runoff to existing structural BMPs;
- Dust suppression to control fugitive dust from haul roads;
- Good housekeeping practices and preventative maintenance;

- Routine facility inspections to assess the efficacy of stormwater control practices (**Appendix A**); and
- Annual employee training.

2.3.9.2 Air Quality

Mine operations can produce particulate dust emissions and gases from internal combustion engines. Potential sources of dust include mining, drilling and blasting, ore crushing and screening, and material hauling. These would be mitigated or minimized using the following controls:

- Use dust suppressants, such as magnesium chloride, calcium chloride, or water, where and when practical;
- Use liquid dust suppressants on all blast hole drilling operations; and
- Install hoods, containment chutes, and sprays, as necessary, at tipple crusher and screen areas.

Appropriate air permits would be obtained from the IDEQ which would also include specific BMPs and other mitigative measures.

2.3.9.3 Fire Prevention and Control

The Blackfoot Bridge Mine is served by Caribou County's Emergency Services. Fire and ambulance services originate in Soda Springs, approximately 10 miles from the site. A private ambulance and trained emergency medical personnel would be on site. Numerous pieces of heavy equipment and large-capacity water trucks are on site and available for fire fighting. Fire extinguishers are located in all mobile equipment, and mine personnel are regularly trained in their use.

2.3.9.4 Protection of Fish, Wildlife, and Natural Resources

Water management, including the water management control measures discussed above (**Section 2.3.9.1**) and WMP1 and WMP 2 would prevent contamination of fish habitat. Terrestrial wildlife habitat that could be affected by mining and associated activities includes bald eagle, grouse (including blue, ruffed and sage), elk and deer. Specific environmental control measures for the protection of nesting bald eagles are discussed in the following paragraphs.

One pair of nesting bald eagles has been identified in the vicinity of the project. Bald eagles are afforded protections by federal law including the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. A Bald Eagle Management Plan has been proposed, consistent with the intent of the USFWS's Bald Eagle Management Guidelines (USFWS 2007). Under the plan, P4 would take the steps listed below to ensure that its operations would not impact the eagles (P4 2009b).

- No mining operations would be conducted within 660 feet of the bald eagle nest during the breeding season. As set forth by the Guidelines, mining activities, except blasting, may occur during the breeding season beyond the 660-foot perimeter from the nests.
- Initially, blasting activities would not occur within 0.5 mile of eagle nests during the breeding season (February through mid-July). Implementing these limitations to mining

activities and monitoring these activities during the mine development (two to four years) is expected to result in a time frame and activity level that would allow the eagles to habituate to the activity. By year 5 of the mine, mine development is anticipated to create a northern high wall in the North Pit of at least 50 below the natural top, thus providing an additional topographic barrier between the mine activity and the nest location. Blasting may then occur behind the wall, within the 0.5 mile zone of the nests to minimize any disturbance to the birds from blasting.

- Proposed mining would not alter the existing ridge, and the forested area would be maintained between the mining activity and the nests to ensure that the mining activities would not be visible from the nest sites.
- The distance criteria set forth by the Guidelines as well as the natural terrain (ridge line) would assist in abating noise levels associated with mining operations. Noise reduction measures for all blasting operations (including outside the 0.5-mile zone of the nests) would be implemented including the following:
  - Limit the charge size to 250 pounds per delay and use best management blasting practices to design all blasts. These practices seek to achieve proper relationships between blast hole depth, spacing, and burden such that air blast or shock waves are controlled and minimized.
  - Time delay detonators (blasting caps) would be used to reduce the overall detonation to a series of single explosions separated by a minimum of 25 millisecond delay.
  - Blast holes would be filled or stemmed to grade to confine the blast.
  - Comprehensive monitoring of eagle behaviors during the breeding season would be implemented. Monitoring would include documentation of eagle behavior and reproductive success in response to noise, vibration, and other activities associated with mining. While the breeding season has been historically February through mid-July, monitoring would determine the actual date for initiation and cessation of activities on any given year.
  - Additional conservation measures would be undertaken such as preconstruction monitoring of the nests, construction and operational monitoring, avoidance of eagle activity areas, protection of the nest site, removal of road-killed animals, monitoring of eagle populations in Bald Eagle Management Zone 19, and avoidance of potentially harmful materials.

While P4 is not required to obtain an eagle take permit, given the uncertainty as to whether bald eagles could be disturbed by the project, P4 submitted an application for a 5-year eagle take permit to USFWS on March 22, 2010. Issuance of the eagle take permit is subject to review and approval by USFWS, including an additional NEPA review. Issuance of an eagle take permit can range from 60 days to 24 months, depending on the complexity and scope of the activity. If the permit is issued to P4, the permit would cover the development of Blackfoot Bridge Mine, including construction of site facilities, site preparation (e.g. vegetation removal), removal of overburden, and the recovery of ore from three open mine pits (North, Mid, and South pits). The eagle take permit would authorize a limited amount of take, resulting from a specific activity that occurs within an identifiable time. Should the eagle take permit expire while the project is in progress, P4 would need to submit a renewal permit application 30 days prior to the expiration of the eagle take permit.

Wildlife habitat and other natural resources would be affected by mining. These areas would be reclaimed after mining, but reestablishment of some habitat types would take many years. P4 would mitigate impacts to wildlife values impacted by the project by placing a legal restriction such as a restrictive covenant or conservation easement on 120 acres of its undeveloped private property in the vicinity of the Soda Hills area near Soda Springs or other similar undeveloped, natural property in the general area of the mine and Soda Springs. P4's Soda Hills property is located in what BLM and IDFG have identified as mule deer winter range. The covenant would preclude use of the land for any purpose other than buffer zone and require it be maintained in its current natural state. P4 would fund a management reserve with a third party, if necessary, to monitor compliance and take actions necessary to ensure that compliance.

2.3.9.5 Wetland Mitigation

P4 submitted a Section 404 permit application to the USACE for disturbance of 9.43 acres of wetlands. As part of the application, and in compliance with the Final Rule, Compensatory Mitigation for Losses of Aquatic Resources (33 CFR Parts 325 and 332, and 40 CFR Part 230), P4 submitted a Compensatory Mitigation Plan (P4 2010b) that identified potential compensatory mitigation for the USACE to consider in replacement of wetlands and lost functions and values. The primary goal of the proposed compensatory wetland mitigation for the Proposed Action is to replace or enhance wetland functions to maintain no net loss. The amount of wetland mitigation required was determined based on the functional assessment conducted for projected levels of ecological functions. Under the Proposed Action, 3.21 functional units would be lost.

2.3.9.5.1 Compensatory Mitigation for Waters of the U.S.

The proposed Compensatory Mitigation Plan (P4 2010b) identifies potential compensatory mitigation for the USACE to consider to replace wetlands and lost functions and values for the Proposed Action. Compensatory mitigation is proposed at P4's Fox Hills Ranch, located along the banks of the Blackfoot River. On-site mitigation was deemed impracticable for the Blackfoot Bridge Project because most of the wetland areas related to the unnamed tributaries of the Blackfoot River within the project area would be affected by mine-related activities. Additionally, only a small portion of upper State Land Creek drainage basin is within the project area. Several locations were considered for off-site mitigation and P4's Fox Hills Ranch was chosen. The Blackfoot River on P4's Fox Hills Ranch, which is within the same watershed as the Blackfoot Bridge Project, is an appropriate and preferred location to meet compensatory mitigation goals and would maintain and improve the quality and quantity of aquatic resources within the Blackfoot River watershed.

Areas along the Blackfoot River on P4's Fox Hills Ranch were assessed for potential new wetland creation or wetland enhancement. Areas were identified where existing degraded wetlands in upland areas near the Blackfoot River could be enhanced and degraded river banks could be restored. For the P4's Fox Hills Ranch area, the most feasible method of wetland enhancement was determined to be fencing of existing wetland areas in abandoned oxbows that have been impacted by cattle grazing and restoration of degraded river banks.

A total of 5,500 linear feet of unstable banks along the Blackfoot River within the Fox Hills Ranch would be restored by a combination of: reducing bank slope; placing wetland sod strips along base of the slope at the water surface; planting willow cuttings along the uphill side of the wetland sod;

and revegetating reduced slopes (transitional areas between upland and wetlands) by broadcast seeding and hydromulching.

Mitigation for impacts to Fish Pond (2.8 acres of non-wetland waters of U.S.) would be accomplished by creating a new 2.8-acre non-wetland waters of U.S. pond within a new fenced area (**Figure 2.3-9**). The new pond would be excavated into alluvium in an upland area where shallow groundwater is present on a year-round basis. A new 1-acre fringe wetland area would also be constructed around the pond.

Areas along the Blackfoot River valley bottom on P4's Fox Hills Ranch were inspected to identify existing wetlands currently degraded by cattle grazing. Selected locations would be fenced to allow natural wetland vegetation and habitat to become reestablished over time. Most of these areas are located along tributary channels and abandoned oxbows in the Blackfoot River valley bottom where seasonal flooding occurs and shallow groundwater is present. As part of overall compensatory mitigation proposed for wetlands in the Blackfoot Bridge Project, a total of 6 acres in an abandoned oxbow would be fenced in the central part of the P4's Fox Hills Ranch (**Figure 2.3-9**).

Based on the summary presented above, total new restored functional units for proposed wetland mitigation activities on the P4's Fox Hills Ranch would be 3.46 units (0.67 + 2.10 + 0.69). This would compensate for the 3.21 functional units that would be lost for the 6.11 acres of wetlands potentially impacted by the Blackfoot Bridge Project. These functional units are calculated based on the following three wetland mitigation components: restoration of 5,500 linear feet of river banks; enhancement by fencing 6.0 acres of degraded wetlands; and creation of a 1.0-acre fringed wetland around the new pond (**Figure 2.3-9**).

For the 3.32 acres of non-wetland waters of the U.S. that would be impacted by the Blackfoot Bridge project, 2.82 acres comprise Fish Pond. The remaining 0.5 acre consists of ephemeral or intermittent channels located near the impacted wetland areas. Of the total 3.32 acres of mitigation described above for non-wetland waters of the U.S., 0.5 acre of mitigation is included in the restoration of river banks, and the remaining 2.82 acres of mitigation would be accomplished by creation of a new fenced pond in the west-central area of the P4's Fox Hills Ranch (**Figure 2.3-9**).

2.3.9.5.2 Monitoring

In compliance with the Final Rule, Compensatory Mitigation for Losses of Aquatic Resources (33 CFR Parts 325 and 332, and 40 CFR Part 230), in order to determine the success of mitigation, a monitoring program would be initiated immediately after construction of wetlands to assess biological, hydrological, and structural characteristics of restored and enhanced wetland and riparian areas. The monitoring program would evaluate and determine if the wetland mitigation project met the criteria for the three parameters in USACE (1987). Additional performance standards based on functional assessment methods could be incorporated into the performance standard evaluations to determine if the site was achieving the desired functional capacity.

The monitoring program would last a minimum of 5 years and until it was demonstrated that the compensatory mitigation project had met performance standards.

A number of BMPs would also be implemented to limit the potential impacts to wetlands that could result from the Proposed Action. P4 would implement BMPs such as: 1) erosion matting on fill slopes for haul roads to control possible movement of soil into drainages; 2) silt fencing and straw bales/wattles would also be used extensively to control movement of water and soil from mining disturbances; 3) brush barriers would also be used, where possible, to control the movement of soil from slopes during runoff; and 4) water drainage on haul roads would be controlled with sloping and crowning to direct runoff into planned retention ponds. Implementation of BMPs is expected to limit the potential for impacts of sedimentation and erosion to wetlands, and reduce the possibility of selenium contamination via surface water runoff from the project area.

2.3.9.6 Subsidence Prevention

Subsidence in surface phosphate mines is not typically a major concern. Some minor settling of external overburden piles and backfill would occur. Mine operations predominantly would use a plug dumping approach that utilizes overburden placed in lifts typically less than 10 feet tall. As described in the overburden placement section, this practice results in compaction and limited infiltration with the added benefit of minimal settling or subsidence.

2.3.9.7 Hazardous Materials and Wastes

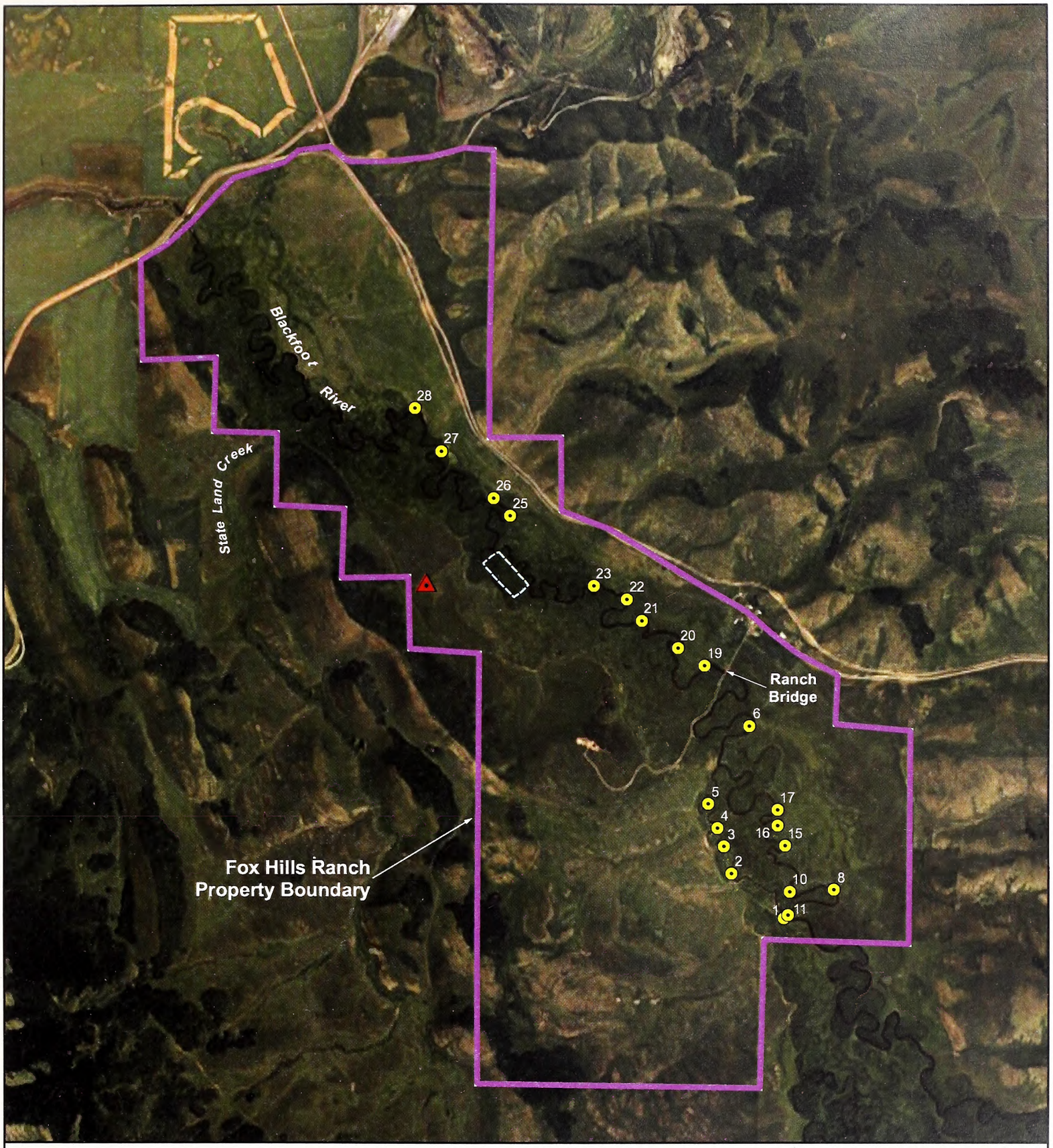
The proposed project would comply with the applicable federal hazardous materials regulations, including the Resource Conservation and Recovery Act of 1976 (RCRA), the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA or "Superfund"), the Superfund Amendments and Reauthorization Act of 1986 (SARA), the Clean Air Act, the Clean Water Act, Clean Drinking Water Act, and other applicable federal and state laws and regulations.

Surface mining operations would be subject to the Mine Safety and Health Act (MSHA) of 1969. Training for site personnel in hazard recognition and spill response would be required, in addition to standard health and safety procedures and policies.

The term "hazardous wastes" designates materials defined in 40 CFR Part 261.3 and would be regulated under RCRA. Hazardous wastes would be regulated from the point of generation to the point of disposal. If less than 100 kilograms of hazardous waste is generated per month, the facility would be considered a small-quantity generator. If 100 kilograms or more of hazardous waste is generated per month, the facility would be considered a large-quantity generator. An evaluation would be made of the types and amounts of hazardous waste generated per calendar month at the facility in order to determine which rules apply to the facility. The level of hazardous waste generation would determine specific waste management requirements including containment, emergency equipment, and inspections (see 40 CFR §§261, 262 and 265).

Universal waste regulated at 40 CFR Part 273 and uncontaminated Used Oil regulations at 40 CFR Part 279 would not count towards the hazardous waste generation totals but would be properly managed.

Potential hazardous materials to be handled at the Blackfoot Bridge Mine may include diesel fuel, gasoline, oil, solvent, and waste oil. Overburden produced from mine operations would be exempted from hazardous waste regulations.



LEGEND

- Location of Proposed River Bank Restoration
- Location of Proposed New Fenced Pond
- Location of Proposed New Fence for Wetland Enhancement
- Fox Hills Ranch Boundary

NORTH

0 750 1,500 3,000

Feet

Source:
Aerial - ESRI Prime Imagery Service
All other data - AMEC Geomatrix

BLACKFOOT BRIDGE PROJECT EIS

FIGURE 2.3-9
Fox Hills Ranch Mitigation Site

ANALYSIS AREA: Caribou County, Idaho	
Date: 8/6/2010	Prepared By: JC
File: K\1356\EIS2010\Fig_2_3-9_FoxHillsRanchMitigation.mxd	

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All hazardous materials and wastes would be stored and shipped in appropriate containers and labeled according to the U.S. Department of Transportation (USDOT) regulations for hazardous materials, as provided in 40 CFR Parts 171-180. The transport of hazardous materials would be via regulated transporters. Currently, the primary route for transporting hazardous materials from Soda Springs to and from the mine site would be along State Highway 34, Blackfoot River Road, and the existing haul road to the mine site. Transportation of hazardous materials and wastes associated with the Proposed Action would comply with federal regulations.

Under CERCLA, listed "hazardous substances" are defined as the elements, chemical compounds, and hazardous wastes appearing in Table 302.4, 40 CFR Part 302, Designation, Reportable Quantities, and Notification. The reportable quantity for each listed hazardous substance is also provided in Table 302.4 of 40 CFR Part 302. Spills or releases of reportable quantities would be reported to the EPA and appropriate local agencies, as required by Section 101 (14) of CERCLA. For petroleum products, the reportable spill quantity is 25 gallons or more that is spilled onto the ground. Any quantity of petroleum product that is spilled into a stream is reportable. For 100 percent antifreeze (undiluted), the reportable spill quantity is 5,000 pounds or more.

"Hazardous chemicals" are defined in 1910.1200 (c) of Title 29 of CFR. Under 40 CFR Part 370, Hazardous Chemical Reporting: Community Right-to-Know, facilities are required to have available a material safety data sheet for every chemical or hazardous material brought on site.

"Extremely hazardous substances" and the threshold planning quantities of each are listed in the appendices to 40 CFR Part 355, Emergency Planning Notification. The chemicals and materials typically used in surface mine development and operations are not classified as extremely hazardous substances.

"Toxic chemicals" are defined as those chemicals listed in Subpart D of 40 CFR Part 372, Toxic Chemical Release Reporting: Community Right-To-Know, as well as with their reportable threshold amounts. For community right-to-know and emergency planning, facilities that use toxic chemicals in amounts over the defined threshold quantities are required to notify the EPA. The chemicals and materials typically used in surface mine development and operations do not include toxic chemicals.

Oil is defined in 40 CFR Part 112, Oil Pollution Prevention, as "oil of any kind or in any form, including, but not limited to, petroleum, fuel oil, sludge, oil refuse, and oil mixed with wastes other than dredged spoil." Oil storage facilities or tanks with more than 1,320 gallons of combined storage capacity that are not buried nor with a single container with a storage capacity of more than 660 gallons require an SPCC Plan in accordance with 40 CFR Part 112, Oil Pollution Prevention. Oil spills that may affect navigable waters must be reported to the EPA National Response Center, as required by 40 CFR Part 110, Discharge of Oil.

Hazardous materials that are regulated must be stored at designated locations on site in approved containers. Spill containment structures must be provided for liquid hazardous materials that are stored on site.

An SPCC Plan would be developed prior to construction and operations at the mine, providing management direction for preventing and controlling potential spills; describing the aboveground tanks and secondary containment structures for bulk petroleum products, solvents, and antifreeze;

identifying the routine monitoring requirements; and describing BMPs for the pollutants of concern. The pollutants of concern are defined as any with potential to be released from the site and include sediment discharge from stormwater runoff and fuels and oil from the vehicle maintenance/tire shop. The SPCC Plan for the mine is also incorporated into the SWPPP document.

All liquid petroleum products, solvents, and antifreeze at the project site would be stored in aboveground storage tanks off-site at the existing Enoch Valley operations. The existing secondary containment facilities have sufficient capacity to hold the entire contents of the largest tank within the storage area including freeboard for precipitation.

Equipment maintenance, including oil changing, would be conducted at the existing maintenance shop. Used engine oil would be stored on site and periodically shipped off site to be recycled by a licensed recycling contractor.

2.3.9.8 Prevention of Hazards to Public Health and Safety

Due to limited public access opportunity, this project would have very minimal public safety exposure potential. As production at the project initiates and mining at P4's South Rasmussen Mine ceases, public safety concerns associated with haul truck traffic would be reduced by eliminating the need for an ore haul road/public road intersection at Ballard. As described previously, ore train haulers currently cross county roads on the route from the South Rasmussen mine to the ore dump facility at P4's Soda Springs Plant. These intersection areas are regulated using pressure-actuated crossing lights. Due to the project's location, the intersection located at Ballard would not be needed. In addition, any potential safety concerns associated with the mine and dump truck-railroad crossing would be appropriately addressed by employing safety systems to confirm safe mine and railroad operations. Although typical train traffic is only one to three trains per 24-hour period, preventing potential collisions is of the utmost importance. It is likely that typical safety systems employed would involve the utilization of flagmen or mechanical crossing equipment to confirm safe train/mine and dump truck crossing activities.

2.3.9.9 Other Environmental Control Measures

P4 plans to implement actions to reduce selenium discharges from other sources in the Upper Blackfoot River Drainage. Groundwater modeling indicates that under the Proposed Action potential selenium loading could be as great as 85 pounds over the next 50 years. P4 has identified the South Rasmussen and Ballard Mine projects, discussed below, that are required by other regulatory programs (e.g., CWA and CERCLA) to reduce impacts such as selenium loading, and that would reduce overall impacts to the Blackfoot River well beyond the estimated contribution of selenium from the Blackfoot Bridge Mine. In addition, compensatory mitigation associated with the Blackfoot River Restoration would compensate for impacts to the river by helping to improve fish habitat, increasing biodiversity, and restoring wetlands.

These projects include the necessary and appropriate BMPs and monitoring required for these environmental control measures. The projects identify reductions in selenium loading to the Blackfoot River basin from other sources to address concerns associated with the potential impacts of selenium on fish tissue. The reduction in selenium loading to the Blackfoot River basin is expected to exceed the Blackfoot Bridge project's modeled potential contribution of selenium to

the Blackfoot River for the cover designs provided in **Section 2.4.1**. In addition, the river restoration project would help to improve fish habitat, increase biodiversity, and restore wetlands.

2.3.9.9.1 South Rasmussen Mine

As part of the original Horseshoe Overburden Area design at the South Rasmussen Mine, a "toe trench" system was constructed at the toe of the overburden area to eliminate any buildup of water within the overburden pile that might cause a possible stability issue on the hillside. The toe trench also intercepts groundwater that may seep from below the pile. In 2008, P4 instituted a program to collect all of the water from the toe trench and pump that water back into the mining area water system, where it is now being utilized or evaporated thereby significantly reducing selenium loading to the Blackfoot River. In 2008, approximately 15 lbs of selenium was removed, and in 2009, approximately 20.3 lbs of selenium was removed from the water. In late 2009, the toe trench system was extended to intercept all potentially impacted water that may express from the overburden pile and pump the intercepted water to a holding pond for use or evaporation. Preliminary data suggests that the toe trench extension has significantly reduced selenium loading to the Blackfoot River Basin.

2.3.9.9.2 Blackfoot River Restoration

Restoration and construction of new wetlands would provide the required compensatory mitigation for losses of jurisdictional wetlands for the Blackfoot Bridge project. The proposed Compensatory Mitigation Plan (P4 2010b) includes restoring approximately 5,500 feet of degraded Blackfoot River bank and associated wetland and riparian vegetation within P4's Fox Hills Ranch property (**Figure 2.3-9**). In addition to improving wetlands and increasing biodiversity within the river bed, this project would improve the fish habitat in those areas while reducing sediment (and possibly selenium load) being released when river flow exceeds normal conditions (e.g., spring snowmelt, large rainfall episodes).

2.3.10 Environmental Monitoring Plan

P4's Environmental Monitoring Plan (**Appendix A**) identifies the environmental monitoring that would be undertaken at the Blackfoot Bridge Mine. Environmental monitoring work began during the pre-project baseline period in 2005 and would continue throughout the mine life and post-closure period.

Appendix A describes the resources to be monitored, duration and frequency of the monitoring locations, individuals responsible for implementation and completion of monitoring events, and the sampling and analysis methods to be implemented. **Appendix A** includes an overview of P4's BMPs and describes monitoring data reporting requirements and the proposed monitoring and sampling plans for the following:

- stormwater
- groundwater
- fish, invertebrates, amphibians, reptiles, aquatic habitat quality
- soil and vegetation - reclamation
- birds

- mammals
- bats
- cultural and paleontological resources
- compensatory wetlands mitigation
- NPDES stormwater permit monitoring
- overburden suitability analysis plan
- Revised Mine Water Management Plan including the Adaptive Management Plan and OSMS
- Air Quality Monitoring

2.4 ALTERNATIVES 1A AND 1B

This section describes Alternatives 1A and 1B to the Proposed Action carried forward for Analysis. Subsequent sections are **Section 2.5** No Action Alternative, **Section 2.7** Agency Preferred Alternative, and **Section 2.6** Alternatives Considered But Eliminated From Detailed Analysis. Alternatives selected for analysis in this EIS are based on potential issues and impacts that could result from implementation of the Proposed Action as identified during the scoping process. Alternatives are intended to reduce or eliminate identified impacts.

The Environmental Monitoring Plan (**Appendix A**) included in the Proposed Action, as supplemented to address cover system and water management system features unique to Alternatives 1A and 1B, would also apply to these alternatives.

2.4.1 Common Elements of Alternatives 1A and 1B

Issue: Groundwater modeling has been used to analyze the potential effects of the Proposed Action on groundwater and surface water resources in the project area. Model results indicate that the project, as designed, has the potential to release Constituents of Potential Concern (COPCs) to groundwater and ultimately surface water in excess of the applicable water quality standard. To address this potential exceedance, alternative capping designs were developed to reduce the amount of precipitation that would infiltrate through the backfilled pits and external overburden piles. The reduction in infiltration would result in a reduction in the volume of water that would leach through mine overburden, thereby reducing the volume of water containing COPCs that could potentially affect the quality of area groundwater and surface water.

These alternatives were developed to address the issue of the potential for COPCs to leach into the groundwater. Various BMPs have been developed to control COPC migration from mining activity in southeast Idaho. An impermeable (low permeability) cover over external overburden piles containing segregated Meade Peak overburden and backfilled pit areas are perceived as a way to reduce infiltration into the materials, and thus, reduce the potential leaching of COPCs from the materials. Analysis of the mobility of COPCs under this alternative presents information that can be compared to analysis of the Proposed Action.

Alternatives 1A and 1B would include all of the components of the Proposed Action, but would also require P4 to install a layer of impermeable (low permeability) material (a Geosynthetic Clay Laminate Liner or "GCLL") between the segregated Meade Peak overburden and the applied growth medium to reduce the volume of water infiltrating into the backfilled pits and external overburden piles (**Section 2.4.2**). Alternatives 1A and 1B would also include a modified Mine Water Management Plan (P4 2010c) that differs in many details from the Proposed Action. This section discusses the revised water management system and the environmental control for both Alternatives 1A and 1B. **Section 2.4.2** discusses the cover system and the differences between Alternatives 1A and 1B. The Blackfoot Bridge project boundary for Alternatives 1A and 1B includes approximately 29 acres more area than the Proposed Action property boundary because diversion ditches on the south end of Alternative 1A and 1B extend outside the Proposed Action boundaries. This revised boundary encompasses 1,483 acres and includes 634 acres of Federal Phosphate Lease I-05613 and 80 acres on I-013709, covering subsurface mineral rights. There is approximately 1,074 acres of P4 owned land within the project boundary. Other private landowners hold 178 acres. The BLM administers 231 acres of public land within the project boundary as shown on **Figure 1.1-2**. The estimated maximum surface disturbance area is shown in **Table 2.4-1**. Approximately 703 acres of the 768 total acres of disturbance would be revegetated, with approximately 65 acres remaining non-vegetated. Alternatives 1A and 1B would account for an additional 29 acres from the Proposed Action. This increase in acreage represents new water management designs described in following sections.

Table 2.4-1 Alternatives 1A and 1B Surface Disturbance Area

Surface Ownership Description	Category Description	Disturbance Acres
Public	Overburden Pile	0.8
Public	Pits	73.8
Public	Road & Service	1.1
Public	Sediment Control Structures*	22.4
Public	Topsoil	0.0
	Subtotal	**98.1**
Private	Overburden Pile	185.0
Private	Pit	287.7
Private	Road & Service	81.7
Private	Sediment Control Structures*	78.2
Private	Topsoil	36.9
	Subtotal	**669.5**
	Total	**767.6**

Note:
* Water control structures include channels, ditches, aboveground pipes, water control pond area, and wetlands.

2.4.1.1 Modified Water Management

The following sections summarize the Revised Mine Water Management Plan (P4 2010c) provided for Alternatives 1A and 1B. This plan includes an overall water management system for the active mine, a mine dewatering plan, and a post-mine (post-closure) phase. The 2010 Mine Water Management Plan provides an updated water balance that is further discussed in **Section 2.4.1.1.10**.

2.4.1.1.1 Water Management System Overview

As with the Proposed Action, the water management system and BMPs that would be employed during Alternatives 1A and 1B have been designed to protect the quality of surface water and groundwater in and adjacent to the project area to prevent discharge of stormwater to the Blackfoot River. Stormwater runoff that meets surface water quality criteria, however, may be discharged in accordance with requirements of a NPDES permit. Runoff that does not meet surface water quality criteria would be stored and managed on-site. Run-on diversion ditches would be used to intercept runoff from undisturbed areas and return non-contact runoff to the drainages thereby reducing the volume of water that reports to the water management system.

The proposed layout of water management facilities for Alternatives 1A and 1B is shown in **Figure 2.4-1**. Components of the water management system include two water management ponds (WMP1 and WMP2) to be constructed in the flat area west of the equipment yard and loadout area. An overburden seepage management system (OSMS) would be constructed below the EOP and NWOP and would drain to the water management system. The water management system would also include diversion ditches and pump/piping systems. The volume of water in ponds WMP1 and WMP2 may be managed through the use of evaporative sprayers. In addition, water may be pumped on an emergency basis to a portion of the Mid Pit that would be backfilled with non-seleniferous materials (e.g., volcanics and limestone), as discussed in **Section 2.4.1.1.11** below.

A total of nine water control ponds would be constructed in drainages immediately adjacent to proposed disturbance areas, rather than the 11 under the Proposed Action. In addition, the size and orientation of several of the ponds would be different from the equivalent ponds under the Proposed Action. EP1 through EP4 would be constructed along the unnamed tributary to Fish Pond to the east of the EOP. NWP1/2 and NWP3/4 would be constructed along the west side of the NWOP, but would not be located directly in the channel of the unnamed tributary or Wetland X. NEP1 would be constructed on the east side of the North Pit upstream of Wetland M. The remaining two (CP1 and CP2) would be constructed in the vicinity of the proposed equipment yard and loadout area. CP1 would be constructed in the unnamed tributary channel downstream from Fish Pond and the ore haul road, and would be the farthest downstream structure that would capture runoff and sediment from the central portion of the project area. CP1 would be designed to prevent release of water downstream to the Blackfoot River, if necessary, to ensure compliance with water quality standards. If necessary, the capacity of Fish Pond (a man-made impoundment) may be increased by enlarging the pond and raising the elevation of the spillway by 5 feet. The pond would also be sealed to reduce leakage to Wetland L below Fish Pond. Capacities of the water control ponds are provided in **Table 2.4-2**.

P4 would fence the project area to control general access of unauthorized vehicles and neighboring livestock. P4 would also inspect and observe wildlife interaction at the proposed water management facilities as described in the Environmental Monitoring Plan (P4 2010a).

Impacts to waters of the U.S. resulting from the construction of water control ponds, placement of rock fill in the unnamed tributary to Fish Pond east of the EOP, alteration of Fish Pond, and the construction of mine facilities (e.g., ore truck turn-around loop and equipment yard) would be mitigated under Section 404 of the Clean Water Act (P4 2010d). Any necessary permits, such as dam permits, would be obtained from the IDWR.

Table 2.4-2 Water Management Capacities and Descriptions for Alternatives 1A & 1B

Pond	Description	Capacity		
		Million Gallons	Volume (acre-feet)	Surface Area (acres)
WMP1	Storage pond for pit dewatering. May also receive runoff from EOP and NWOP.	118.3	363.0	16.06
WMP2	Storage pond for pit dewatering. May also receive runoff from EOP and NWOP.	111.1	341.0	16.21
CP1	Water control pond for equipment yard and loadout area. May also receive runoff from upper unnamed tributary to Fish Pond including Fish Pond.	3.2	9.5	1.12
CP2	Water control pond for ore pad and tipple, and equipment yard and loadout area. May also receive runoff from EOP	3.3	10.0	1.74
EP1	Water control pond in unnamed tributary to Fish Pond.	2.8	8.5	1.64
EP2	Water control pond in unnamed tributary to Fish Pond.	1.5	4.5	0.65
EP3	Water control pond in unnamed tributary to Fish Pond	0.9	2.8	0.58
EP4	Water control pond in unnamed tributary to Fish Pond.	2.1	6.3	0.58
NWP1/2	Water control pond at toe of NWOP.	4.7	14.4	1.7
NWP3/4	Water control pond at toe of NWOP.	6.8	21.0	2.68
NEP1	Water control in Beaver Pond watershed east of North Pit.	2.1	6.5	0.38
Fish Pond[1]	Existing manmade pond. Would receive runoff from drainage north of diversion ditch. May also receive runoff from unnamed tributary to Fish Pond.	7.1	21.8	2.83

Note:
[1] Additional capacity if Fish Pond spillway elevation is raised by 5 feet.
Source: P4 2010c

2.4.1.1.2 Mine Dewatering

Mine dewatering under Alternatives 1A and 1B would not differ from the Proposed Action. Mining would occur below the water table in the Mid Pit in year 5 and in the North Pit in years 6 – 9 and again in years 12 – 13. The Mid and North Pits would be dewatered using a series of sumps excavated one to two levels below the ore being mined (P4, 2008a). Pumping rates required to dewater the Mid and North Pits during these periods were estimated by ARCADIS (2010) using a groundwater flow model developed for the Blackfoot Bridge EIS. **Table 2.3-5** summarizes the estimated volumes of water that would be pumped from the pits during these periods.

2.4.1.1.3 Water Management – North Pit Area

Stormwater runoff on the west side of the North Pit area, including the NWOP, would flow to the west toward the wetland complex that includes Wetland X (JBR 2003, 2006). A ridge separates the

north end of the North Pit from the river. Precipitation that falls within the perimeter of the North Pit would be contained by the pit and would not drain to the water management system. NWP1/2 and NWP3/4, with a combined capacity of 35.4 acre-feet would be constructed to reduce sediment load in runoff from the NWOP (**Figure 2.4-1**). A berm would be constructed along the toe of the topsoil pile south of the NWOP to capture runoff from the pile. In addition, BMPs such as silt fences would also be employed in the drainage to protect surface water quality. The NWOP would contain low and non-seleniferous material. Runoff that does not exceed surface water quality criteria would be allowed to discharge from the water control ponds to the wetland complex in accordance with the NPDES permit. In the event that runoff in NWP1/2 and NWP3/4 does not meet surface water quality criteria, the water would be pumped to ponds WMP1 and WMP2.

An OSMS would be constructed beneath the NWOP that includes groundwater drain system and a seepage underdrain system. The groundwater drain system would be installed to address a potential area of seasonal shallow groundwater and the seepage underdrain system would be constructed to collect seepage that infiltrates to the base of the NWOP and forms saturated conditions above compacted clay layer prior to the placement of the final cover or in the unlikely event of a failure of the final cover system. The OSMS is discussed in more detail in **Section 2.4.1.1.6.**

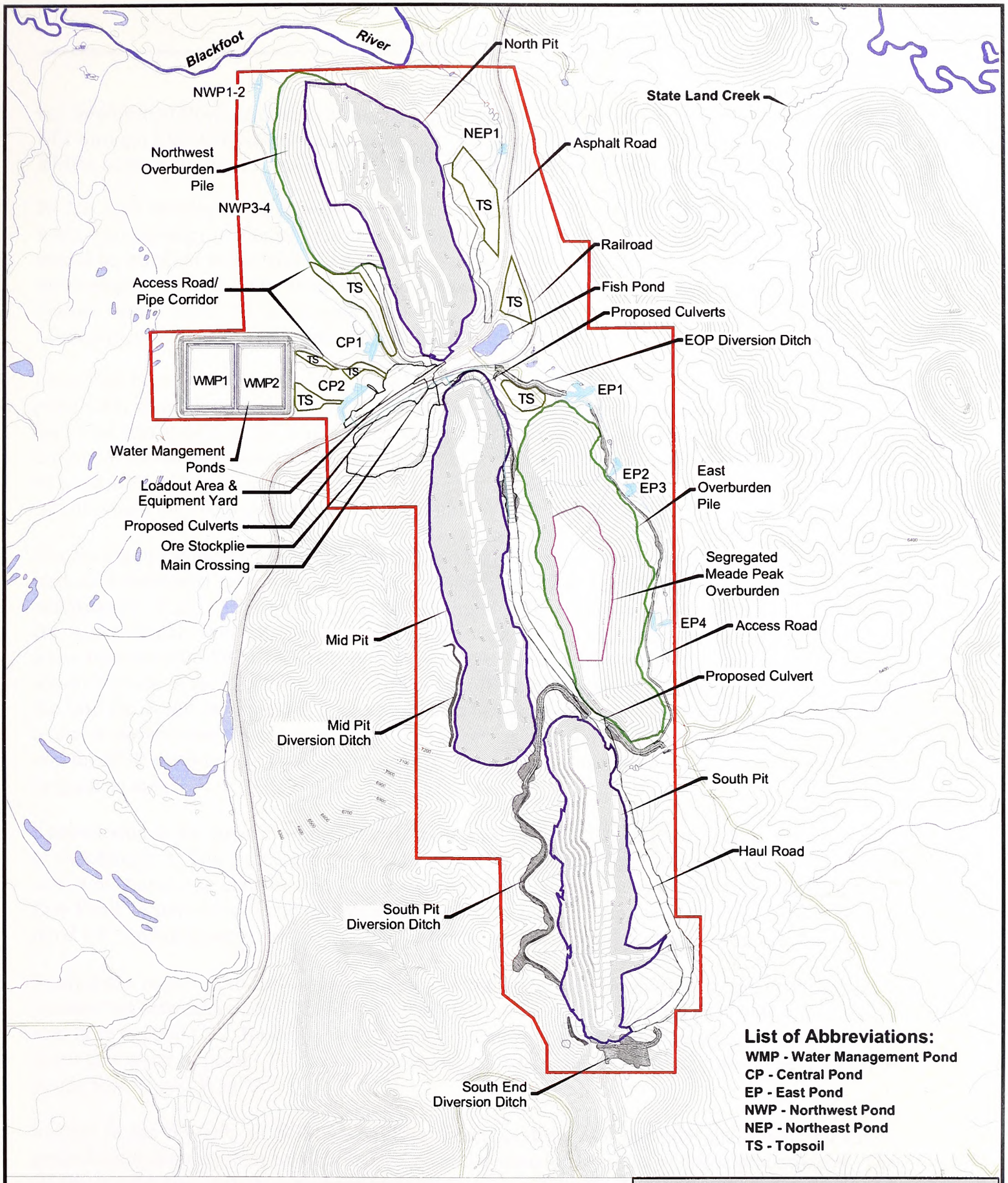
Runoff from the southern half of the Beaver Pond watershed (on the east side of the North Pit area) would drain to the east toward NEP1 (**Figure 2.4-1**). In the event that runoff from this area does not meet surface water quality criteria, it would be pumped from pond NEP1 to one of the other water control ponds and ultimately routed to one of the water control ponds. The specific water control pond(s) that would receive water from NEP1 would be determined based on the mining activities occurring at the time of pumping and the water levels in individual water control ponds. Runoff from the northern portion of the Beaver Pond watershed (north of NEP1) would flow to a series of small riparian areas that drain north to the Blackfoot River. This area would be undisturbed, and runoff would be unaffected by mining activities. BMPs (e.g., silt fences) would be constructed as necessary to control runoff from this area.

As shown on **Figure 2.4-1**, the North Pit would terminate along the south side of a ridge approximately 655 feet from the Blackfoot River. The area north of the above-referenced ridge line would remain undisturbed. Runoff from this area would be unaffected by mining activities and would drain as it currently does to the Blackfoot River.

As discussed in **Section 2.4.1.1.2**, groundwater would be encountered in the North Pit in years 6 through 9 and again in years 12 through 13. Based on the groundwater flow model developed for this EIS, ARCADIS (2010) estimates that a total of approximately 1,550 acre-feet of groundwater would be pumped from sumps in the North Pit to ponds WMP1 and WMP2 during these periods. As discussed in **Sections 2.4.1.1.6** and **2.4.1.1.7**, the volume of water in ponds WMP1 and WMP2 would be managed through the use of evaporative sprayers. Water may also be pumped to Mid Pit backfill on an emergency basis.

2.4.1.1.4 Water Management – Mid Pit and Facilities Area

As shown on **Figure 2.4-1**, stormwater runoff from the central portion of the project area that includes the EOP would flow to the unnamed tributary to Fish Pond east of the EOP. This drainage



BLACKFOOT BRIDGE PROJECT EIS

FIGURE 2.4-1
Alternative 1A and 1B
Facility Layout

ANALYSIS AREA: Caribou County, Idaho	
Date: 12/21/10	File: Facility Layout.dwg
Drawn By: EC	Layout: Facility Layout

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has intermittent flow, primarily during spring runoff and precipitation events. P4 would construct EP1 through EP4 with a combined capacity of 22.1 acre-feet to reduce sediment load in the runoff. BMPs, such as silt fences, would also be employed in the drainage to protect surface water quality.

P4 has also developed an Adaptive Management Plan (P4 2010e) in **Appendix B** to direct the water management of the system in the unnamed tributary to Fish Pond. Piping (with a valve) would be installed at the base of each of the four sediment control dams in the drainage to allow uninterrupted flow to Fish Pond as long as the water meets surface water quality criteria. The system would allow P4 to manage each pond independent of the other ponds. The Adaptive Management Plan is summarized in **Section 2.4.1.2** below.

From Fish Pond, the water may be allowed to flow through a 24-inch culvert under the haul road to pond CP1, where it may ultimately be discharged to the wetland complex downstream of CP1. In the event that runoff in the unnamed tributary to Fish Pond does not meet surface water quality criteria, it would be impounded behind the water control dams and then conveyed from pond EP1 to pond CP2 either through a pipeline system for the OSMS or through a diversion ditch. The runoff would then be pumped from CP2 to ponds WMP1 and WMP2.

The diversion channel between EP1 and CP2 would be lined with riprap over an impermeable liner such as a laminated geosynthetic clay liner, linear low-density polyethylene (LLDPE) or HDPE. Additionally, Pond CP2 would also be lined. The Mid Pit would terminate along the ridge line of the Aspen Range. Precipitation that falls on the west side of the Aspen Range would flow west away from the Mid Pit as surface runoff. A run-on diversion ditch would be constructed along the southwest side of the Mid Pit to direct surface runoff from upgradient undisturbed areas away from the Mid Pit. A run-on diversion ditch would also be constructed along the western toe of the EOP to direct surface runoff away from the EOP. The construction of the haul road between the Mid Pit and the EOP would serve as an additional barrier to prevent stormwater run-on to the EOP from upgradient areas.

Construction of the diversion ditch between ponds EP1 and CP2 would isolate the northern portion of Catchment A. This portion of the project area would be predominantly undisturbed by mining activities. Following construction of the diversion ditch, runoff north of the ditch would drain to Fish Pond. Water in Fish Pond that meets surface water quality criteria would be allowed to flow to pond CP1 and ultimately may be discharged to the wetland complex downstream of CP1.

Stormwater runoff from the area around the ore pad and tipple would flow to the diversion ditch constructed between ponds EP1 and CP2. Runoff from the equipment yard and loadout area would also flow to pond CP2. Based on water quality, water in pond CP2 may be pumped to CP1. In the event that water in pond CP2 does not meet surface water quality criteria, it would be pumped to ponds WMP1 and WMP2.

Similar to the NWOP, an OSMS would be constructed beneath the EOP that would include a groundwater drain system to address two potential areas of seasonal shallow groundwater. The OSMS would also include a seepage underdrain system to collect seepage that infiltrates to the base of the EOP and forms saturated conditions above compacted clay layer prior to the placement of the final cover or in the unlikely event of a failure of the final cover system.

As discussed in **Section 2.4.1.1.2**, groundwater would be encountered in the Mid Pit in year 4. Based on the groundwater flow model developed for the Blackfoot Bridge EIS, (ARCADIS 2010) an estimated total of approximately 44.5 acre-feet of groundwater would be pumped from sumps to ponds WMP1 and WMP2 while mining occurs below the groundwater in the Mid Pit. The volume of water in ponds WMP1 and WMP2 would be managed through the use of evaporative sprayers. Water may also be pumped to Mid Pit backfill on an emergency basis.

2.4.1.1.5 Water Management – South Pit Area

As stated for the Proposed Action, stormwater runoff from the area that surrounds the South Pit generally flows east and north towards an unnamed tributary of State Land Creek (**Figure 2.4-1**). The north end of the South Pit would potentially be mined across the drainage above Wetland A (**Figure 2.4-1**), depending on the geology encountered. Wetland A contains a flowing spring, which is fed by perched groundwater originating in the drainage to the west and is tributary to State Land Creek. Prior to mining this area, P4 would conduct a subsurface investigation to identify the source of the spring.

Construction of a haul road prior to the start of mining activities in the South Pit area would provide a downgradient barrier to stormwater runoff originating from the mine development. The east side of the haul road would be graded to direct runoff from the road away from Wetland A. In addition, BMPs such as silt fencing would be employed to control stormwater runoff, reduce the sediment load, and protect Wetland A and State Land Creek. In addition, the haul road would act as a barrier for stormwater runoff in the area between the pit and the road. Run-on diversion ditches would also be constructed along the west side and around the southwest end of the South Pit.

2.4.1.1.6 Overburden Seepage Management System

Baseline investigations identified two locations within the footprint of the proposed EOP and one within the NWOP where shallow groundwater conditions may exist seasonally. To address the potential that these shallow groundwater conditions could affect the stability of the overburden piles, an OSMS would be constructed at the EOP and NWOP to provide additional protection of water quality in the vicinity of the overburden areas. The system is described in detail in **Appendix C** of the Mine Water Management Plan (P4 2010c), and would include the following listed below.

- Groundwater Underdrain System – Collects and directs shallow groundwater occurrences within the footprint of the NWOP and EOP through a system of 8-inch diameter perforated pipes which would direct natural groundwater to the surface at a discharge point outside of the footprint of each overburden pile. The Groundwater Underdrain System would protect the stability of each overburden pile by preventing upward hydraulic pressure and would protect groundwater quality by preventing contact with overburden materials. The discharge of the Groundwater Underdrain System would be monitored. Should analysis indicate that the groundwater quality has been affected; the groundwater would be redirected to the seepage underdrain system for management.
- Compacted Clay Subgrade – P4 would construct a clay amended subgrade to form the foundation of each overburden pile. This subgrade would be 1-foot thick and would form a low permeability layer which, prior to installation of the GCLL cover, or if needed, after installation of the cover, would collect and direct seepage to collection drains.

- Seepage Underdrain System – Seepage collected on top of the clay subgrade layer would be directed through perforated collection pipes that would direct seepage to topographical low areas where it could be collected in the drain pipes. These drain pipes would convey the collected seepage to the Toe Drain Collection and Seepage Conveyance Pipeline located at the toe of the overburden pile.
- Toe Drain Collection and Seepage Conveyance Pipeline – Seepage delivered from the Seepage Underdrain System would be collected in this system and would be conveyed as follows:
  - EOP – collected seepage would be directed to pond EP1 or to the EOP Diversion Ditch where the seepage would be directed to pond CP2 or to WMP1 and WMP2 for evaporation; and
  - NWOP – collected seepage would be pumped to pond CP1 and discharged to Wetland X if water quality is acceptable for discharge, if water quality exceeds standards, collected seepage would be pumped to pond CP2 or toWMP1 and WMP2 for evaporation.
- Hydraulic Break – P4 would install a hydraulic break on the up-hill side and the northern and southern boundaries of the Meade Peak material cell to intercept meteoric water that infiltrates from adjacent areas and directs the seepage away from the seleniferous Meade Peak material contained in the EOP. The hydraulic break would consist of a zone of coarse, free-draining non-seleniferous overburden material placed around the uphill side of the Meade Peak cell. This zone of coarse material would conduct water away from these areas during high runoff (saturated) conditions and would act as a hydraulic break by interrupting unsaturated flow towards the seleniferous Meade Peak material during dryer periods. Any seepage from the bottom of the Hydraulic Break would report to the Compacted Clay Subgrade layer and Seepage Underdrain pipeline system.
- An access road would be constructed along the toe of the EOP to allow maintenance equipment to access all water control ponds, BMPs, and seepage collection facilities within the unnamed tributary to Fish Pond. The road is designed and located to minimize impacts to wetlands and non-wetland waters of the U.S. and would augment other BMPs included in the Revised Mine Plan (P4 2008a).

This system would be monitored for flow and seepage quality as part of the site-wide water monitoring program.

2.4.1.1.7 Water Management Ponds

WMP1 and WMP2 would be constructed with a combined capacity of approximately 704 acre-feet (not including freeboard) to contain pit water and stormwater runoff from watersheds within the project area, as discussed above. The design of the ponds includes dimensions of approximately 1,470 feet by 980 feet with an embankment height of approximately 32 feet above the natural ground surface (including two feet of freeboard). The pond embankments would have side slopes of 2.5:1 with the ponds bottom being sloped to one corner where a reclaim system would be positioned. The ponds may be constructed in phases, with WMP1 being constructed in year 2 and WMP2 constructed in year 4.

Shallow groundwater may be seasonally present at the natural ground surface in the area of WMP1 and WMP2. The ponds would be constructed above the existing ground surface and an underdrain system would be installed beneath the pond liner system to prevent the buildup of hydrostatic pressure. The water management ponds would be lined with a LLDPE geomembrane above a compacted clay layer. A sump system would be installed in each water management pond beneath the pond liner to collect any water built up between the LLDPE geomembrane and the clay layer. Any water collected in those sumps would pumped into WMP1 and WMP2 for evaporation.

2.4.1.1.8 Evaporative Sprayers

Based on the water balance for the project (**Section 2.4.1.1.10**), up to 12 evaporative sprayers may be employed to control the volume of water in WMP1 and WMP2. Under Alternatives 1A and 1B, the sprayers would be operated seasonally during the period of May through October when climatic conditions are optimal for evaporation. Based on pan evaporation rates for the climate station at Blackfoot Dam, each sprayer would be capable of evaporating approximately 17.6 acre-feet of water during this six month period. Use of the sprayers is not anticipated until mining begins below the water table in year 5, depending on the volume of stormwater routed to the water management ponds and the volume of groundwater pumped from the pits.

The proposed number of evaporative sprayers (12) was selected to allow a minimum 250-foot distance between the sprayers and the edges of the ponds to prevent drift from the sprayers onto the surrounding land surface. The maximum spray distance of the sprayers is 180 feet. WMP1 and WMP2 are approximately 1,470 feet long by 980 feet wide and overspray (even in high winds) is unlikely.

2.4.1.1.9 Dust Suppression

Based on the volumes of water used at P4's Enoch Valley and South Rasmussen Mines, up to 30 acre-feet of water from the water management ponds may be used for dust suppression annually at the proposed Blackfoot Bridge Mine site. The water would be pumped into water trucks from Fish Pond or other water sources. Water from the WMP1 and WMP2 would not be used for dust suppression.

2.4.1.1.10 Water Balance

As part of the updated Mine Water Management Plan (P4 2010c) water balance was prepared to evaluate the capacity of the proposed water management system associated with the Alternatives 1A and 1B and utilized more conservative runoff coefficients to ensure proper sizing and design of the system. The additional water management capacities (e.g., the water control ponds) are shown in **Table 2.4-2**. The water control ponds would be used to manage all stormwater runoff that may come in contact with seleniferous material, as well runoff from the NWOP. As discussed in **Section 2.4.1.1.1**, stormwater runoff would only be routed to the WMPs if it exceeds surface water quality criteria. In addition, groundwater from pit dewatering has the potential to contact seleniferous material and would be managed in the WMPs. Runoff from the following areas of the proposed mine would not be conveyed to WMP1 and WMP2 because it would not contact seleniferous material or it would be contained at another location:

- Runoff from the area around and within the South Pit would either remain within the pit or be contained by the haul road adjacent to the pit.

- Runoff from the Beaver Pond watershed at the northeastern end of the project area would not contact seleniferous material. Runoff from this area would only result from precipitation on undisturbed ground and a topsoil stockpile. This runoff would be routed to pond NEP1 prior to being released and would not be conveyed to the WMPs for management. Should monitoring detect selenium above water quality standards, water would not be released and would be pumped to the WMPs. See the Environmental Monitoring Plan in **Appendix A**.

As discussed in **Section 2.4.1.1.8**, up to 12 evaporative sprayers would be operated seasonally (May through October) and would evaporate up to approximately 9.2 million cubic feet of water from the WMPs per year.

Based on the results of the water balance model, the larger-sized WMPs would have sufficient capacity to contain runoff throughout the life of the mine. It is anticipated that the ponds would be filled to their highest level in year 14, resulting from an estimated 687 acre-feet of water being pumped from the North Pit to the ponds in year 13, followed by projected inflows during spring snowmelt in year 14. It is predicted that the volume of water stored in the water management ponds would peak at approximately 667 acre-feet.

2.4.1.1.11 Contingency Pumping to Backfill

As discussed in **Section 2.4.1.1.1**, water may be pumped on an emergency, short-term basis from the water management ponds to a portion of the Mid Pit that would be backfilled with non-seleniferous materials (e.g., dolomite and limestone). The location and conceptual design of the Mid Pit infiltration is shown on **Figure 2.4-1**. The Mid Pit infiltration system would consist of a pond with a storage capacity of approximately 37-acre feet (not including two feet of freeboard) positioned above the dolomite or limestone backfill. This backfill would be highly permeable material that would allow rapid infiltration of ponded water into the underlying Wells Formation. Emergency pumping may be initiated if the volume of water in the water management ponds exceeds 90 percent of their design capacity (i.e., 634 acre-feet). This would provide 70 acre-feet of additional storage capacity in the ponds (not including freeboard) to handle incoming stormwater/pit dewatering flows while emergency pumping is initiated.

As discussed in **Section 2.4.1.1.10**, it is anticipated that the water management ponds would be filled to their highest level in year 14 due to dewatering of the North Pit in year 13 and spring runoff in year 14. Therefore, the greatest potential for emergency pumping would occur in year 13 and 14.

The emergency pump and piping system would have the capacity to pump 3.61 cfs (approximately 1,580 gallons per minute) of water from the ponds to the Mid Pit backfill infiltration gallery. This is the greatest anticipated pit dewatering rate, which is predicted to occur in the North Pit during year 13 (**Table 2.4-3**). Pumping to the Mid Pit and operation of the evaporative sprayers would continue until the volume of water in the water management ponds is below 90 percent of their design capacity (634 acre-feet).

Table 2.4-3 Water Management System Culverts for Alternatives 1A and 1B

Location	100-yr Peak Flow (cfs)	Shape	Material	Barrels	Diameter (in)	Headwater Depth (ft)
EOP Culvert	222	Circular	HDPE	1	72	6.2
Haul Road Culvert 1	48	Circular	HDPE	2	30	2.8
Haul Road Culvert 2	74	Circular	HDPE	2	36	3.3
South Pit Diversion	63	Circular	HDPE	1	48	4.5
Mid Pit Culvert	74	Circular	HDPE	2	36	3.3

Source: P4 2010c

2.4.1.1.12 Diversion Ditch System

With the exception of a diversion ditch along the east side of the Mid Pit, diversion channels in the water management system were designed based on stormwater runoff volumes and peak flows associated with a 100-year, 24-hour storm event plus one foot of freeboard. This ditch, the Haul Road Ditch, is located in a confined area of the site and sheet flow over the adjacent mine road is acceptable. Therefore, the Haul Road Ditch was designed to convey runoff associated with a 25-year, 24-hour storm event with no free board under the water balance for Alternatives 1A and 1B. The hydrologic modeling program HEC-HMS (version 3.3) was used to estimate design flows for the diversion channels in the water management system. The diversion channel between EP1 and CP2 would be lined with riprap over an impermeable liner such as a GCLL, LLDPE, or HDPE.

2.4.1.1.13 Culverts

Culverts would be installed at five locations in the project area. All culverts were designed to handle peak flows associated with the 100-year, 24-hour storm event. The location, peak flow, and size of each culvert are listed in **Table 2.4-3**.

2.4.1.1.14 Water Management – Post Mine Phase

The water management system at the proposed Blackfoot Bridge mine would continue to be maintained and operated following the completion of mining activities until reclaimed areas have stabilized (i.e., vegetation is fully established). Surface water monitoring would continue as described in **Appendix A** until it is demonstrated that runoff from the reclaimed project area meets surface water quality standards. Portions of the water management system, including the water control ponds and the diversion ditch between ponds EP1 and CP2, would then be removed. Sediment in the water management ponds would be removed, sampled, and used as growth medium on site if it meets suitability requirements (e.g., contains selenium at concentrations below 13 mg/kg or less than 0.1 mg/L by the 2:1 hot water extract method). Sediment that does not meet suitability criteria would be managed as seleniferous material and would be placed as backfill in the South Pit. The HDPE/LLDPE pond liners would be transported off site for disposal in accordance with applicable state and federal regulations. The pond embankments would be leveled and contoured to create a slightly mounded area that would then be covered with growth medium and reclaimed following procedures provided in the Revised Mine Plan (P4 2008a). The run-on diversion ditches upgradient of the Mid Pit, South Pit, and EOP (**Figure 2.4-1**) would remain in place.

Sediment that collects behind the sediment control dams would also be carefully removed, as feasible. The sediment would be sampled and used as growth medium on site if it meets suitability

requirements (contains selenium at concentrations below 13 mg/kg or less than 0.1 mg/L by the 2:1 hot water extract method). Sediment that is not suitable for use as growth medium would be placed as backfill in the South Pit and managed as seleniferous material. The sediment control dams would be breached and contoured to reestablish the natural drainage channel.

Following removal of components of the water management system, runoff patterns in the project area watersheds would be similar to current (pre-mining) conditions. The unnamed intermittent channel that extends along the east side of the proposed EOP (**Figure 2.4-1**) would flow to Fish Pond and then to the wetland area along the west side of the NWOP. The Beaver Pond watershed would continue to drain to Wetland M and then north to the Blackfoot River. Surface runoff from the southern portion of the project area would flow to tributary drainages of State Land Creek.

As discussed in the Revised Mine Plan, the Mid Pit and North Pit would be backfilled to resemble pre-mining slopes and contours. Surface runoff would flow over growth media on the reclaimed pits to downgradient drainages. Upon completion of mining, the South Pit would be partially backfilled with overburden from the EOP. The northern portion of the pit would be backfilled and graded to direct surface runoff to flow over the cover toward Wetland A and unnamed intermittent channel along the east side of the EOP. The backfill in the southern portion of the pit would be graded to direct surface water and snow melt flowing over the cover to infiltrate into the Upper Wells Formation (P4 2008a).

2.4.1.2 Environmental Control Measures

Environmental control measures for Alternatives 1A and 1B would include all of the environmental control measures for the Proposed Action, including **Appendix A, Sections 1.0** through **3.1.14** (Environmental Monitoring Plan; [P4 2010a]). There would be a few additional environmental control measures associated with the water management system (**Section 2.4.1.1**) and cover system (**Section 2.4.2**). As under the Proposed Action, P4 would apply for coverage under the stormwater MSGP or an individual NPDES, if required.

An Adaptive Management Plan has been developed for the modified water management system to address issues raised in the application process for a 404 permit. The water management system, described above, is designed to control runoff and seepage of water the quality of which may be affected by mining operation. The Adaptive Management Plan provides for the implementation of management actions to avoid or minimize the placement of fill or sediment in selected areas that currently contain wetland and non-wetland waters of the U.S. unless monitoring identifies specific conditions of concern. Measures identified in the Adaptive Management Plan would: avoid or limit discharging dredged or fill material to areas currently containing wetland and non-wetland waters of the U.S.; protect the quality of off-site water by isolating and controlling onsite water; maintain adequate storage capacity; provide for restoration of affected wetlands; and establish criteria for implementation of water manage actions. BMPs would be employed throughout the water management system to direct runoff water and runon water, and to capture sediment. Each pond and ditch in the water management system has been designed with adequate capacity of allow P4 to maintain water within the system and to discharge water only if it meets Idaho water quality standards. If certain criteria are met, adaptive management actions would be implemented to minimize impacts to current wetlands and non-wetland waters of the U.S. The design of sediment control dams would include a decant piping system with valves that could be opened to allow water to flow through the dam or closed to allow water to pond behind the dam. Four

Adaptive Management Actions and the criteria for site water conditions that would trigger those actions are discussed briefly in the following paragraphs.

If surface water samples collected at monitoring stations in the unnamed tributary to Fish Pond exceed the State of Idaho water turbidity standards, Action No. 1 would be implemented. P4 would close the valves on the pass-through pipe in EP1-4 to prevent discharge of water. As the water ponds, suspended sediment in the water would settle into existing wetlands and non-wetland waters of the U.S. The decant system would be monitored to ensure that water is ponded for sufficient time to allow settlement of suspended solids. Once the water meets turbidity standards, the water would be decanted for discharge.

If selenium concentration in surface water samples collected at monitoring stations in the unnamed tributary to Fish Pond along the toe of the EOP exceeds water quality standards, Action No. 2 would be implemented. P4 would close valves on some or all of the EP dams to impound water that exceeds water quality standards. If or when water quality of the impounded water improves to meet water quality standards, water in the ponds would be released. If water quality does not improve sufficiently, several possible actions may be taken including but not limited to: allowing the water to evaporate; pumping the contaminated water into the OSMS system; discharging the water to CP2 for treatment by way of the northern diversion ditch; or comingling the ponded water with clean water from other ponds until discharge criteria are achieved.

If one or more seeps are discovered in the foundation of the EOP, the toe area of the EOP, or the unnamed tributary to Fish Pond drainage basin and if selenium or COPC concentrations in the seeps exceed water quality standards, Action No. 3 would be implemented. P4 would excavate the seep or seeps to create a collection sump for water. Water in the sumps would be pumped or drained through a lined ditch to the OSMS. Seepage from the sump would be transported to CP2 or the WMP system for treatment. If the water quality associated with a seep reflects natural groundwater conditions, P4 would review the need to capture and convey the seep water.

If the unmodified operational storage capacity of the EP ponds is found to be inadequate to allow for the retention time needed to ensure that water meets permit limits for discharge, Action No. 4 would be implemented. P4 would raise the height of the dam and spillway associated with the Fish Pond up to five feet. The maximum increase in storage capacity in Fish Pond would be approximately 11.8 acre-feet. The additional storage capacity would allow additional retention time for a greater volume of water to achieve permit limits for discharge.

2.4.2 Cover Systems

The GCLL cover system would be composed of the following materials (from surface to base):

- 18 inches of topsoil;
- 1 foot of weathered alluvium cover material;
- 6 inches of protective layer material;
- A GCLL layer (sodium bentonite encased between two geotextiles and a laminate layer);
- 6 inches of a protective subgrade layer (weathered alluvium or other earthen material); and
- Run-of-Mine overburden.

The GCLL itself includes a thin layer of powdered sodium bentonite clay layer inserted between two geotextile layers. A geotextile is a woven or nonwoven sheet material that is resistant to penetration damage (EPA 2001). The top geotextile layer is laminated with a polyethylene geomembrane layer, providing an additional layer of protection as shown on **Figure 2.3-6**.

The bentonite component of the GCLL (a type of processed clay) is dry when manufactured, and becomes hydrated by contact with natural moisture present in the surrounding materials. When hydrated, the bentonite swells and the voids and spaces between the bentonite granules close. This swelling allows the GCLL to attain low permeability. For example, model results indicate that the GCLL would achieve an average net annual percolation rate of 0.005 inch/year (O'Kane 2009b).

The swelling also allows the GCLL the ability to "self-heal" holes. The GCLL has self-sealing capabilities that allow it to self-repair holes and punctures, including holes up to 75 millimeters or 3 inches in diameter (EPA 2001). This capability also allows for effective self-sealing at the overlap joints of the cover itself.

The initial evaluation of capping designs that would include a synthetic barrier considered use of a GCL without lamination to address the issue of percolation rates. The non-laminated GCL is discussed at length in the Modeling of Soil Cover System Alternatives Report (O'Kane 2009a), incorporated herein by reference. A GCL barrier without lamination would result in percolation rates ranging from 0.02 to 0.03 inch/year (O'Kane 2009a). The bentonite clay layer in non-laminated products, however, can be subject to desiccation (drying out) and chemical breakdown as a result of cation exchange under certain conditions.

The addition of the laminate layer in the GCLL ensures that desiccation and cation exchange do not occur and provides for nearly a ten-fold reduction in percolation rates compared to GCL barriers without lamination. The GCLL product provides ease of installation together with puncture and tensile strengths beyond conventional polyethylene membranes (O'Kane 2009a).

GCLLs are also considered to provide enhanced resistance to penetration by plant roots or burrowing animals by providing an extra layer of protection, in addition to its self-sealing qualities (O'Kane 2009a, EPA 2001). The laminated geotextiles are stronger and more resistant to penetration damage from burrowing animals or plant roots. Additionally, the design of the cover above the GCLL (including the topsoil layer, the weathered alluvium and the drainage layer) provides for moisture retention in the upper layers of the cover design. The drainage layer is specifically designed to transport water during high runoff periods and, therefore, would likely contain water during portions of each year. The drainage layer materials and the bentonite component for the GCLL would be imported to the site from outside sources. Animals are unlikely to burrow into a zone that transports water seasonally and which could affect the integrity of the burrow.

The GCLL is also very durable. Biological degradation of bentonite used in the GCLL is not possible, and the polypropylene geotextiles have an expected lifetime of up to 200 years. The seed mix for the reclamation plan would be adjusted to account for any potential impacts from plant rooting in areas where the GCLL would be used. Plant rooting depths would be controlled by selection of the volume and types of species proposed to be used for reclamation seed mix. Species in the seed mix would be selected based on their shallow rooting depths in order to minimize penetration of the liner by roots. For example, alfalfa and antelope bitterbrush are comparatively

deep-rooting species that may potentially be eliminated from the seed mix in areas using the GCLL cover. Establishment of a grass community on the reclaimed areas would also limit invasion by native species that may exhibit deeper rooting characteristics. The unique nature of the GCLL is the ability to "self-repair" in the event of root penetration.

P4 plans to develop the appropriate seed mix for whatever alternative is selected as per agency cooperation and concurrence. The seed mix would be developed to contain a combination of native and naturalized species and modified to adjust for deep rooting plants, as discussed above. The final seed mix would be selected for attributes that would establish vegetative cover that would minimize erosion plus provide species diversity with additional considerations (e.g., rooting depth).

Both alternatives include placement of a "store and release" layer above the GCLL consisting of topsoil and weathered alluvium and a drainage layer. The drainage layer serves to enhance stability of the cap on slopes and eliminates potential ponding of water on the GCLL layer that is otherwise not evapotranspired from the cap. The actual thickness of the drainage layer is dependent on specific slopes and aspect of the coverage areas. In addition, both alternatives include placement of a subgrade layer at least 6 inches thick to provide protection to the GCLL. The following sections describe the differences in the cover system for Alternatives 1A and 1B.

2.4.2.1 Alternative 1A – GCLL Cover System Over Core Materials in EOP and Overburden in Pits

Alternative 1A involves placing a combination of the GCLL cover system over 383 acres, and the Simple 1 cover system over the remaining 99 acres of overburden pile. The 383 acres covered with the GCLL cover system design would include:

- 86 acres covering the 35 acres of segregated Meade Peak overburden core associated with the EOP;
- 63 acres of overburden associated with South Pit;
- 110 acres of overburden associated with Mid Pit; and
- 123 acres of overburden associated with North Pit.

The 99 acres covered with the Simple 1 cover system design consists of:

- 45 acres of external overburden associated with the NWOP; and
- 54 acres of external overburden associated with the EOP.

The revised Alternative 1A would include a GCLL cover over 86 acres of overburden associated with the EOP including the "cell" of seleniferous Meade Peak overburden material. The Meade Peak overburden material would be located within the EOP utilizing the available topography to enhance isolation of this material. To ensure that meteoric water would not infiltrate from above or laterally into this seleniferous material, the GCLL cover layer would be expanded to overlap the entire localized drainage area within which the cell would be located. Groundwater modeling for the cover design for Alternative 1A estimates that potential selenium loading from the mine may range from 0 to about 1 pound per year over approximately the next 50 years.

A hydraulic break would be installed on the side and up-gradient portion of the Meade Peak segregation cell in the EOP to intercept meteoric water that may infiltrate from adjacent up gradient areas. The hydraulic break would consist of a zone of coarse, free-draining chert or limestone placed around the uphill sides of the segregation cell. The coarse material would effectively conduct water away from these areas during high runoff (saturated) conditions in the unlikely event of a failure of the final cover system and would act as a hydraulic break by interrupting unsaturated flow towards the seleniferous Meade Peak material, during dryer periods. Any seepage from the bottom of the hydraulic break would report to the compacted clay subgrade layer and seepage underdrain pipeline system.

Figure 2.4-2 illustrates the areas of the proposed mine development that would be covered on the basis of this alternative. The seed mix would be adjusted to address the need to limit rooting depth in areas covered with the GCLL.

2.4.2.2 Alternative 1B – GCLL over the Entire EOP and Overburden in Pits

Alternative 1B involves placing the GCLL cover system over the entire 141 acres of the EOP, in addition to 296 acres of backfilled pits for a total of 437 acres. The GCLL cover system design would include:

- 141 acres external overburden associated with the EOP;
- 63 acres external overburden associated with the South Pit;
- 110 acres external overburden associated with the Mid Pit; and
- 123 acres external overburden associated with the North Pit.

The Simple 1 cover system design occupies 45 acres covered only within the NWOP.

Figure 2.4-3 illustrates the areas of the proposed mine development that would be covered on the basis of this alternative. The seed mix would be adjusted to address the need to control rooting depth for areas covered by GCLL.

2.5 NO ACTION ALTERNATIVE

CEQ regulations require that an EIS include a No Action Alternative. Under this alternative, the Blackfoot Bridge Mine would not be approved for mining or any associated development on the existing leases. Similarly, the lease modification request would not be approved. As a result, the No Action Alternative would not provide ore for P4's processing plant and could result in closure of the plant. Ore for P4's processing plant would be obtained from other sources (e.g., other new and existing mines) elsewhere in the phosphate district, and environmental impacts might be greater or less than the Proposed Action.

In the case of phosphate leases, however, the lease grants the lessee the exclusive right and privilege to explore for and mine the phosphate deposit on the leased land, subject to the conditions provided in the lease. It also gives the lessee the right to use such surface of the leased land as may be necessary for the development of the phosphate resource. Phosphate leases are not cancellable by the United States, except by due process in the case where the lessee does not meet the terms and conditions of the lease. Thus, the No Action Alternative does not imply that the

leases would never be developed, only that they would not be developed under the 2008 Revised Mine Plan evaluated in this EIS. As the rights to mine the leased phosphate deposits have been acquired, if the No Action Alternative were selected, another Mine Plan for these two leases could be submitted in the future.

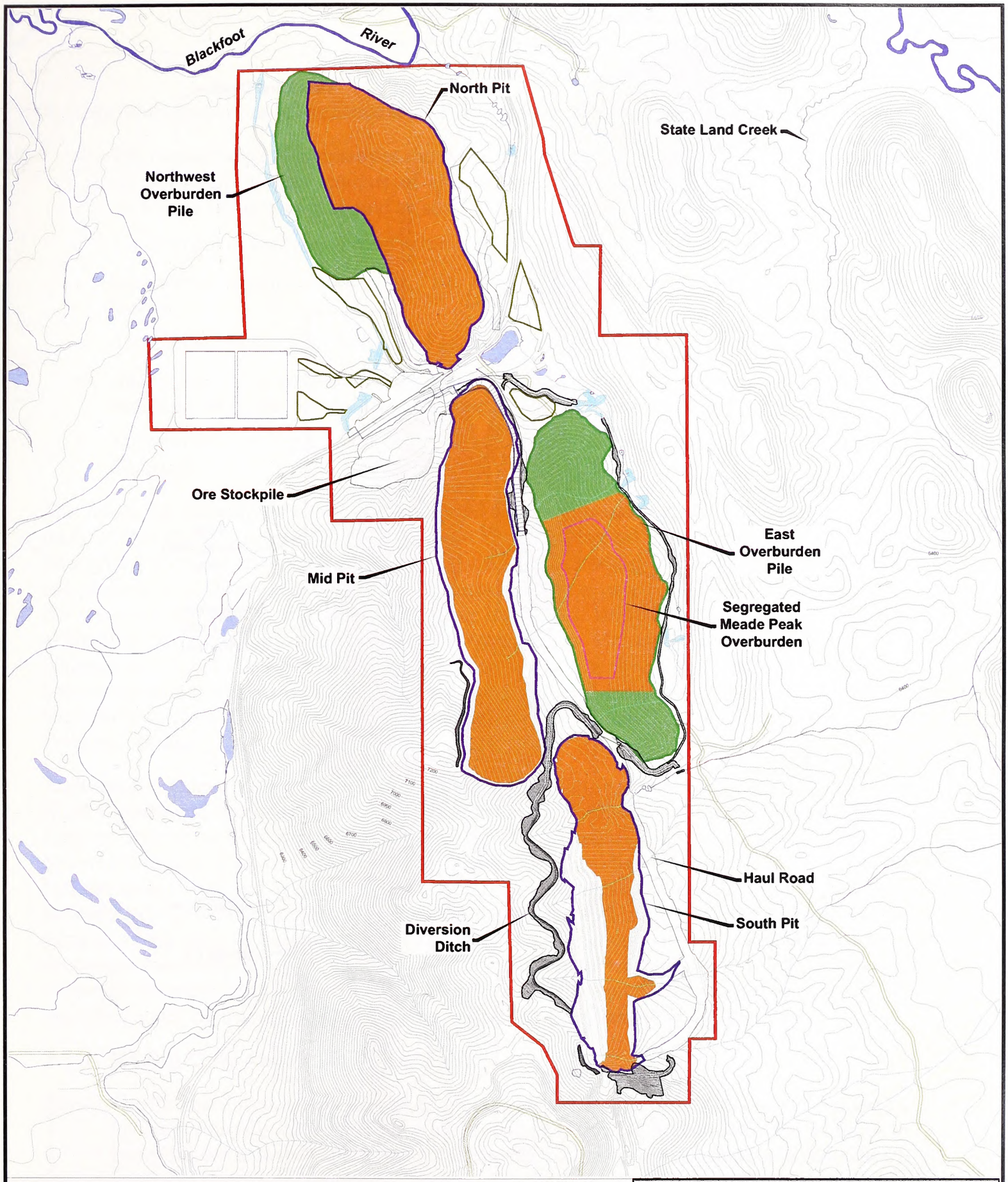
2.6 AGENCY-PREFERRED ALTERNATIVE

At this time, the BLM, IDL, and the IDEQ prefer Alternative 1A as the Agency Preferred Alternative because it employs measures to satisfy regulatory requirements and reduce potential environmental impacts on regional water quality. The effectiveness of these measures is enhanced by the development of specific management plans for the implementation of environmental control measures. These include, but are not limited to the updated Mine Water Management Plan (P4 2010c), expansion of the area to be covered by the GCLL, the Environmental Monitoring Plan (P4 2010a) in **Appendix A**, and the Adaptive Management Plan (P4 2010e) in **Appendix B**. The USACE is neither an opponent nor a proponent of the applicant's Proposed Action or alternatives. Decision options available to the USACE are to issue the permit as applied for, issue permit with modifications or conditions, or deny the permit. The intent of the USACE is to ensure that the analysis of alternatives is thorough enough to use for the public interest review outlined in USACE regulations at 33 CFR 320 et seq and the 404(b)(1) guidelines (40 CFR part 230).

Implementation of Alternative 1A would reduce the volume of leachate that could form in overburden placed as backfill and in external overburden piles, resulting in a reduction in the concentration and load of COPCs in groundwater reporting to the Blackfoot River. The resultant concentration of COPCs in the Blackfoot River would not exceed applicable water quality standards and therefore would be protective of aquatic life. Additionally, the implementation of Alternative 1A would generally reduce loading of COPCs to groundwater and would reduce the potential for these to enter wetlands in the project area, protecting water quality and fisheries and aquatic resources. Alternative 1A would also reduce the potential for exposure of COPCs to special status species. A GCLL-based alternative is considered to be less potentially susceptible to biointrusion from plants and animals in comparison to other cover designs (O'Kane 2009a). The principal difference between Alternatives 1A and 1B is the extent of the GCLL cover. The additional areas covered by the GCLL under Alternative 1B, and associated environmental protection measures would greatly increase project costs without appreciably increasing the environmental protection achieved from the cover system.

2.7 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

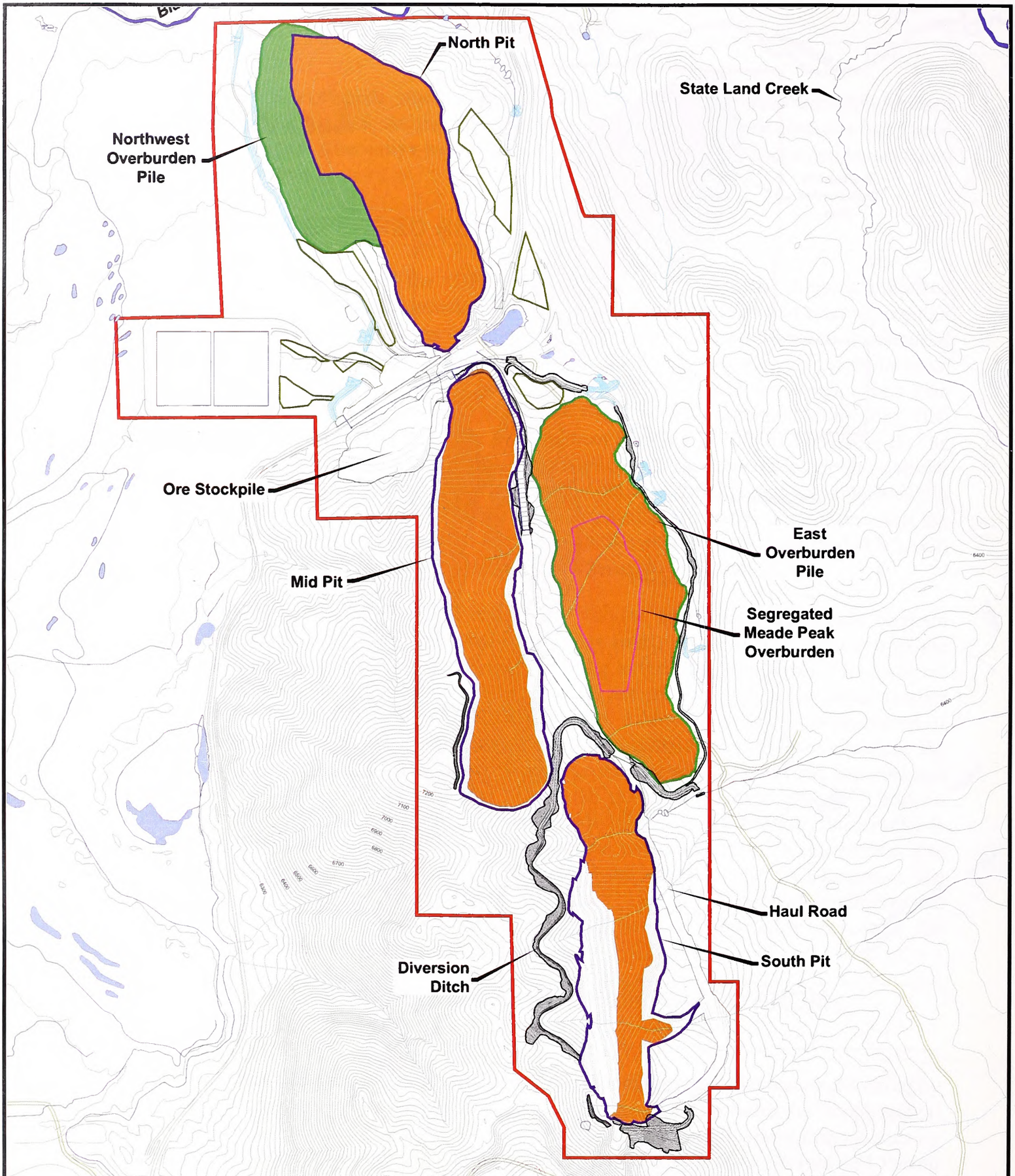
This section describes alternatives identified through the scoping process that were considered by the agencies but dismissed from detailed analysis. The section also includes six supplemental alternatives that were developed and analyzed for the least environmentally damaging practicable alternatives (LEDPA) as part of the application process to the USACE for a Section 404 Permit (P4 2010d). Components of the Proposed Action, respective functions, and potential environmental effects resulting from implementation of the proposed project are considered in the development of alternatives. The rationale for dismissal of these alternatives is provided in this section.



BLACKFOOT BRIDGE PROJECT EIS

FIGURE 2.4-2
Alternative 1A Cover Scenario

ANALYSIS AREA: Caribou County, Idaho	
Date: 09/25/10	File: Cover Scenarios_Alt.dwg
Drawn By: EC	Layout: Alternative 1a



BLACKFOOT BRIDGE PROJECT EIS

FIGURE 2.4-3
Alternative 1B Cover Scenario

ANALYSIS AREA: Caribou County, Idaho	
Date: 09/25/10	File: Cover Scenarios_Alt.dwg
Drawn By: EC	Layout: Alternative 1b

A range of alternatives to be evaluated in an EIS should meet certain key principles including:

- The overall range of alternatives should be governed by the "rule of reason." When there are potentially a large number of alternatives, only a reasonable number of examples covering a full spectrum should be analyzed.
- All alternatives considered must achieve the objectives of the purpose and need.
- Alternatives must be "reasonable," i.e., they must be both technically and economically feasible.
- Alternatives that are speculative and geographically remote need not be considered.
- Alternatives with environmental impacts that are obviously worse than the Proposed Action or other alternatives under consideration can be eliminated.
- Alternatives with impacts that are indistinguishable from the Proposed Action need not be evaluated.

The following alternatives were eliminated from further evaluation in the EIS based on one or more of the above-listed principles. In general the supplemental alternatives (**Sections 2.7.10** through **2.7.15**) were eliminated from further consideration because it was determined that it was not practicable to eliminate the potential for impacts to the aquatic ecosystem without the use of the unnamed tributary to Fish Pond, including Fish Pond. However, some elements of these alternatives have been incorporated into the Mine Water Management Plan (P4 2010c) for Alternatives 1A and 1B. These alternatives and the reasons why they were eliminated from further consideration are briefly discussed in the following sections. Generally, they were found to be technically infeasible, economically unreasonable, or would not meet the purpose and need of the Proposed Action.

Additionally, federal policy for the management of mineral resources on public lands requires BLM to foster and encourage private enterprise in the development of a stable domestic minerals industry and the orderly and economic development of domestic mineral resources; Domestic Minerals Program Extension Act of 1953; the Mining and Minerals Policy Act of 1970; the Federal Land Policy and Management Act of 1976; the National Materials and Minerals Policy; Research and Development Act of 1980; and the Energy Policy Act of 2005. Moreover, the purpose of the Mineral Leasing Act of 1920 and its implementing regulations requires BLM to encourage maximum recovery and use of all known mineral resources (43 C.F.R. 3590.0-1). Where an alternative would have a negative effect on the maximum recovery of known mineral resources under the lease, that factor also plays a role in the dismissal of the alternative.

2.7.1 Mining Only Above the Water Table

Issue: The Proposed Action would result in mining below the water table which would require P4 to create sumps in two of the open pits to collect inflowing groundwater. P4 proposes to pump this water to the water management ponds to be evaporated. Limiting the mine depth to an elevation above the water table would eliminate the need to pump and evaporate groundwater.

The alternative would include all component footprints of disturbance of the Proposed Action but would eliminate mining into the regional water table in the North Pit and northern portions of the

Mid Pit. The issue addressed by this alternative would be reduction of potential contamination of the groundwater in the regional aquifer.

This alternative was eliminated from further consideration because it would not fully recover the maximum amount of the ore body as required under the leases and would not comply with the Purpose and Need. Approximately 12 percent of the total ore proposed for recovery would not be mined from the deposit under this alternative. Elimination of this ore would reduce the mine life by approximately 2 years.

Implementation of this alternative would not eliminate the COPCs entering groundwater and surface water resources in the project area. Moreover, a similar amount of surface disturbance as compared to the Proposed Action would result from this alternative. External overburden piles (NWOP and EOP) would still be constructed. Water management during and after closure of the project would be similar to that needed under the Proposed Action. Placement of backfill in mined-out pits would place segregated Meade Peak overburden in a position similar to that of the Proposed Action backfill; therefore, COPC release to groundwater would be similar to the Proposed Action.

2.7.2 No Permanent External Overburden Piles

Issue: External overburden piles have the potential to release COPCs to the shallow groundwater system and adjacent surface water resources.

This alternative would involve rehandling the NWOP and EOP overburden materials after mining activities have been completed and prior to final reclamation. Material from these facilities would be placed as backfill into both the Mid and South Pits. This alternative would result in the removal of the external overburden piles at the completion of mining, thereby restoring the original topography at these temporary overburden storage sites. Original topography would be restored on approximately 186 acres. This alternative would also restore an additional 48 acres of open pit to original land surface, leaving approximately 50 acres of open pit highwall remaining after backfilling.

Once mining of the available ore in the entire Blackfoot Bridge Mine has been completed, the post-mining period would commence. During this period, the first overburden area to be excavated and rehandled would be the NWOP, which is located immediately adjacent to and connected with the North Pit backfill. The NWOP has a volume of about 2.84 million cubic yards of material. This pile has a corresponding swelled volume of approximately 3.38 million loose cubic yards (mlcy) of non-Meade Peak overburden located outside the original pit limit outline. In order to remove this material and maintain appropriate slopes in the remaining adjacent backfill and over fill materials, excavation of approximately 7.0 mlcy of additional material would be necessary. As a result, the removal of the NWOP would require excavation and transport of approximately 10.38 mlcy of material from the NWOP to the Mid Pit backfill over at least 2 years. Transport distance of material from the NWOP to the Mid Pit backfill is approximately 10,100 feet. This alternative would result in the removal of approximately 45 acres of external overburden pile to the Mid Pit as backfill. Once material of the NWOP is removed to the approximate original ground topography, the area would be appropriately seeded and reclaimed.

The EOP is located east of the Mid Pit area. It has a total capacity to contain approximately 20.3 bcy of material. This overburden pile is expected to contain approximately 5.7 bcy of segregated Meade Peak overburden. Under this alternative, after the NWOP has been successfully rehandled, material movement from the EOP would commence. Movement of this material is expected to take 3 to 4 years to complete, which would reduce the life of mine by approximately 4 years. Under this plan, approximately 57 percent of the EOP rehandled overburden would be placed in the Mid Pit with the remaining 43 percent being placed in the South Pit. After the overburden materials are moved back into the pits, the original footprint area would be appropriately prepared, fertilized, and seeded.

Compared to the Proposed Action, this alternative would increase the total backfill from approximately 294 acres to approximately 342 acres. The total percentage of the backfilled pit would also increase from 81 percent to 95 percent.

This alternative was eliminated from further evaluation because it would not decrease the disturbed area associated with the Proposed Action. Temporary placement of overburden in external piles would result in a short-term release of COPCs to the groundwater and surface water features. However, it would eliminate long-term release of COPCs over permanent disposal at these sites.

Implementation of this alternative would also not comply with the purpose and need because it would result in reducing the recoverable ore volume by more than 30 percent and reducing the life of the mine by a minimum of 4 years. Accordingly, the selection of this alternative and the corresponding volume of ore loss (as a function of the costs associated with rehandling the overburden in the NWOP and EOP) would render the project infeasible.

2.7.3 Interception Ditch Along Toe of East Overburden Pile

Issue: Section 404(b)(1) of the Clean Water Act requires an applicant for a 404 Permit to evaluate alternatives that would identify the least damaging practicable alternative to wetlands and waters of the U.S. This alternative was developed by P4 during compilation of the 404 permit application.

This alternative was developed to minimize impacts to wetlands and waters of the U.S. in the Fish Pond Drainage. The alternative would include construction of a large ditch at the eastern toe of the EOP extending approximately one mile along the entire length of the pile (south to north). This ditch would be positioned to intercept and transport runoff water from the overburden pile surface to EP1 or to a new pond constructed at the end of the new EOP ditch at the north end of the EOP (at a site currently scheduled for storage of topsoil). The purpose of the new EOP toe ditch would be to intercept runoff water from the EOP before it can contact wetlands located in Fish Pond drainage. The EOP ditch design would also incorporate a perforated PVC pipe buried to a depth below the frost line that would allow shallow groundwater moving beneath the EOP to be intercepted and transported to EP1 or the new EOP pond.

Runoff water that collects in EP1 or a new pond would be retained to settle solids from the water. Water that collects in this pond that meets discharge criteria would be diverted to CP1 for release to Wetland X. Should water quality not meet discharge criteria, it would be pumped to pond CP2 or the water management ponds for evaporation.

Conceptual design of a runoff interception ditch for the EOP includes construction of a trapezoidal shaped ditch with a bottom width of 5-feet and 3H:1V side slopes. A 16-foot wide access/maintenance road would be constructed parallel to the ditch to allow maintenance by an excavator. The access road would be a single lane road with a 10-foot running surface width and a two-foot high wheel berm on the outside of the road. Construction of the ditch and access road would require approximately 30,900 cubic yards of cut with the maximum cut of 12 feet. Approximately 1.4 million cubic yards of overburden would need to be displaced to allow sufficient space between the toe of the EOP and the unnamed tributary to Fish Pond to construct the ditch and access road corridor. Construction of the ditch and access road corridor would result in disturbance of an additional 4 acres of land as compared to the Proposed Action.

Overburden that would be displaced by the ditch and access road corridor would be placed on the uppermost lift of the EOP. Placement of the 1.4 million cubic yards would occur during mining and would raise the elevation of the proposed EOP by approximately 60 feet to 6,720 amsl. Placement of overburden would not increase the footprint of the EOP. All slopes associated with placement of overburden would not exceed 3H:1V; however, construction of a toe ditch could have consequences on the natural slope stability at the proposed EOP site. Construction of the EOP ditch would disturb natural slopes comprised of sedimentary rock that dips to the east and would cut across the dip slope potentially reducing the stability of these slopes. A portion of the runoff water collected in the ditch would infiltrate into the dip slope which could further affect the slope stability.

Installation of the EOP toe ditch and access road would eliminate need for construction of EP2, EP3, and EP4. These ponds are designed to contain approximately 9.8 acre-feet of runoff water under the current water management system and are the proposed sediment control system for the EOP. The EOP toe ditch and buried pipe would intercept flow previously planned for storage behind these dams and would require that a new pond or increased capacity of existing ponds (EP1 or CP2) be constructed to replace the capacity associated with EP2, EP3, and EP4.

Based on available land downgradient from the EOP, a possible location where a new pond could be situated is at the site currently proposed for a topsoil stockpile at the north end of the EOP. Given the configuration of the north end of the EOP and elevation of the end of the toe ditch, a pond of sufficient size to contain 9.8 acre feet of storage would require pulling the north end of the EOP uphill or relocating a volume of overburden to accommodate this facility. This would require construction of a side-hill dam.

To fully capture all runoff that could result from the EOP, the toe ditch would need to be designed to extend the full length of the EOP. The toe of the north end of the EOP is located at elevation 6,320 amsl and the toe ditch would need to end at approximately this elevation. This elevation also coincides with the elevation of the head of the proposed diversion ditch that extends from pond EP1 to pond CP2. The area available for a new pond, however, lies above this elevation. Given these constraints, this new pond site was not considered practicable.

Expanding pond EP1 by 9.8 acre-feet of capacity would result in increasing the height of the dam and a total capacity of 18.6 acre feet. Consistent with the current water control pond, water that meets surface water standards would be discharged from pond EP1 to pond CP1 and to Wetland X.

Water that exceeds the capacity of EP1 and does not meet standards, would flow to pond CP2 or the water management ponds for evaporation.

The projected footprint of the resultant pool of the enlarged EP1 facility would likely impinge on the toe of the EOP overburden upstream of the dam. As a consequence, the pool would either have to be managed to reduce the volume so as to ensure water does not contact the overburden or the elevation of the decant outlet would have to be lowered which would reduce the capacity of the pond. This lost capacity due to reduction in decant outlet would need to be replaced somewhere in the water management system.

Using CP2 to store an additional 9.8 acre feet of volume would result in a pond with a total capacity of 19.5 acre feet and would require an expansion of CP2 to accommodate this additional capacity. The current dam design location for CP2 is at the edge of Wetlands V and W. Pond CP2 is constrained on the upgradient side by the proposed equipment yard and load out facility and the haul road and railroad corridor. Therefore, any expansion of CP2 would require relocating the dam into wetlands V and W. In addition, increasing the capacity of CP2 does not resolve the stormwater storage needs for the east side of the project. Therefore, expansion of CP2 was considered not practicable.

Under the current water management plan for the EOP, the volume of runoff water that would report to the unnamed tributary to Fish Pond would be stored in five facilities (e.g., Fish Pond, EP1, EP2, EP3, and EP4). The evaporative loss associated with these five surface water facilities exceeds the evaporative loss associated with the modified EP1 because the surface area of the multiple ponds is greater. The reduction in evaporative loss would also need to be accounted for within the overall water management system.

Because the ditch would be located on the leeward side of the proposed mine area, maintenance of the ditch system would require periodic removal of snow and sediment that would build up in the ditch during each year. Snow removal would be preceded by plowing snow on the access road into the toe ditch. An excavator or backhoe with sufficient reach would need to be mobilized along the access road followed by dump trucks. Snow would be loaded into the dump trucks and hauled and placed in EP1 or a new pond. Excavated snow may contain sediment from the bottom of the toe ditch and therefore would need to be placed in EP1 or the new pond to ensure it is trapped during melting.

This maintenance program would require increased monitoring of snow conditions and weather patterns to ensure ditch capacity is maintained; especially in conditions where a rain-on-snow event is likely. Snow removal would also likely be necessary in conditions where the ditch is partially filled with snow to ensure that adequate capacity is maintained at all times during the winter and spring melt out periods. Based on storm frequency in this part of Idaho, it is likely that maintenance of the ditch would occur several times throughout the year.

Maintenance of the ditch is considered difficult to reliably maintain because during spring runoff periods, the access road would likely be unstable due to mud and water on the road. Mobilizing a backhoe or excavator and dump trucks along this road would result in more sediment and water reporting to the toe ditch thereby increasing the amount of sediment that would need to be managed either in a water management pond or placed on the EOP.

As described previously, installation of a perforated pipe system underneath the toe ditch would intercept shallow groundwater associated with infiltration of precipitation into the EOP. The underground drain system would not intercept all groundwater that could have elevated concentrations of COPCs as a result of infiltration. Test pit excavation in portions of the EOP revealed fracture Dinwoody Formation materials and as such, infiltration would likely report to the bedrock aquifer as well as alluvial groundwater that is below the depth of the perforated pipe.

Constraints to implementing this alternative include: (1) construction of the ditch would require an additional 4 acres of disturbance within the project area that would not otherwise be disturbed; (2) the ditch and buried pipe is not expected to successfully intercept a significant volume of potentially impacted groundwater before it could enter the unnamed tributary drainage, thereby requiring continued management of water in the wetlands and not meeting a primary purpose of installing the interceptor ditch; (3) proximity of the ditch to waters of the U.S. in the unnamed tributary drainage could result in increased sedimentation from the toe ditch and access road disturbance area; (4) inability to adequately address water management needs due to pond size limitations and reduction in evaporative pond areas; and (5) inability to reliably clear the toe ditch and access road during the winter and spring runoff periods.

Due to the low lying elevation profiles of the 1.42 acres of wetlands and 0.35 acre of non-wetland waters of the U.S., these wetlands would continue to act as a water management system collecting water not captured by the interception ditch. The interceptor ditch is considered unreliable at this site and impractical because of the constraints described above, is not expected to meet its stated purpose, and was eliminated from further analysis.

Although the EOP toe interception ditch alternative as originally proposed was considered impractical, the Mine Water Management Plan was revised (P4 2010c) for Alternatives 1A and 1B to include measures that accomplish the same objectives. The diversion ditch system consists of diversion channels that intercept runoff and divert it to water control ponds before it can contact wetlands or other sensitive areas. In addition, the OSMS at the EOP and NWOP would provide additional protection of water quality by capturing and directing shallow groundwater and seepage that infiltrates to the base of the EOP or the NWOP and forms saturated conditions above compacted clay layer prior to the placement of the final cover or in the unlikely event of a failure of the final cover system and shallow groundwater to collection drains and water control ponds.

2.7.4 Reduce Size of EOP and Construct Additional Overburden Pile On Site

Issue: Section 404 (b)(1) of the Clean Water Act requires an applicant for a 404 Permit to evaluate alternatives that would identify the least damaging practicable alternative to wetlands and waters of the U.S. This alternative was developed by P4 during compilation of the 404 permit application.

This alternative would require P4 to reduce the size of the EOP and place a portion of the overburden originally scheduled to be placed in the EOP at a different overburden disposal site within the project area. To reduce the potential for dredging or filling any wetlands associated with the EOP, a minimum of approximately 6 million cubic yards of material would need to be relocated to an alternative disposal site. This volume of overburden would be sufficient to reduce the footprint of the EOP to avoid one mapped wetland area (Wetland B) that would otherwise be impacted by the EOP.

Based on topographic restrictions, lease boundary limitations, land ownership issues, and haul distances, the current EOP location in the Proposed Action is the only practicable and economically feasible location. Locations for the placement of a substantial portion of the EOP (i.e., at least 6 million cubic yards) on the project area are limited, due to the limited amount of side-valley areas and slope fill locations on site that are appropriate for construction of an overburden pile.

The EOP in the Proposed Action is designed as a side-valley or slope fill configuration. Given the topographic limitations of the project area, there would be no other areas suitable for placement of overburden. Accordingly, because there are no locations on the project area that could otherwise hold 6 million cubic yards of fill necessary to avoid impacts to the wetland near EOP, this alternative was dismissed from further evaluation as impracticable.

2.7.5 Relocate EOP to an Alternate Location Off Site

Issue: Section 404 (b)(1) of the Clean Water Act requires an applicant for a 404 Permit to evaluate alternatives that would identify the least damaging practicable alternative to loss of wetlands and waters of the U.S. This alternative was developed by P4 during compilation of the 404 permit application.

This alternative would require P4 to relocate the EOP to an alternate off-site location that would result in a lesser amount of wetlands acreage affected in comparison to the Proposed Action. No property has been identified within an economically or logistically feasible haulage distance that would meet the following criteria in order to make this alternative feasible or practicable:

- Reduce the acres of wetlands potentially affected by the Proposed Action overburden piles;
- Identify a site with the capacity to accept the volume of overburden (approximately 20 million cubic yards); and
- Identify land that is under or could reasonably come under P4's control or public land that could otherwise be available for such use.

The placement of overburden at P4's processing plant facility north of Soda Springs was evaluated. However, any potential areas that might be considered for overburden placement have already been allocated for other process materials. Accordingly, placement of the EOP overburden at the Soda Springs Plant site is not feasible.

The placement of overburden at other potential sites for off-site storage of the EOP was also evaluated, and it was determined that the haulage is cost-prohibitive. For example, implementation of this alternative would require approximately 130,890 large off-road triple-trailer haul truck trips to move the volume of the EOP to an alternate off-site location. To the extent that this haulage could occur on P4 private roads, which would require significant modification to support this type of haul truck, the major traffic issue would arise at intersections with public roads. If the alternate site is located where access would require use of public roads, smaller highway trucks (30-ton/16.7 cubic yard) would be used. Use of this size truck would require approximately 1,200,000 loads to move the overburden. To meet the haulage rate that could be achieved through use of the highway trucks, more than 10 over-highway trucks would be required. This large fleet of trucks would create concerns for safety and associated road maintenance of the traveled public roads. In

addition, corresponding increases in dust, fuel use, and generation of greenhouse gases would increase. The actual number of trucks and the cycle time needed to support this haulage can only be identified once a disposal site has been identified.

The cost associated with this alternative would most notably be the expense of haul distance and the fleet of highway trucks that would be needed to support such haulage. The cost for removal and transport of this material would need to be offset by revising the mine plan to only mine the high grade ore. This would increase margin of return on operations but reduce the amount of ore reserves that could be mined under the action alternatives, thus shortening the life of mine. For these reasons, this alternative has been eliminated from detailed analysis.

2.7.6 Mining Buffer to Avoid Eagle Nest and Blackfoot River

Issue: Bald eagle nests are located on the north end of the project area near the North Pit. Mining activity associated with the Proposed Action has the potential to affect the bald eagles during the nesting time period of the year.

This alternative would require that the mine plan be redesigned to provide an additional 500-foot natural buffer between mining activities and the existing eagle nests and Blackfoot River located on the north side of the North Pit. This alternative would eliminate removal of approximately 3 percent of the recoverable ore. This alternative would also provide additional protection from noise and visibility of mining in the North Pit to the eagle nests. P4 has developed an Eagle Management Plan for the Proposed Action to avoid impacts to eagle nesting including mining activities within 660 feet from the eagle nests during the breeding season. Accordingly, this alternative has been dismissed from further analysis.

2.7.7 No Issuance of Lease Modifications

Issue: Modification of the existing leases held by P4 would result in disturbance of additional land area associated with the Proposed Action.

This alternative would use the same basic mine plan as the Proposed Action, but would limit ore extraction to only those areas within existing lease boundaries. Without them, the economic and efficient recovery of the resource would not be realized. Reductions in total mine disturbance might be offset by the need to mine other leases in the region at an earlier date. If these lease modifications are not issued now, the ore identified within the parcels would likely become uneconomic to future operations, and thus would not be recovered. For these reasons, this alternative was dismissed from further analysis.

2.7.8 Overburden Haul to Ballard Mine

Issue: Placement of a segregated Meade Peak overburden cell in the EOP as described in the Proposed Action has the potential to result in release of COPCs to groundwater and surface water associated with the project site.

This alternative would consist of hauling 5.7 million cubic yards of segregated Meade Peak overburden and 0.6 million cubic yards of chert, limestone, and weathered alluvium that would otherwise be placed into the EOP from the Blackfoot Bridge Mine to the Ballard Mine. The

Ballard Mine was operated in the 1950s and 1960s and is located approximately 4 miles northeast of the Blackfoot Bridge Mine. Haulage of overburden to the Ballard Mine would require haul road modifications and modification of an existing bridge crossing the Blackfoot River.

This alternative was dismissed for multiple reasons.

- The selection of this alternative is not economically feasible, as it would result in the loss of at least 9.4 percent of ore compared to the Proposed Action and reduce the life of mine by at least 3 years.
- Alternatives 1A and 1B would require placement of GCLL in the capping system above the segregated Meade Peak overburden and, as such, the volume of precipitation that would infiltrate into the EOP would be reduced to levels that would not degrade groundwater or surface water in the vicinity of the EOP. Given the results of modeling demonstrating that applicable Idaho water quality standards would be met as needed with application of a GCL-based cover system, haulage of segregated Meade Peak overburden to the Ballard Mine would not have an advantage over Alternatives 1A and 1B.
- Other potential adverse effects of hauling and disposing segregated Meade Peak overburden from the Blackfoot Bridge Mine include haul road modifications, bridge modifications, consumption of fuel in excess of that needed to dispose of the segregated Meade Peak overburden in the EOP, additional haulage traffic and associated noise impacts, an increase of the ultimate overburden footprint necessary to handle the EOP material at both locations, and an increased risk of accidents and spills.
- Portions of the Ballard Mine area, and in particular, the mine overburden placed on the west side of the Ballard West Pit, have altered groundwater quality. It appears probable that remedial actions addressing this area would be needed. In addition, this area may be one of the priorities for remediation in the three inactive mine areas being addressed by the Administrative Order on Consent (AOC) Engineering Evaluations/Cost Analyses (EE/CA) process at the Ballard Mine.
- With the site investigation still in progress, the need and type of remedial actions would be identified in the future, and backfilling the Ballard West Pit with the overburden derived from the Ballard West Pit may be a viable remedial action. Backfilling the Ballard West Pit with overburden from outside of the Ballard Mine area prior to selection of the remedial action for the Ballard Mine would complicate remediation at the Ballard Mine, including premature elimination of currently available potential remediation options. Additionally, data collection characterizing existing site conditions at the Ballard Mine is ongoing, and analysis of the potential effects associated with placement of segregated Meade Peak overburden from the Blackfoot Bridge project into the Ballard West Pit, and development and review of other options pertaining to closure and reclamation of the Ballard West Pit that would serve to meet future requirements associated with the AOC process would be required. Given the timeframe needed to address the AOC process, it is unlikely that a decision regarding the use of the Ballard West Pit would occur within the mining schedule associated with the Blackfoot Bridge project.

All regulatory agencies involved in the AOC EE/CA process, and the probable future Remedial Investigation/Feasibility Study (RI/FS) process (including IDEQ, BLM, USFWS, and EPA), need

to be involved in approving any use of the Ballard West Pit for overburden placement from sources outside of the Ballard Mine, or for any action in the Ballard Mine area. At this time, it appears that placement of the Blackfoot Bridge Mine overburden in the Ballard West Pit does not provide any benefit associated with the AOC EE/CA process and would likely complicate and delay the remedial action selection process. As a result, this alternative was not carried forward for further analysis.

2.7.9 HDPE Cap

Issue: HDPE is a synthetic liner material with properties that are potentially superior to GCLL in some applications for controlling or limiting seepage or infiltration into underlying materials.

This alternative would be similar to Alternatives 1A and 1B, with the exception that it would require P4 to install a welded HDPE synthetic cover. The cover would be placed over all overburden piles and pit backfill areas instead of the GCLL cover.

This alternative was dismissed from further analysis because installation of a welded HDPE synthetic cover on 3H:1V mine overburden slopes has not been satisfactorily demonstrated. The HDPE would be subject to failure from relatively minor differential settling that may occur in the overburden pile and pit backfills. The area covered by HDPE would be complicated to construct, requiring specialized equipment, training, and quality assurance/quality control programs.

This alternative was also eliminated from further consideration because it does not provide performance advantages over Alternatives 1A or 1B in meeting water quality criteria and reclamation goals, and is not economically feasible. The selection of this alternative would result in a 6.4 percent loss in ore compared to the Proposed Action, and a corresponding decline in the life of mine by at least 1 year.

2.7.10 Modified EOP Toe Ditch

Issue: Runoff from the surface of the EOP has the potential to transport selenium and other COPCs to wetlands and non-wetland waters of the U.S. This alternative was developed by P4 in response to USACE comments on the 404 permit application.

This alternative would consist of the construction of a toe ditch along the eastern edge of the EOP as part of an upland water management system at the toe of the EOP. The purpose of the toe ditch is to collect runoff water from the surface of the EOP and divert this water into pond EP1 or the EOP diversion ditch. This would reduce the potential for any runoff water from entering the unnamed tributary to Fish Pond. Under this alternative the modified Fish Pond would remain part of the water management system because of the retention capacity needed during peak runoff periods. The Modified EOP Toe Ditch would be constructed as a trapezoidal shaped ditch with a bottom width of 5 feet and 3H:1V side slopes. A 15-ft wide access and maintenance road would be constructed parallel to the ditch for the entire length. This Alternative would not include water control ponds EP2, EP3, and EP4 and allow for construction of the water management system without direct impact to Wetlands B, C, D, and F.

The revised road and modified ditch design impact the eastern limits of the EOP footprint. To maintain the required capacity of the EOP, the eastern slope of the EOP would be regraded with

additional overburden material being placed on top of the pile. Because of constraints on the western side of the EOP (e.g., haul road between the Mid-Pit and EOP), this regraded configuration does not meet the required capacity for the EOP. As a result, the capacity of the EOP would be reduced by approximately one million cubic yards to accommodate the Modified EOP Toe Ditch and road. Approximately 19 additional acres would be disturbed to construct the Modified EOP Toe Ditch.

This alternative would be comparable to the Interception Ditch along Toe of East Overburden Pile and this alternative would not be practicable for the same reasons discussed in **Section 2.7.3**. Primarily, the alternative would be impracticable because it would require that P4 reduce the size of the EOP and identify an alternative location for placement of approximately one million cubic yards of overburden. Based on geology, topographic restrictions, lease boundaries, land ownership, and haul distances, the EOP site is the only practicable location and there are no additional suitable locations for the placement of a significant quantity of overburden that are as protective of the aquatic resources. In addition, implementing this alternative would not result in significantly less adverse impact on the aquatic ecosystem. The toe ditch would intercept much of the surface flow from the EOP currently reaching wetlands B, C, D, and F, further degrading their functionality. This could cause a reduction in both habitat and food-chain support as compared to alternatives carried forward for detailed analysis. The Modified EOP Toe Ditch would not intercept all shallow groundwater flowing from the EOP area to the unnamed tributary to Fish Pond drainage. This groundwater may be impacted by some metals and then discharge to the unnamed tributary to Fish Pond. Because of the considerable thickness of alluvium along the toe of the EOP (greater than 100 feet in places), the Modified EOP Toe Ditch cannot be constructed to these depths in unconsolidated material, making it impracticable.

2.7.11 Cut-off Wall along EOP Toe Ditch

Issue: Runoff from the surface of the EOP has the potential to transport selenium and other COPCs to wetlands and non-wetland waters of the U.S. This alternative was developed by P4 in response to USACE comments on the 404 permit application.

This alternative would involve the construction of the Modified EOP Toe Ditch as described in **Section 2.7.10** and would add the installation of a cut-off wall coincident with the toe ditch. The purpose of the cut-off wall would be to intercept seepage that bypasses the OSMS or emanates from below the EOP. The cut-off wall would direct seepage into the toe ditch. To achieve this purpose, the cut-off wall would be constructed to key into bedrock underlying the valley fill/alluvium material along the trace of the toe ditch, with the goal of intercepting all groundwater flow within the alluvial material above the alluvial/bedrock contact. This Alternative would not include water control ponds EP2, EP3, and EP4 and allow for construction of the water management system without direct impact to Wetlands B, C, D, and F.

This alternative is impracticable because it would require that P4 reduce the size of the EOP and identify an alternative location for the placement of approximately one million cubic yards of overburden. Based on geology, topographic restrictions, lease boundaries, land ownership, and haul distances, the location of the EOP is the only practicable site and there are no additional suitable locations for the placement of a significant quantity of overburden that are as protective of the aquatic resources.

Implementing this alternative would not result in significantly less adverse impact on the aquatic ecosystem. The modified toe ditch and cutoff wall would intercept much of the surface water and shallow groundwater flow from the EOP currently reaching Wetlands B, C, D and F, further degrading their functionality. This could cause a reduction in both habitat and food-chain support as compared to alternatives carried forward for detailed analysis. In addition to limitations discussed above for the EOP toe ditch, the depth of alluvium and valley fill at some locations would make it impossible to ensure that the cutoff wall would perform as designed.

2.7.12 Partial Modified EOP Toe Ditch

Issue: Runoff from the surface of the EOP has the potential to transport selenium and other COPCs to wetlands and non-wetland waters of the U.S. This alternative was developed by P4 in response to USACE comments on the 404 permit application.

This alternative would consist of the construction of the southern linear half of the Modified EOP Toe Ditch (**Section 2.7.10**). This alternative was selected for analysis because it would avoid having to remove the one million cubic yards of EOP overburden and the EOP footprint would remain the same as the Proposed Action. This portion of the toe ditch would intercept runoff from the southern half of the EOP and would avoid disturbance to Wetlands B, C, and D. A total of 8.15 acres of wetland and non-wetland waters of the U.S. would be directly impacted under this alternative. This alternative would also eliminate the need for EP4 (3.3 acre-feet capacity).

The logistics associated with providing adequate capacity and control of surface water if a toe ditch is installed along a portion of the EOP are similar to and just as intractable as if the toe ditch is installed along the entire base of the EOP. Principal issues associated with this alternative make it not practicable at this site for many of the same reasons presented in **Section 2.7.10**.

The Partial Modified EOP Toe Ditch for this alternative would not intercept all shallow groundwater flowing from the EOP area to the unnamed tributary to Fish Pond drainage. This groundwater may be impacted by some metals and then discharge to the unnamed tributary to Fish Pond. Because of the considerable thickness of alluvium along the toe of the EOP (greater than 100 feet in places), the Partial Modified EOP Toe Ditch cannot be constructed to these depths in unconsolidated material.

Implementing this alternative would not result in significantly less adverse impact on the aquatic ecosystem. The Partial Modified Toe Ditch would intercept much of the flow from the EOP currently reaching Wetlands B, C, and D, further degrading their functionality. This could cause a reduction in both habitat and food-chain support as compared to alternatives carried forward for detailed analysis. Because of the limitations to operation and maintenance of the toe ditch, it is expected that any water that does reach these wetlands from the EOP would potentially be impacted by sediment and metals, reducing the quality of water reaching Wetland X and ultimately the Blackfoot River.

2.7.13 Road Fill Sediment Control Ditch and New Sediment Pond

Issue: Runoff from the surface of the EOP has the potential to transport selenium and other COPCs to wetlands and non-wetland waters of the U.S. This alternative was developed by P4 in response to USACE comments on the 404 permit application.

This alternative would include a modification of the access and maintenance road associated with the Seepage Conveyance Pipeline such that the road base would be further elevated and the fill would allow for sediment control using a roadside ditch and other BMPs on the uphill side of the road. The purpose of this roadside ditch is similar to the Modified EOP Toe Ditch. The road would be constructed above-grade for its length along the toe of the EOP, with the roadside ditch designed to handle the 100-hr/24-hr storm event. Portions of the road that extend around the nose of ridges would require cut-and-fill construction. The EOP footprint would not be changed for this alternative.

To the extent practicable, the bottom of the roadside ditch formed by the road fill material would be sloped to direct runoff water to a new pond constructed at the location proposed for a growth media stockpile located at the northern end of the EOP. Other BMPs that are part of the mine reclamation plan (e.g., silt fences) would be installed between the road and the toe of the EOP to reduce sediment load to surface water captured by the roadside ditch.

Construction of a new pond would require excavation into a side-hill and placement of a hill-side dam. Discharge from this pond could be routed to pond CP1 and then to Wetland X (if water quality meets standards) or to pond CP2 or to WMP1 and WMP2 if water quality is not acceptable for direct discharge. Because of the side-hill location, this pond would have to be excavated deeply into alluvium and would require a dewatering system to be in place around the pond or construction of a liner.

Implementation of this alternative allows for construction of the water management system without direct impact to Wetlands B, C, D, F, G, H, I, J, K, and L and would eliminate ponds EP1, EP2, EP3, EP4, and Fish Pond from the water management system.

The installation of a roadside ditch suffers from many of the same limitations as described for the Modified EOP Toe Ditch, including logistics associated with providing adequate capacity and control of surface water. There are major limitations in being able to construct the roadside ditch to accommodate a 100-yr/24-hr storm event from the EOP area, including excessive heights of the road bed, large cuts along the steeper hillside, and potential saturation of the toe of the overburden pile. Such constraints would result in significant impacts to existing wetlands and waters in the unnamed tributary to Fish Pond. These and other issues associated with the construction and maintenance of the road and ditch, such as frozen conditions in the ditch, make this supplemental alternative technically infeasible and impracticable.

Implementing this alternative would not result in significantly less adverse impact on the aquatic ecosystem. Proximity of the road and ditch to the unnamed tributary to Fish Pond would mean that the increased dimensions of the road base would result in impacts to the waters and wetlands. Moving the road and ditch away from the tributary and wetlands is not feasible because of constraints imposed by the need for overburden placement. Although the existing waters and wetlands would remain jurisdictional, the roadside ditch would intercept much of the flow from the EOP currently reaching the existing waters and wetlands, further degrading their functionality. This could cause a reduction in both habitat and food-chain support as compared to alternatives carried forward for detailed analysis.

2.7.14 Elimination of Discharge to Fish Pond

Issue: Runoff from the surface of the EOP has the potential to transport selenium and other COPCs to wetlands and non-wetland waters of the U.S. This alternative was developed by P4 in response to USACE comments on the 404 permit application.

This alternative would comprise the same components of the water management system contained in the modified Mine Water Management Plan (P4 2010c) and OSMS, except for the Modified Fish Pond. All water that reports to the unnamed tributary to Fish Pond would ultimately collect in pond EP1 located above Fish Pond, where water would discharge via the EOP Diversion Ditch to ponds CP1, CP2, or to WMP1 and WMP2.

EP1, EP2, EP3, and EP4 would remain as designed under P4's modified Mine Water Management Plan. Fish Pond would not be affected under this alternative, but this alternative would result in the loss of 21.8 acre-feet of storage capacity (Modified Fish Pond capacity) for the water management system. This alternative would allow for construction of the water management system without direct impacts to Wetlands I, J, and K, and non-wetland waters associated with Fish Pond. Implementation of this alternative would result in direct impacts to 2.81 acres of wetlands and non-wetland waters of the U.S.

Replacement of the 21.8 acre-feet of lost storage capacity associated with Modified Fish Pond would require increasing the size of other ponds (EP1 through EP4, and CP2), or constructing a new pond. The logistics associated with providing adequate capacity for management of surface water and seeps emanating from the EOP are severely constrained by the geology and topography of the area. Without the use of the land currently occupied by the existing wetlands and tributary channel, attempts to overcome these limitations are infeasible and would likely result in significant impacts to these and other higher functioning wetlands in the project area. As such, this alternative is not practicable.

This alternative would eliminate the flow of surface water from this tributary to Fish Pond and its associated wetlands. Thus, the functionality would be degraded significantly. This could cause a reduction in both habitat and food chain support as compared to the alternatives carried forward for detailed analysis. This alternative would have similar impacts to water quality as described for the Modified EOP Toe Ditch. In addition to the loss of 21.8 acre-feet of storage capacity at the Modified Fish Pond, seepage loss through the OSMS, EP water control ponds, and the alluvial system of the unnamed tributary to Fish Pond would ultimately, at least in part, reach Fish Pond and its associated wetlands. It is expected that this seepage would be impacted by the EOP and contain elevated concentrations of certain metals.

2.7.15 Elimination of Discharge to Fish Pond with Expanded EP1 Dam and Cut-off Wall

Issue: Runoff from the surface of the EOP has the potential to transport selenium and other COPCs to wetlands and non-wetland waters of the U.S. This alternative was developed by P4 in response to USACE comments on the 404 permit application.

Under this alternative, P4 would construct a larger EP1 on the unnamed tributary to Fish Pond than proposed in the original water management system. A cut-off wall would be constructed underneath the dam keyed into bedrock. The cut-off wall would be designed to intercept

groundwater flow in the alluvium of the unnamed tributary to Fish Pond which would cause groundwater to well-up behind the EP1 dam. Water collected behind the EP1 dam would be tested for quality characteristics. If the collected water does not exceed Idaho standards, it would be directed to Fish Pond or pond CP1 where it could be discharged to Wetland X near the Blackfoot River. If water does not meet state standards, it would be discharged to pond CP1 or to WMP1 and WMP2) for evaporation. The expanded EP1 pond would have a capacity of 22.5 acre-feet (compared to its initial design capacity of 8.8 acre-feet). This alternative would result in direct impacts to 2.81 acres of wetlands and non-wetland waters of the U.S.

Replacement of some of the 21.8 acre-feet of lost storage capacity associated with the Modified Fish Pond would be accomplished through the larger impoundment at EP1 (net increase of EP1 pond of 13.7 acre-feet). Additional storage needs may require increasing the size of other ponds (EP2 through EP4, or CP2), or constructing a new pond. The logistics associated with providing adequate capacity for management of surface water and seeps emanating from the EOP are severely constrained by the geology and topography of the area. Because of the proximity of EP1 to the toe of the EOP, expansion of pond EP1 may sacrifice the integrity and stability of the EOP. Without the use of the land currently occupied by the existing wetlands and tributary, attempts to overcome these limitations are infeasible and would likely result in significant impacts to these and other higher functioning wetlands in the project area. This alternative is not practicable.

This alternative does not result in significantly less adverse impact on the aquatic resources. This alternative would eliminate the flow of surface water, as well as shallow groundwater, from this tributary to Fish Pond and its associated wetlands, and ultimately to Wetland X. The functionality of Fish Pond and associated wetlands would be degraded significantly. This could cause a reduction in both habitat and food chain support as compared to the alternatives carried forward for detailed analysis.

Construction of a cut-off wall along the dam would also create other adverse environmental consequences including: saturating OSMS system as water is captured behind the cut-off wall, thereby limiting its functionality; blocking natural groundwater discharge to the unnamed tributary to Fish Pond drainage; creating the need for additional storage capacity resulting from having to manage groundwater intercepted by the cut-off wall; and, problems in eventual removal of the cut-off wall and reestablishing groundwater flow to a condition similar to that which exists naturally and which contributes to the hydrology of wetlands in the unnamed tributary to Fish Pond. Moreover, excavation and removal of the cut-off wall in an effort to achieve pre-mine conditions would create the need for a disposal site for wall materials, as well as development of a borrow area to obtain suitable fill material to place in the cut-off wall trench.

2.8 ALTERNATIVE COMPARISON AND EFFECTS SUMMARY

Table 2.8-1 provides a tabular summary and comparison of potential effects from the Proposed Action and alternatives. Detailed descriptions of potential effects for specific resources are described in **Chapter 4**.

Table 2.8-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	Alternative 1A	Alternative 1B	No Action Alternative
Geology, Minerals, and Paleontology	Removal of 91million bcy of overburden and 8.4 million bcy of phosphate ore.	Removal of 91million bcy of overburden and 8.4 million bcy of phosphate ore.		No phosphate would be removed from Blackfoot Bridge Mine under 2008 Revised Mine Plan submittal; however, P4 has rights to mine the leases it currently holds.
	Currently undisturbed and buried rock exposed to weathering processes with minor release of COPCs.	Currently undisturbed and buried rock exposed to weathering processes with minor release of COPCs.		No mining activities that would expose buried rock from 2008 Revised Mine Plan submittal.
	Modification of 739 acres of natural terrain; 65 acres reclaimed as pit highwall would represent long-term modification.	Modification of 768 acres of natural terrain; 65 acres reclaimed as pit highwall would represent long-term modification.		No terrain modified or mining activities from 2008 Revised Mine Plan submittal.
	A potential for minor instability of slopes due to the reclaimed landscape for roads, overburden piles, and mine pits.	A potential for minor instability of slopes due to the reclaimed landscape for roads, overburden piles, and mine pits.		No reclamation of the terrain modified or mining activities from 2008 Revised Mine Plan submittal.
	Potential for paleontological resources contained in undisturbed geologic formations could be destroyed.	Potential for paleontological resources contained in undisturbed geologic formations could be destroyed.		No effects on paleontological resources from 2008 Revised Mine Plan submittal.
Air Resources	Minor annual fugitive dust emissions from mining operations estimated at 138 tons/year due to vehicle traffic and material handling activity however, these emissions would replace emissions associated with current operations at the South Rasmussen Mine.	Minor emissions expected to be slightly higher than under Proposed Action due to increased vehicle traffic and material handling activity related to the cover designs. However, these emissions would replace emissions associated with current operations at the South Rasmussen Mine.		No effects to air quality from 2008 Revised Mine Plan submittal. Declining impacts to regional air quality over time as South Rasmussen Mine ore is depleted and the mine is closed.

Table 2.8-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	Alternative 1A	Alternative 1B	No Action Alternative
	Minor gaseous emissions from fuel combustion and explosives however, these emissions would not increase over current operations at the South Rasmussen Mine.	Minor gaseous emissions from fuel combustion and explosives however, these emissions would not increase over current operations at the South Rasmussen Mine.		No effects to air quality from 2008 Revised Mine Plan submittal. Declining impacts to regional air quality over time as South Rasmussen Mine ore is depleted and the mine is closed.
Noise	Minor noise levels would be below the EPA guideline of 55 dBA for each source (except blasting) at nearest sensitive noise receptors.	Minor noise levels expected to be slightly higher than under Proposed Action due to increased vehicle traffic and material handling activity related to the cover designs.		No noise effects from 2008 Revised Mine Plan submittal.
	Moderate short-term blasting noise would exceed 55 dBA at nearest sensitive noise receptors.	Moderate short-term blasting noise would exceed 55 dBA at nearest sensitive noise receptors.		No noise effects from 2008 Revised Mine Plan submittal.
Climate	Mine related activities would result in greenhouse gas emissions but would have a negligible contribution to climate change.	Mine related activities would result in greenhouse gas emissions but would have a negligible contribution to climate change.		No generation of greenhouse gases from 2008 Revised Mine Plan submittal.
Water Resources	Alteration of natural surface water flow in the project area following reclamation would be negligible.	Alteration of natural surface water flow in the project area following reclamation would be negligible.		No disruption surface water flow.
	Disturbance areas would not cause increased sediment load in drainages of the Blackfoot River because of the application of water management systems and BMPs.	Disturbance areas would not cause increased sediment load in drainages of the Blackfoot River because of the application of water management structures and BMPs.		No increased sediment load from 2008 Revised Mine Plan submittal.
	Construction of water management ponds and potential placement of rock fill in the unnamed tributary to Blackfoot River and would affect springs and alter natural surface water flow in the drainage.	Construction of water control ponds and potential placement of rock fill in the unnamed tributary to Blackfoot River and would affect springs and alter natural surface water flow in the drainage.		No disruption of the channel or spring flows.
	Excavation of South Pit could	Excavation of South Pit could permanently		No disruption of flow in Wetland A

Table 2.8-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	Alternative 1A	Alternative 1B	No Action Alternative
	intercept the shallow alluvial groundwater supply for Wetland A Spring and could cause Wetland A to partially or completely dry up. Upon completion of mining and backfilling using appropriate practices and materials, some or all flow to Wetland A may be re-stored.	intercept the shallow alluvial groundwater supply for Wetland A Spring and could cause Wetland A to partially or completely dry up. Upon completion of mining and backfilling using appropriate practices and materials, some or all flow to Wetland A may be re-stored.		Spring.
	Short-term reduction in the amount of groundwater flow to Blackfoot River, Woodall Spring, and North Woodall Spring during mine dewatering.	Short-term reduction in the amount of groundwater flow to Blackfoot River, Woodall Spring and North Woodall Spring during mine dewatering.		No change in existing groundwater or spring flow.
	Water quality in Blackfoot River and surface water in the unnamed tributary potentially adversely affected by COPC loading from overburden/backfill seepage.	Potential COPC loading to Blackfoot River and the unnamed tributary to the Blackfoot River would be minimal.	Potential COPC loading to Blackfoot River and the unnamed tributary to Blackfoot River would be minimal.	No change in COPC loading to surface water.
	Depth to groundwater would be temporarily increased by groundwater pumping during mine dewatering. Long-term changes in groundwater levels would occur because of reduced infiltration through capped overburden and backfill.	Temporary effects to groundwater levels would be similar to the Proposed Action. Long-term changes would be slightly greater.	Temporary effects to groundwater levels would be similar to the Proposed Action and Alternative 1A. Long-term changes would be slightly greater than for Proposed Action and Alternative 1A.	No change to water levels in the project area.

Table 2.8-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	Alternative 1A	Alternative 1B	No Action Alternative
	Increased loading of COPCs to groundwater resulting in selenium and manganese concentrations that exceed applicable groundwater standards outside of the project boundary.	Potential loading of COPCs to groundwater reduced to below groundwater standards.	Potential loading of COPCs to groundwater reduced to below groundwater standards.	No change in groundwater quality from the existing condition.
Soils	Approximately 739 acres of soil would be disturbed. Soil erosion and sedimentation within disturbed area controlled with BMPs.	Approximately 768 acres of soil would be disturbed. Soil erosion and sedimentation within disturbed area controlled with BMPs.		No soils would be disturbed under 2008 Revised Mine Plan submittal.
	Total reclaimed area of 674 acres, 65 acres of unreclaimed pit highwalls.	Total reclaimed area of 703 acres, 65 acres of unreclaimed pit highwalls.		No unreclaimed areas from 2008 Revised Mine Plan submittal. No reclamation necessary.
	Loss of soil productivity during salvage and replacement of growth media.	Loss of soil productivity during salvage and replacement of growth media.		No soil impacts from 2008 Revised Mine Plan submittal.
	The Proposed Action would include 739 acres of surface disturbance of which 674 acres would be reclaimed. The additional 65 acres would consist of pit highwalls with steep slopes that would be impractical to reclaim. Approximately 1.6 million bcy of primary plant growth medium (PPGM) would be used to cover the proposed reclamation area of 674 acres with 18 inches of PPGM. To meet the design criteria for the	The use of the GCLL and Simple 1 cover systems would require increased amounts of "weathered alluvium" for construction. To meet the design criteria for the GCLL cap, a thickness of 2.5 feet (18 inches of topsoil and 12 inches of alluvium) over an area of 703 acres, would require excavation of approximately 2.6 million bcy of cover material. This represents an increase of about 1 million bcy compared to the Proposed Action.		No reclamation would be necessary.

Table 2.8-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	Alternative 1A	Alternative 1B	No Action Alternative
	Simple 1 cap, a thickness of 2.5 feet (18 inches of topsoil and 12 inches of alluvium) over an area of 35 acres, would require excavation of approximately 141,000 bcy.			
Vegetation, Riparian Areas, and Wetlands	Upland vegetation communities altered on 725 acres of new disturbance, including aspen 149 acres, mixed needleleaf/broadleaf forest 118 acres, and sagebrush 458 acres.	Upland vegetation communities altered on 755 acres of new disturbance, including aspen 151 acres, mixed needleleaf/broadleaf forest 131 acres, and sagebrush 473 acres.		No effected vegetation under 2008 Revised Mine Plan submittal.
	Replacement of forest and shrub communities with grass and forb communities except on 65 acres that would remain as pit highwall.	Replacement of forest and shrub communities with grass and forb communities except on 65 acres that would remain as pit highwall.		No removal of vegetation would occur.
	Many plant roots could reach seleniferous materials and accumulate selenium. Effects to vegetation could include proliferation of selenium-tolerant plants on reclaimed sites.	A revised seed mix with shallow rooting species would be developed and approved by the agencies. The GCLL would limit root penetration into seleniferous materials.		Selenium accumulation would remain at current levels.
	Direct disturbance to 6.11 acres of wetlands and 3.32 acres of non-wetland waters of the U.S.	Direct disturbance to 6.11 acres of wetlands and 3.32 acres of non-wetland waters of the U.S.		No wetlands or non-wetland waters of the U.S. would be effected under 2008 Revised Mine Plan submittal.
	3.21 functional wetland units lost. Restoration of wetland and riparian areas adjacent to Blackfoot River would provide 3.21 functional	3.21 functional wetland units lost. Restoration of wetland and riparian areas adjacent to Blackfoot River would provide 3.21 functional units to offset disturbance effects. Remainder of		No functional wetland units lost under 2008 Revised Mine Plan submittal and no mitigation required.

Table 2.8-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	Alternative 1A	Alternative 1B	No Action Alternative
	units to offset disturbance effects. Remainder of required mitigation would be provided by construction of new wetlands adjacent to State Land Creek or Blackfoot River.	required mitigation would be provided by construction of new wetlands, adjacent to Blackfoot River on P4's Fox Hills Ranch.		
	Excavation of South Pit could permanently intereept the shallow alluvial groundwater supply for Wetland A Spring and could cause Wetland A to partially or completely dry up. Upon completion of mining and backfilling using appropriate practices and materials, some or all flow to Wetland A may be re-stored.	Excavation of South Pit could permanently intercept the shallow alluvial groundwater supply for Wetland A Spring and could cause Wetland A to partially or completely dry up. Upon completion of mining and backfilling using appropriate practices and materials, some or all flow to Wetland A may be re-stored.		No disruption of flow in Wetland A Spring.
	Noxious weeds and exotic plant species would be controlled through BMPs and weed control programs. Due to the incorporation of BMPs into the project design, the potential for the establishment of noxious weeds is minimized, and therefore, impacts from noxious weeds are anticipated to be short-term and minor	Noxious weeds and exotic plant species would be controlled through BMPs and weed control programs. Due to the incorporation of BMPs into the project design, the potential for the establishment of noxious weeds is minimized, and therefore, impacts from noxious weeds are anticipated to be short-term and minor.		No potential for noxious weed expansion resulting from 2008 Revised Mine Plan submittal.
	Replacement of 267 acres of forest with grass-dominated community, shifting much of project area from	Replacement of 282 acres of forest with grass-dominated community, shifting much of project area from Aspen/Conifer and Dry		There would be no removal of vegetation under 2008 Revised Mine Plan submittal.

Table 2.8-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	Alternative 1A	Alternative 1B	No Action Alternative
	Aspen/Conifer and Dry Conifer fire regimes to Perennial Grass fire regime.	Conifer fire regimes to Perennial Grass fire regime.		
Terrestrial Wildlife	Direct loss of habitat on 739 acres, displacing wildlife from direct effect areas. 674 acres would be reclaimed with soil replacement and seeding; but with a shift in community composition.	Direct loss of habitat on 774 acres, displacing wildlife from direct effect areas. 703 acres would be reclaimed with soil replacement and seeding, but with a shift in community composition.		No habitat loss or displacement of wildlife would occur under 2008 Revised Mine Plan submittal.
	Negligible to major effects from selenium exposure could occur, depending on mobility and the susceptibility of the affected species.	Decrease in potential for selenium exposure to wildlife compared to the Proposed Action. Use of shallow rooting plant species, installation of drainage layer, and additional synthetic layer in GCLL cover would limit potential for root or animal burrowing penetration.	Potential for selenium exposure to wildlife lower than under the Proposed Action or Alternative 1A. Use of shallow rooting plant species, installation of drainage layer, and additional synthetic layer in GCLL cover would limit potential for root or animal burrowing penetration.	No exposure of wildlife to elevated selenium levels beyond what may occur naturally in the vicinity of the project area.
	Effects to big game include direct disturbance to winter range (155 acres), short-term displacement,	Effects to big game include direct disturbance to winter range (168 acres), short-term displacement due to noise and activity, and		No effects to big game resulting from 2008 Revised Mine Plan submittal.

Table 2.8-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	Alternative 1A	Alternative 1B	No Action Alternative
	and habitat fragmentation, due to noise and activity, and temporary increase in forage quality following reclamation.	temporary increase in forage quality following reclamation.		
	Effects to raptors, including bald eagles, could result due to noise and activity. An Eagle Management Plan has been prepared to reduce potential effects to bald eagles.	Effects to raptors, including bald eagles, could result due to noise and activity. An Eagle Management Plan has been prepared to reduce potential effects to bald eagles.		No effect to raptors beyond what already occurs in the vicinity of the project area.
	65 acres of migratory bird habitat lost in the long-term; avian species affected by habitat alteration, habitat fragmentation, possible direct mortality and disturbance.	65 acres of migratory bird habitat lost in the long-term; avian species affected by habitat alteration, habitat fragmentation, possible direct mortality and disturbance.		No effect to migratory birds beyond what already occurs in the vicinity of the project area.
	Long-term loss of 267 acres of forest habitat and 458 acres of marginal mountain big sagebrush habitat for sage grouse.	Long-term loss of 282 acres of forest habitat and 473 acres of marginal mountain big sagebrush habitat for sage grouse.		No disturbance to grouse beyond what already occurs in the vicinity of the project area.
	Depending on dosage and exposure to COPCs, potential direct mortalities of reptiles, amphibians, and water birds using Fish Pond area could result.	Depending on dosage and exposure to COPCs, potential direct mortalities of reptiles and amphibians using Fish Pond area could result.		No disturbance to reptiles and amphibians beyond what already occurs in the vicinity of the project area.
Fisheries and Aquatic Resources	Direct loss of 9.43 acres of waters in the project area (6.11 acres of wetlands and 3.32 acres of non-wetland waters of the U.S.).	Direct loss of 9.43 acres of waters in the project area (6.11 acres of wetlands and 3.32 acres of non-wetland waters of the U.S.).		No wetlands or non-wetlands waters of the U.S. would be impacted under 2008 Revised Mine Plan submittal.

Table 2.8-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	Alternative 1A	Alternative 1B	No Action Alternative
	The amounts of sediment in runoff within project area drainages would be minor. The effects to aquatic species in the Blackfoot River would be negligible. Implementation of proposed water management system and BMPs would help prevent sediment from discharging into streams.	The amounts of sediment in runoff within project area drainages would be minor. The effects to aquatic species in the Blackfoot River would be negligible. Implementation of proposed water management system and BMPs would help prevent sediment from discharging into streams.		No increased sedimentation resulting from 2008 Revised Mine Plan submittal.
	Selenium could enter streams and wetlands near the project area and bioaccumulate in aquatic food chains. Implementation of proposed water management system and BMPs would limit selenium and other COPC concentration in streams.	Potential for selenium to enter water bodies would be reduced in comparison to the Proposed Action and would not exceed water quality standards. Use of shallow rooting plant species, installation of drainage layer, and additional synthetic layer in GCLL cover would limit potential for root or animal burrowing penetration.	Potential for selenium to enter water bodies would be reduced in comparison to Proposed Action or Alternative 1A and would not exceed water quality standards. Use of shallow rooting plant species, installation of drainage layer, and additional synthetic layer in GCLL cover would limit potential for root or animal burrowing penetration.	No potential for selenium accumulation resulting from 2008 Revised Mine Plan submittal.

Table 2.8-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	Alternative 1A	Alternative 1B	No Action Alternative
Threatened, Endangered, and Special Status Species	There is one listed species that may occur in the vicinity of the project area, the gray wolf. The gray wolf is listed as a nonessential experimental population in the portion of Idaho south of Interstate 90. However, the Proposed Action will not jeopardize the continued existence of this non-essential experimental population. There are no other proposed or listed threatened or endangered species or any designated or proposed critical habitat within the project area and, therefore, the Proposed Action would not result in any effects to threatened and endangered species or critical habitat.	There is one listed species that may occur in the vicinity of the project area, the gray wolf. The gray wolf is listed as a nonessential experimental population in the portion of Idaho south of Interstate 90. However, the Proposed Action will not jeopardize the continued existence of this non-essential experimental population. There are no other proposed or listed threatened or endangered species or any designated or proposed critical habitat within the project area and, therefore, Alternatives 1A and 1B would not result in any effects to threatened and endangered species or critical habitat.		No potential for impacts to threatened and endangered species or critical habitat from 2009 Revised Mine Plan submittal.
	Long-term loss of 267 acres of habitat for forest-dependent special status species such as flammulated owl, olive-sided flycatcher, and red-naped sapsucker. Long-term loss of 458 acres of habitat for sagebrush-dependent special status species such as greater sage grouse and Brewer's sparrow.	Long-term loss of 282 acres of habitat for forest-dependent special status species such as flammulated owl, olive-sided flycatcher, and red-naped sapsucker. Long-term loss of 473 acres of habitat for sagebrush-dependent special status species such as greater sage grouse and Brewer's sparrow.		No loss of special status species habitat from 2008 Revised Mine Plan submittal.

Table 2.8-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	Alternative 1A	Alternative 1B	No Action Alternative
	Complies with the *Management Plan for Conservation of Yellowstone Cutthroat Trout in Idaho.*	Complies with the *Management Plan for Conservation of Yellowstone Cutthroat Trout in Idaho.*		No action that would necessitate compliance with trout management plan.
	Depending on dosage and exposure to COPCs, direct mortality of leopard frogs inhabiting Fish Pond could result.	Depending on dosage and exposure to COPCs, direct mortality of leopard frogs inhabiting Fish Pond could result.		No direct mortality of leopard frogs beyond what already occurs in the project area.
	Depending on dosage and exposure to selenium and other COPCs and the mobility and susceptibility of the affected species, negligible to major effects could occur.	Potential for selenium exposure to special status species would be reduced in comparison to the Proposed Action. Use of shallow rooting plant species, installation of drainage layer, and additional synthetic layer in GCLL cover would limit potential for root or animal burrowing penetration.	Potential for selenium exposure to special status species would be reduced in comparison to the Proposed Action or Alternative 1A. Use of shallow rooting plant species, installation of drainage layer, and additional synthetic layer in GCLL cover would limit potential for root or animal burrowing penetration.	No exposure of special status species to elevated selenium levels beyond what may occur in the vicinity of the project area.

Table 2.8-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	Alternative 1A	Alternative 1B	No Action Alternative
Visual Resources	The facilities would be evident to viewers, but would not dominate the landscape as viewed from the road and would be considered a major impact until reclamation. After reclamation, there would be minor impact because the facilities would harmonize with the surrounding landscape. Proposed project would meet VRM Class IV objectives.	The facilities would be evident to viewers, but would not dominate the landscape as viewed from the road and would be considered a major impact until reclamation. After reclamation, there would be minor impact because the facilities would harmonize with the surrounding landscape. Proposed project would meet VRM Class IV objectives.		No effects on visual resources from 2008 Revised Mine Plan submittal.
Land Use and Access	Disturbance to 372 acres used for grazing, most of which would be short-term. There would be 65 acres of unreclaimed pit highwalls which would be a long-term disturbance.	Disturbance to 416 acres used for grazing, most of which would be short-term. There would be 65 acres of unreclaimed pit highwalls which would be a long-term disturbance.		No effects on grazing resources from 2008 Revised Mine Plan submittal.
	Short-term disturbance to 76 acres of public land currently available for public use.	Short-term disturbance to 98 acres of public land currently available for public use.		No effects on recreational hunting from 2008 Revised Mine Plan submittal.
Cultural Resources	No historic properties affected. One historic property within the mine permit area (10CU260) should be protected from any future disturbance.	No historic properties affected. One historic property within the mine permit area (10CU260) should be protected from any future disturbance.		There would be no action and no effects to historic properties.

Table 2.8-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	Alternative 1A	Alternative 1B	No Action Alternative
Tribal Treaty Rights and Interests	Shoshone-Bannock Tribes access to land to exercise treaty rights and traditional uses would be interrupted during mine development, operation and initial reclamation. Access to active portions of the mine would not be allowed.	Shoshone-Bannock Tribes access to land to exercise treaty rights and traditional uses would be interrupted during mine development, operation and initial reclamation. Access to active portions of the mine would not be allowed.		Public access would continue at the present rate.
	Disturbance and displacement of plant and wildlife species used for traditional purposes and subsistence. See resource sections for discussions of effects (Vegetation, Riparian Area, and Wetlands; Terrestrial Wildlife; Fisheries and Aquatic Resources). On disturbed and reclaimed areas, forest and shrub communities would be replaced with grass and forb communities.	Disturbance and displacement of plant and wildlife species used for traditional purposes and subsistence. See resource sections for discussions of effects (Vegetation, Riparian Area, and Wetlands; Terrestrial Wildlife; Fisheries and Aquatic Resources). On disturbed and reclaimed areas, forest and shrub communities would be replaced with grass and forb communities.		No disturbance or displacement of plant and wildlife species used for traditional purposes and subsistence under 2008 Revised Mine Plan submittal.
Social and Economic Conditions	Mining employment maintained, community stability enhanced, continued payment of local, state, and federal taxes by P4 and its employees.	Mining employment maintained, community stability enhanced, continued payment of local, state, and federal taxes by P4 and its employees.		Decline in mining employment opportunities, tax revenues, and revenues paid into the local economy through operating expenditures and payroll.

Table 2.8-1 Alternative Comparison and Effects Summary

Resource	Proposed Action	Alternative 1A	Alternative 1B	No Action Alternative
	The estimated total federal royalties could be $39 million over the 17-year life of the Blackfoot Bridge Mine. The state would receive an estimated average annual payment of $1.0 million, of which an average annual amount of $100,000 would be received by Caribou County.	The estimated total federal royalties could be $39 million over the 17-year life of the Blackfoot Bridge Mine. The state would receive an estimated average annual payment of $1.0 million, of which an average annual amount of $100,000 would be received by Caribou County.		No royalties resulting from 2008 Revised Mine Plan submittal.
	No effects expected on population size, housing, or need for community services.	No effects expected on population size, housing, or need for community services.		County population may decrease as unemployed workers leave the area; loss of tax revenue could jeopardize community services.
Environmental Justice	Issues associated with environmental justice would not be affected by the Proposed Action.	Issues associated with environmental justice would be the same as for the Proposed Action.		There would not be any issues associated with environmental justice.
Hazardous Materials and Waste	There would be no anticipated effects of mining activities contributing to hazardous materials entering the environment.	There would be no anticipated effects of mining activities contributing to hazardous materials entering the environment.		No hazardous materials resulting from the 2008 Revised Mine Plan submittal.
	The fate and transport of hazardous materials due to mining would continue at the present rate.	The fate and transport of hazardous materials due to mining would continue at the present rate.		Traffic would continue at the present rate.

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CHAPTER 3

AFFECTED ENVIRONMENT

CHAPTER 3
AFFECTED ENVIRONMENT

This chapter describes the environment that would be affected by the development of the Proposed Action and alternatives including the No Action Alternative. The environmental baseline information summarized in this chapter was obtained from field and laboratory studies of the project area, published information sources, unpublished materials, and communication with relevant government agencies and private individuals with knowledge of the area. The affected environment for individual resources was delineated based on the area of potential direct and indirect environmental impacts for the proposed project. For some resources, such as geology, soils, and vegetation, the affected area was determined to be the physical location and immediate vicinity of the areas to be disturbed by the project. For other resources, such as water resources, air quality, and social and economic values, the affected environment comprised a larger area (e.g., watershed, airshed, local communities). The area of potential effects for Alternatives 1A and 1B is slightly greater than the area of potential effects for the Proposed Action. That difference is addressed in **Chapter 4 - Environmental Consequences**. This chapter is organized by environmental resources, and **Sections 3.1** through **3.14** describe the existing conditions associated with these resources.

3.1 GEOLOGY, MINERALS AND PALEONTOLOGY

3.1.1 Geologic Setting

The study area straddles the boundary between the Basin and Range and Rocky Mountain Physiographic Provinces. The transition between the two provinces occurs at the western edge of the Aspen Range with the western region (Basin and Range) consisting of wide, deeply filled, flat basins separated by block-faulted mountains and the eastern region (Rocky Mountain) consisting of subparallel folded mountain ranges separated by thinly filled valleys (Mabey and Oriel 1970; Fenneman 1917). A geologic map and cross-sections for the study area are shown in **Figures 3.1-1**, **3.1-2**, and **3.1-3**.

Rocks in the study area range from Paleozoic to recent in age and include Quaternary-age alluvium, colluvium, basalt, rhyolite, tuff, and travertine and Pennsylvanian to Triassic-age limestone, dolomite, chert, shale, and siltstone. Phosphatic shale and siltstone from Meade Peak Member of the Phosphoria Formation (Permian-age) were deposited in an interior marine basin that extended across parts of Idaho, Utah, Wyoming, and southwestern Montana (Perkins and Piper 2004). The basin had a maximum depth of 1,000 to 1,600 feet and was an area of moderate to intense upwelling caused by the equatorial surface current (Hein 2004). Upwelling brought cold, nutrient-rich water to the surface, causing increased algal and plankton productivity. The resulting steady rain of organic debris on the former seafloor is the source of the high-grade phosphorite deposits (Hein 2004, Piper and Link 2002, Moyle and Piper 2004).

The Phosphoria Formation was buried and compacted after deposition by about 2.6 miles of sedimentary overburden (Edman and Surdam 1984). Compressional forces during the Laramide mountain building (late Cretaceous to Eocene time) formed the dominant regional structural fabric of northwest-trending anticlines and synclines and may have added 5.6 to 7.4 miles of

tectonic overburden above the Permian rocks (Evans 2004, DeCelles et al. 1993, Armstrong and Oriel 1965). Subsequent uplift and erosion exposed the Phosphoria Formation over a large portion of the South East Idaho Phosphate District as it is currently observed today. Block faulting related to Basin and Range extension began about 17 million years ago and continues to the present. Several episodes of volcanic activity occurred relatively late in the geologic history of the area. Most of the volcanic rocks are Pleistocene in age, but some are as old as Pliocene (Mabey and Oriel 1970). The overwhelming majority of the volcanic rocks are basaltic and occur in the Blackfoot Lava Field west and north of the project area. Rhyolitic rocks also are present south of Blackfoot Reservoir and near the crest of the Aspen Range. The most recent phase of volcanism occurred less than 100,000 years ago.

3.1.2 Mineral Resources

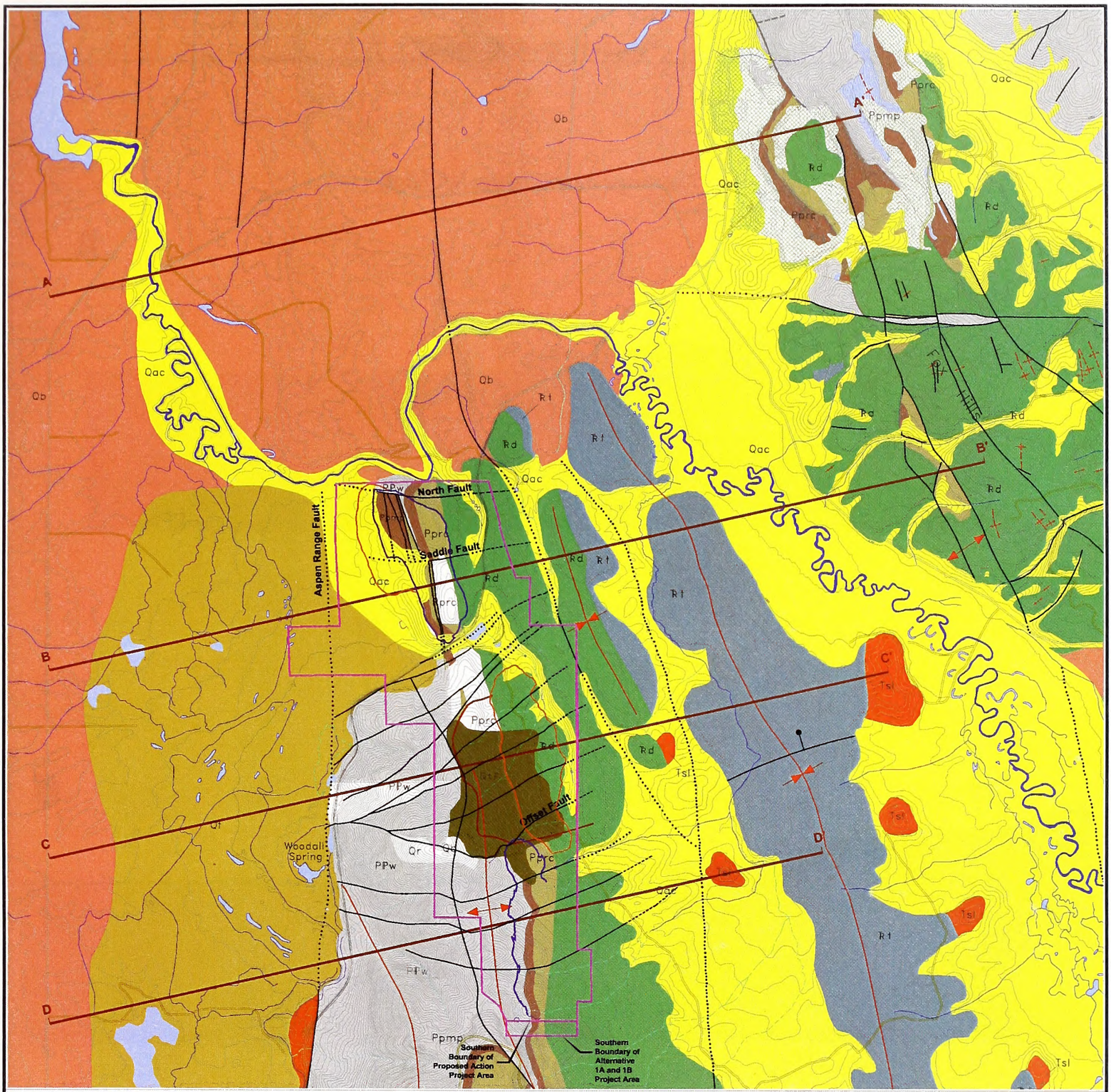
During the Permian Period, the Phosphoria Formation was deposited in a deep basin, at depths of up to a few hundred meters over a large area of eastern Idaho, northern Utah, western Wyoming, and southwestern Montana (Piper 2004). The Phosphoria Formation forms the western phosphate field and comprises one of the world's largest known reserves of phosphate. The phosphate-bearing Meade Peak Phosphatic Shale Member of the Phosphoria Formation is described above.

The most important mineral commodity in the Blackfoot Bridge Mine area is the phosphate rock of the Meade Peak Phosphatic Shale Member of the Phosphoria Formation. This rock is composed of carbonate fluorapatite minerals that occur as nodules, pisolites, oolites, pellets, and fossil fragments, along with organic matter and quartz, muscovite, and calcite as accessory minerals, and very small amounts of such metals as vanadium, uranium, chromium, nickel, and rare earths. Minor phases, such as pyrite and sphalerite, have also been identified in the deposit (Piper 2004).

Phosphate is a leasable mineral and one of a group of minerals named in the Mineral Leasing Act of 1920, as amended. Leasable minerals include oil, gas, geothermal, uranium, coal, and non-energy common minerals (sand, gravel, cinders). These minerals have widespread occurrence and purchasing a Federal or State lease gives an operator the right to mine these minerals. Leasable minerals are in contrast to locateable minerals for which a claim is staked after an ore body is found. Locateable minerals are those with intrinsic value and include base and precious metals and others with very specific chemical composition.

3.1.3 Stratigraphy

The stratigraphic section for the study area includes a thick sequence of carbonate and clastic sedimentary rocks overlain by younger volcanic rocks and unconsolidated deposits. Detailed stratigraphic descriptions of the regional geology are available from studies prepared by Mansfield (1927), Petrun (1999), and Murchey (2004). Numerous other researchers have also added to the geologic understanding of the area, including Mabey and Oriel (1970), Armstrong et al. (1975), and Oriel and Platt (1980). The following stratigraphic descriptions are compiled from geologic literature for the region and are supplemented by site-specific data from the Blackfoot Bridge Exploration Drilling Program and baseline studies. A generalized stratigraphic section for the study area is presented in **Figure 3.1-4**. Lithologic units are discussed in order from oldest to youngest.



LEGEND

- PROJECT BOUNDARY
- PROPOSED OPEN PIT
- PROPOSED OVERBURDEN PILE
- PERENNIAL STREAM OR RIVER
- INTERMITTENT STREAM
- RESERVOIR, LAKE OR POND
- FAULT (DOTTED WHERE CONCEALED; DASHED WHERE COVERED)
- SYNCLINAL AXIS
- ANTCLINAL AXIS
- A — LINE OF CROSS-SECTION
- EXISTING OVERBURDEN PILE

MAP UNITS

- Qac — ALLUVIUM AND COLLUVIUM
- Qt — TRAVERTINE
- Qb — BASALT
- Qr — RHYOLITE DOME
- Qtf — RHYOLITE TUFF
- Tsl — SALT LAKE FORMATION
- Rt — THAYNES FORMATION
- Rd — DINWOODY FORMATION
- Pprc — PHOSPHORIA FORMATION - REX CHERT MEMBER
- Ppmp — PHOSPHORIA FORMATION - MEADE PEAK MEMBER
- PPw — WELLS FORMATION / PARK CITY FORMATION - GRANDEUR MEMBER

Source: Mansfield 1927; Onel and Platte 1980, and Carpenter 2009

Cross-sections shown on Figures 3.1-2 and 3.1-3

NORTH

2,000' 0 2,000' 4,000'

BLACKFOOT BRIDGE PROJECT EIS

FIGURE 3.1-1
Geologic Map of Project and Surounding Area

ANALYSIS AREA: Caribou County, Idaho	
Date: 08/06/10	File: Geologic Map.dwg
Drawn By: SE	Layout: Geologic Map 8.5x11

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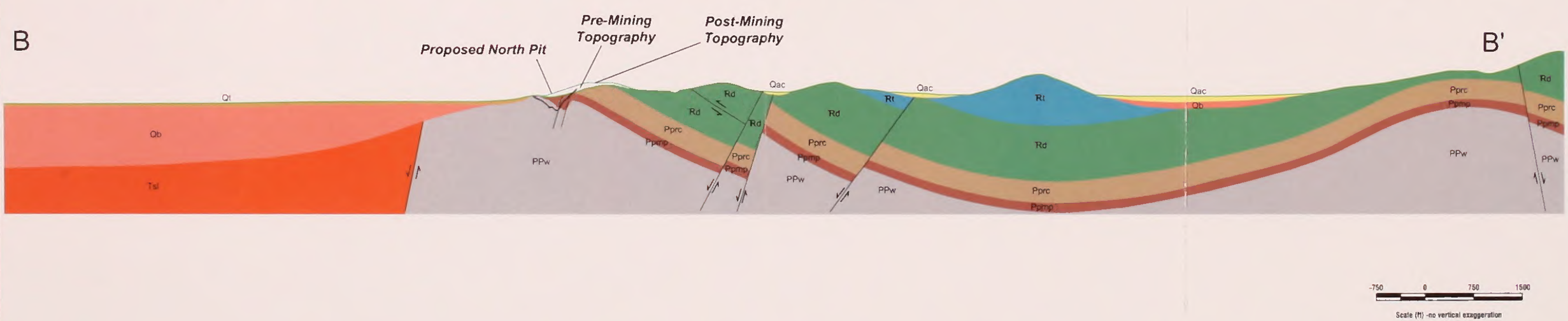
Geologic Cross-Section A - A'

Geologic Cross-Section B - B'



LEGEND AND DESCRIPTION OF MAP UNITS

Oac	ALLUVIUM AND COLLUVIUM	TRt	THAYNES FORMATION	PPw	WELLS FORMATION / PARK CITY FORMATION - GRANDEUR MEMBER
Qt	TRAVERTINE	TRd	DINWOODY FORMATION	Mb	BRAZIER LIMESTONE
Ob	BASALT	Pprc	PHOSPHORIA FORMATION - REX CHERT MEMBER		FAULT
Tsl	SALT LAKE FORMATION	Ppmp	PHOSPHORIA FORMATION - MEADE PEAK MEMBER		PIT OUTLINE

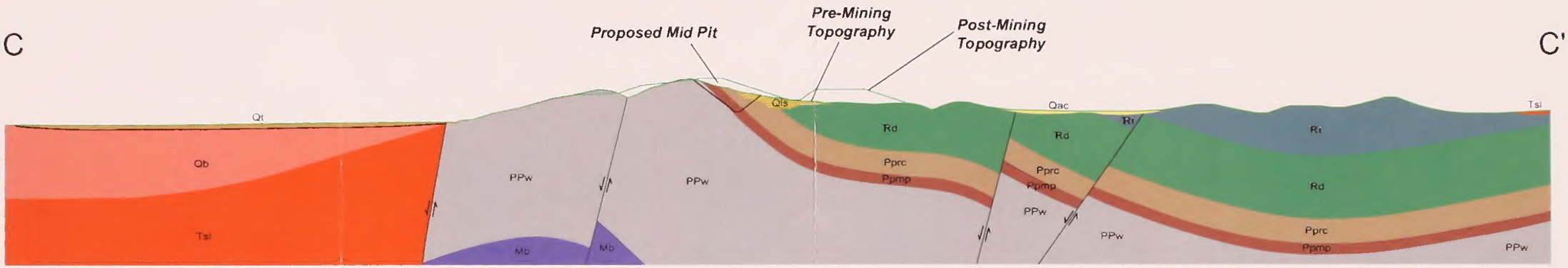
Cross section lines shown on Figure 3.1-1

BLACKFOOT BRIDGE PROJECT EIS

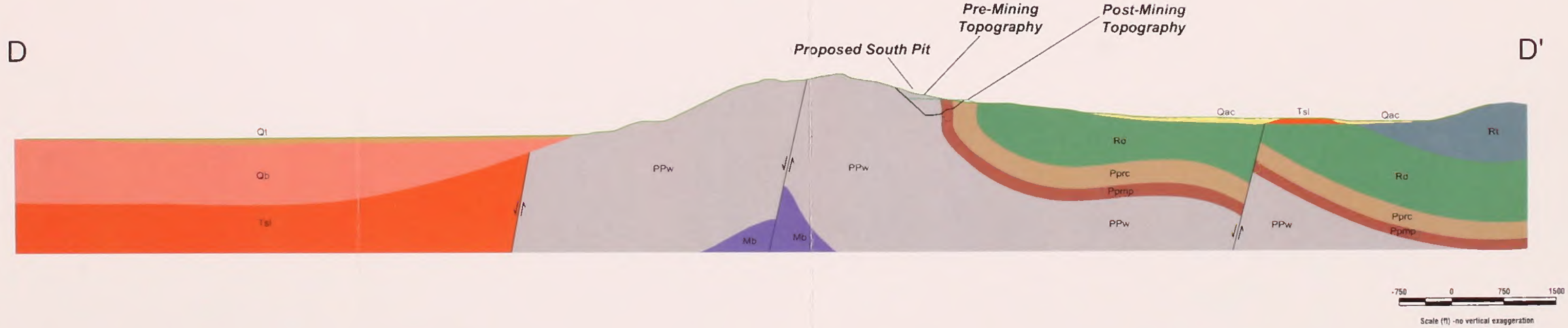
FIGURE 3.1-2
Geologic Cross-Sections
A - A' and B - B'

ANALYSIS AREA: Caribou County, Idaho	
Date: 07/23/10	File: Geo-Cross Sections.dwg
Drawn By: EC	Layout: Cross Sections A and B

Geologic Cross-Section C - C'



Geologic Cross-Section D - D'



LEGEND AND DESCRIPTION OF MAP UNITS

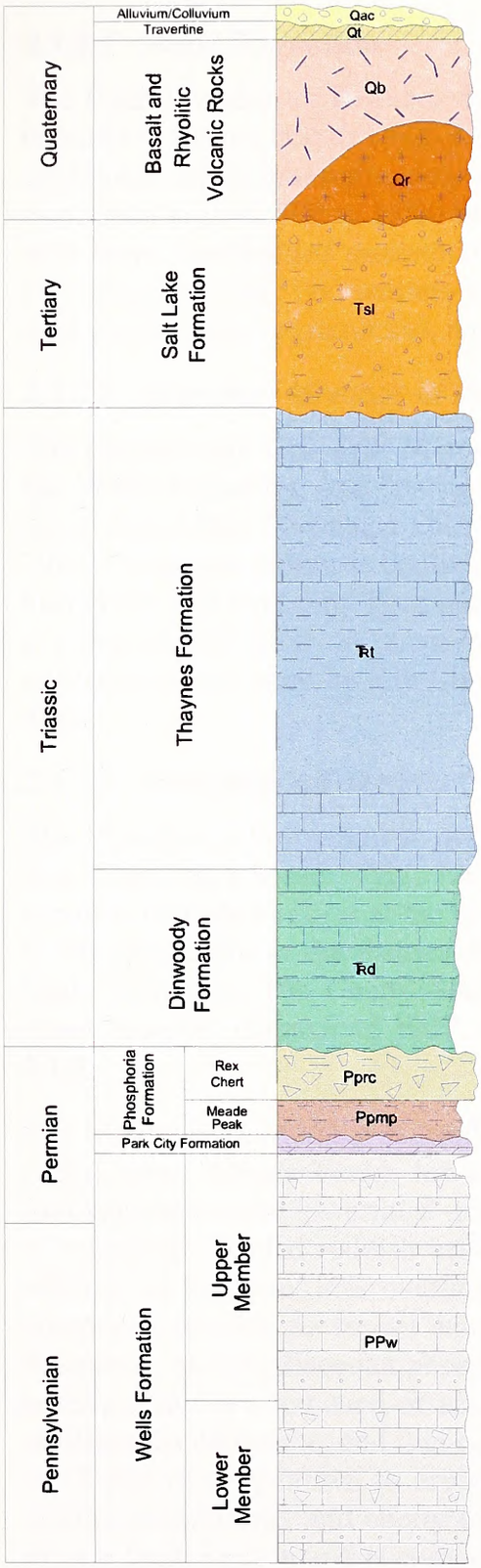
Oac	ALLUVIUM AND COLLUVIUM	TSl	SALT LAKE FORMATION	Ppmp	PHOSPHORIA FORMATION - MEADE PEAK MEMBER
Qls	LANDSLIDE	TRt	THAYNES FORMATION	PPw	WELLS FORMATIOM / PARK CITY FORMATION -GRANDEUR MEMBER
Qt	TRAVERTINE	TRd	DINWOODY FORMATION	Mb	BRAZIER LIMESTONE
Ob	BASALT	Pprc	PHOSPHORIA FORMATION - REX CHERT MEMBER		FAULT

PIT OUTLINE

BLACKFOOT BRIDGE PROJECT EIS

FIGURE 3.1-3
Geologic Cross-Sections
C - C' and D - D'

ANALYSIS AREA: Caribou County, Idaho	
Date: 07/23/10	File: Geo-Cross Sections.dwg
Drawn By: EC	Layout: Cross Sections C and D



Alluvial and Colluvial Deposits - 0' to 100' thick, unconsolidated sand, silt, and gravel in drainages and along hillsides.

Travertine Deposits - 0' to 50' (?) thick, white, gray, buff, or reddish travertine associated with carbonate springs.

Basalt - 1' to <1,000' thick; black to dark gray basalt flows, scoria, and cinders.

Rhyolitic Volcanic Rocks - 0 to 800' (?) thick, tan-weathering rhyolite and rhyolite tuff.

Salt Lake Formation - 0' to greater than 1,000' thick, siltstone, sandstone, and conglomerate with white, gray, and green tuff.

Thaynes Formation - 2,200' to 2,300' thick, clayey gray limestone, brown-weathering siltstone, and dark gray to olive-green shale.

Dinwoody Formation - 900' thick, gray limestone that grades downward into olive-green to gray shale and siltstone with thin limestone interbeds.

Rex Chert Member of the Phosporia Formation - 200' to 250' thick, thin-bedded brown to black, cherty mudstone, siliceous shale, and clayey chert that grades downward into thick-bedded black, blue, and reddish brown chert with interbedded mudstone and limestone.

Meade Peak Member of the Phosphoria Formation - 150' to 200' thick, brown to black shale and siltstone with gray-brown to brown phosphatic mudstone, and phosphorite.

Grandeur Member of the Park City Formation - 65' to 100' thick, massively to thick-bedded gray dolomite that is occasionally sandy or clayey.

Wells Formation - 2,000' to 2,400' thick, the upper member (1,000' to 1,400') consists of buff colored sandy limestone, gray to reddish brown sandstone, and interbedded gray limestone and dolomite. The lower member (500' to 1,000') consists of medium-bedded, gray, cherty limestone with some interbedded sandstone.

BLACKFOOT BRIDGE PROJECT EIS

FIGURE 3.1-4
Generalized Column and Stratigraphic Section for Project and Surrounding Area

ANALYSIS AREA: Caribou County, Idaho	
Date: 07/23/10	File: Strat Column.dwg
Drawn By: SW	Layout: Strat Column

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3.1.3.1 Wells Formation

The Pennsylvanian to Permian Age Wells Formation is divided into two members. The upper member is from 1,000 to 1,400 feet thick and is composed of fine-grained gray to reddish brown sandstone, sandy limestone, dolomitic limestone and dolomite. The Lower Member of the Wells Formation is from 500 to 1,000 feet thick and consists of medium-bedded, gray cherty limestone with some interbedded sandstone. The Wells Formation is prominently exposed in the project area along the ridge and western flank of the Aspen Range. Regionally, it is an important aquifer used for domestic, agricultural, and industrial water supply.

3.1.3.2 Grandeur Member of the Park City Formation

The Permian-age Grandeur Member of the Park City Formation overlies the Upper Member of the Wells Formation and has historically been mapped as part of the Wells Formation in the South East Idaho Phosphate District (Mansfield 1927; Oriel and Platt 1980; Oberlindacher et al. 1982). This convention is continued in **Figure 3.1-1,** where the two units are mapped as Wells Formation and Park City Formation, Grandeur Member undifferentiated. The Grandeur Member is composed of thick- to massively bedded cherty gray dolomite that is occasionally sandy or argillaceous and may be recrystallized. Locally, the Grandeur Member is about 65 to 100 feet thick.

3.1.3.3 Phosphoria Formation

The Phosphoria Formation is divided into three stratigraphic units including the Cherty Shale, Rex Chert, and Meade Peak Phosphatic Shale Members. The Meade Peak Phosphatic Shale Member (Meade Peak) is at the bottom of the section in the Phosphoria Formation and is the host of Phosphate ore in the district. It is overlain in ascending order by the Rex Chert and Cherty Shale Members. The Cherty Shale and Rex Chert are generally mapped together as the Rex Chert Member (Mansfield 1927, Oriel and Platt 1980). This convention is observed in **Figure 3.1-1**.

The Meade Peak Member is subdivided into five informal units that include footwall mud (also called lower Meade Peak), lower ore, center waste, upper ore, and upper Meade Peak. The footwall mud is the lowermost unit of the Meade Peak Member and is composed of about 3 feet of massively bedded reddish brown siltstone with a thin bed of black fossiliferous phosphatic siltstone at the base. It is overlain by lower ore. Lower ore is about 28 to 38 feet thick and is composed of gray to brown interbedded oolitic phosphorite, phosphatic mudstone, siltstone, limestone, and argillaceous phosphorite. Center waste occurs between the lower and upper ore horizons and is composed of about 80 to 110 feet of dark gray to black mudstone, siltstone, argillaceous carbonate, and thin oolitic phosphorite interbeds. Upper ore is composed of about 15 to 18 feet of gray-brown to brown interbedded phosphatic mudstone, argillaceous phosphorite, oolitic, phosphorite, and cherty to calcareous mudstone. Upper Meade Peak is at the top of the Meade Peak Section and is composed of mudstone, siltstone, and cherty phosphorite that vary in thickness from 15 to 35 feet.

The lower stratigraphic horizon of the Rex Chert (Rex Chert Member) consists of thick-bedded black to bluish-white or occasionally reddish-brown chert with interbedded mudstone and lenticular limestones. It is overlain by up to 170 feet of brown to black cherty mudstone and siliceous shale and argillaceous chert of the Cherty Shale Member. The Rex Chert (including the Cherty Shale Member) is about 200 to 250 feet thick in the project area.

3.1.3.4 Dinwoody Formation

The Triassic-age Dinwoody Formation is exposed in the eastern portion of the project area. It is about 900 feet thick and is composed of interbedded olive-green to gray siltstone, shale, and limestone that grade downward into calcareous shale and siltstone with thin limestone interbeds. It is indistinct in outcrop and forms rounded and vegetated slopes. Surficial weathering of the Dinwoody Formation forms dense clayey soils.

3.1.3.5 Thaynes Formation

The Triassic-age Thaynes Formation is exposed along a low ridge east of the project area where it strikes parallel to the course of the Blackfoot River. It is approximately 2,200 to 2,300 feet thick and is composed of clayey gray limestone, brown-weathering calcareous siltstone and dark gray to olive-green shale. Limestone beds within the formation form subdued ledges and rough slopes in outcrop. Siltstones and shale beds are typically recessive and form rounded slopes.

3.1.3.6 Salt Lake Formation

The Pliocene- to Miocene-age Salt Lake Formation is exposed southwest of the project area where it is stratigraphically below basalt in the Blackfoot Lava Field. The Salt Lake Formation consists of fluvial and lacustrine calcareous siltstone, sandstone, and conglomerate, with white, gray, and green tuff that grades into red-weathering diamictite near exposures of older rocks. Conglomeratic sections are typically light gray to buff in color with locally derived angular to subangular clasts up to 4 or 5 feet in diameter. The formation may also contain beds of white marl and calcareous clay. Locally, the thickness of the Salt Lake Formation may exceed several thousand feet (Oriel and Platte 1980).

3.1.3.7 Rhyolite

Three rhyolitic domes (China Hat, Middle Cone, and North Cone) crop out in the center of the Blackfoot Lava Field south of Blackfoot Reservoir. The domes are composed of tan-weathering, partly devitrified rhyolitic glass containing interbedded microcrystalline felsic layers. The domes pre-date the surrounding basalt flows and are about 100,000 years old (Armstrong et al. 1975). Additionally, an area of light tan, fine-grained rhyolite and tuff with spherical quartz grains occurs near the proposed Middle Pit and South Pit. The thickness of the tuff ranges from 0 to about 30 feet and may be interbedded with alluvium. The tuff is likely related to a small volcanic vent on the western edge of the planned Mid Pit.

3.1.3.8 Basalt

Extensive Pleistocene to Pliocene-age lava flows consisting of vesicular olivine basalt, scoria, and microporphyritic basalt are present in the Blackfoot Lava Field west of the project area. The basalts are typically covered by a thin veneer of soil, but crop out as rocky islands in cultivated fields. Studies by Mabey and Oriel (1970) and Armstrong et al. (1975) indicate two cycles of basaltic volcanism originating from vents near China Hat. The earliest phase of volcanism is older than 700,000 years. The second phase of volcanism occurred less than 100,000 years ago.

The basalt flows were emplaced over unconsolidated deposits in the low lying areas adjacent to the Aspen Range. In many locations, subsequent flows are separated by soil horizons that may include gravel and stiff clay. The thickness of the basalt ranges from a few feet near the margins

of the lava field to more than 1,000 feet near the vents. Basalt is also present below alluvium along the Blackfoot River south of Fox Ranch.

3.1.3.9 Alluvium and Colluvium

Quaternary-age alluvium and colluvium are present in drainages and along hillsides within the project area. Larger areas of alluvium are also mapped along the Blackfoot River and State Land Creek. Unconsolidated deposits in the project area are composed of poorly sorted clay, silt, and sand with angular to subangular pebbles, cobbles, and occasionally larger material derived from the Dinwoody, Phosphoria, and Wells Formations. They range in thickness from about 10 to 40 feet. Alluvium adjacent to the Blackfoot River is approximately 60 to 100 feet thick in Lower Valley and about 10 to 20 feet thick north of the project area. Alluvium adjacent to State Land Creek may vary from about 20 to 60 feet.

3.1.4 Structural Setting

The project area is contained within the Meade Thrust Plate, one of several thrust plates that were formed during development of the Rocky Mountain Overthrust Belt. Large scale movement along thrust faults during the late Cretaceous produced long northwest trending folds with tear faults perpendicular to fold axes (Petrun 1999). Fold geometry ranges from open to tight and may be upright or overturned. Later Basin and Range extension starting in the Miocene (about 17 million years) produced horst and graben structures characterized by high-angle normal faulting. High-angle normal faults typically bound range fronts adjacent to wide valleys with flat bottoms, strike north-northwest, and are downthrown on the west (Mabey and Oriel 1970).

Gravity data (Mabey and Oriel 1970) indicate that the western flank of the Aspen Range is bound by a high-angle normal fault (**Figures 3.1-1**). The Aspen Range Fault was originally mapped by Mansfield (1927) and is down dropped to the west. Although displacement along the fault is not precisely known, work by Mabey and Oriel (1970) suggests that it is approximately 5,000 feet. The Aspen Range Fault is a major hydrologic feature in the area that discharges deeply circulating groundwater to a series of springs and wetlands along the mountain front.

Rocks in the proposed North Pit strike approximately north 10° west and dip from 30° to 35° east. The section is repeated where it is displaced by a series of high-angle normal faults that strike north and dip 70° to 75° west. The faults are down-dropped to the west and have several hundred feet of displacement in aggregate. A second east-west trending fault orientation is also mapped in the North Pit. The North Fault dips 70° to 75° south. The Saddle Fault dips 70° to 75° north. Displacement along east-west trending faults appears to be relatively minor.

Rocks in the proposed Mid Pit strike north 10° west and dip about 55° east. The dip becomes steeper in the proposed South Pit where bedding is near vertical to slightly overturned. The mid and southern parts of the ore deposit are cut by a series of high angle normal faults that strike northeast and dip north. Displacement of bedding along the faults is minor with the exception of the Offset Fault. The Offset Fault separates the Mid Pit from the South Pit and displaces bedding by about 1,000 feet (**Figure 3.1-1**). A north-south trending fault is also mapped along the western edge of the proposed Mid Pit (Mansfield 1927).

A portion of the Phosphoria Formation is omitted from the geologic section near the south end of the Mid Pit. The omitted section is believed to be caused by a series of rotational landslide

blocks that failed during emplacement of the rhyolite vent near the crest of the ridge. Hummocky ground northeast of the omitted section is the projected toe of the landslide blocks.

3.1.5 Seismicity and Geotechnical Stability

3.1.5.1 Seismicity

The Blackfoot Bridge project area lies within a Zone III seismic region extending from northern Arizona through the Wasatch Front in Utah to the Yellowstone and Hebgen Lake regions in Wyoming and Montana. About 20 earthquakes capable of damaging structures (greater than 5.0 on the Richter scale) have occurred within this seismic region from 1880 through 1994. The Idaho Geological Survey has mapped the southeastern part of Idaho, east of the Snake River Plain as having the highest of three seismic shaking rankings (BLM and USFS 2007). The near-future earthquake activity would probably be similar to that observed during the past 100 years (BLM and USFS 2002). There was a recent earthquake in southern Idaho with a magnitude of 4.4 on October 28, 2008, with the epicenter located near Malad City, Idaho (USGS 2008). Although several earthquakes have occurred in recent years, there have been no reports of damage to surface features such as scarps, displacement of streams, or creation of sagponds (BLM and USFS 2007).

3.1.5.2 Geotechnical Stability

Stability issues associated with highwalls include the type and strength of rock, degree of rock alteration, steepness of the final highwall slope, presence of any groundwater, spacing and orientation of fractures and faults, and blasting practices (BLM and USFS 2007). Stronger rock is less fractured and altered, and therefore would produce more stable highwalls than the weaker altered or fractured rock. Associated groundwater discharges from a highwall can also destabilize it. Mine designs would be adapted, as needed, to respond to any indications of highwall instability.

Issues associated with the stability of overburden fill slopes include the topography of the surface underlying the overburden pile; stress, such as shock loading or overloading; slope heights; reduction of material strength by introduction of water; and the scheduling of reclamation contouring (BLM and USFS 2007). Mine design and operating procedures would be developed to preclude any future slope failures.

3.1.6 Mineralogy and Elemental Distribution

The mineral assemblage of the Meade Peak Member is dominated by quartz, potassium feldspar, and plagioclase, with subordinate amounts of illite, chlorite, keolinite, carbonate fluorapatite (CFA), calcite, dolomite, and oxide minerals (Grauch et al. 2004; DePangher 2007). CFA is the primary phosphate mineral in both ore and overburden materials. CFA is similar to common fluorapatite with extensive substitution of CO_3^{2-} for PO_4^{3-} (Knudsen and Gunter 2004). Sulfate (SO_4^{2-}) also substitutes for PO_4^{3} in the crystal lattice of CFA, but to a lesser extent than CO_3^{2-} (Knudsen and Gunter 2004). Grauch et al. (2004) recognized at least two generations of CFA in the Meade Peak Member: early pelloids and later interstitial cement. The pelloids formed near the sediment water interface during deposition and early digenesis. Cementation occurred after burial and was probably coincident with the formation of CFA masses that replaced earlier pelloids.

Fine-grained pyrite (FeS_2) is widely distributed in the Meade Peak Member. The earliest generation of pyrite occurs as disseminated masses in the Meade Peak rocks or as inclusions in CFA pellets. Later generations of framboidal pyrite occur in veinlets and bitumen veins (Grauch et al. 2004). Vaesite (NiS_2), a nickel sulfide mineral, commonly occurs in solid-solution with pyrite (Grauch et al. 2004). It is not known if significant compositional differences exist between subsequent generations of pyrite and vaesite (Grauch et al. 2004).

Trace amounts of sphalerite (ZnS) are also distributed throughout the Meade Peak Member. Three generations of sphalerite are identified (Grauch et al. 2004). The earliest generation occurs as inclusions in CFA or as disseminated masses and is commonly associated with the copper-vanadium sulfide mineral sulvanite (Cu_3VS_4) (Grauch et al. 2004). The second generation of sphalerite replaces CFA pelloids. The third generation is a weathering product that occurs as rounded masses on dolomite. Grauch et al. (2004) suggests the habit of the supergene ZnS may be evidence of bacterial mediation. Cadmium sulfide (CdS) may also occur as a weathering product of sphalerite (Grauch et al. 2004).

Native selenium occurs as small (< 2 to > 5 micrometers [µm]) needle-shaped clusters of crystals in pore spaces, fractures, and voids within the Meade Peak Member (Grauch et al. 2004). It is associated with weathered pyrite, bitumen, and CFA. Textural relationships suggest that most, if not all, of the native selenium formed late in the diagenetic history of the Meade Peak Member, probably from the weathering of primary sulfide minerals in near surface environments (Grauch et al. 2004). Isotopic fractionation of selenium indicates that it could have formed by either biotic or abiotic processes (Grauch et al. 2004).

Glauconite pelloids occur in the upper Meade Peak but are restricted to a fairly narrow horizon below the Rex Chert (Grauch et al. 2004). The pelloids are believed to have formed in a reducing environment at the sediment-water interface shortly after deposition (Chafetz and Reed 2000). Buddingtonite (ammonium feldspar) occurs throughout the Meade Peak Member, but is especially concentrated in the center waste (Knudsen and Gunter 2004). Degradation of organic matter during early digenesis was the probable source of ammonium for buddingtonite formation (Grauch et al. 2004). Roscoelite (vanadium illite) occurs as coatings on bedding planes and as open-space fillings (Grauch et al. 2004). Carbonate minerals (calcite and dolomite) occur as cement and overgrowths on sedimentary grains.

A variety of other minerals are also present in the Meade Peak Member. Uraninite occurs as inclusions in CFA (Zielinski et al. 2004). Fluorite and barite occur in veinlets with quartz and calcite (Grauch et al. 2004). Bitumen, although not technically a mineral, is disseminated throughout the matrix and occurs in veins (Grauch et al. 2004). Apatite, zircon, and rutile are also present in trace amounts (Grauch et al. 2004).

A detailed study by Perkins and Foster (2004) indicated that pyrite and sphalerite are the primary residence of selenium, cadmium, copper, and zinc in unweathered rocks of the Meade Peak Member. Nickel and vanadium are associated with sulfide mineralogy as well. Fine-grained pyrite is the principal host of selenium with observed concentrations of up to 20,000 ppm. Reported selenium concentrations for sphalerite and sulvanite exceed 2,000 ppm and 5,000 ppm, respectively (Perkins and Foster 2004). A small fraction of selenium is also present in elemental form. In weathered rocks, selenite (Se^{4+}) dominates over reduced forms and is associated with

oxyhydroxides. It is assumed that the selenite is derived from the oxidation of primary sulfide minerals (Perkins and Foster 2004). Sphalerite and organic matter are the primary unweathered hosts of cadmium and zinc. Strong sorption to oxyhydroxides dominates their occurrence in weathered rocks (Perkins and Foster 2004).

Organic matter and oxyhydroxides contain the majority of selenium, cadmium, copper, zinc, nickel, and vanadium that occurs outside of the sulfide mineral reservoir. Apatite is the primary host for uranium. Both apatite and organic matter host molybdenum. Chromium and vanadium are contained in acid-insoluble phases (probably silicates and oxides). Chromium, uranium, and vanadium have minimal association with organic matter in unweathered rocks (Perkins and Foster 2004).

3.1.6.1 Environmental Mobility of Selenium

Reduced forms of selenium, such as selenide (Se^{2-}) and elemental selenium (Se^{0}), are relatively insoluble in water and have low environmental mobility (Seed et al. 2000). Exposure to the atmosphere, however, can oxidize Se^{2-} and Se^{0} into mobile forms such as selenite (Se^{4+}) and selenate (Se^{6+}) that can be transported in groundwater and surface water and bioaccumulate in plants and organisms (Pickering et al. 1995, Hem 1989, Fessler et al. 2003, Masscheleyn et al. 1990).

Selenium occurs as three principal species in oxygenated water: selenite (SeO_3^{2-}), biselenite ($HSeO_3^{-}$), and selenate (SeO_4^{2-}) (Hem 1989, Masscheleyn et al. 1990). Geochemical controls that reduce or limit the solubility of selenium in water include adsorption to mineral surfaces such as oxyhydroxides of iron, manganese, and aluminum (Hayes et al. 1987, Balistrieri and Chao 1990, and Rajan 1979). Clay and carbonate minerals may also provide effective sorption surfaces for selenium (Bar-Yosef and Meek 1987, Cowan et al. 1990). In general, selenate is less strongly sorbed to mineral surfaces than is selenite. Redox potential and pH both affect selenium solubility and adsorption reactions. Adsorption reactions for selenium are least efficient under oxidizing conditions at circum-neutral pH (Elrashidi et al. 1987).

Redox reaction rates for selenium are generally rapid (Pickering et al. 1995) with the aqueous species selenite (SeO_3^{2-}) and selenate (SeO_4^{2-}) being readily reduced to insoluble elemental selenium (Se^{0}) (Hem 1989). Beauwens et al. (2005) suggest the reduction of selenate to elemental selenium in sediments is only rapid when bacterially mediated. Likewise, elemental selenium (Se^{0}) and selenide (Se^{2-}) are easily oxidized to forms that are more mobile in the environment (Pickering et al. 1995). Microbial processes strongly affect the redox state of selenium. Selenate in solution (SeO_4^{2-}) is reduced to elemental selenium and precipitated by anaerobic bacteria in a wide range of sediments (Stolz et al. 2002). Oxidizing bacteria may also mobilize selenium in favorable environments. Bacterially mediated oxidation rates are generally three to four orders of magnitude less than the reductive part of the cycle (Stolz et al. 2002).

Selenium bio-accumulates in plants. Although it is an essential nutrient for the maintenance of health in mammals, it is toxic at high concentrations. Plant species of the genus *Astragalus* and *Grindelia* are particularly notable for bio-accumulating selenium with some plants having been found to contain several thousand milligrams of selenium per kilogram of dried plant material (Fessler et al. 2003; Hem 1989). Organic selenium compounds, such as selenomethionine, are common in the environment, but have not been identified in unweathered rocks of the

Phosphoria Formation. Organo-selenium compounds are commonly formed in plant tissue and become present in soil and water by the decay of seleniferous vegetation.

3.1.6.1.1 Regional Selenium Studies

Studies of the environmental mobility of selenium in the Southeast Idaho Phosphate District have been performed under the direction of the USGS, Idaho Mining Association (IMA), Selenium Working Group, and Selenium Area Wide Advisory Committee (SeAWAC). These studies provide a regional overview of the sources, release mechanisms, transportation pathways, receptors, and effects of selenium and other COPCs associated with phosphate mining and are relevant to the proposed project at Blackfoot Bridge. Brief summaries of the regional studies are presented in the following sections.

Selenium releases from phosphate mines in the Blackfoot River watershed are described in a study by Presser et al. (2004). Their analysis of the temporal variation of selenium in overburden seeps indicates that concentrations fluctuate throughout the year with the highest concentrations generally occurring during spring runoff. Selenium concentrations in receiving streams also vary seasonally in response to changes in discharge and concentration from the overburden seeps. An analysis of selenium speciation in the watershed during 2001 and 2002 concluded that the analyses for total and dissolved concentrations were generally equivalent, and that the predominant form of selenium was dissolved (Presser et al. 2004). Selenite represented less than 10 percent of the selenium in the water column. The majority of the dissolved selenium was a mixture of selenate and organic selenide. Approximately 70 percent of the annual selenium load in the watershed occurred during high flow period, mostly as selenate. This finding is consistent with selenium data from USGS monitoring station 13063000 on Blackfoot River (**Section 3.3.1.2.1**). Organic selenide concentrations increased during low flow periods, suggesting elevated biotic productivity and enhanced selenium uptake in food webs.

Stillings and Amacher (2004) presented data from a 2-year study of a wetland that received drainage from a phosphate mine. Selenium concentrations in the overburden seep were highest in the spring following the winter with the heaviest snowfall. Concentrations in the discharged water decreased along the flow path as it moved through the wetland. Selenium concentrations in sediment also decreased with increasing distance away from the overburden seep. The results of the study indicated that selenium was sequestered in sediments as discharge moved through the wetland. Most of the selenium was adsorbed and/or coprecipitated with iron oxides. Some selenium was also partitioned to organic material. Selenium concentrations in vegetation showed a similar trend of decreasing concentration with increasing distance away from the seep. The authors suggested that plant uptake was another factor contributing to the attenuation of selenium from the water column in the wetland environment.

Hamilton (2004) investigated the occurrence of selenium and other trace elements in water, sediment, aquatic plants, aquatic invertebrates, and fish at nine locations in the Blackfoot River watershed. Selenium concentrations in water were below the detection limit except for two sites on East Mill Creek. Water from East Mill Creek had selenium concentrations exceeding the chronic cold water aquatic life CCC standard of 0.005 mg/L. Selenium concentrations in stream sediments from the drainage were also elevated. Sediment concentrations correlated with aquatic plant and invertebrate concentrations, indicating that selenium had transferred from the streams to the local food webs.

Mackowiak et al. (2004) studied the uptake of selenium and other COPCs by plants and discussed the potential effects it could have on grazing animals in the phosphate resource area. The study presented selenium analyses from vegetation growing on uncapped phosphate overburden dumps, wetlands associated with overburden dumps, and undisturbed sites in the Blackfoot River watershed including some outcrop areas of the Meade Peak Member. Selenium concentrations in plants at undisturbed sites were less than 2 mg/kg, which is the maximum tolerable dietary content for most livestock (National Research Council 1980). The average selenium concentration for vegetation growing on uncapped overburden was 38 mg/kg. Average selenium values for legumes (80 mg/kg), trees (52 mg/kg), grasses (18 mg/kg), and shrubs (6 mg/kg) were more than the critical threshold value of 5 mg/kg for animal forage diets (National Research Council 1980). Selenium concentrations in alfalfa growing on overburden piles were cited as being four times greater than in grasses. Forbs had average selenium concentrations of 3 mg/kg. Grasses in contaminated wetlands (53 mg/kg) were one of the highest selenium accumulators in that environment. In most places, uptake of cadmium, chromium, copper, manganese, molybdenum, nickel, and zinc was below critical levels for plant growth.

The IMA Selenium Subcommittee formed in 1997 in response to public concern about selenium-associated livestock deaths near phosphate mine sites. Members of the subcommittee included FMC (now Astaris), J.R. Simplot Company, Nu-West Industries (Agrium), Rhodia LLC, and P4 Production, LLC (a joint venture between Monsanto, Inc. and Solutia, Inc.). The purpose of the subcommittee was to evaluate mitigation methods for seleniferous mine overburden materials. The interagency-industry Selenium Working Group was established shortly after the formation of the IMA Selenium Subcommittee. The Selenium Working Group was subsequently redesignated as the Selenium Area Wide Advisory Committee and is composed of representatives from the mining companies, IDEQ, IDL, BLM, USFS, EPA, USGS, the Shoshone-Bannock Tribes, Bureau of Community and Environmental Health, Bureau of Indian Affairs, Idaho Department of Fish and Game (IDFG), USFWS, researchers from the University of Idaho, Congressional Delegation staff, and other interested parties. However, there was no formal mechanism for the agencies to require that their concerns were addressed satisfactorily by the mining companies. In some cases, the agencies disagreed with some of the content and/or conclusions of some of the reports. Therefore, the work products/regional studies completed under the direction of the IMA Selenium Subcommittee were neither adopted nor approved by the participating agencies. These regional studies include:

- Montgomery Watson. 1997. Fall 1997 Interim Surface Water Survey Report;
- Montgomery Watson. 1998. Regional Investigation Report, Southeast Idaho Phosphate Resource Area Selenium Project;
- Montgomery Watson. 1998. Final 1998 Regional Investigation Report, Southeast Idaho Phosphate Resource Area Selenium Project;
- Montgomery Watson. 2000. Draft 1999 Interim Investigation Data Report, Southeast Idaho Phosphate Resource Area Selenium Project;
- Montgomery Watson. 2001. Draft 1999-2000 Regional Investigation Data Report for Surface Water Sediment and Aquatic Biota Sampling Activities, September 1999, Southeast Idaho Phosphate Resource Area Selenium Project; and

- Montgomery Watson. 2001. Draft 1999-2000 Regional Investigation Data Report for Surface Water Sediment and Aquatic Biota Sampling Activities, May – June 2000, Southeast Idaho Phosphate Resource Area Selenium Project.

The IMA Selenium Subcommittee studies indicated that selenium in approximately 70 percent of the surface water samples collected at mine sites exceeded the chronic cold water standard for aquatic life (0.005 mg/L). Twenty percent of the sampled surface water outside of the mining areas also exceed the chronic aquatic life standard. Seeps issuing from overburden and French drains had the highest selenium concentrations. Soil and vegetation samples at mine sites generally had elevated selenium, cadmium, nickel, and zinc concentrations compared to the surrounding areas.

Liver and muscle tissue from elk harvested by hunters near mine sites also had higher selenium concentrations than those harvested away from mining areas (Wright et al. 2002, Kuck 2003). Idaho Department of Health and Welfare, Bureau of Community and Environmental Health (BCEH 2006a) determined that hunters or family members who eat two or more meals of elk liver over a few days will exceed the health-based guideline developed for selenium digestion over short periods. Because the exposure dose of selenium depends on body weight, the amount of elk liver which can be safely consumed over a two-week period was calculated. For example, persons with a body weight of 80 kg or 176 lb should not eat more than two 10-ounce meals of elk liver from animals harvested within 10 miles of a phosphate mine over a period of two weeks. Results of an earlier study (BCEH 2006b) released by the U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry, recommended much stricter limits on the consumption of elk liver in this phosphate mining district (no more than 10 ounces per month for a person weighing 75 kg). This limit was not based on the level of selenium in elk liver, but on copper levels. The level of selenium found in elk muscle in this area is not considered to be a cause of concern for those who regularly eat elk meat. Persons who take selenium supplements or vitamins with selenium, persons with iodine or thyroid deficiencies, persons with Vitamin-E deficient diets, and insulin-dependant diabetics would have an increased risk for health effects due to consumption of elk liver or meat, as well as other plants and animals from the contaminated areas. Similarly, a fish consumption advisory has been issued for East Mill Creek (IDEQ 2002a).

IDEQ took over coordination of the area-wide assessment in August 2000 and completed additional environmental investigations. The Final Human Health and Ecological Risk Assessment was released in 2002 (IDEQ 2002a). The conclusions of the risk assessment were:

- There is a low probability of significant human health effects based on current conditions. Potentially significant human health risks are indicated only in the case of subsistence use of resources in a limited number of highly impacted areas.
- There is a low probability of population level impacts to regional wildlife based on current conditions and the low percentage of impacted areas compared to unaffected surrounding habitat.
- There is a high probability of subpopulation and or individual effects occurring for ecological receptors residing in the vicinity of highly impacted areas.

- There is a potential for risks to aquatic and riparian ecological receptors residing in highly impacted areas as indicated by significant exceedances of conservative benchmarks for surface water, sediment, and fish tissue concentrations.

Tetra Tech (2008) also completed a study characterizing Meade Peak rock and vapor composition in overburden disposal facilities. The study included monitoring pore moisture and oxygen content in overburden disposal facilities at several mine sites and characterization of grain size and the selenium and organic carbon content of the Meade Peak rock. The conclusions from the study include:

- The material in the overburden piles is gravel size (256 mm) and less.
- The oxygen content of overburden pore gasses is independent of the type of facility and age, but appears to be affected by the dump construction method. End dumping appears to support overburden with oxygenated interiors, and plug dumping results in oxygen-depleted conditions.
- The water-soluble selenium content of oxygenated and oxygen-depleted dumps is similar and does not appear to increase with increasing time of weathering. This result suggests that microbiological reduction of selenium in oxygen-depleted disposal facilities is limited.
- Water-soluble selenium and organic carbon masses in overburden are small fractions of their total concentrations in overburden.
- The moisture contents of the studied facilities are below field capacity.
- Two mechanisms control selenium releases from phosphate mine overburden. The primary release is controlled by the water-soluble selenium that is present in the material at the time of placement. The secondary release is from the weathering of sulfide mineral (pyrite) and organic material in shale. Oxidative weathering of sulfide minerals and organic material is sluggish, and releases by this mechanism are minor compared to releases of water-soluble selenium.

3.1.6.1.2 Baseline Geochemical Characterization Studies

The Blackfoot Bridge Mine would produce about 90.7 million cubic yards of overburden that would be placed in external overburden piles or backfilled into the mined-out pits. The majority of the rock would be derived from the Phosphoria Formation (32.2 percent Rex Chert and 33.3 percent Meade Peak). The remaining balance would include alluvium (11.1 percent), Grandeur Member Dolomite (22.1 percent), and rhyolite tuff (1.0 percent).

Studies by the USGS and others indicate that selenium and other constituents of environmental concern are present in elevated concentrations in overburden from phosphate mines in southeast Idaho (Perkins and Foster 2004; Hein et al. 2004b; Grauch et al. 2004; Herring and Grauch 2004; Maxim 2000, 2002a, 2004). The Meade Peak Phosphatic Shale Member of the Phosphoria Formation is identified as the primarily geologic residence of selenium. When released from mine-related facilities, selenium has been implicated in livestock deaths and deformities in aquatic birds at several mining sites near the project area (Presser et al. 2004, Hamilton 2004). Cadmium, nickel, and zinc (among other elements) are also present in the Meade Peak Member

at concentrations above average crustal abundance (Perkins and Foster 2004). These elements are mobile in seepage from phosphate mine overburden materials (Maxim 2000, 2002a, 2004).

Recent studies indicate that the Rex Chert Member of the Phosphoria Formation may also release selenium and other constituents into the environment, both naturally and from disturbance from mine and other related activities (Hein et al. 2004b; Maxim 2002a, 2004). Clean chert beds generally have low selenium and metal content and are commonly used as construction material and road base. Shale interbeds and the transitional zone above the Meade Peak Member may have elevated selenium content with reported values of up to 138 ppm (Hein et al. 2004b).

Geochemical characterization of the proposed overburden and ore from the Blackfoot Bridge project has been completed to assess the potential environmental impacts that could occur from handling and disposal of the material (Whetstone 2009a). The characterization study included an extensive sampling and testing program with analysis of the paste chemistry and elemental content of the rocks that would be produced from the proposed mine. Column and synthetic precipitation leaching procedure (SPLP) leaching tests were also performed to evaluate the mobility of metals and other COPCs in seepage from the planned facilities. The sample set for the geochemistry study consisted of 3,075 samples collected from 43 boreholes, 12 test pits, and a surface trench. The sample locations were selected to characterize the spatial variability of overburden and ore as a function of geology. The sample set was composited in three steps to form 204 samples representing the average composition of each rock type in each borehole (A-composites), 28 samples representing the average composition of each rock type from each proposed pit area (B-composites), and 11 samples representing the ROM composite of mixed rock that would be placed in overburden piles, backfills, and ore stockpiles. The relative percentages of the material that would be generated by the project are shown in **Tables 3.1-1** and **3.1-2**. An overview of the geochemical testing program is presented in **Figure 3.1-5**.

Table 3.1-1 Overburden Percentage by Source

Source	Tuff (%)	Alluvium (%)	Rex Chert (%)	Upper Meade Peak (%)	Center Meade Peak (%)	Lower Ore Partings (%)	Footwall Mud (%)	Grandeur Member (%)	Total From Source (%)
North Pit	--	3.7	12.6	2.2	8.1	1.3	1.2	9.2	38.4
Mid Pit	--	4.9	10.9	1.2	7.9	1.2	0.3	6.9	33.4
South Pit	1.0	2.6	8.9	0.9	7.8	0.7	0.4	6.0	28.2
Total	**1.0**	**11.2**	**32.4**	**4.3**	**23.8**	**3.2**	**1.9**	**22.1**	**100.0**

Source: P4 2009c

Table 3.1-2 Ore Percentages by Source

Source	Upper Ore (%)	Lower Ore (%)	Total
North Pit	13.1	18.8	31.9
Mid Pit	13.6	28.4	42.0
South Pit	11.9	14.2	26.1
Total	**38.6**	**61.4**	**100**

Source: P4 2009c

3.1.6.1.3 Potential for Acid Rock Drainage

Acid Rock Drainage (ARD) is produced when sulfide minerals chemically react with oxygen and water to produce sulfuric acid and other reaction products. Many metals are more soluble under acidic conditions, and the formation of ARD can result in increased metal mobility in groundwater and surface water. Acid produced by the oxidation of sulfide minerals can be neutralized by a number of reactions involving carbonate minerals and basic silicates (Morin and Hutt 1994). The potential for ARD formation can also be minimized by using appropriate engineering practices to reduce the availability of oxygen and water for the reaction.

Acid-Base Accounting (ABA) provides a screening level evaluation of the net acid-producing potential of rock by comparing the total acid generating potential (AGP) of the material to the acid neutralizing potential (ANP) of the material. According to BLM and USFS guidelines, the ratio of ANP to AGP is used to evaluate ABA data (BLM 1996). Rocks with ANP/AGP ratios greater than 3 are considered to have low potential to produce acidic drainage. ANP/AGP ratios between 3 and 1 are indeterminate, and ratios below 1 are potentially acid generating.

Regional ABA data for overburden in the Southeastern Idaho Phosphate District were evaluated to determine potential for the Blackfoot Bridge project to generate acidic drainage (Whetstone 2009a). Data from 613 tests were used in the evaluation including 19 tests from the Enoch Valley Mine, 61 tests from the Dry Valley Mine, 151 tests from the Rasmussen Ridge Mine, and 382 tests from the Smoky Canyon Mine. The results of the evaluation indicate that the regional average ANP:AGP ratio for overburden is 240. The median value exceeds the BLM and USFS criteria for non-acid generating overburden by a factor of 10. These results are consistent with the observation that phosphate mining has occurred near Soda Springs for almost 85 years with no report of acidic drainage from overburden piles.

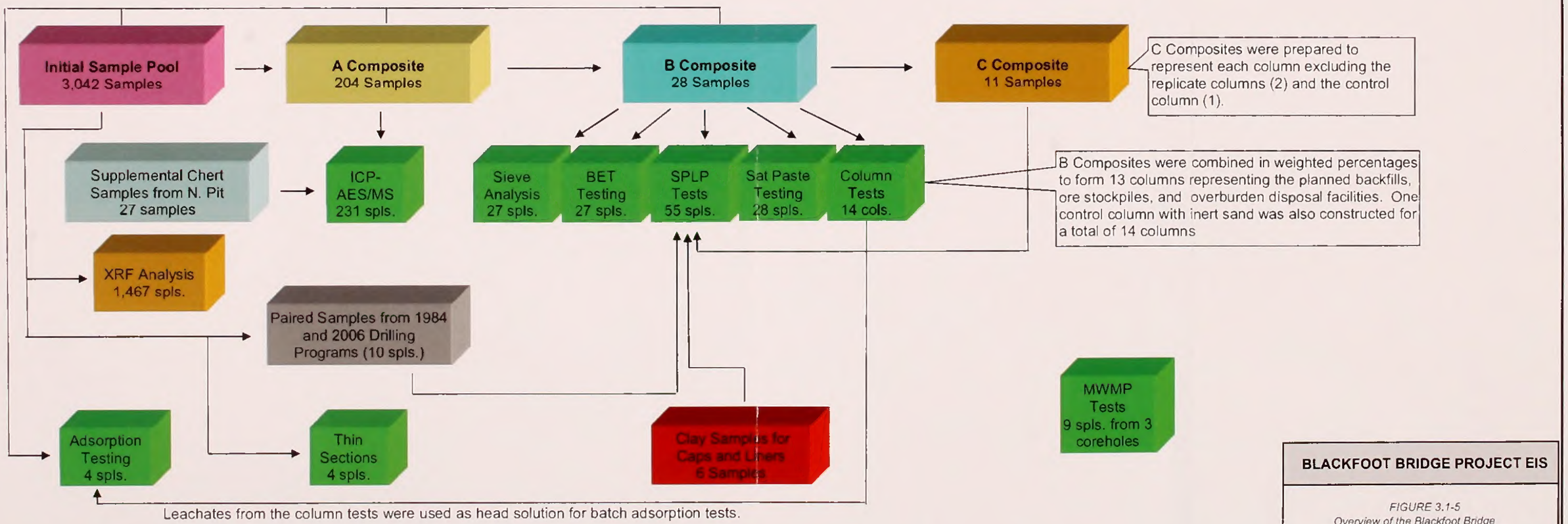
3.1.6.1.4 Elemental Content of Overburden and Ore

The elemental content and distribution of COPCs in the proposed overburden and ore were evaluated (Whetstone 2010a) using inductively coupled plasma atomic emission spectrometry/mass spectrometry (ICP-AES/MS) and X-ray fluorescence spectroscopy (XRF). Samples for ICP-AES/MS analysis (231 total) were analyzed for 28 elements and were prepared using the cone and quarter method to generate representative splits of 204 A-composite samples (see discussion of composited samples in **Section 3.1.6.1.2**) and 27 samples of Rex Chert from the North Pit. The splits were crushed to minus 100 mesh and digested using EPA method 3050B for ICP-MS analysis (EPA method 6020) and EPA method 3050B-M for ICP-AES analysis (EPA method 6010B). EPA method 7471A, an aqua regia digestion with cold vapor atomic absorption spectrometry was used for mercury. Total sulfur was determined using a LECO furnace method for sulfur dioxide (SO_2) generation and infrared detection (ASTM D4239). Samples for XRF analysis (1,467 total) were analyzed for cadmium, iron, manganese, nickel, phosphorus, selenium, sulfur, uranium and zinc using a SPECTRO xSort spectrometer. XRF spectrometry exposes the sample to a burst of energy at a wavelength of 10^{-10} meter and displaces an electron from the inner-orbital of each atom. An electron from a higher-energy orbital falls to fill the vacancy and emits energy at a wavelength characteristic to the element. XRF samples represented uncomposited material from 33 boreholes including 603 samples of Rex Chert and 864 samples of center waste.

Sample Type	Number of Samples	Elemental Testing	Saturated Paste	Column Testing	SPLP Testing	Batch Adsorption Testing	Thin Section Analysis	Sieve [1] Analysis	BET [2] Testing	MWMP Testing
Initial Sample Pool	3,042	x(1)								
A-Composite Samples (Single Borehole Monolithologic)	204	x(2)								
B-Composite Samples (Multi Borehole Monolithologic Composites)	28		x	x	x			x	x	
C-Composite Samples (Multilithologic Composites Identical to Columns)	11				x					
Clay Samples for Caps and Liners	6				x					
Supplemental Rex Chert Samples	27	x								
Paired Samples from 1984 and 2006	10				x					
Samples for Thin Section Petrography	4						x			
Monolithologic Samples for Batch Sorption Tests	--									
- Wells Formation/Grandeur Tongue	1					x				
- Grandeur Tongue	1					x				
- Dinwoody Formation	1					x				
- Rex Chert	1					x				
Grandeur Tongue Samples for EOP Placement	9									x

(1) A total of 1,467 samples were evaluated for elemental content using XRF spectroscopy (603 samples of Rex Chert and 864 samples of Meade Peak)

(2) Elemental Content evaluated by ICP-AES/MS spectrometry



Notes: Sieve analyses were used to determine particle sizes
Brunauer, Emmett, and Teller (BET) testing was used to determine specific surface areas
Samples for MWMP testing were not part of the original sample pool

Source: (Whetstone 2009b)

BLACKFOOT BRIDGE PROJECT EIS

FIGURE 3.1-5
Overview of the Blackfoot Bridge Baseline Geochemical Characterization Study

ANALYSIS AREA: Caribou County, Idaho

Date: 06/25/2010 | File: Figure 3_1-5_2010.ai

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The ICP-AES/MS analyses indicate that the proposed overburden and ore contain concentrations of arsenic, cadmium, copper, molybdenum, nickel, phosphorous, selenium, strontium, sulfur, uranium and zinc that are above world shale averages (Whetstone 2009a). Elemental content varies by lithology, and location with the Meade Peak rocks generally having the highest average metal content. Trace metal concentrations generally increase from north to south along the strike of the deposit with increasing metal content being related to decreased weathering. Cadmium is an exception to this generalization with the highest average concentrations occurring in weathered rocks from the proposed North Pit. A summary table of the relative elemental content of the proposed overburden and ore is presented in **Table 3.1-3**. Histograms showing average selenium and cadmium contents for each rock type and pit area are presented in **Figures 3.1-6** and **3.1-7**.

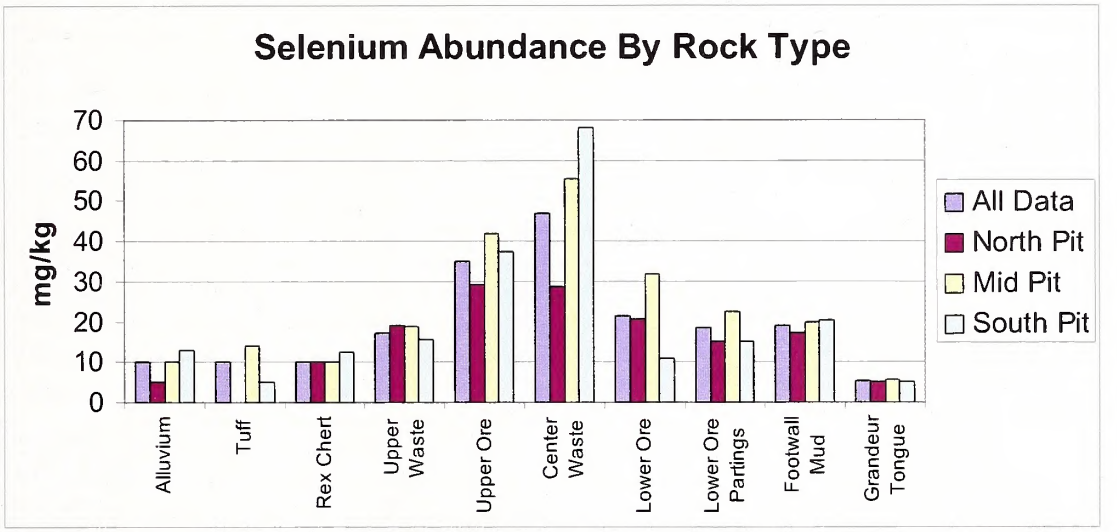

Figure 3.1-6 Average Selenium Distribution in Blackfoot Bridge Rocks

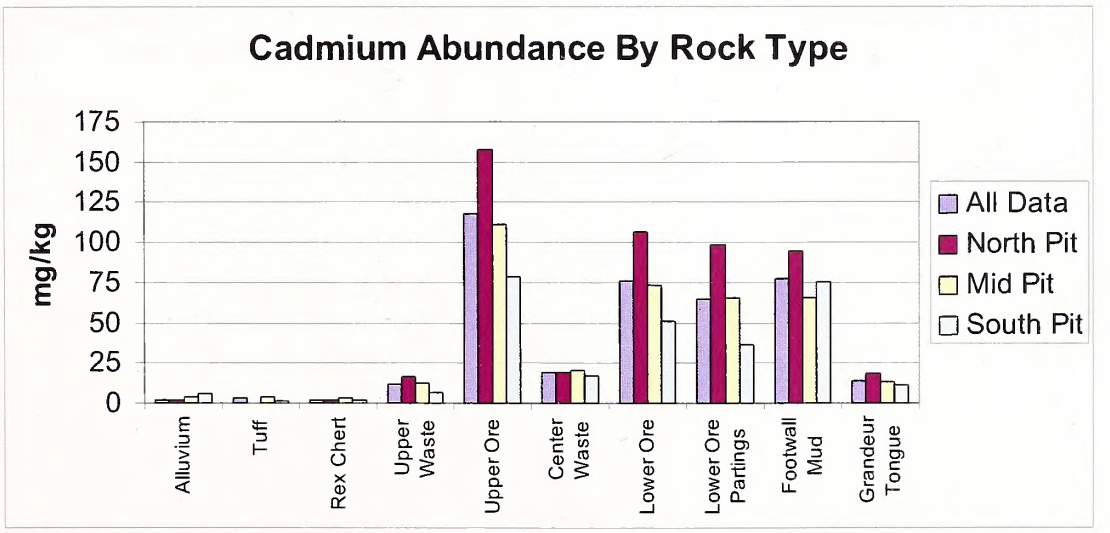

Figure 3.1-7 Average Cadmium Distribution in Blackfoot Bridge Rocks

The XRF analyses were performed on uncomposited samples to evaluate the distribution of COPCs in the Rex Chert and Meade Peak overburden. The results of the study are in general agreement with the ICP-AES/MS analyses and indicate that indicate that selenium and other COPCs are widely distributed throughout the center waste with average selenium concentrations

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Table 3.1-3 Summary Matrix for ICP-AES/MS Whole Rock Elemental Analyses

Parameter	Concentrations	Relative Abundance						Comments
	Generally Similar Across Pits	Systematic Differences Between Pits	Complex Differences Between Pits Depending on Lithology	Highest Abundance	2nd Highest Abundance	3rd Highest Abundance	4th Highest Abundance	
Aluminum	*		ALL	HWM	TUF	UO		
Antimony	*			UO	LOP	FWM/CWS	--	Concentrations near DL w/ exception of UO
Arsenic		*	UO	FWM	CWS	HWM/LO		
Barium	*		ALL	UO	REX	HWM		Concentrations generally near DL
Beryllium	*		--	--	--	--		Concentrations consistently below DL
Boron	*			--	--	--	--	Consistently below DL
Cadmium		*	UO	LO	FWM	LOP		North Pit generally highest
Calcium		*	LO	UO	GTD	LOP		
Chromium		*	UO	LO	CWS	HWM/LOP		North Pit generally higher in Meade Peak lithologies
Copper		*	UO	CWS	LO	FWM		South Pit concentrations are consistently the lowest
Iron	*		HWM/ALL	--	--	--		
Lead		*	UO	HWM	LO	--		North Pit concentrations are typically higher
Lithium	*		--	--	--	--		Generally near DL, but statistics are affected by variable DL
Magnesium		*	GTD	LOP	FWM	--		
Manganese		*	ALL	TUF	HWM	--		
Mercury		*	UO	CWS	HWM/LO	--		South Pit concentrations are generally the lowest
Molybdenum		*	UO/FWM	CWS	--	--		
Nickel		*	FWM	CWS	UO	HWM		
Phosphorus	*		LO	UO	LOP	CWS		
Potassium		*	HWM/UO	--	--	--		
Selenium		*	CWS	UO	LO	FWM/LOP/HWM		
Silver	*			UO/LOP	HWM	--	--	Below or near DL w/ sporadic detections in HWM, UO, and LOP
Sodium		*	LO	LOP	UO	FWM		General decrease from north to south All analyses below DL
Strontium	*		UO/LO	LOP	CWS	--		
Sulfur, Total		*	LO	CWS/LOP	UO	--		
Thallium	*		--	--	--	--		
Uranium	*		UO/LO	LOP	--	--		
Zinc		*	FWM	UO	--	--		

Notes: Abbreviations: ALL = alluvium, TUF = volcanic tuff, REX = Rex Chert, HWM = upper Meade Peak (hanging wall mud), UO = upper ore, CWS = center waste shale, LO = lower ore, LOP = lower ore partings, FWM = footwall mud (lower Meade Peak), GTD = Grandeur Member Dolomite / Wells Formation, DL = detection limit.
Source: Whetstone 2009a

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increasing from north to south along the strike of the deposit. No subunits in the center waste were identified that could be reliably segregated and selectively handled based on visually distinguishable lithologic characteristics or selenium content. Selenium was also widely distributed in the Rex Chert samples but at significantly lower concentrations than in the Meade Peak rocks. The average selenium concentration of the Meade Peak rocks was 58 ppm. The average selenium concentration for the Rex Chert samples was 8 ppm.

3.1.6.1.5 Saturated Paste Extract Analyses

Twenty eight B composite samples were submitted for saturated paste extract testing and determination of total organic carbon (TOC) content. The samples were prepared using American Society of Agronomy method 62-1.3.2.1. Extracts from the saturated pastes were analyzed for selenium, cadmium, nickel, manganese, and zinc using EPA method 6020 (ICP-MS). Electrical conductivity (EC) and pH were analyzed using EPA 2501B and 150.1 methods, respectively. TOC for the sub-samples was analyzed using USDA method 90-3, which includes chemical oxidation followed by colorimetric measurement.

Selenium, cadmium, and nickel were detected in all of the paste extracts. Zinc and manganese were detected in all but one and two of the paste extracts, respectively. USFS guidelines define non-seleniferous overburden that is suitable for surface placement as having less than 13 mg/kg total selenium and less than 0.1 mg/L extractable selenium (USFS 2003a). Paste extractable selenium concentrations were highest for center waste (0.029 to 4.88 mg/L) with samples from the proposed Mid Pit and South Pit exceeding the 0.1 mg/L threshold. Some samples of alluvium, upper ore, lower ore, lower ore partings, lower waste, and Grandeur Member Dolomite also had extractable selenium concentrations greater than 0.1 mg/L. Upper ore has the highest organic carbon content (1.74 to 2.13 percent), followed by center waste (1.00 to 1.91 percent), and lower ore partings (0.52 to 1.51 percent).

3.1.6.1.6 SPLP Tests

SPLP tests were used to evaluate the leaching characteristics of overburden and ore from the proposed mine (Whetstone 2009a). The tests were performed in accordance with EPA method 1312 (EPA 1994) and consisted of leaching the samples in a solution of weakly acidified de-ionized water for a period of 18 hours. A total of 55 samples were tested including 28 B-composite samples, 11 C-composite samples, six clay samples, and 10 core samples.

Leachates from the B-composite samples contained selenium and cadmium concentrations at levels above potentially applicable water quality standards. Concentrations for all other constituents met water quality standards with the exceptions of iron and aluminum, which were elevated in one leachate from the Mid Pit alluvium. Approximately 79 percent of the leachates had measurable selenium concentrations above the laboratory detection limit (0.001 mg/L). Selenium concentrations in 29 percent of the leachates exceeded the chronic cold water aquatic life standard of 0.005 mg/L. SPLP leachates from the center waste had the highest selenium concentrations (0.001 to 0.1 mg/L), followed by lower Meade Peak (< 0.001 to 0.027 mg/L). Leachable selenium concentrations generally increased southward along the strike of the deposit for all rock types except the Rex Chert and upper ore (**Figure 3.1-8**).

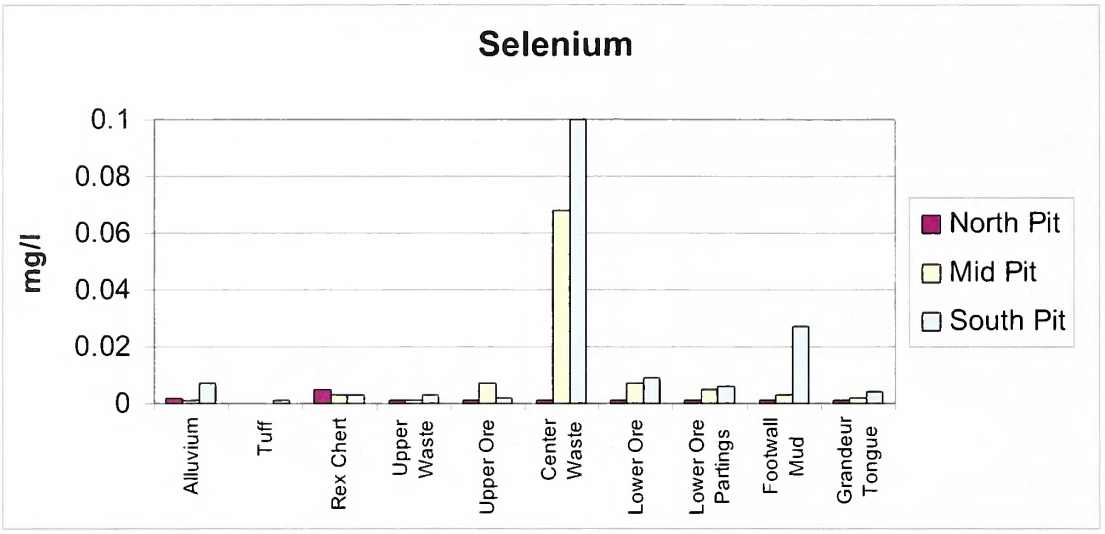


Figure 3.1-8 Selenium Concentrations in SPLP Leachates for B-Composite Samples

Cadmium concentrations were highest in leachates from the upper ore followed by lower ore partings and lower ore **(Figure 3.1-9)**. Approximately 68 percent of the B-composite leachates had measurable cadmium concentrations above the detection limit of 0.0001 mg/L. Cadmium concentrations in 14 percent of the leachates exceeded the Idaho chronic cold water aquatic life standard of 0.0006 mg/L. Leachable cadmium concentrations generally increased northward along the strike of the deposit for each rock type except center waste, upper Meade Peak, and alluvium. Leachable cadmium concentrations for center waste increased southward. Leachable cadmium concentrations for alluvium and upper Meade Peak were highest in rocks from the proposed Mid Pit.

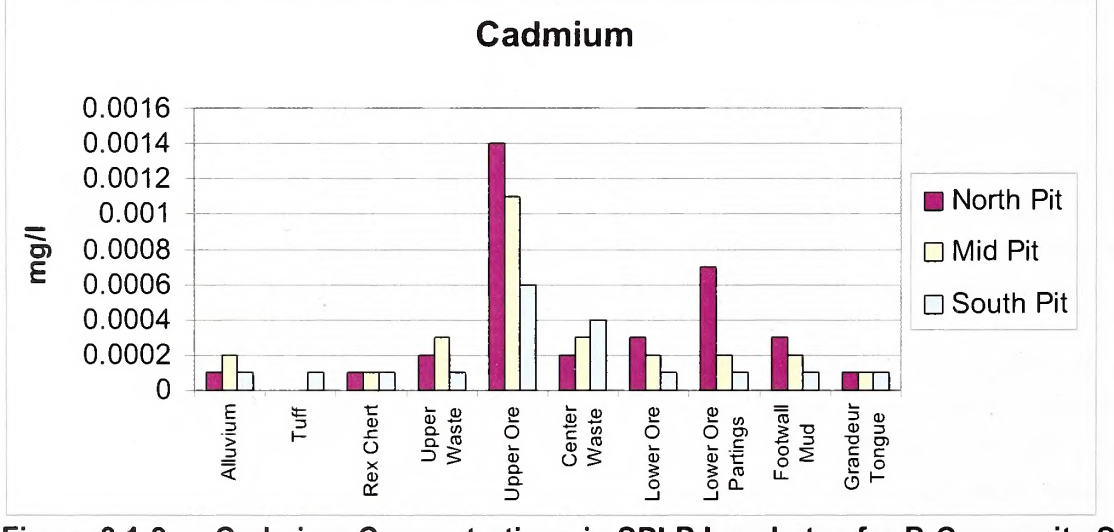


Figure 3.1-9 Cadmium Concentrations in SPLP Leachates for B-Composite Samples

SPLP leachates from C-composite samples (ROM ore and overburden) displayed the same general trends as the B-composite samples. Fifty percent of the C-composite leachates had measurable cadmium above 0.0001 mg/L. The highest concentration (0.0007 mg/L) was in a leachate generated by an ore sample. Selenium in SPLP leachates from overburden ranged from 0.003 to 0.02 mg/L. The highest concentration was from a sample that represents segregated Meade Peak shales and siltstone from the Meade Peak Member.

Cadmium and selenium in SPLP leachates from samples of material that may be used to construct caps and covers (clay) were generally at or near the detection limit with the exception of one leachate from the proposed Mid Pit area that contained elevated cadmium (0.0009 mg/L). Selenium concentrations in the leachates from the proposed cover material were equal to or below 0.001 mg/L.

SPLP testing of core samples was also performed as a control study to evaluate if the age of the samples affected their leaching characteristics. Five sets of paired core samples from the 1984 and 2006 drilling programs were used for the study. The average selenium concentration in leachates from the 1984 cores was 0.025 mg/L. Selenium concentration in leachates from the 2006 cores was 0.0014 mg/L. The results of the study suggest that extended time of exposure after drilling increases selenium releases in laboratory leaching tests.

3.1.7 Column Leaching Tests

Fourteen columns were prepared for the Baseline Geochemical Characterization Study (Whetstone 2009b). Eight of the columns were designed to evaluate the leaching characteristics of ROM rock in unsaturated overburden piles, backfills, and stockpiles. Three of the columns were designed to evaluate the leaching characteristics of saturated backfill. Three columns were prepared for quality assurance/quality control (**Table 3.1-4**).

Table 3.1-4 Column Summary

Column Designation	Design Basis	Material Representation
Unsaturated Columns		
EOP-1	East Overburden Pile	Run of mine alluvium, chert, and limestone
EOP-2	East Overburden Pile	Segregated Meade Peak shale and ore partings
NWOP-1	Northwest Overburden Pile	Run of mine alluvium, chert, and limestone
NPBF-1	North Pit Backfill	Run of mine overburden from North Pit and Mid Pit
MPBF-1	Mid Pit Backfill	Run of mine overburden from Mid Pit with smaller percentages derived from North Pit and South Pit
SPBF-1	South Pit Backfill	Run of mine overburden from South Pit
OS-1	Ore Stockpile (years 1-7)	Average ore composition
OS-2	Ore Stockpile (years 8–15)	Average ore composition
Saturated Columns		
NPBF-2S	North Pit Backfill	Run of mine overburden from North Pit and Mid Pit
MPBF-2S	Mid Pit Backfill	Run of mine overburden from Mid Pit with smaller percentages derived from North Pit and South Pit
SPBF-2S	South Pit Backfill	Run of mine overburden from South Pit
Control Columns		
Control	Control Column	Material blank for experimental control
EOP-2R	Replicate of EOP-2	Replicate column for experimental control (unsaturated)
NPBF-2RS	Replicate of NPBF-2	Replicate column for experimental control (saturated)

Source: Whetstone 2009a

3.1.7.1 Column Testing and Determination of Constituents of Concern

Column leaching tests from the Blackfoot Bridge Baseline Geochemical Characterization Study (Whetstone 2009b) indicate that total dissolved solids (TDS), sulfate, cadmium, copper, iron, manganese, nickel, selenium, and zinc are likely to be released from overburden piles, backfills,

and stockpiles at concentrations of potential regulatory concern. The following section discusses column test results and presents the rationale that was used to determine the COPCs that were evaluated in the numerical contaminant transport model.

The columns were packed with composite rock samples obtained from exploration boreholes and trenches completed in the project area between 1984 and 2006. The samples were weighted in percentage to represent the source areas and volumes of each rock type that would be placed in the mine facilities based on the material balance for the 2005 Mine and Reclamation Plan (P4 2005). The mine plan was revised in 2008 (P4 2008a) after the conclusion of the column leaching tests. Revisions to the mine plan modified the material balance (P4 2009c), and the columns are no longer proportional representations of the proposed facilities. Although the material percentages in the columns are somewhat different than what is currently proposed, application of the column leach results as described in the Source Term Development Report was modified to account for these changes in material balance, and the columns represent the expected range of ROM overburden and ore that would be produced from the Proposed Action. A summary of the design basis for the columns and their material representation is presented in **Table 3.1-4**.

3.1.7.2 Particle Size and Surface Area Analyses for Column Samples

Samples for the columns were evaluated for particle size distribution and specific surface area. The analyses were performed to address concerns that leachate concentrations could be excessively high if the material in the columns had significantly smaller particle sizes than field-placed overburden. The evaluation of particle size distribution was performed by Golder Associates using a standard sieve analysis. Specific surface area was determined by Micromeretics, Inc. using Brunauer, Emmett, and Teller (BET) testing. BET testing determines the specific surface area of a solid by adsorbing a monolayer of a gas to the solid. The gas is then desorbed, and the volume of the gas is used to calculate the surface area.

The results of the sieve analyses for the column samples indicated that the maximum particle size was approximately 0.75 inch. This sizing provided a minimum column diameter to particle size ratio of 8:1 and meets commonly accepted guidelines for column construction (Potter 1981, Cathles and Breen 1983). Unweighted averages for the B-composite samples indicate that 61.5 percent of the stock material used in the columns was gravel size, 32.7 percent of the material was sand size, and 5.7 percent of the material was silt size or less. Particle sizes for the columns were compared to observed particle sizes in overburden dumps at Enoch Valley, Rasmussen Ridge, and Smoky Canyon. Data for the field-placed overburden were obtained from a regional geochemical characterization study that was performed for the Idaho Phosphate Working Group (Tetra Tech 2008). The results of the comparison indicate that column particle sizes were generally larger than field placed overburden (Whetstone 2009b). This comparison suggests that the size of the sample material used in the columns is not likely to bias the column leachates toward unrealistically high concentrations.

Chemical reactions occur on the surfaces of solids where solutions are in contact with soluble ions. Other factors being equal, solids with large surface areas have faster reaction rates than solids with small surface areas. This is because solutions are in contact with more soluble ions at any given time. BET analyses indicate that the specific surface areas of column samples are largely independent of particle size. In other words, equal masses of large and small particles

from the columns have similar surface areas. The average BET surface areas of the sub 0.85 mm and the 0.85 mm to 4.75 mm fractions were calculated to be 15.2 m^2/cc and 15.9 m^2/cc, respectively. These surface areas are several orders of magnitude larger than can be explained by simple geometric models and indicate that the effective surface areas of the samples are dominated by internal pore spaces (Whetstone 2009b). This concept is consistent with the clastic nature of the rocks used for the column leaching experiments. Given that leaching reactions are more strongly influenced by surface area rather than particle size, the BET analyses suggest that column leachate concentrations, and by extension, concentrations in seepage from field-scale facilities, are minimally affected by particle size variations.

3.1.7.3 Unsaturated Columns

Ten unsaturated columns were prepared for the baseline study. Six of the columns were prepared to represent the average run of mine composition of overburden that would be placed above the water table in external overburden piles and backfills. Two of the columns were prepared to evaluate the leaching characteristics of the planned ore stockpile, and two were prepared for experimental control (a replicate of EOP-2 and a material blank).

The columns were packed with 20 kg of material representing the expected compositions of the various rock types that would be placed in the proposed mine facilities. The samples were placed in 1- to 2-inch thick random lifts that were gently compacted by tapping on the sides of the columns with a rubber mallet. A layer of washed 6/9 Colorado Silica Sand (3 to 4 inches) was placed at the top of each column to distribute the head solution evenly and minimize the potential for the development of channelized flow.

The columns were operated for 11 leaching cycles and were un-sterilized and un-inoculated in response to agency concerns regarding the feasibility of culturing bacteria populations that are representative of field conditions. Each leaching cycle required 19 days to complete and included a solution application period (14 days), a drain down period (2 days), and an aeration period (3 days). The head solution (distilled water from a common reservoir) was applied to the tops of the columns using metering pumps at a rate of about 15 ml/hr. The columns were allowed to drain freely, and the leachates were collected at the bottom. Approximately 5 liters of solution were applied to each column per cycle (0.25:1 solution to sample weight ratio). At the end of the application period, the columns were allowed to drain for 48 hours before circulating dry air (up-flow) through the material at a flow rate of about 1 liter per minute. The unsaturated columns were inspected daily for ponding and channelized flow. Neither condition was observed during the operation of the columns. The columns were also inspected for bio-films. No evidence of bio-film formation was noted during the leaching tests.

Leachates from the unsaturated columns were analyzed for an extensive suite of water quality parameters for cycles 1, 2, 3, 4, 6, and 8. A limited suite of parameters (alkalinity, sulfate, cadmium, manganese, and selenium) was also evaluated for cycle 11. The volume of head solution applied during each cycle was approximately equal to the volume of pore space in the packed material. The leachate recoveries from the first cycle averaged 38 percent of the applied volume with approximately 62 percent solution being retained to satisfy the field capacity of the dry material. Recoveries for subsequent leaching cycles were approximately equal to the applied volume of solution.

In addition to the testing described above, columns EOP-2 and EOP-2 R were operated for an additional 8 cycles after the completion of the 32 week baseline testing period (19 cycles total). The total testing time was approximately 1 year (361 days). The purpose of the additional cycles was to evaluate the effect that aeration of the columns had on sulfide mineral oxidation rates and the release of selenium. During cycles 12 through 15, circulation of dry air through column EOP-2R was discontinued and the column was allowed to sit idle during the aeration period. The column was otherwise operated as it had been previously. No changes were made to the operating procedure for EOP-2. In cycles 16 through 19, column EOP-2R was swept with nitrogen gas during the aeration period to remove residual oxygen from the pore spaces. As before, no changes were made to the operating procedure for column EOP-2.

3.1.7.4 Saturated Column Construction and Operation

Saturated columns were prepared to represent the portions of the North Pit and Mid Pit backfills that would be placed below the water table. A saturated column was also prepared for South Pit backfill; however, baseline groundwater studies indicate that the South Pit backfill would be constructed above the regional water table (Whetstone 2009b).

Saturated columns were charged with approximately 20 kg of material in exact replications of both the material percentages and stacking orders of the unsaturated backfill columns. The columns were operated for a total of 11 cycles and were un-sterilized and un-inoculated. Each leaching cycle was 19 days long and included a 14-day solution application and collection period followed by a 5-day rest period. The saturated columns were operated under up-flow conditions and the head solution (distilled water from the same source as the unsaturated columns) was applied to the bottoms of the columns at a rate of 15 mL/hr. Approximately 5 liters of solution were applied to each column per cycle with the exception of cycle one. The average volume of leachate collected from the first cycle was equivalent to 24 percent of the pore volume of the packed overburden. The leachate volumes from the subsequent cycles were approximately equal to one pore volume. Leachates from the saturated columns were analyzed for an extended suite of water quality parameters for cycles 1, 2, 3, 4, 6, and 8. The leachates from cycle 11 were analyzed for alkalinity, sulfate, cadmium, manganese, and selenium.

3.1.7.5 Column Results

The data from the column tests indicate markedly different leaching behaviors for overburden depending on whether the material is saturated or unsaturated. In general, the analyses for both saturated and unsaturated columns showed an initial flushing effect in which leachates for the first one to three cycles had higher concentrations of TDS, sulfate, and metals than leachates from subsequent cycles. With the exceptions of iron and manganese, metals in the leachates from the saturated columns were less mobile than in the leachates from the unsaturated columns. This was particularly true for selenium, which was relatively immobile in leachates from the saturated columns.

The column leachates were moderately buffered to well-buffered solutions with calcium-sulfate to calcium-bicarbonate compositions and near neutral pH (**Figure 3.1-10**). The pH of the leachates from saturated columns NPBF-2S, MPBF-2S, and SPBF-2S were lower than leachates from their unsaturated counterparts (NPBF-1, MPBF-1, and SPBF-1). This difference may have been caused by increased partial pressure of CO_2 gas (pCO_2) in the saturated columns which

were closed to the atmosphere and could not separate the CO_2 released by anaerobic bacteria (Whetstone 2009b).

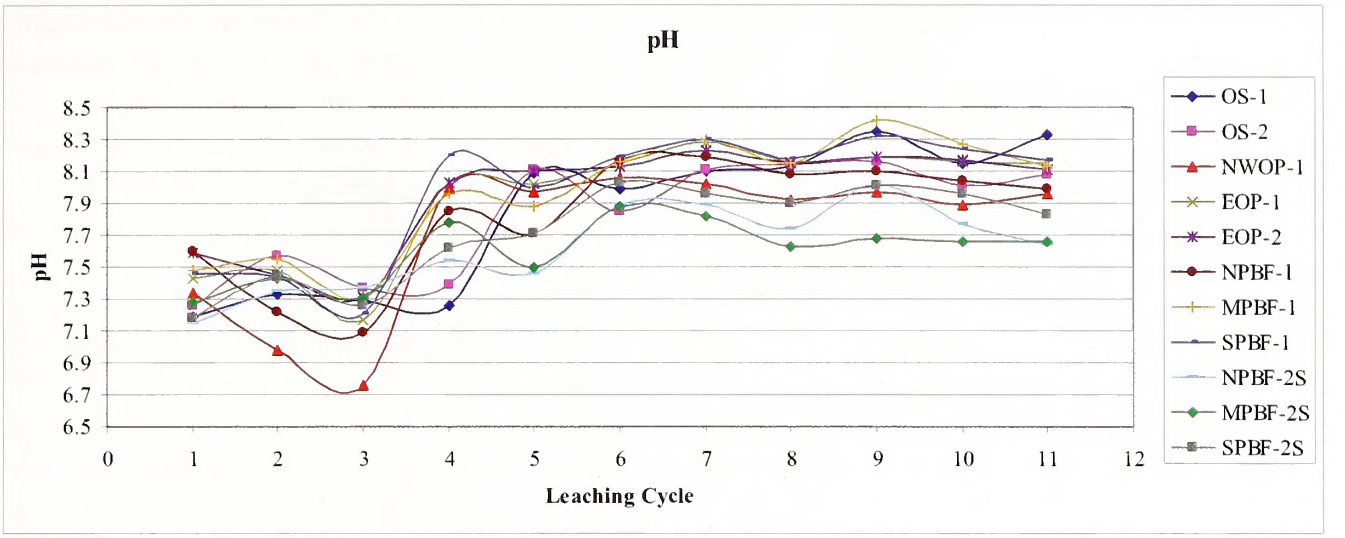


Figure 3.1-10 Plot of pH of Column Leachates

The alkalinity of the column leachates decreased rapidly during the first two cycles and then at a lower rate during cycles 3 through 11. In all cases, the initial alkalinities of the saturated columns were lower than the alkalinities for the corresponding unsaturated columns. By cycle 3, all leachates had similar total alkalinities between 114 to 149 mg/L as $CaCO_3$ which stabilized between 68 and 89 mg/L as $CaCO_3$ by cycle 11. Bicarbonate was the major ion contributing to alkalinity in the column leachates.

TDS was similar in alkalinity in that it decreased rapidly during the first two leaching cycles to near steady-state concentrations by cycle 3. Bicarbonate, calcium, and sulfate were the major ions contributing to TDS. The TDS concentrations of the leachates from the saturated columns were lower than in the leachates from the corresponding unsaturated columns.

Eight constituents were identified in the column leachates that could be released from the proposed mine facilities at levels of regulatory concern. COPCs include TDS, sulfate, cadmium, iron, manganese, nickel, selenium, and zinc. Graphs of COPCs concentrations in column leachates are presented **Figure 3.1-11**. Complete results from the column test are presented in the Baseline Geochemical Characterization Study (Whetstone 2009a).

In general, selenium concentrations increased with increasing column content of overburden from the southern portion of project area. This difference is related to the degree of weathering of the rocks with the rocks from the north end of the deposit being more highly weathered than the south end of the deposit (Whetstone 2009b). Other metals displayed the same trend in the leachates with the exception of cadmium, which was more concentrated in column leachates containing a higher percentage of rocks from the north end of the deposit.

Selenium mobility in the leachates from the saturated columns was significantly lower than in leachates for the unsaturated columns (Whetstone 2009b). Differences in the leaching behavior of selenium in the saturated and unsaturated columns is likely related to redox state of the two environments. Limited oxygen availability in the saturated columns may have favored the

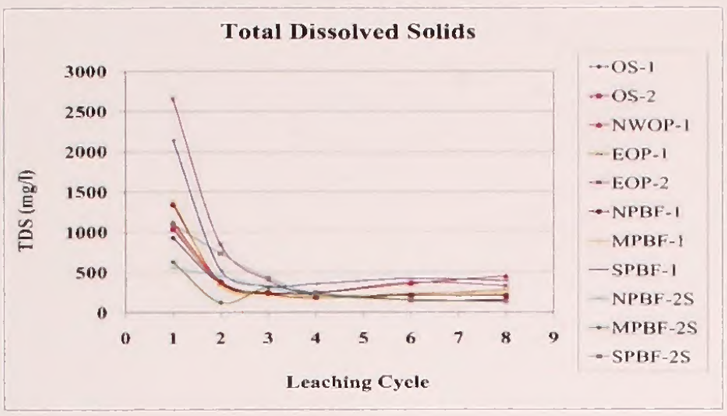
development of reducing conditions and the growth of anaerobic bacteria. Unsaturated columns were well aerated because of the dry air that was circulated through the material for 3 days during each leaching cycle. Reduced forms of selenium, such as selenide (Se^{2-}) and elemental selenium (Se^{0}), are relatively insoluble in water (Seed et al. 2000). Oxidized species [selenite (SeO_3^{2-}), biselenite ($HSeO_3^{-}$), and selenate (SeO_4^{2-})] are readily soluble and mobile in solution (Hem 1989, Masscheleyn et al. 1990). Redox reaction rates for selenium are rapid under bacterially mediated conditions (Beauwens et al. 2005) with the dissolved selenite (SeO_3^{2-}) and selenate (SeO_4^{2-}) being readily reduced to insoluble elemental selenium Se^{0} (Hem 1989). Anaerobic bacteria are the most likely mechanism responsible for reduced selenium concentrations in the saturated leachates.

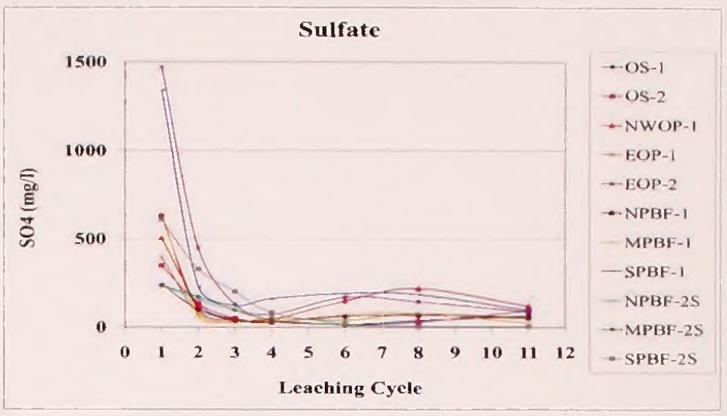
Data from the extended testing of columns EOP 2 and EOP-2R confirm that sulfide mineral weathering rates and the release of selenium in leachates were declining at the end of the 32 week baseline testing period, and that after approximately one year of testing, sulfate and selenium concentrations in leachates were still declining. Sulfate production (and hence sulfide mineral weathering) tracked together in both columns and decreased with subsequent leaching cycles (**Figure 3.1-12**). The pH of the leachates was stable near 8, and the alkalinity for EOP-2 (the non-modified column) stabilized at about 70 mg CaCO3/L. Alkalinity in EOP-2R decreased to 45 mg/L after it was swept with nitrogen gas. Dissolved selenium concentrations tracked together in both columns decreasing to 0.028 and 0.03 mg/L in leachates from EOP-2 and EOP-2R respectively at the end of cycle 19 (**Figure 3.1-13**). The columns gave no indication that increased leaching of selenium from sulfide mineral was likely to develop with time. The data also suggest that sulfide mineral oxidation and selenium release from the columns were not significantly affected by the aeration cycle. The implication of this observation is that the use of longer drying periods with rapid flushing in the column testing protocol would not have resulted in increased sulfide mineral oxidation and selenium releases from the columns.

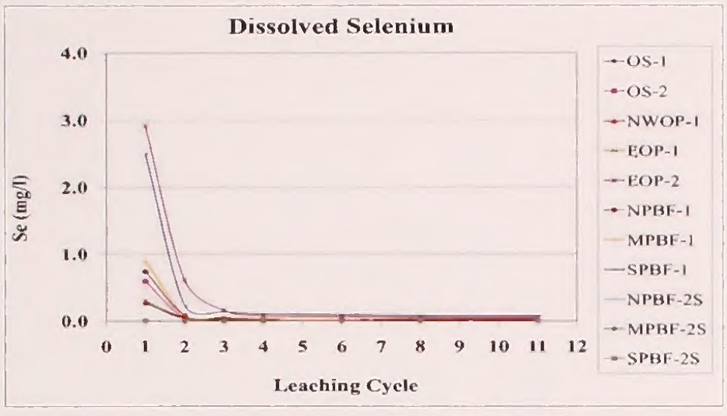
3.1.7.6 MWMP Testing

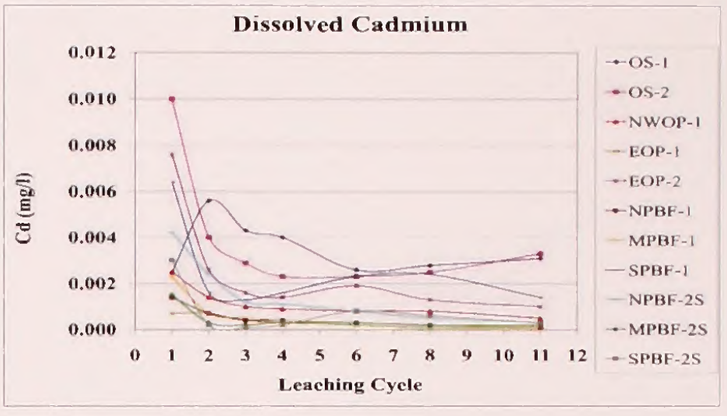
Nine samples of dolomite and limestone overburden (Grandeur Member) that would be selectively handled to provide material for north end of the EOP and the contingency infiltration area in the Mid Pit were submitted for Meteoric Water Mobility Procedure (MWMP) testing to determine leachable concentrations of major ions and COPCs. The rock samples were collected from sections of core from three boreholes in the North and Mid Pits. The tests were performed in accordance with the MWMP method used by the Nevada Division of Environmental Protection and consisted of a column leach over a 24 hour period using distilled water in a water to rock ratio of 1:1.

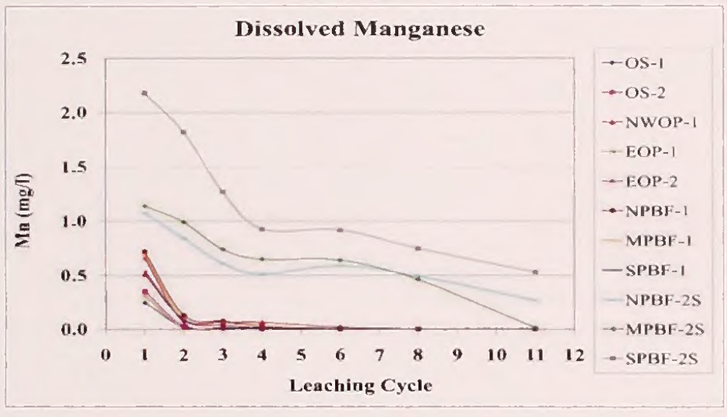
Leachates from the samples contained cadmium, uranium, and zinc concentrations at levels above potentially applicable water quality standards. All other analytes had values below water quality standards. Concentrations for all other constituents met water quality standards. Cadmium concentrations ranged from < 0.0001 mg/L to 0.0063 mg/L and were above potentially applicable water quality standards in the three samples from the southernmost core. All other samples were below the laboratory practical quantitation limit (0.0003 mg/L). Uranium concentrations ranged from 0.0002 mg/L to 0.0015 mg/L and were above potentially applicable water quality standards in seven of the nine samples. However, the water quality standard (0.0003 mg/L) is less than the laboratory practical quantitation limit and actual values may be

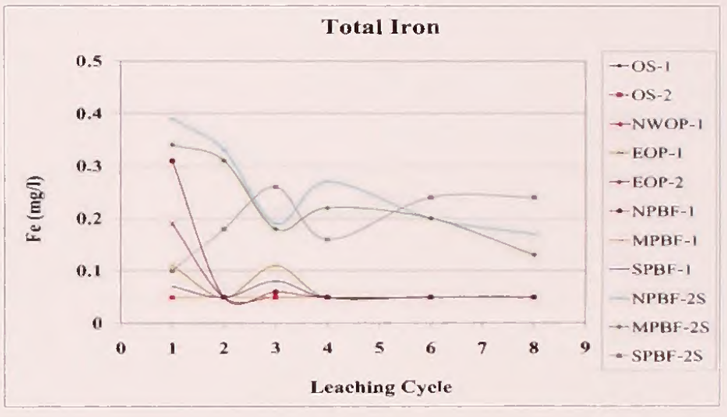


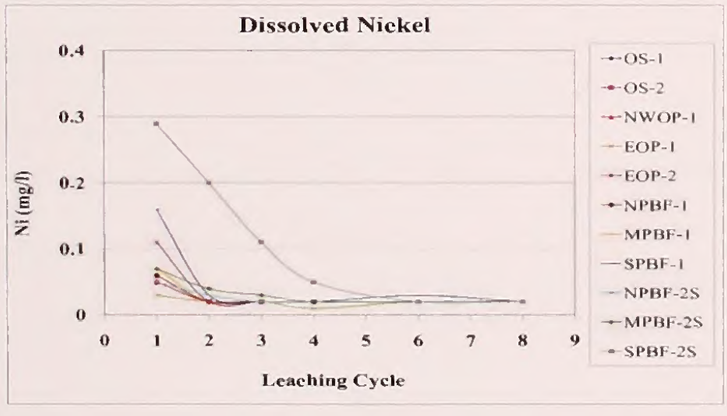


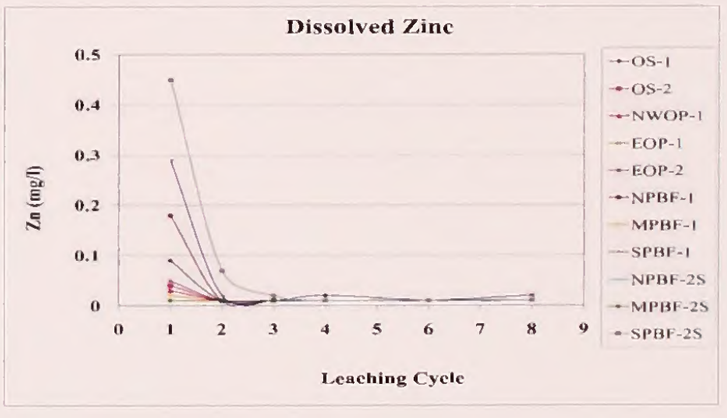


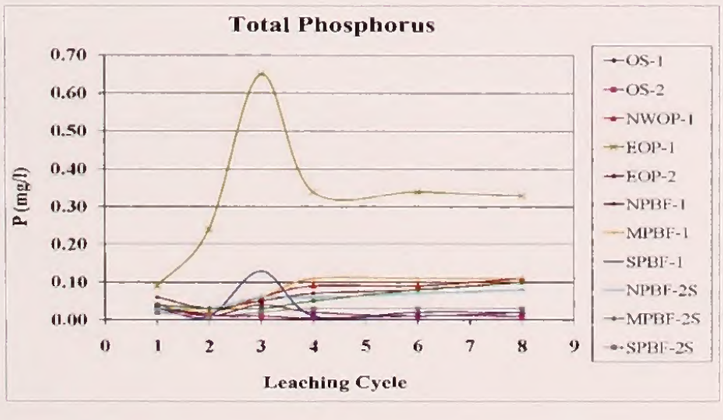


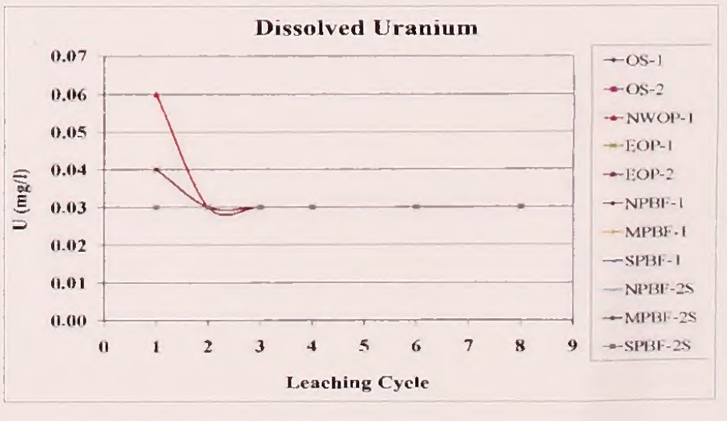












LEGEND

OS-1 = ORE STOCKPILE 1
OS-2 = ORE STOCKPILE 2
NWOP-1 = NORTHWEST OVERBURDEN PILE
EOP-1 = EAST OVERBURDEN PILE 1
EOP-2 = EAST OVERBURDEN PILE 2
NPBF-1 = NORTH PIT BACKFILL
MPBF-1 = MID PIT BACKFILL
SPBF-1 = SOUTH PIT BACKFILL
NPBF-2S = NORTH PIT BACKFILL SATURATED
MPBF-2S = MID PIT BACKFILL SATURATED
SPBF-2S = SOUTH PIT BACKFILL SATURATED

BLACKFOOT BRIDGE PROJECT EIS

FIGURE 3.1-11
Concentrations of Constituents in Discharge from Column Studies

ANALYSIS AREA: Caribou County, Idaho	
Date: 12/21/10	File: ConCon_inDischarge_fromColStudies.dwg
Drawn By: JC	Layout: 2010

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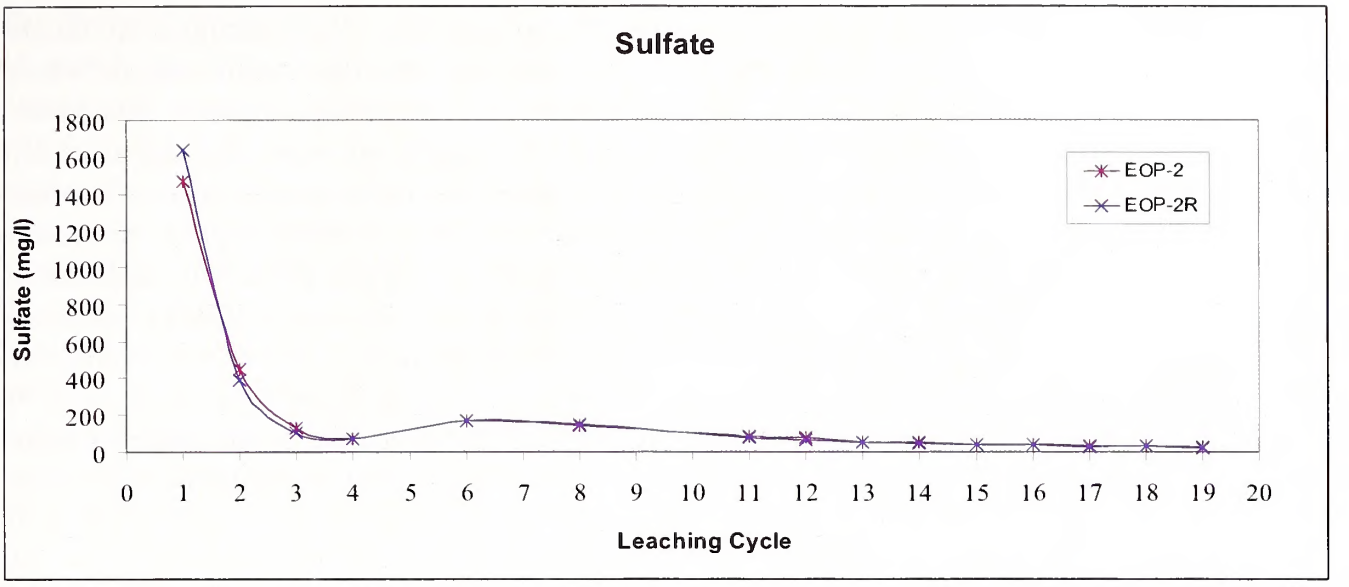


Figure 3.1-12 Plot of Sulfate Concentrations in Leachates from Columns EOP-2 and EOP-2R

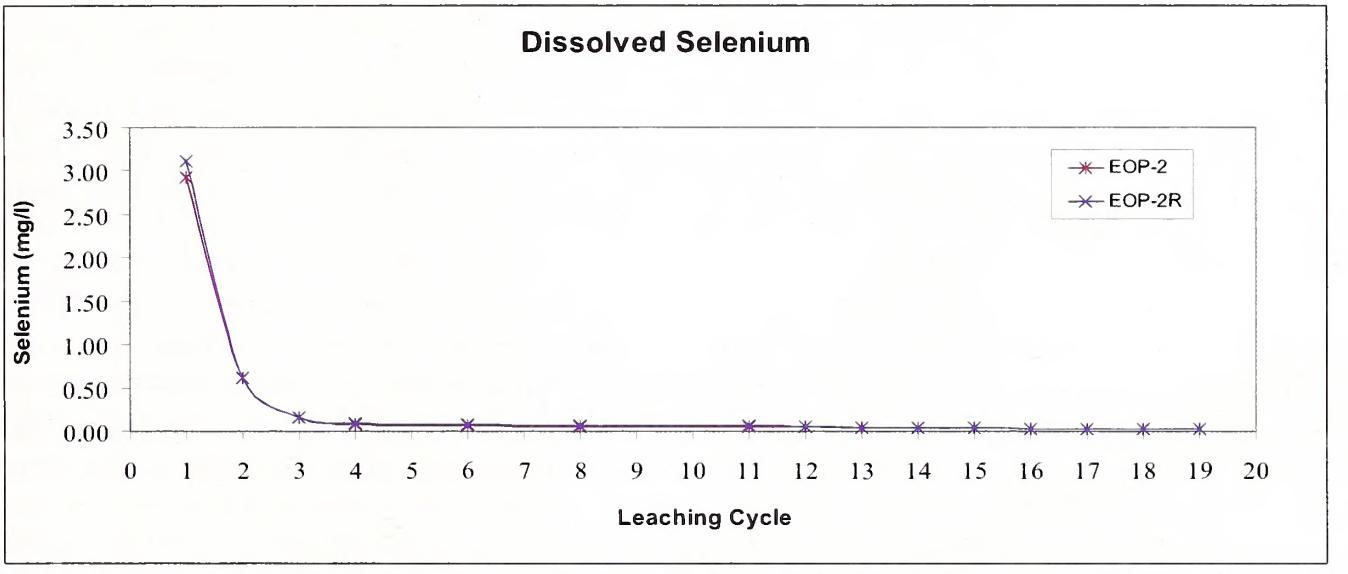


Figure 3.1-13 Plot of Selenium Concentrations in Leachates from Columns EOP-2 and EOP-2R

slightly greater or less than the standard. Zinc concentrations ranged from 0.01 mg/L to 0.30 mg/L and were above potentially applicable water quality standards in two of the three samples from the southernmost core. All other samples had zinc values below potentially applicable water quality standards.

3.1.7.7 MWMP Testing

Nine samples of dolomite and limestone overburden (Grandeur Member) that would be selectively handled to provide material for north end of the EOP and the contingency infiltration area in the Mid Pit were submitted for Meteoric Water Mobility Procedure (MWMP) testing to determine leachable concentrations of major ions and COPCs. The rock samples were collected from sections of core from three boreholes in the North and Mid Pits. The tests were performed in accordance with the MWMP method used by the Nevada Division of Environmental Protection and consisted of a column leach over a 24 hour period using distilled water in a water to rock ratio of 1:1.

Leachates from the samples contained cadmium, uranium, and zinc concentrations at levels above potentially applicable water quality standards. All other analytes had values below water quality standards. Concentrations for all other constituents met water quality standards. Cadmium concentrations ranged from < 0.0001 mg/L to 0.0063 mg/L and were above potentially applicable water quality standards in the three samples from the southernmost core. All other samples were below the laboratory practical quantitation limit (0.0003 mg/L). Uranium concentrations ranged from 0.0002 mg/L to 0.0015 mg/L and were above potentially applicable water quality standards in seven of the nine samples. However, the water quality standard (0.0003 mg/L) is less than the laboratory practical quantitation limit and actual values may be slightly greater or less than the standard. Zinc concentrations ranged from 0.01 mg/L to 0.30 mg/L and were above potentially applicable water quality standards in two of the three samples from the southernmost core. All other samples had zinc values below potentially applicable water quality standards.

3.1.7.8 Adsorption Tests

Adsorption to soil or rock matrices may remove metals and other constituents from seepage and retard their transport in groundwater. Adsorption of dissolved solutes onto geologic materials is controlled by a number of processes that vary in intensity depending upon the substrate, the solute, and solution chemistry. Elements like cadmium may be initially adsorbed onto mineral surfaces and then affected by other processes like substitution and co-precipitation. Others ions are held in surface charge complexes with variable degrees of strength and rate-dependent reversibility (EPA 1992).

The potential for rocks from Dinwoody Formation, Rex Chert, Grandeur Member and the Wells Formation to attenuate cadmium, copper, iron, manganese, nickel, selenium, sulfate, and zinc from overburden seepage was evaluated using batch adsorption tests (EPA 1992). The results of the tests suggest that cadmium may be adsorbed from solution by contact with rocks from the Dinwoody Formation. The tests did not indicate significant adsorption of other COPCs by project area rocks.

3.1.8 Topography

The project area is located along the north flank of the westernmost ridge of the north-south trending Aspen Range. Two knolls north of the existing private haul road rise from the valley floor (6,150 feet amsl at the northeast corner of the project area) to an elevation of approximately 6,530 feet amsl. South of the haul road, the dominant ridge gains a maximum elevation of about 7,240 feet amsl near the south border of the project area. Woodall Mountain is located further south along this ridge at an elevation of 7,822 feet amsl. Aspen Range slopes generally have a grade of 20 to 30 percent. A series of east-west trending gullies drain both flanks of the Aspen Range.

3.1.9 Paleontology

Sedimentary rocks of southeastern Idaho have paleontological resources consisting of vertebrate, invertebrate, and paleobotanical fossils including fish and shark remains. Although some of the known genera of fossils found in the project area are found elsewhere in southeastern Idaho (BLM and USFS 2002), all fossils represent unique data concerning paleoecology and evolution.

The Pennsylvanian Wells Formation is described as fossiliferous, and predominantly consisting of widely distributed bryozoa and brachiopods. The Meade Peak Member of the Phosphoria Formation contains abundant pelecypods, gastropods, brachiopods, ammonites, nautiloids, crinoids, bryozoa, and sponge spicules. The base of the Meade Peak Member contains a thin marker bed identified as the "fishscale bed," which reportedly contains abundant disarticulated fish fossils. Remains of Heliocoprion, a fossil shark, have been found in various units in the Meade Peak Member including Phosphatic ore-bearing units. The Rex Chert Member of the Phosphoria Formation contains brachiopods, crinoid fragments, and sponge spicules (BLM and USFS 2002). Together, the Meade Peak and Rex Chert Members define approximately 50 percent of surface exposures in the project area. Due to the common occurrences of invertebrate fossils within the Wells and Phosphoria Formations throughout southeastern Idaho, these resources are not considered to be scientifically significant. Likewise, because the fish fossils of the Meade Peak "fishscale bed" are abundant throughout the region and disarticulated, they are not considered unique or rare representations of vertebrate fossils that could be used for paleoecologic reconstructions.

Early Triassic invertebrate marine fossils have been discovered in the Dinwoody Formation of the Aspen Range to the south of the project area, as well as with specimens from eastern California, these are the only known representatives from that period in North America (Smith 1914). The Dinwoody Formation is exposed across approximately 20 percent of the project area. Approximately 10 miles north of the project area, the Cretaceous Wayan Formation has produced dinosaur (ornithopod, ankyloraur, iguanodontid, eggshell), crocodile, turtle, and invertebrate fossils. However, the Wayan Formation is not exposed in the project area (Dorr 1985).

Unconsolidated quaternary valley fill sediments in southeastern Idaho have yielded Ice Age and older mammals including mammoths, mastodons, horses, bison, camels, ground sloths, carnivores, ferrets, rodents, and other animals. The sediments are derived from lake, stream, and/or windblown deposits and consist of clay, silt, ash, sand, and gravel (BLM and USFS 2002). Quaternary deposits are exposed across approximately 15 percent of the project area.

The extensive vegetative cover and a lack of bedrock outcrop in the project area minimizes the potential for locating these resources. The presence of thick soils formed on various geologic units, including the Dinwoody Formation, also reduces the potential for impacts to fossils. As a result, no significant paleontological resources are expected to occur in the area.

3.2 AIR RESOURCES

3.2.1 Climate

The project area is located approximately 10 miles north of Soda Springs, Idaho. Locally, the topography is characterized by a series of north- to northwest-trending mountain ranges that are separated by broad intermountain valleys. Relief at the site exceeds 1,000 feet, with elevations ranging from 6,160 feet near Blackfoot River to about 7,240 feet at the crest of the Aspen Range. The climate of the project area is semi-arid, and local patterns of wind, precipitation, and temperature are influenced by prominent geographic features including Blackfoot Reservoir and the Aspen and Wooley Mountain Ranges.

The project area experiences wide annual and diurnal variations in temperature and humidity. Normally, May is the wettest month of the year; July and August are the driest months. Temperature extremes range from -11 degrees Fahrenheit (°F) in January to 93°F in July. Frost or freezing conditions may occur in any month, with the exceptions of July and August.

Climate data from 13 stations in the region were evaluated to estimate average monthly and annual precipitation and temperature for the project area (Whetstone 2009a). The evaluated stations include National Weather Service (NWS) meteorological monitoring stations at Conda, Henry, Wayan, Soda Springs, Montpelier, Pocatello, Grace, and Afton; NRCS SNOTEL (Snow Telemetry) stations at Somsen Ranch, Slug Creek Divide, and Emigrant Summit; and P4's stations at Enoch Valley and Blackfoot Bridge (**Figure 3.2-1**).

The Blackfoot Bridge meteorological station provides the most representative dataset for the site, but has a relatively short period of record (4 years). Data from the Soda Springs Airport are available for a longer period of time (29 years) and provide the best correlation of the 13 stations with data from the Blackfoot Bridge. The meteorological analysis for the project area used the data from the Soda Springs Airport to scale the Blackfoot Bridge data and develop long-term averages of precipitation and temperature at the site (Whetstone 2009a). Based on the scaled data, the estimated average annual precipitation at Blackfoot Bridge is 17.18 in/yr. Estimated average monthly precipitation and temperature for the site are summarized in **Table 3.2-1**.

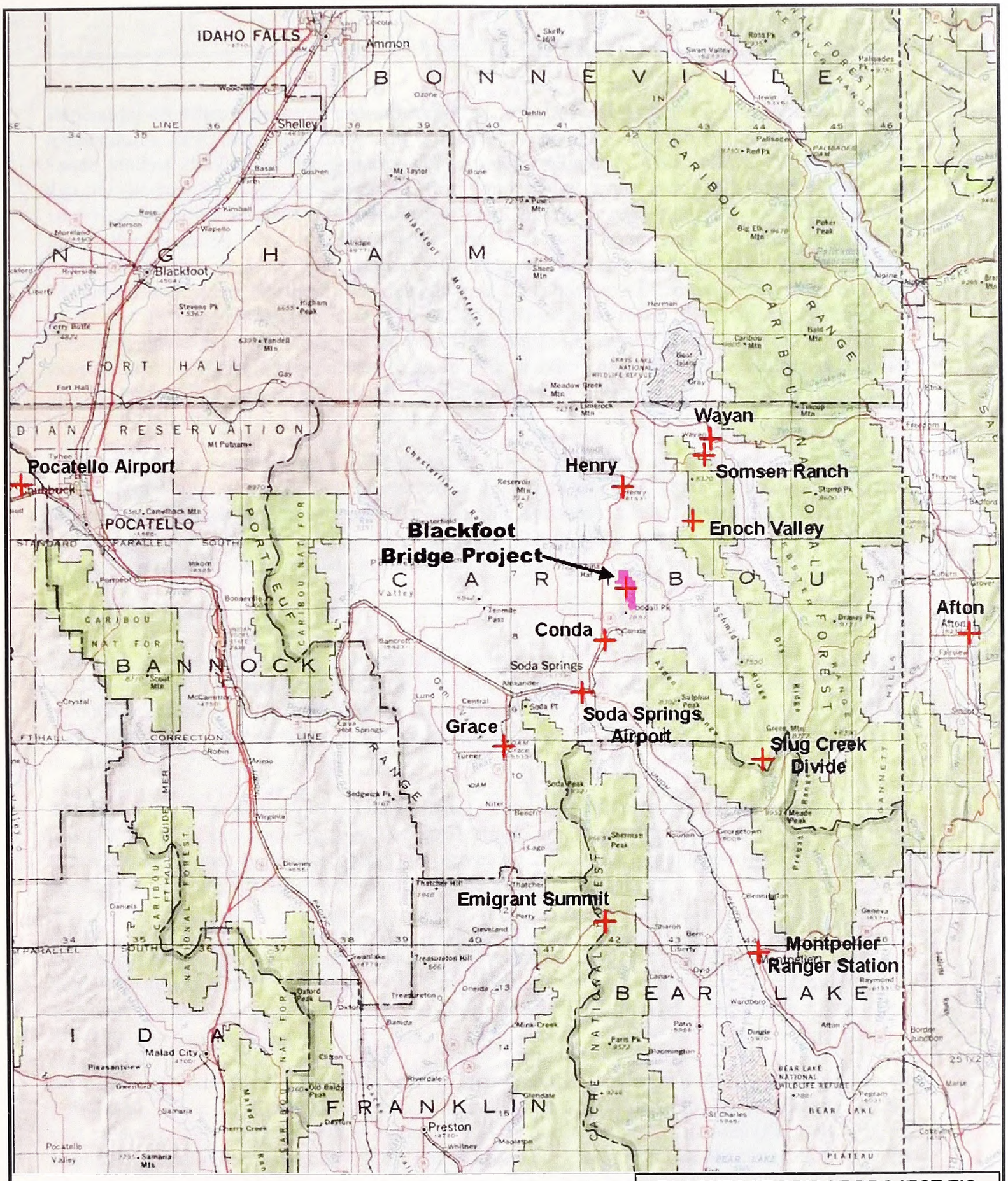
Table 3.2-1 Estimated Long-Term Average Precipitation and Temperature at Blackfoot Bridge

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Avg. Monthly Precipitation (in.)	1.24	1.25	1.4	1.51	2.38	1.63	1.17	1.35	1.43	1.4	1.22	1.19	17.18
Avg. Monthly Minimum Temperature (°F)	14.3	17.5	24.5	33.1	40.5	46.6	50.8	49.9	43.3	33.3	23.3	16.3	32.8
Avg. Monthly Temperature (°F)	16.4	17.6	26.3	33.0	41.0	49.1	59.6	55.3	45.1	35.4	25.2	22.7	35.5
Avg. Monthly Maximum Temperature (°F)	25.2	29.5	38.7	49.8	60.8	71.3	79.8	79.3	69.3	53.8	38.5	28.1	52.0

Source: Whetstone 2009a

3.2.2 Climate Change

Ongoing scientific research has identified the potential impacts of the "greenhouse effect" resulting from several types of greenhouse gases (GHGs) in air including CO_2, methane, nitrous oxide, water vapor, and several trace gasses on global climate. GHGs make up approximately 0.1 percent of the atmosphere. Through complex interactions on regional and global scales, these GHG emissions are believed to cause a net warming effect of the atmosphere, primarily by decreasing the amount of heat energy radiated by the Earth back into space. Although GHG levels have varied for millennia (along with corresponding variations in climatic conditions), recent industrialization and burning of fossil carbon sources is believed by some scientists to have caused CO_2 concentrations to increase, and are likely to contribute to overall climatic changes, typically referred to as global warming. Increasing CO_2 concentrations also lead to preferential fertilization and growth of specific plant species.


IDAHO FALLS
Ammon
BONNEVILLE
Shelley
Blackfoot
FORT HALL
INDIAN RESERVATION
Pocatello Airport
POCATELLO
Wayan
Somsen Ranch
Henry
Enoch Valley
Blackfoot Bridge Project
CARIBOU
BANNOCK
Conda
Soda Springs
Soda Springs Airport
Grace
Slug Creek Divide
Afton
Emigrant Summit
Montpelier Ranger Station
BEAR LAKE
IDAHO
Malad City
FRANKLIN
Preston
LEGEND
METEOROLOGICAL MONITORING STATION
BLACKFOOT BRIDGE MINE AREA
NORTH
5 0 5 10
MILES
BLACKFOOT BRIDGE PROJECT EIS
FIGURE 3.2-1
Location of Meteorological Monitoring Stations
Near Blackfoot Bridge Project Area
ANALYSIS AREA: Caribou County, Idaho
Date: 06/22/09
File: Figure 3.2-1 Met Station.dwg
Drawn By: JC
Layout: Met Station

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Depending on where measurements are reported, some scientists believe global mean surface temperatures have increased nearly 1.0°C (1.8°F) from 1890 to 2006 (Goddard Institute for Space Studies 2009). The Intergovernmental Panel on Climate Change (IPCC 2007) indicated that, by the year 2100, global average surface temperatures could increase 1.4 to 5.8°C (2.5 to 10.4°F) above 1990 levels, but also indicated that there are uncertainties in the modeled results; especially regarding how climate change may affect different regions. Observations and predictive models indicate that average temperature changes are likely to be greater in the Northern Hemisphere. Northern latitudes (above 24° N) have exhibited temperature increases of 1.2°C (2.1°F) since 1900, with nearly a 1.0°C (1.8°F) increase since 1970. Warming during the winter months is expected to be greater than during the summer, and increases in daily minimum temperatures are more likely than increases in daily maximum temperatures. Without additional meteorological monitoring systems, it is not possible to determine the spatial and temporal variability and change of climatic conditions.

Some other scientists have linked global temperature to solar activity, specifically related to the presence of sunspots on the sun (Patterson 2007). In their view, global temperature changes reflect the various natural solar cycles including the Sunspot cycle (11 years); the 75 to 90 year Gleissberg Solar Cycle; the 200 to 500 year Suess Solar Cycle; and the 1,100 year Bond Solar Cycle, rather than from man-made influences.

3.2.3 Air Quality

The IDEQ is the state agency with authority delegated by the federal government to issue air quality permits in Idaho. Any business or industry (source) in Idaho that emits, or has the potential to emit, pollutants into the air is required to have an air pollution control permit from the IDEQ. Appropriate air permits for operations within the project area would be obtained from the IDEQ.

The Blackfoot Mine project would be a mining operation, with phosphate ore mined and hauled about 8 miles to the Soda Springs elemental phosphorus plant for processing. No processing activities other than typical crushing and screening operations would take place on site. All chemical processing activities would occur at the Soda Springs plant.

Sources of gaseous air pollutants from mining operations include drilling, blasting, and tailpipe emissions. Sources of fugitive dust include drilling and blasting, ore crushing and screening, and vehicle travel on haul roads. Fugitive dust is particulate matter suspended in the air by the wind and human activities and originates primarily from soil. IDEQ regulates fugitive dust emissions in Idaho.

The EPA has established National Ambient Air Quality Standards (NAAQS) for criteria air pollutants. The criteria pollutants are carbon monoxide (CO), lead (Pb), sulfur dioxide (SO_2), particulate matter less than or equal in diameter to 10 microns and 2.5 microns (PM_{10} and $PM_{2.5}$), ozone (O_3), and nitrogen dioxide (NO_2). The NAAQS are absolute allowable concentration limits for criteria air pollutants that apply to areas where the public has access. The State of Idaho has adopted the EPA's NAAQS for criteria air pollutants.

The project area is located within an area designated as an attainment area or unclassifiable for all NAAQS. Air quality in the project area is, therefore, designated as attainment or unclassified

for all pollutants. The attainment or unclassified designation means that existing ambient air quality meets all NAAQS for that area.

Four areas in Idaho are in nonattainment for PM_{10}. The closest nonattainment area for PM_{10} is located in Bannock County at the Fort Hall Reservation. A PM_{10} maintenance area encompasses this area.

The IDEQ has conducted ambient air monitoring in the region, with sites monitoring background levels for criteria pollutants near and around Pocatello and Soda Springs, Idaho. There have been 12 years (1990 through 2002) of PM_{10} ambient air quality data collected at the Caribou County monitoring locations, with monitors located in Soda Springs recording higher values than those located throughout other portions of the county (BLM and USFS 2007). Annual average ambient concentration of PM_{10} throughout this period has been approximately one half the NAAQS limit. PM_{10} monitoring in Caribou County was ended in 2002 by the State of Idaho, with the $PM_{2.5}$ monitoring beginning that same year. No exceedances of PM_{10} or $PM_{2.5}$ occurred in 2002. The previous PM_{10} exceedance for the county occurred in 1992 (BLM and USFS 2007). However, in each of the other years within the 12-year monitoring period, average annual 24-hour PM_{10} concentrations were recorded at approximately one third of the particulate standard (BLM and USFS 2007).

The area surrounding the project area is designated as Class II, as defined by the EPA Prevention of Significant Deterioration (PSD) program (IDEQ 2002b). In Class II designated areas, moderate degradation of air quality is allowed to occur within certain prescribed limits above baseline levels. In order for an industrial source to locate or expand within a Class II area, it must demonstrate that the increase in emissions would not cause degradation of air quality in all classified areas and would not cause visibility degradation in Class I areas (BLM and USFS 2007).

The level of deterioration allowed within a Class I PSD area (typically wilderness areas and National Parks) is more stringent than for Class II designated areas, resulting in more stringent standards. Within 110 miles of the project area, the EPA Mandatory Class I areas are shown in **Table 3.2-2**. The federal Clean Air Act requires that Class I areas be evaluated for haze and visibility impacts if a new or a major-modification facility is planned within 60 miles (100 kilometers) of a Class I area. In addition, a major action (e.g., construction) is also subject to visibility and hazard impact analyses. The distances and directions to the nearest Class I areas are presented in **Table 3.2-2**.

Table 3.2-2 Federal Mandatory Class I Air Sheds Nearest to Blackfoot Bridge Project Area

Area	Direction From Project	Distance From Project (Miles)
Grand Teton National Park	Northeast	65
Bridger Wilderness Area	East	84
Yellowstone National Park	North	98
Teton Wilderness Area	Northeast	92
Fitzpatrick Wilderness Area	Northeast	96
Craters of the Moon National Monument	Northwest	107

Source: NPS 2009

The nearest Class I area to the project area is Grand Teton National Park, located approximately 65 miles (104 km) to the northeast. The next closest Class I area is Bridger Wilderness Area located 84 miles (135 km) to the east. Because the Blackfoot Bridge Mine Project would not be a major/stationary source, as defined in the Clean Air Act, and it is not located within 100 km of the nearest Class I area, there is no requirement for evaluation of regional haze and visibility.

3.2.4 Noise

Noise is generally described as unwanted sound. Discussions of environmental noise do not focus on pure tones because commonly heard sounds have complex frequency and pressure characteristics. Accordingly, sound measurement equipment has been designed to account for the sensitivity of human hearing to different frequencies. Correction factors for adjusting actual sound pressure levels to correspond with human hearing have been determined experimentally. For measuring noise in ordinary environments, A-Weighted correction factors are employed. A filter de-emphasizes the very low and very high frequencies of sound in a manner similar to the response of the human ear. Therefore, the A-weighted decibel (dBA) is a good correlation to a human's subjective reaction to noise.

The dBA measurement is on a logarithmic scale. To the average human ear, the apparent increase in "loudness" doubles for every 10 dBA increase in noise (Bell 1982). Measurements and descriptions of sounds are usually based on various combinations of the following factors:

- The vibration frequency characteristics of the sound, measured as sound wave cycles per second (Hertz [Hz]) which determines the "pitch" of a sound;
- The total sound energy being radiated by a source, usually reported as a "sound power level";
- The actual air pressure changes experienced at a particular location, usually measured as a "sound pressure level"(the frequency characteristics and sound pressure level combine to determine the "loudness" of a sound at a particular location);
- The duration of a sound; and
- The changes in frequency characteristics or pressure levels through time.

Equivalent noise levels (L_{eq}) values are used to develop single-value descriptions of average noise exposure over various time periods. Such average noise exposure ratings often include additional weighting factors for potential annoyance due to time of day or other considerations. The L_{eq} data used for average noise exposure descriptors generally are based on A-weighted sound level measurements.

L_{eq} are not an averaging of decibel values, but are based on the cumulative acoustical energy associated with the component decibel values. High dB events contribute more to the L_{eq} value than low dB events.

Average noise exposure over a 24-hour period is often presented as a day-night average sound level (L_{dn}). L_{dn} values are calculated from hourly L_{eq} values, with the L_{eq} values for the nighttime

period (10 p.m. to 7 a.m.) increased by 10 dB to reflect the greater disturbance potential from nighttime noises. **Table 3.2-3** shows examples of noise levels generated in land use areas.

Table 3.2-3 Examples of Outdoor Day-Night Average Sound Levels in dB Measured at Various Locations

Noise Location	L_{dn} Sound Level (dB)
Apartment next to a freeway	87.5
Urban high density apartment	78
Urban row housing on major avenue	68
Wooded residential	51
Agricultural crop land	44
Rural residential	39
Wilderness ambient	35

Source: EPA 1978

For comparison to a normal human activity, the noise level experienced during normal conversation of two people 5 feet apart is 60 dBA.

The EPA has identified outdoor levels of 55 dBA L_{dn} and L_{eq} as desirable to protect against interference and annoyance where people spend widely varying amounts of time in sensitive areas such as residences and other places where quiet is a basis for use. Based on this, the project area is not considered a sensitive noise area. Outdoor sites are generally unacceptable if exposed to sound levels of 70 dBA L_{eq} or greater (EPA 1974).

The affected environment is determined by sensitive noise receptors including residential areas, schools, and hospitals. If a noise receptor is located where project noise can be detected, then there may be an effect.

3.2.4.1 Existing Noise Levels

Existing noises levels in the project area are low. The area is rural and undeveloped. The Conda Mine is located just south of the property boundary, but this mine is not active. A private haul road and the Union Pacific Dry Valley Branch Railroad run through the northern third of the property. Noise from these two sources would be short-term and intermittent. Intermittent traffic from State Highway 34 would contribute to existing noise at the receptors. In **Table 3.2-3**, existing noise levels are predicted to be between 39 and 51 L_{dn}. According to the Noise Effects Handbook (EPA 1981), at 55 and 60 dBA L_{dn}, possible effects to humans in an outdoor setting will lead to a slight or moderate disturbance of normal conversation with 100 percent intelligibility at 0.35 and 0.2 meter, respectively.

3.2.4.2 Existing Regulations

A review of the Idaho Statutes and Soda Springs Regulations did not reveal any noise regulations. There are no national noise regulations. In the Noise Control Act of 1972, Congress directed the EPA to publish scientific information on the effects of different qualities and quantities of noise and to define acceptable noise levels under different conditions that would protect public health and welfare with an adequate margin of safety. EPA published "Information on Levels of Environment Noise Requisite to Protect Public Health and Welfare With An

Adequate Margin of Safety" in 1974. This guidance document is not a standard, specification, or regulation. The 1974 document provides a summary of noise levels identified to be protective of public health and welfare in indoor settings and "outdoors in residential areas and farms and other outdoor areas where people spend widely varying amounts of time and other places in which quite is a basis for use". The outdoor level is 55 dBA L_{dn}. The document also provides a level of 55 dBA L_{eq} for outdoor areas where people spend limited amounts of time such as school yards and playgrounds (EPA 1974).

3.3 WATER RESOURCES

3.3.1 Surface Water Resources

The project area straddles the surface water divide between the Blackfoot and Bear Lake Sub-Basins, but it is located primarily within the Blackfoot Sub-Basin (**Figure 3.3-1**). The Blackfoot Sub-Basin (Hydrologic Unit Code [HUC] 17040207) is tributary to the Upper Snake Basin which drains into the Columbia River. The Bear Lake Sub-Basin (HUC 1601021) is tributary to the Bear River Basin and is part of the Great Basin Drainage System. Primary activities in the catchments include agriculture, livestock grazing, and phosphate mining. Waterbodies within Blackfoot Sub-Basin sustain several beneficial uses. All streams support cold water aquatic life and agricultural water supply as well as secondary-contact recreation. The larger streams also support primary-contact recreation. Most streams maintain spawning populations of salmonids.

The northern and eastern portions of the project area are drained by the Blackfoot River, which flows into Blackfoot Reservoir and eventually into the Snake River. The total drainage area for Blackfoot River is approximately 1,300 square miles, about half of which is above Blackfoot Reservoir (Dion 1974). The southwestern portion of the project area is part of the Bear River Basin above Alexander Reservoir and is tributary to the Great Salt Lake. The Bear River Drainage Basin spans three states (Idaho, Wyoming, and Utah) and has a total area of about 7,400 squares miles (Dion 1969). Soda Creek is the main tributary of the Bear River Basin that drains the Blackfoot Lava Field west of the project area (**Figure 3.3-1**).

3.3.1.1 Area Watersheds

The project is located in watersheds for State Land Creek, an unnamed tributary to Fish Pond, an unnamed tributary to Beaver Pond, Gardner Spring Creek, and numerous other small, intermittent drainages. Drainage areas for the project area are summarized in **Table 3.3-1**. A watershed map is presented in **Figure 3.3-2**.

Table 3.3-1 Drainage Basin, Sub-Basin, Watershed, and Sub-Watershed Areas and HUCs

Watershed	Area (acres)	Area (mi^2)	Tributary to	Huc[1]
Major Drainage Basins				
Bear River Basin	4,678,400	7,310	Great Salt Lake	1601
Upper Snake River Basin	22,912,000	35,800	Columbia River	1704
Sub-Basins				
Portneuf River Sub-Basin	844,800	1,320	Snake River	17040208
Blackfoot River Sub-Basin	691,200	1,080	Snake River	17040207
Bear Lake Sub-Basin	780,800	1,220	Bear River	16010201

Table 3.3-1 Drainage Basin, Sub-Basin, Watershed, and Sub-Watershed Areas and HUCs

Watershed	Area (acres)	Area (mi^2)	Tributary to	Huc[1]
Watersheds				
State Land Creek Watershed	2,828	4.42	Blackfoot River	n/a
Fish Pond Watershed	627	0.98	Blackfoot River	n/a
Gardner Spring Watershed	332	0.52	Blackfoot River	n/a
Beaver Pond Watershed	135	0.21	Blackfoot River	n/a
Subwatersheds[2]				
North Pit Area #1	26	0.04	Blackfoot River	n/a
North Pit Area # 2	188	0.29	Blackfoot River	n/a
North Aspen Area #1	125	0.20	Blackfoot River	n/a
North Aspen Drainage #2	104	0.16	Blackfoot River	n/a
North Aspen Area #3	98	0.15	Blackfoot River	n/a
North Aspen Area #4	103	0.16	Bear River	n/a
North Aspen Drainage #5	97	0.15	Bear River	n/a
Woodall Mountain Creek	192	0.30	Bear River	n/a
State Land Creek Upper Mainstem	650	1.02	Blackfoot River	n/a
State Land Creek Tributary #1	265	0.41	Blackfoot River	n/a
State Land Creek Tributary #2	345	0.30	Blackfoot River	n/a
State Land Creek Tributary #3	399	0.62	Blackfoot River	n/a
State Land Creek Tributary #4	195	0.54	Blackfoot River	n/a
State Land Creek Area #5	199	0.31	Blackfoot River	n/a
State Land Creek Area #6	479	0.75	Blackfoot River	n/a
State Land Creek Area #7	396	0.46	Blackfoot River	n/a

Notes:
1 Hydrologic Unit Codes do not extend below the sub-basin level.
2 Subwatersheds referred to as "areas" contain multiple small channels and lack a single master channel.
Source: Whetstone 2009b

3.3.1.1.1 State Land Creek Watershed

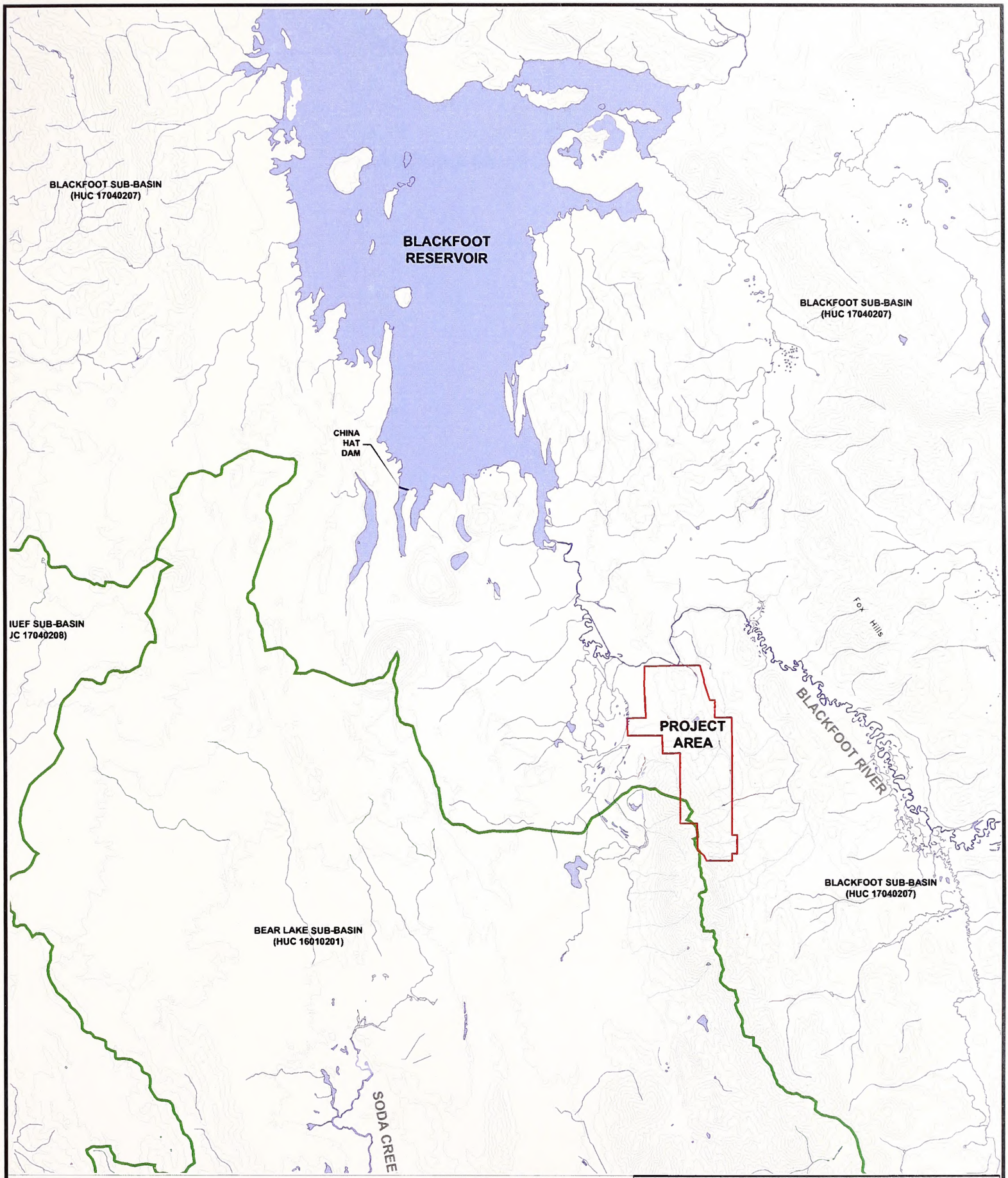
The southern third of the project area and a portion of the inactive Conda Mine are located within the upper portion of the watershed for State Land Creek (**Figure 3.3-2**). The State Land Creek watershed encompasses an area of approximately 2,828 acres and is tributary to Blackfoot River. The proposed South Pit would be the only major mine facility that would be situated within the watershed.

3.3.1.1.2 Fish Pond Watershed

The central portion of the project area is located within the watershed for Fish Pond (**Figure 3.3-2**). The Fish Pond Watershed encompasses an area of about 627 acres and is part of the Blackfoot Sub-Basin. The proposed EOP and portions of the proposed North, Mid, and South Pits would be situated in the watershed, as well as with three topsoil storage areas.

3.3.1.1.3 Beaver Pond Watershed

The northeastern corner of the project area is located within the Beaver Pond Watershed (**Figure 3.3-2**). The watershed encompasses an area of about 135 acres and is tributary to Blackfoot River. Proposed mine facilities that would be situated within the watershed include a topsoil storage area and a portion of the North Pit.



LEGEND

- PROJECT BOUNDARY
- WATERTSHED DIVIDE BETWEEN MAJOR SUB-BASINS
- PERENNIAL STREAM CHANNEL MAPPED BY USGS
- INTERMITTENT STREAM OR EPHEMERAL CHANNEL MAPPED BY USGS

Contour Interval = 100 ft.

NORTH

5,000' 0 5,000' 10,000'

BLACKFOOT BRIDGE PROJECT EIS

FIGURE 3.3-1
Major Watershed Divides
for Project Area

ANALYSIS AREA: Caribou County, Idaho	
Date: 12/21/10	File: Drainage Basin Maps.dwg
Drawn By: SE	Layout: Major Watersheds

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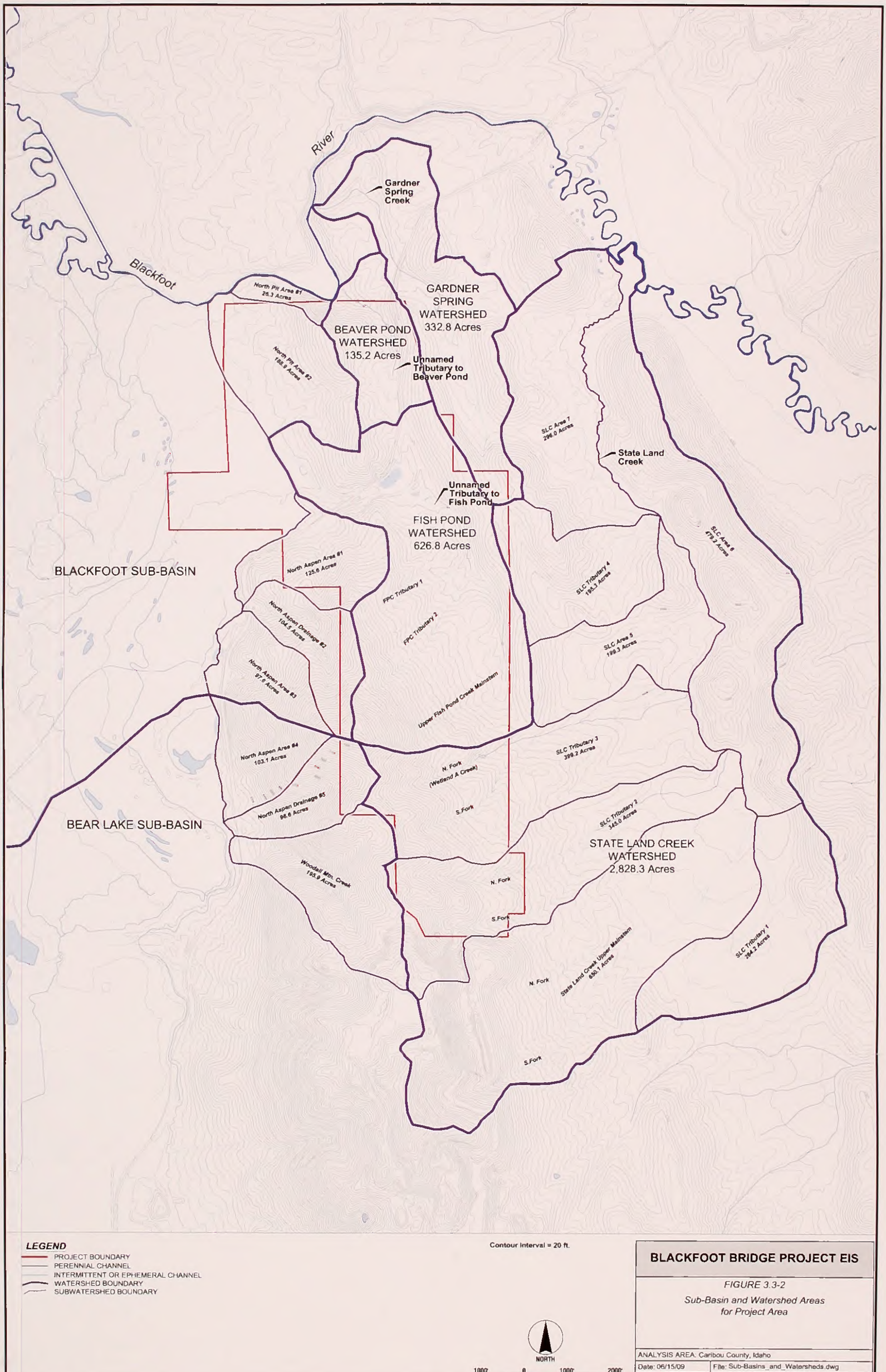
River
Blackfoot
Gardner Spring Creek
GARDNER SPRING WATERSHED 332.8 Acres
BEAVER POND WATERSHED 135.2 Acres
Unnamed Tributary to Beaver Pond
North Pit Area #1 26.3 Acres
North Pit Area #2 108.9 Acres
FISH POND WATERSHED 626.8 Acres
Unnamed Tributary to Fish Pond
BLACKFOOT SUB-BASIN
North Aspen Area #1 125.6 Acres
North Aspen Drainage #2 104.5 Acres
North Aspen Area #3 97.6 Acres
North Aspen Area #4 103.1 Acres
North Aspen Drainage #5 96.6 Acres
FPC Tributary 1
FPC Tributary 2
Upper Fish Pond Creek Mainstem
N. Fork (Wetland A Creek)
S.Fork
BEAR LAKE SUB-BASIN
Woodall Mtn. Creek 185.9 Acres
SLC Area 7 296.0 Acres
State Land Creek
SLC Area 6 479.2 Acres
SLC Tributary 4 195.3 Acres
SLC Area 5 199.3 Acres
SLC Tributary 3 399.2 Acres
SLC Tributary 2 345.0 Acres
STATE LAND CREEK WATERSHED 2,828.3 Acres
N. Fork
S.Fork
State Land Creek Upper Mainstem 650.1 Acres
SLC Tributary 1 284.2 Acres
N. Fork
S.Fork
LEGEND
PROJECT BOUNDARY
PERENNIAL CHANNEL
INTERMITTENT OR EPHEMERAL CHANNEL
WATERSHED BOUNDARY
SUBWATERSHED BOUNDARY
Contour Interval = 20 ft.
NORTH
1000' 0 1000' 2000'
BLACKFOOT BRIDGE PROJECT EIS
FIGURE 3.3-2
Sub-Basin and Watershed Areas for Project Area
ANALYSIS AREA: Caribou County, Idaho
Date: 06/15/09
File: Sub-Basins_and_Watersheds.dwg
Drawn By: SE
Layout: EIS_Rpt

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3.3.1.1.4 Gardner Spring Watershed

A small portion of the project area is located within the Gardner Spring Watershed (**Figure 3.3-2**). The watershed encompasses an area of about 332 acres and is tributary to Blackfoot River. The existing paved haul road crosses the drainage, but no new mine facilities are proposed in Gardner Spring Watershed.

3.3.1.1.5 Western Project Area Watersheds

The southwestern portion of the project area is drained by three intermittent drainages that are part of the Bear Lake Sub-Basin (Figure 3.3-2). The drainages include North Aspen Area #4 (103 acres) above Woodall Spring, North Aspen Area #5 (97 acres), and Woodall Mountain Creek (192 acres). A portion of the boundary of the proposed Mid Pit is located along the watershed divide for North Aspen Area #5, but none of the proposed mine facilities would be located within the Bear Lake Sub-Basin. The northwestern portion of the project area is part of the Blackfoot Sub-Basin and is tributary to the Blackfoot River. Proposed mine facilities in the northwestern project area include the North Pit, NWOP, ore stockpile, and the water control ponds.

3.3.1.2 Baseline Monitoring Network and Description of Surface Waterbodies

Surface water data for the proposed project were compiled from public domain sources including reports, maps, and databases prepared by governmental agencies, private entities, university researchers, and non-governmental organizations. The study area for the surface water investigation is shown in **Figure 3.3-1**. Public domain surface water data were supplemented by site-specific baseline studies for the Blackfoot Bridge project that were completed between April 2005 and November 2008 (Whetstone 2009b). The baseline studies were performed under the direction of the BLM and IDEQ and included:

- Quarterly monitoring (excluding winter) of 15 surface water stations at Blackfoot Bridge from April 2005 to October 2007;
- Semi-annual monitoring (spring and fall) of surface water stations in 2008; and
- Two gain-loss surveys on the Blackfoot River north of the project area in 2007.

Monitoring stations for the baseline investigation are shown in **Figure 3.3-3**.

Several surface water features occur within the study area (**Figure 3.3-4**). The largest waterbody is the Blackfoot River, which flows west along the northern property boundary. The Blackfoot River discharges into Blackfoot Reservoir about 2.5 miles northwest of the project area (**Figure 3.3-1**). Perennial streams in the study area include State Land Creek, an unnamed tributary to Beaver Pond, and Gardner Spring Creek. The streams are all tributary to the Blackfoot River (**Figure 3.3-4**). Intermittent streams in the study area include an unnamed tributary to Fish Pond and the upper reaches of the tributaries to State Land Creek. Other notable waterbodies in the study area include Fish Pond, Woodall Spring, and North Woodall Spring. Fish Pond is located within the project area north of the EOP. Woodall Spring and North Woodall Spring are located west of the project area at the edge of the Blackfoot Lava Field.

Twenty-six smaller springs are also located near the proposed project (**Figure 3.3-4**). Six of the springs occur within the project boundary. Four springs occur along the Aspen Range Fault west

of the project area. One spring is located in the Gardner Creek drainage northeast of the project area. The remaining 15 springs issue from the bank or streambed of the Blackfoot River north of the project area.

Water quality standards for surface water are contained in Idaho Administrative Procedures Act 58.01.02 (IDEQ 2009b). According to IDAPA 58.01.02, streams and lakes are classified by beneficial use. Designated beneficial uses for a waterbody may include cold or warm water aquatic life; salmonid spawning; primary- or secondary-contact recreation; domestic, agricultural, or industrial water supply; wildlife habitat; or aesthetics. If more than one beneficial use is recognized for a waterbody, the most stringent standard is applicable. Criteria for cold water aquatic life and primary- or secondary-contact recreation are applicable for undesignated waterbodies. Water quality criteria are not applicable to mine facilities such as sedimentation ponds and pit impoundments.

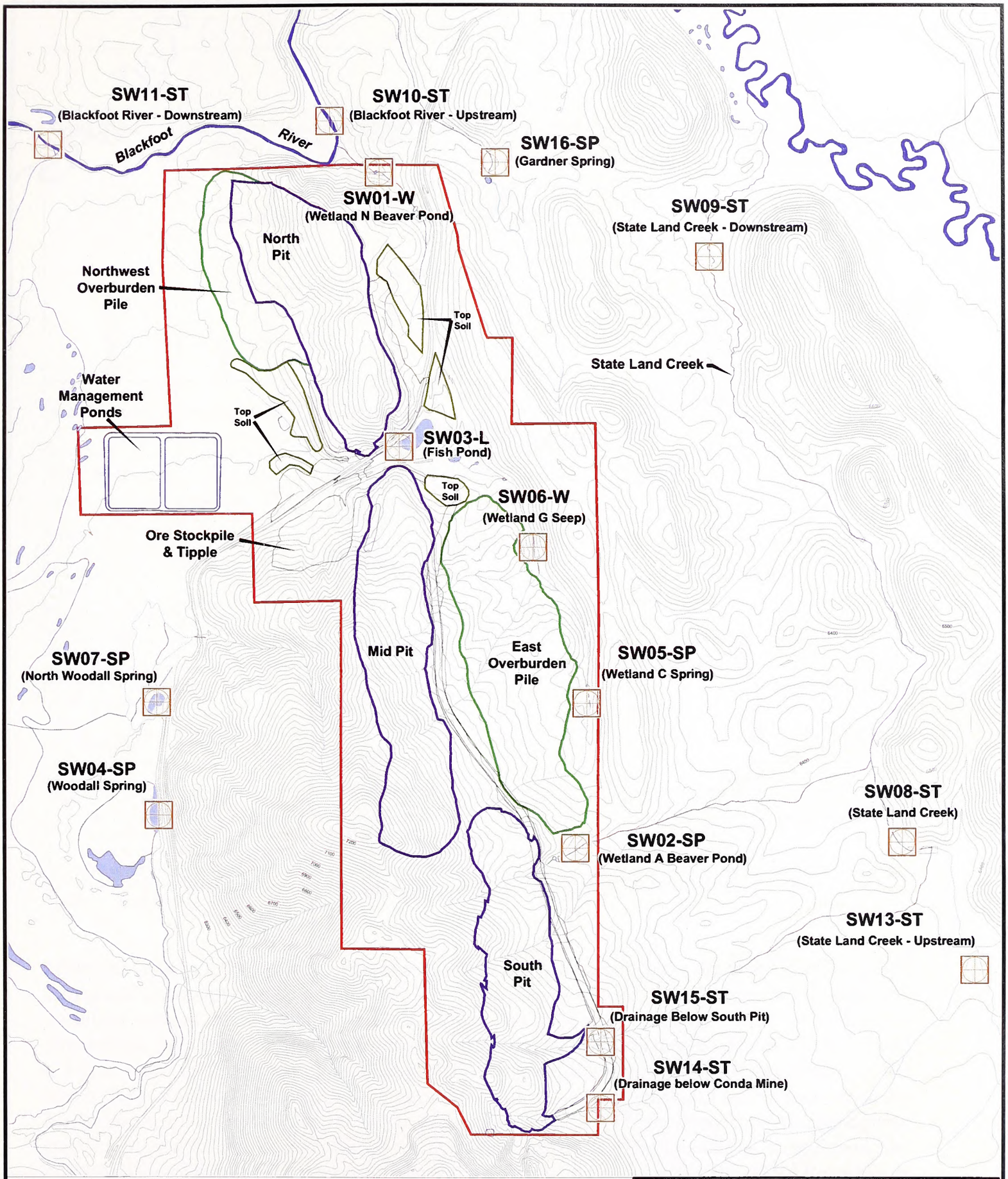
The Blackfoot River and Blackfoot Reservoir are the only waterbodies in the study area with designated beneficial uses (IDEQ 2009a). Designated beneficial uses for Blackfoot River include cold water aquatic life, salmonid spawning, primary recreation, and domestic water supply. It is also a Special Resource Water recognized as needing protection to preserve outstanding or unique characteristics or to maintain current beneficial uses. Designated beneficial uses for Blackfoot Reservoir include cold water aquatic life and primary-contact recreation. Regardless of designation status (designated or non-designated), standards for cold water aquatic life, primary- or secondary-contact recreation, agricultural water supply, industrial water supply, wildlife habitat, and aesthetics apply to all non-private surface waters of the State of Idaho.

Section 303(d) of the Clean Water Act requires states to identify streams and lakes that do not meet water quality standards and to establish Total Maximum Daily Loads (TMDLs) for the listed pollutants. Blackfoot River and State Land Creek are listed as 303(d) waterbodies that do not fully support their beneficial uses (IDEQ 2005a and 2008a). Applicable beneficial uses and 303(d) listed pollutants for surface waterbodies in the study area are summarized in **Table 3.3-2**.

3.3.1.2.1 Blackfoot River

Blackfoot River flows generally northwest from its headwaters near the Idaho-Wyoming state line to its confluence with Snake River upstream of American Falls Reservoir. It drains an area of approximately 650 square miles above Blackfoot Reservoir (Dion 1974) and is a low-gradient stream where it meanders along the alluvial valley at the base of the Fox Hills (**Figure 3.3-1**). The river becomes incised in a narrow canyon north of the project area where it enters the Blackfoot Lava Field and heads west and then south before resuming its generally northwesterly direction. Numerous springs issue from the banks of the river near the northern project boundary. Blackfoot River discharges into Blackfoot Reservoir approximately 2.5 miles downstream from the project area.

Blackfoot River is designated for cold water aquatic life, salmonid spawning, primary recreation, and domestic water supply (IDEQ 2009a). It is also a designated Special Resource Water from the confluence of Lanes and Diamond Creeks to the Blackfoot Reservoir that is recognized as needing protection to preserve outstanding or unique characteristics and to maintain current beneficial uses. Lanes Creek and Diamond Creek are tributary to Blackfoot River about 15 miles



LEGEND

- PROJECT BOUNDARY
- PROPOSED OPEN PIT
- PROPOSED OVERBURDEN PILE
- PROPOSED TOPSOIL STOCKPILE
- BASELINE SURFACE WATER MONITORING STATION

Contour Interval = 20 ft.

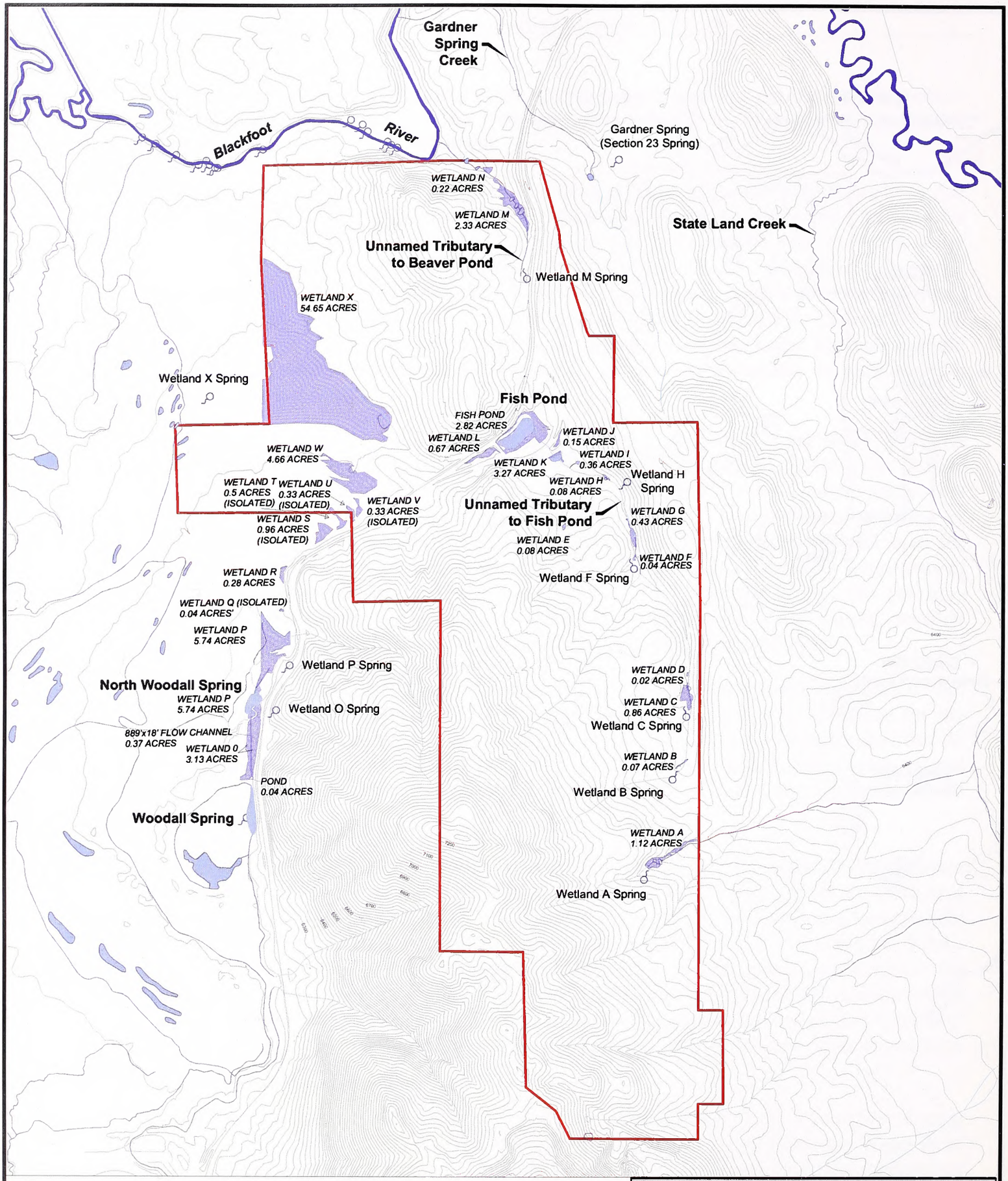
NORTH

1,000' 0 1,000' 2,000'

BLACKFOOT BRIDGE PROJECT EIS

FIGURE 3.3-3
Baseline Surface Water Monitoring Stations

ANALYSIS AREA: Caribou County, Idaho	
Date: 12/21/10	File: Project Area Map R2.dwg
Drawn By: SE	Layout: Surface Water



LEGEND

- PROJECT BOUNDARY
- PERENNIAL STREAM CHANNEL
- INTERMITTENT STREAM OR EPHEMERAL CHANNEL
- WETLAND MAPPED BY JBR (2003/2006)
- SPRING LOCATION

Contour Interval = 20 ft.

NORTH

1,000' 0 1,000' 2,000'

BLACKFOOT BRIDGE PROJECT EIS

FIGURE 3.3-4
Surface Water Features
Within or Near Project Area

ANALYSIS AREA: Caribou County, Idaho	
Date: 12/21/10	File: SurfaceWater.dwg
Drawn By: SE	Layout: Surface Water Features

Table 3.3-2 Beneficial Uses and 303(d) Listings for Surface Waterbodies in the Study Area

Waterbody	303(d) Listed Segment[1]			Applicable Beneficial Use									
	Upper	Lower	Pollutants	Special Resource Water	Cold Water Aquatic Life	Salmonid Spawning	Primary Recreation	Secondary Recreation	Domestic Supply	Agricultural Supply[2]	Industrial Supply[2]	Wildlife Habitat[2]	Aesthetics[2]
Blackfoot River	Headwater	Blackfoot Reservoir	Selenium Metals Sediment[3]	Y	Y	Y	Y		Y	Y	Y	Y	Y
Blackfoot Reservoir					Y		Y			Y	Y	Y	Y
State Land Creek[4]	Headwater	Blackfoot River	Sediment[5]		Y			Y		Y	Y	Y	Y
Unnamed tributary to Beaver Pond[4]					Y			Y		Y	Y	Y	Y
Gardner Spring Creek[4]					Y			Y		Y	Y	Y	Y
Unnamed tributary to Fish Pond[4]					Y			Y		Y	Y	Y	Y
Fish Pond[4]					Y			Y		Y	Y	Y	Y
Woodall Spring[4]					Y			Y		Y	Y	Y	Y
North Woodall Spring[4]					Y			Y		Y	Y	Y	Y
All Other Non-designated Waters of the State					Y			Y		Y	Y	Y	Y

Notes:
1 Final 2002 303(d)/305(b) Integrated Report (IDEQ 2005a)
2 Standards for agricultural supply, industrial supply, wildlife habitat, and aesthetics apply to all waters of the state.
3 Listed for selenium, dissolved oxygen, and temperature in the 2008 Draft 303(d)/305(b) Integrated Report (IDEQ 2009a).
4 Non-designated waterbody, water quality standards for cold water aquatic life and primary or secondary contact recreation are applicable.
5 Listed for selenium and sedimentation/siltation in the 2008 Draft 303(d)/305(b) Integrated Report (IDEQ 2009a).
Source: IDEQ 2009a

upstream (east) of the project area. The mainstem of Blackfoot River from the confluence of Lanes and Diamond Creeks to the Blackfoot Reservoir is a 303(d) listed segment for sediment, dissolved oxygen, and temperature (IDEQ 2005a and 2008b). A sediment TMDL of 80 percent streambank stability with subsurface streambed sediment fines less than 6.25 mm, not to exceed a 5-year mean of 25 percent by volume in riffles, was approved April 2, 2002. Additionally, the Idaho State standard is set such that turbidity shall not exceed background by more than 50 Nephelometric Turbidity Units (NTU) instantaneously or 25 NTU for more than 10 consecutive days to prevent further degradation of the mainstem and tributaries. In addition to sediment, the Blackfoot River from the confluence of Lanes and Diamond Creeks to the Blackfoot Reservior is also 303d listed for dissolved oxygen and high temperature (IDEQ 2009a). The mainstem of Blackfoot River from the confluence of Slug Creek to Blackfoot Reservoir is also listed for selenium (IDEQ 2009a). Slug Creek is tributary to Blackfoot River about 8 miles upstream of the project area.

Streamflow data for Blackfoot River near the project area are available from two sources: USGS gaging station 13063000 and gain-loss surveys that were by performed for the baseline investigation (Whetstone 2009b). USGS gaging station 13063000 is located 2 miles upstream from the project area at the bridge where P4's haul road crosses Blackfoot River (**Figure 3.3-5**). The gain-loss surveys were performed on Blackfoot River between the confluence of State Land Creek and Dredge Bridge (**Figure 3.3-5**).

Streamflow in Blackfoot River is regulated by snow melt, precipitation, and groundwater discharge. Peak flows generally occur in April or May during spring runoff and decline to low flow conditions by mid- to late summer. Average discharge for Blackfoot River at the USGS monitoring station is highest in May (520 cfs) followed by April (311 cfs) and June (277 cfs). The low-flow period for Blackfoot River typically extends from August through March with average discharge ranging from 54 to 83 cfs (**Figure 3.3-6**). Peak flows for Blackfoot River have been less than 700 cfs since 2001, with the exception of 2006, when the maximum flow was approximately 1,300 cfs (**Figure 3.3-7**). The highest recorded stream flow at the USGS monitoring station was 1,920 cfs on May 5, 1971.

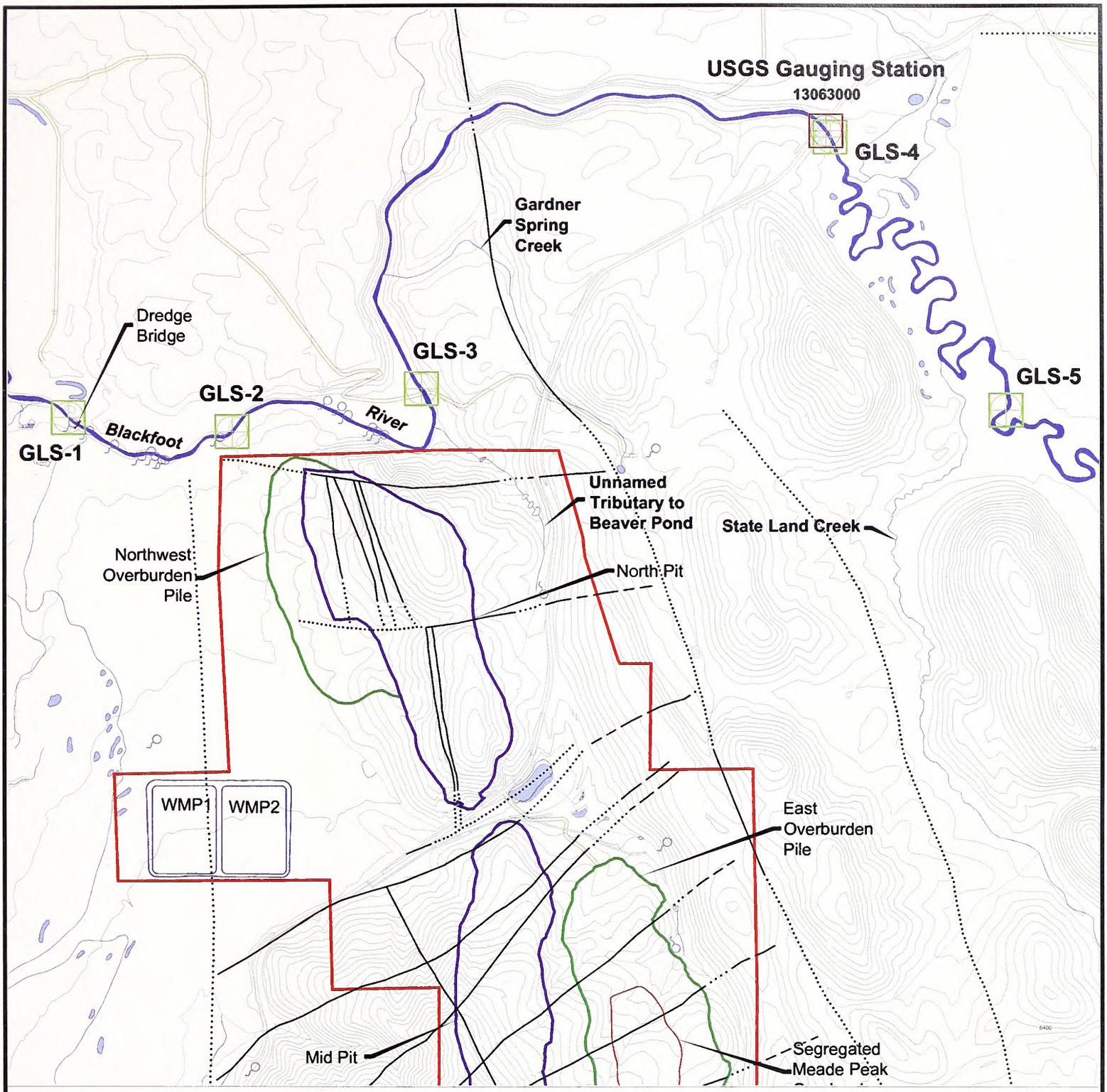
Gain-loss studies for Blackfoot River indicate that river gains approximately 2.5 to 4 cfs from groundwater as it passes north of the project area (Whetstone 2009b). About 0.5 to 0.9 cfs of the gain occurs near where the river crosses the Wells Formation, 650 feet north of the proposed North Pit. The remaining 2 to 3 cfs discharges from the basalt northwest of the project area (**Figure 3.3-8**). Six springs issue from the banks or bed of the river north of the proposed North Pit, where the Wells Formation is exposed at the surface or is thinly covered by alluvium or basalt. Nine springs issue from the south bank of the river near where it crosses the Aspen Range Fault (**Figure 3.3-8**).

3.3.1.2.2 Blackfoot Reservoir

Blackfoot Reservoir was built in 1909 and is operated by Fort Hall Agency of Bureau of Indian Affairs (**Figure 3.3-1**). Water stored in the reservoir is primarily used to irrigate lands in Fort Hall Indian Reservation near Blackfoot and Pocatello, Idaho. Blackfoot Reservoir is a designated waterbody for cold water aquatic life and primary-contact recreation (IDEQ 2009a).

Blackfoot Reservoir was originally designed to store 413,000 acre-feet of water with a surface area of about 18,000 acres at 6,124 feet elevation (Dion 1974). Shortly after the reservoir was filled, it was reported that leakage from the impoundment had converted hay fields in Five Mile Meadows to marshland and doubled the flow in Soda Creek (Mansfield 1927). China Hat Dam was constructed in 1923 to reduce seepage from Blackfoot Reservoir into the Blackfoot Lava Field (**Figure 3.3-1**). The dam is located at the south end of the reservoir and cuts off a small arm of the impoundment that is now referred to as Dike Lake. The crest of China Hat Dam is 6,122 feet, and since construction, the operating level of Blackfoot Reservoir has been limited to about 6120.5 feet, with total storage of 349,800 acre-feet of water (Dion 1974).

Water table maps by Mansfield (1927) and Armstrong (1969) indicate that construction of the reservoir modified groundwater flow in the Blackfoot Lava Field. Presumably, prior to completion of the reservoir, groundwater flow in the basalt was controlled by the surface water divide and flowed into the Blackfoot River Basin north of China Hat Dam, and into the Bear



LEGEND

- PROJECT BOUNDARY
- PROPOSED OPEN PIT
- PROPOSED OVERBURDEN PILE
- PERENNIAL STREAM OR RIVER
- INTERMITTENT STREAM
- RESERVOIR, LAKE, OR POND
- USGS MONITORING STATION 13063000
- GAIN-LOSS MONITORING STATION
- SPRING

Contour Interval = 20 ft.

NORTH

900' 0 900' 1,800'

BLACKFOOT BRIDGE PROJECT EIS

FIGURE 3.3-5
Stream Gauging Locations
on Blackfoot River

ANALYSIS AREA: Caribou County, Idaho	
Date: 07/23/10	File: Stream Gauging Stations.dwg
Drawn By: JC	Layout: EIS_Gauging_P

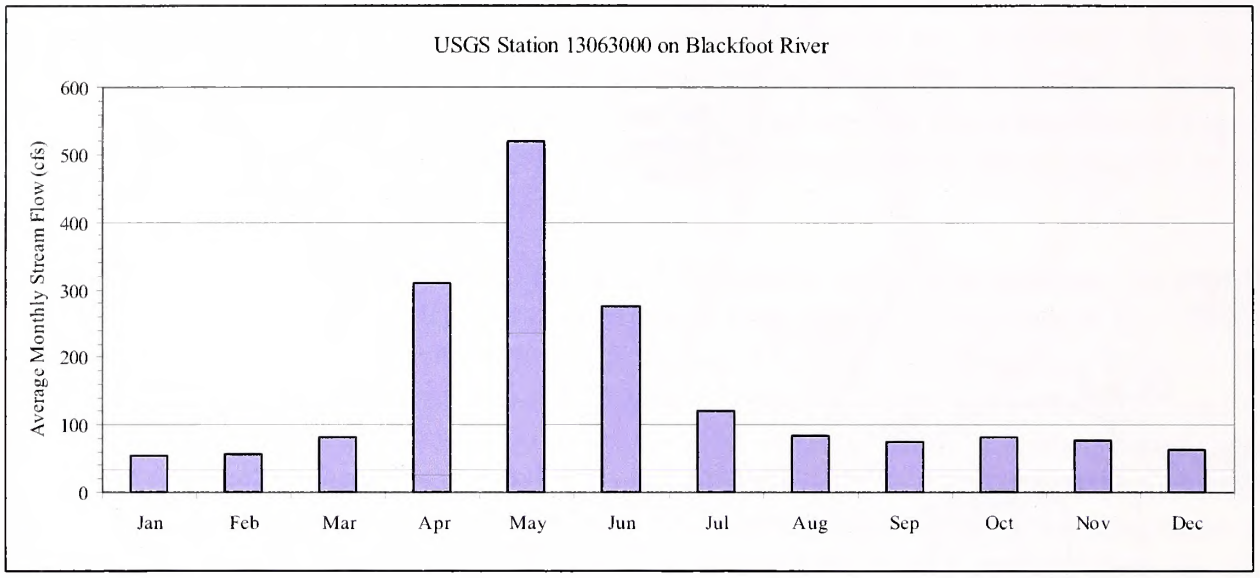


Figure 3.3-6 Average Monthly Streamflow for Blackfoot River above Project Area

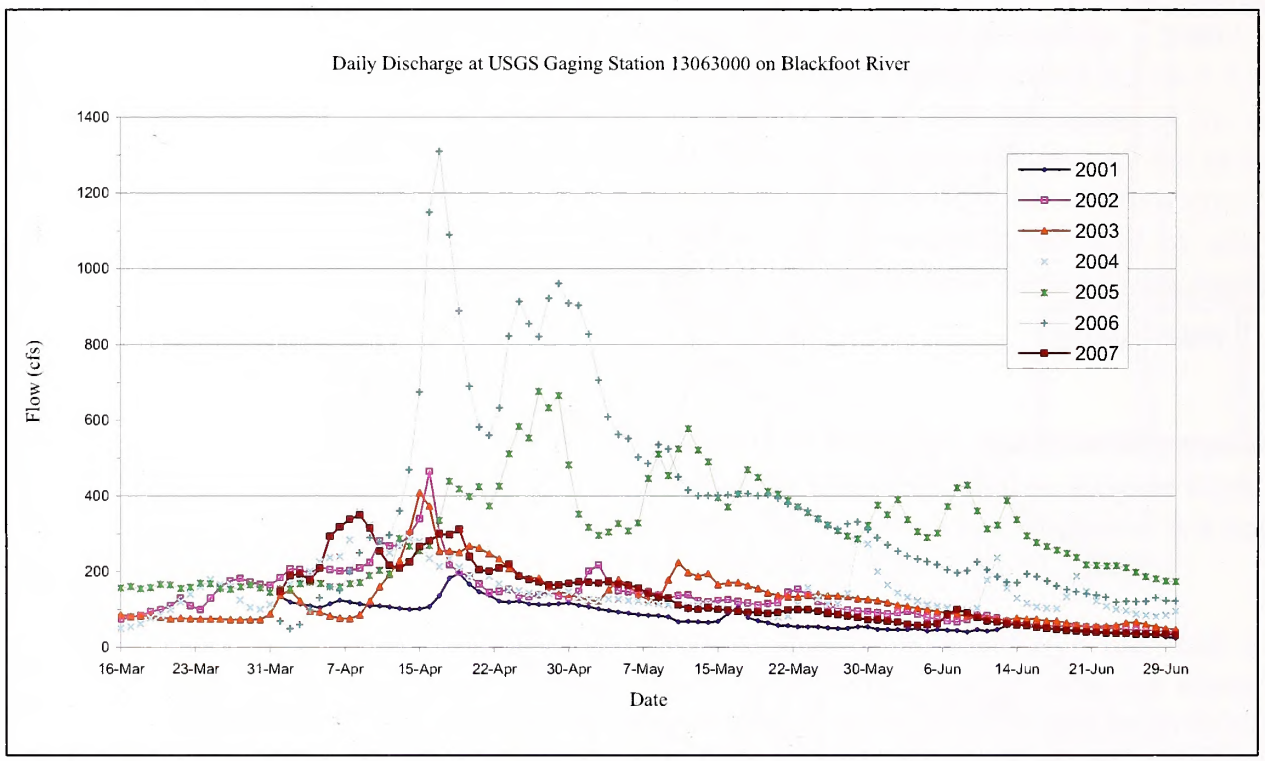
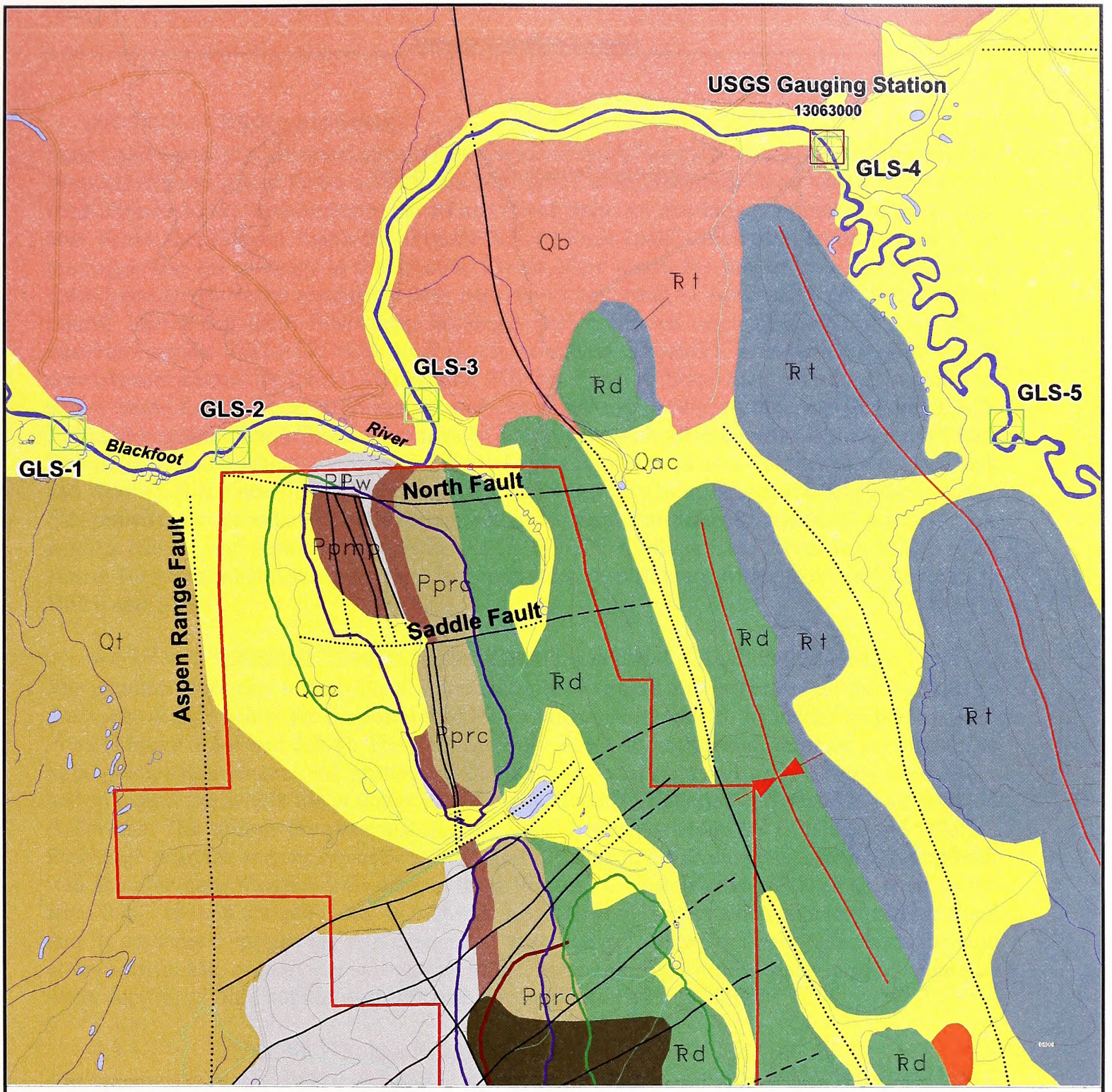


Figure 3.3-7 Hydrographs Showing Peak Flows for Blackfoot River between 2001 to 2007

River Basin south of China Hat Dam. Currently, groundwater moves south from the reservoir toward China Hat Dam and flows below the surface water divide into the Bear River Basin (Dion 1974). Seepage from Blackfoot Reservoir into the Bear River Basin is estimated to be about 12 cfs (Dion 1974).



LEGEND

- PROJECT BOUNDARY
- PROPOSED OPEN PIT
- PROPOSED OVERBURDEN PILE
- PERENNIAL STREAM OR RIVER
- INTERMITTENT STREAM
- RESERVOIR, LAKE, OR POND
- USGS MONITORING STATION 13063000
- GAIN-LOSS MONITORING STATION
- SPRING
- FAULT (DOTTED WHERE CONCEALED,DASHED WHERE INFERRED)
- SYNCLINAL AXIS

MAP UNITS

- Qac — ALLUVIUM AND COLLUVIUM
- Qt — TRAVERTINE
- Qb — BASALT
- Qtf — RHYOLITE TUFF
- Tt — THAYNES FORMATION
- Td — DINWOODY FORMATION
- Pprc — PHOSPHORIA FORMATION - REX CHERT MEMBER
- Ppmp — PHOSPHORIA FORMATION - MEADE PEAK MEMBER
- PPw — WELLS FORMATION / PARK CITY FORMATION - GRANDEUR MEMBER

Source: Mansfield 1927; Oriel and Platte 1980; and Carpenter 2009

Contour Interval = 100 ft.

NORTH

900' 0 900' 1,800'

BLACKFOOT BRIDGE PROJECT EIS

FIGURE 3.3-8
Stream Gauging Locations on Blackfoot River with Surface Geology

ANALYSIS AREA: Caribou County, Idaho	
Date: 12/21/10	File: Stream Gauging Stations.dwg
Drawn By: JC	Layout: EIS_Gauge_with_Geology_P

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3.3.1.2.3 State Land Creek

State Land Creek is a perennial stream that originates on the east side of the Aspen Range below Woodall Mountain and flows north to its confluence with Blackfoot River above the P4 haul road (**Figure 3.3-3**). Tributaries to State Land Creek drain the southeastern portion of the project area below the planned South Pit (**Figure 3.3-2**). State Land Creek also receives flow from drainages that are tributary to the inactive Conda Mine above the project area. Streamflow in State Land Creek varies seasonally with peak flows occurring in April and May during spring runoff. The stream gains flow along its length with measured discharges of 0 to 0.69 cfs at upstream station SW13-ST, 0.01 to 3.15 cfs at station SW08-ST, and 0.06 to 14.06 cfs at downstream station SW09-ST (Whetstone 2009b). Flow in State Land Creek is intermittent above State Land Creek Tributary 2 and perennial below the confluence (**Figure 3.3-2**). Tributaries to State Land Creek are generally intermittent with the exception of State Land Creek Tributaries 2 and 3 which are perennial. State Land Creek is used as a water supply by livestock and wildlife. It is a non-designated waterbody, and water quality standards for cold water aquatic life, primary- or secondary-contact recreation, agricultural water supply, industrial water supply, wildlife habitat, and aesthetics are applicable (IDEQ 2009a). State Land Creek is a 303(d) listed stream for sediment and selenium from its headwaters to confluence with Blackfoot River (IDEQ 2005a and 2009a).

3.3.1.2.4 Unnamed Tributary to Fish Pond and Wetland B, C, F, and H Springs

The unnamed tributary to Fish Pond is an intermittent stream that originates on the east side of the Aspen Range below the proposed Mid Pit and flows northward to its discharge point at Fish Pond (**Figure 3.3-3** and **3.3-4**). The drainage only flows during spring runoff or in response to large precipitation events, but portions of the drainage remain wet all year. Several small seeps and springs occur within the drainage including Wetland B, Wetland C, Wetland F, and Wetland H Springs. The springs are perennial and are used as water supplies by livestock and wildlife. Discharge from the springs typically flow a short distance in the drainage before infiltrating back into the alluvium. Measured discharges from Wetland C and Wetland G Springs have varied from 0.007 to 0.68 cfs and 0.002 to 0.68 cfs, respectively. The unnamed tributary to Fish Pond and its associated springs are non-designated waterbodies, and water quality standards for cold water aquatic life, primary- or secondary-contact recreation, agricultural water supply, industrial water supply, wildlife habitat, and aesthetics are applicable (IDEQ 2009a).

3.3.1.2.5 Unnamed Tributary to Beaver Pond and Wetland M Spring

The unnamed tributary to Beaver Pond is a perennial stream that is tributary to Blackfoot River. It is located on the east side of the ridge opposite of the proposed North Pit (**Figure 3.3-4**). Flow in the drainage originates from Wetland M Spring and gradually increases as it flows northwest through a series of shallow beaver ponds and wetland areas toward Blackfoot River. Measured discharges below monitoring station SW01-W have varied from 0.1 to 0.44 cfs, but it is difficult to accurately gage streamflow because of beaver dams and diffuse seepage. Water in the unnamed tributary to Beaver Pond is used as a water supply by livestock and wildlife. The stream is a non-designated waterbody, and water quality standards for cold water aquatic life, primary- or secondary-contact recreation, agricultural water supply, industrial water supply, wildlife habitat, and aesthetics are applicable (IDEQ 2009a).

3.3.1.2.6 Fish Pond

Fish Pond is a man-made impoundment located north of the proposed Mid Pit (**Figures 3.3-3** and **3.3-4**). It is fed by groundwater and receives intermittent surface water flow from the unnamed tributary to Fish Pond and two other small drainages. It also receives flow from Wetland K. Fish Pond has an approximate surface area of about 3 acres and an overflow level of 6,265 feet. The overflow point is at the dike on the west side of the pond. Stage data indicate the surface elevation of the pond has ranged from about 6,263 feet and 6,265 feet between spring 2005 and fall 2007. Fish Pond is a non-designated waterbody used as water supply by wildlife. Water quality standards for cold water aquatic life, primary- or secondary-contact recreation, agricultural water supply, industrial water supply, wildlife habitat, and aesthetics are applicable (IDEQ 2009a). No fish are known to exist in Fish Pond.

3.3.1.2.7 Woodall Spring

Woodall Spring is a carbonate spring pond that is located west of the project area adjacent to the P4 haul road (**Figures 3.3-3** and **3.3-4**). The spring issues from a shallow 1.5-acre depression that overflows into irrigation ditches located at the north and south ends of the pond. It is associated with an extensive travertine terrace and is actively evolving carbon dioxide (CO_2) gas where it bubbles up from the bottom of the pool. The spring is located along the Aspen Range Fault and is a discharge point for regional groundwater flow from the Wells Formation. Prior to modification of the spring in 1923, the total discharge from Woodall Spring was measured to be about 25 cfs (Mansfield 1927). Damming of the spring for agricultural diversion raised the pond level and induced additional seepage from the travertine terrace. Discharge measurements from the north and south outlets during the baseline monitoring program ranged from 1.5 to 16.82 cfs and 1.04 to 4.29 cfs respectively (Whetstone 2009b). The variance was largely controlled by diversion for irrigation. Ralston et al. (1983) estimated that the total discharge from the terrace may be two to three times greater than the flow observed in the irrigation ditches. Woodall Spring is a non-designated waterbody, and water quality standards for cold water aquatic life, primary- or secondary-contact recreation, agricultural water supply, industrial water supply, wildlife habitat, and aesthetics are applicable (IDEQ 2009a).

3.3.1.2.8 North Woodall Spring and Wetland O and P Springs

North Woodall Spring is a carbonate spring pond fed by regional groundwater discharge along the Aspen Range Fault. It is located west of P4's haul road (**Figures 3.3-3** and **3.3-4**) and issues from a 0.3-acre depression that overflows into an irrigation ditch at the south end of the pond. Discharge measurements for the southern outlet of the spring pond varied from 0.67 to 3.5 cfs during baseline monitoring (Whetstone 2009b). The pond is associated with extensive travertine deposits and is actively evolving CO_2 gas. Wetland O and P springs are seasonally wet seeps, and are located on the east side of the main spring pond. The pond and seeps are non-designated waterbodies, and water quality standards for cold water aquatic life, primary- or secondary-contact recreation, agricultural water supply, industrial water supply, wildlife habitat, and aesthetics are applicable (IDEQ 2009a).

3.3.1.2.9 Gardner Spring

Gardner Spring (also called Section 23 Spring) is a fresh water spring located east of the P4 haul road and northeast of the project boundary (**Figure 3.3-4**). The spring issues from a concrete box and is conveyed via a gravity pipeline to irrigate a hay field on the west side of Blackfoot River and provide domestic water supply to the Conlin house. The flow from Gardner Spring is

diverted into the pipeline for a large portion of the year and is difficult to accurately measure. Spring flow measurements from the baseline monitoring program ranged from 0.06 to 0.11 cfs but are likely biased low (Whetstone 2009b). Gardner Spring is a non-designated waterbody, and water quality standards for cold water aquatic life, primary- or secondary-contact recreation, agricultural water supply, industrial water supply, domestic water supply, wildlife habitat, and aesthetics are applicable (IDEQ 2009a).

3.3.1.3 Chemical Characteristics of Surface Water

Multiple beneficial uses are recognized for all surface waterbodies in the study area (**Table 3.3-2**). According to state regulations, the most stringent applicable water quality standard should be applied to waterbodies with more than one beneficial use (IDEQ 2009a). Water quality standards for cold water aquatic life are the most rigorous standards for springs, streams, rivers, and lakes in the study area, and can be divided into two broad categories based on either detrimental effects to aquatic biota or human exposure by consumption of water and aquatic organisms. Cold water biota standards are based on the duration of exposure and include acute and chronic criteria. The Criteria Maximum Concentration (CMC) is the highest concentration that aquatic life can be exposed to for a 1-hour period without deleterious effects. The Criteria Continuous Concentration (CCC) is the highest concentration that aquatic life can be exposed to for an extended period of time. Standards for human consumption are divided into criteria for the consumption of water and organisms and organisms only.

Cold water aquatic life standards are based on dissolved concentrations, with the exceptions of criteria for selenium, ammonia and turbidity. The standards for selenium are based on total recoverable concentration. Standards for ammonia and turbidity are based on total concentration. The standard for ammonia is based on total concentration and is temperature and pH dependent. Turbidity is not to exceed 50 NTU above background instantaneously or more than 25 NTU for more than 10 days. Cadmium, chromium (III), copper, lead, nickel, silver, and zinc standards are hardness dependent and are calculated according to the following equations:

$$CMC = WER \cdot e^{m_A \cdot \ln(H) + b_A} \cdot K_A$$

$$CCC = WER \cdot e^{m_C \cdot \ln(H) + b_C} \cdot K_C$$

where:

WER is the water effect ratio
m_A is a metal-specific constant for acute toxicity
m_C is a metal-specific constant for chronic toxicity
H is hardness (mg/L as $CaCO_3$)
b_A is a metal-specific constant for acute toxicity
b_C is a metal-specific constant for chronic toxicity
K is a freshwater conversion factor (K_a = acute, K_c = chronic)

Cold water aquatic life standards based on 100 mg hardness and a water effect ratio of 1 are presented in **Table 3.3-3**. Metal-specific constants and conversion factors for the calculation of hardness-specific standards are presented in **Table 3.3-4**.

Table 3.3-3 Idaho Cold Water Aquatic Life Water Quality Standards

Parameter (mg/L)	Analytical Basis	Surface Water Standards[1] (Aquatic Standards from IDAPA 58.01.02)			
		Cold Water Biota Based on 100 mg/L Total Hardness and Water Effect Ratio of 1		Standards for Human Health Based on Consumption of	
		CMC	CCC	Water & Organisms	Organisms Only
Ammonia, nitrogen	Total	See note 2	See notes 3 or 4	—	—
Antimony[9]	Dissolved	—	—	0.0056	0.64
Arsenic[5][6]	Dissolved	0.340	0.150	0.050	0.050
Cadmium[7]	Dissolved	0.0013	0.0006	—	—
Chromium III[7]	Dissolved	0.570	0.074	—	—
Chromium VI[5]	Dissolved	0.016	0.011	—	—
Copper[7]	Dissolved	0.017	0.011	—	—
Lead[7]	Dissolved	0.065	0.0025	—	—
Mercury[8]	—	—	—	—	—
Nickel[7]	Dissolved	0.470	0.0520	0.610	4.6
Selenium[9]	Total Rec.	0.02	0.005	0.17	4.2
Silver[7]	Dissolved	0.0034	—	—	—
Thallium [9]	Dissolved	—	—	0.00024	0.00047
Zinc[7]	Dissolved	0.120	0.120	7.4	26
Field Parameters					
pH (s.u.)	—	6.5 - 9.0			
Dissolved Oxygen (mg/L)	Dissolved	>6 at all times			
Temperature (°C)	—	22 °C (daily average 19)			
Turbidity (NTU)	Total	50 NTU above background (10 day consecutive 25)			

Notes:

— Indicates that no standard has been established.

1 Water quality standards from Idaho administrative code January 1, 2009.

2 Numeric criteria for ammonia CMC: the one hour average concentration of total ammonia nitrogen in mg N/L is not to exceed more than once every three years the value calculated by the following equation: (0.275/(1+107.204-pH))+(39.0/(1+10pH-7.204)).

3 Numeric criteria for ammonia CCC when fish early life stages are likely present: the 30 day average concentration of total ammonia nitrogen (mg N/L) is not to exceed more than once every three years the value calculated by the following equation:: (0.0577/(1+107.688-pH))+(2.487/(1+10pH-7.688))*min(2.85,1.45*(100.028*(25-T))); T = °C, min represents the smallest number in a set of values.

4 Numeric criteria for ammonia CCC when fish early life stages are likely absent is: the 30 day average concentration of total ammonia nitrogen (mg N/L) is not to exceed more than once every three years the value calculated by the following equation: (0.0577/(1+107.688-pH))+(2.487/(1+10pH-7.688))*(1.45*(100.028*(25-T))); T = °C.

5 Standards for CMC and CCC are the presented values multiplied by the WER.

6 Standards for human health apply to inorganic arsenic only.

7 Hardness dependent CMC and CCC standards

8 Fish tissue criterion per implementation guidance document for Idaho mercury water quality criteria (IDEQ 2005b).

9 Fixed numerical standards.

Source: IDEQ 2009a

Surface water quality data for the study area were obtained from several sources including the Baseline Surface Water Monitoring Program (Whetstone 2009b), USGS station 13063000 on Blackfoot River (USGS 2008), and reports by Tetra Tech (2002a, 2002b, 2004), IDEQ (2005c, 2005d, 2006a, and 2007), NewFields (2009a), and Weber (2005, 2006). Quarterly water quality data (excluding winter) for the Blackfoot Bridge project were collected at 15 surface water

stations (**Figure 3.3-3**) over a 3-year period (2005 through 2007). The baseline stations were monitored semi-annually (spring and fall) in 2008. Samples from the baseline station were monitored for an extensive set of parameters including major ions, nutrients, and a suite of 20 metals. Complete documentation for the Water Monitoring Program is presented in the *Water Resources Baseline Characterization Report* (Whetstone 2009a).

Table 3.3-4 Metal-Specific Constants and Conversion Factors for the Calculation of Cold Water Aquatic Life Water Quality Standards

Parameter	m_a	b_a	m_c	bc	K_a	K_c
Cadmium	0.8367	-3.560	0.6247	-3.344	0.944	0.909a
Chromium (III)	0.819	3.7256	0.8190	0.6848	(1)	(2)
Copper	0.9422	-1.464	0.8545	-1.465	0.960	0.960
Lead	1.273	-1.460	1.273	-4.705	(3)	(3)
Nickel	0.846	2.255	0.8460	0.0584	0.998	0.997
Silver	1.72	-6.52	(4)	(4)	0.85	(4)
Zinc	0.8473	0.884	0.8473	0.884	0.978	0.986

Notes:

1 No acute conversion factor is required for cadmium. The cadmium acute criterion equation was derived from dissolved metals toxicity data. The equation Ka = 1.136672-[(ln hardness)(0.041838)] may be used to back calculate an equivalent total recoverable concentration

2 Cadmium Kc = 1.101672-[(ln hardness)(0.041838)].

3 Lead Ka and Kc = 1.46203-[(ln hardness)(0.145712)].

4 No chronic standards have been established for silver.

Source: IDEQ 2009a

3.3.1.3.1 Blackfoot River Water Quality

Baseline water quality data for the Blackfoot River north of the project area were obtained from surface water monitoring stations SW10-ST and SW11-ST (Whetstone 2009b). Station SW10-ST monitors the river upstream from the project area at Conlin Bridge (**Figure 3.3-3**). SW11-ST is the downstream station at Dredge Bridge. Baseline data for Blackfoot River are supplemented by 7 years of seasonal water quality data from USGS station 13063000 at Blackfoot Bridge (USGS 2008), and from samples collected by Tetra Tech (2002a, 2002b, 2004), IDEQ (2005c, 2005d, 2006a, 2007) and Weber (2005, 2006).

Water in the Blackfoot River north of the project area is a well-buffered, calcium-bicarbonate type water with low to moderate TDS (101 to 286 mg/L) and weak to moderately alkaline pH (7.1 to 9.0). Baseline monitoring indicates that metal concentrations are generally below detection limits and meet applicable water quality standards, with the exception of selenium, which was elevated above the CCC aquatic life standard in one sampling round during the spring of 2006. Dissolved selenate was the dominant form of selenium present in the water column and exceeded the CCC at both the upstream and down stream monitoring stations. Baseline monitoring results for COPCs in the Blackfoot River are summarized in **Table 3.3-5**.

Water quality data from the USGS monitoring station indicate that selenium concentrations in the river are cyclic and generally exceed the CCC aquatic life standard for 1 to 3 weeks each spring before decreasing to below the standard during the remainder of the year (**Figure 3.3-9**). This seasonal cycling correlates to increased flow in the Blackfoot River and is likely related to increased runoff from phosphate mine overburden materials in the sub-basin during spring snow-melt (Whetstone 2009b). The USGS station also reported cadmium concentrations near the CCC

on three dates during the spring of 2006 and 2007. The cadmium CCC for Blackfoot River, based on the minimum and maximum observed hardness at the upstream baseline monitoring station SW-10ST, ranges from 0.0006 to 0.0009 mg/L. The three highest cadmium concentrations reported at the USGS station were 0.00062 mg/L, 0.00074 mg/L, and 0.00104 mg/L.

Table 3.3-5 Summary of Baseline Monitoring Results for COPCs in Blackfoot River

Parameter	SW10-ST (Blackfoot River Upstream)			SW11-ST (Blackfoot River Down Stream)		
	Minimum	Maximum	Mean	Minimum	Maximum	Mean
Sulfate (mg/L)	5	19	13	5	22	14
TDS (mg/L)	101	228	177	141	286	196
Cadmium (mg/L)	< 0.0001	< 0.0001	0.0001	< 0.0001	< 0.0001	0.0001
Iron (mg/L)	< 0.01	0.37	0.08	< 0.01	0.39	0.08
Manganese (mg/L)	< 0.005	0.021	0.008	< 0.005	0.026	0.012
Nickel (mg/L)	< 0.02	< 0.02	0.02	< 0.02	< 0.02	0.02
Total Recoverable Selenium (mg/L)	< 0.001	**0.008**	0.002	< 0.001	**0.008**	0.002
Selenium (mg/L)	< 0.001	**0.007**	0.002	< 0.001	**0.007**	0.002
Selenium IV (mg/L)	< 0.001	0.001	0.001	< 0.001	0.001	0.001
Selenium VI (mg/L)	< 0.001	**0.007**	0.002	< 0.001	**0.007**	0.002
Zinc (mg/L)	< 0.01	0.11	0.02	< 0.01	0.17	0.05

Notes:
Less than sign (<) indicates that the parameter was not detected in the referenced sample. The presented value is the detection limit.
Bolded numbers are measured values that exceed Idaho cold water aquatic life water quality criteria.
The mean was calculated using the reported detection limit for non-detect values.
Source: Whetstone 2009b

Water quality data for Blackfoot River between the confluence of Lanes and Diamond Creeks and Blackfoot Reservoir are also available from five stations that were monitored between 2001 and 2007 as part of the TMDL study (Tetra Tech 2002a, 2002b, 2004 and IDEQ 2005c, 2005d, 2006a, 2007). Dissolved selenium concentrations (50 samples) ranged from 0.0001 to 0.012 mg/L. The average concentration was 0.005 mg/L. Dissolved cadmium concentrations (32 samples) were below detection limits, with the exception of one sample, with a reported concentration of 0.0000667 mg/L (Whetstone 2009a, Appendix C5).

3.3.1.3.2 State Land Creek and Tributaries Water Quality

Water quality data for the mainstem of State Land Creek are available from baseline monitoring stations SW08-ST, SW09-ST, and SW13-ST. Stations SW14-ST and SW15-ST monitor the South and North Forks of State Land Creek Tributary 2 (**Figure 3.3-3**). Additional water quality data for State Land Creek and its tributaries are available from monitoring performed for the Conda Mine (NewFields 2006) and from a sample collected by Weber (2006).

The mainstem of State Land Creek contains well-buffered, calcium-bicarbonate to calcium-sulfate water with moderate concentrations of TDS (158 to 299 mg/L) and weakly alkaline pH (7.14 to 8.31). Water in State Land Creek Tributary 2 is a poorly buffered, calcium-sulfate water with neutral pH (7.0 to 7.1) and variable dissolved solids (79 to 465 mg/L). Baseline monitoring indicates that metal concentrations in the mainstem of State Land Creek are below applicable water quality standards, with the exception of selenium, which exceeded the CCC aquatic life standard of 0.005 mg/L at SW08-ST and SW09-ST during the spring sampling rounds (**Figure**

3.3-10). Selenium concentrations at upstream station SW13-ST were below the applicable standards for all sampling events during the baseline monitoring period. Total recoverable selenium concentrations in State Land Creek Tributary 2 ranged from 0.0011 to 0.983 mg/L. Baseline monitoring results for COPCs in State Land Creek are summarized in **Table 3.3-6**.

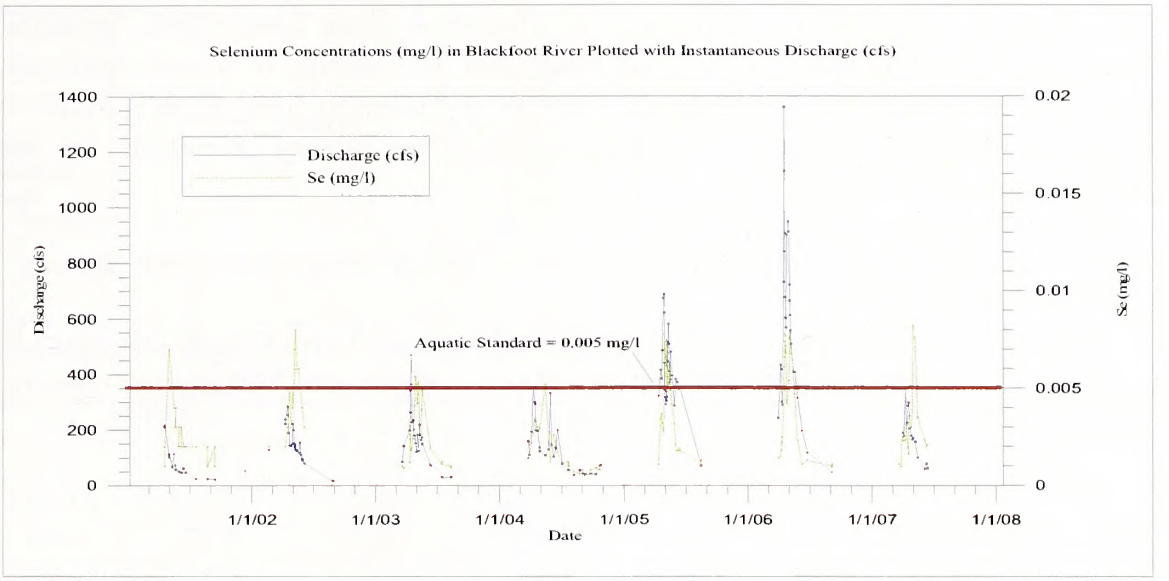


Figure 3.3-9 Plot of Selenium Concentrations and Discharge for USGS Monitoring Station 13063000 on Blackfoot River

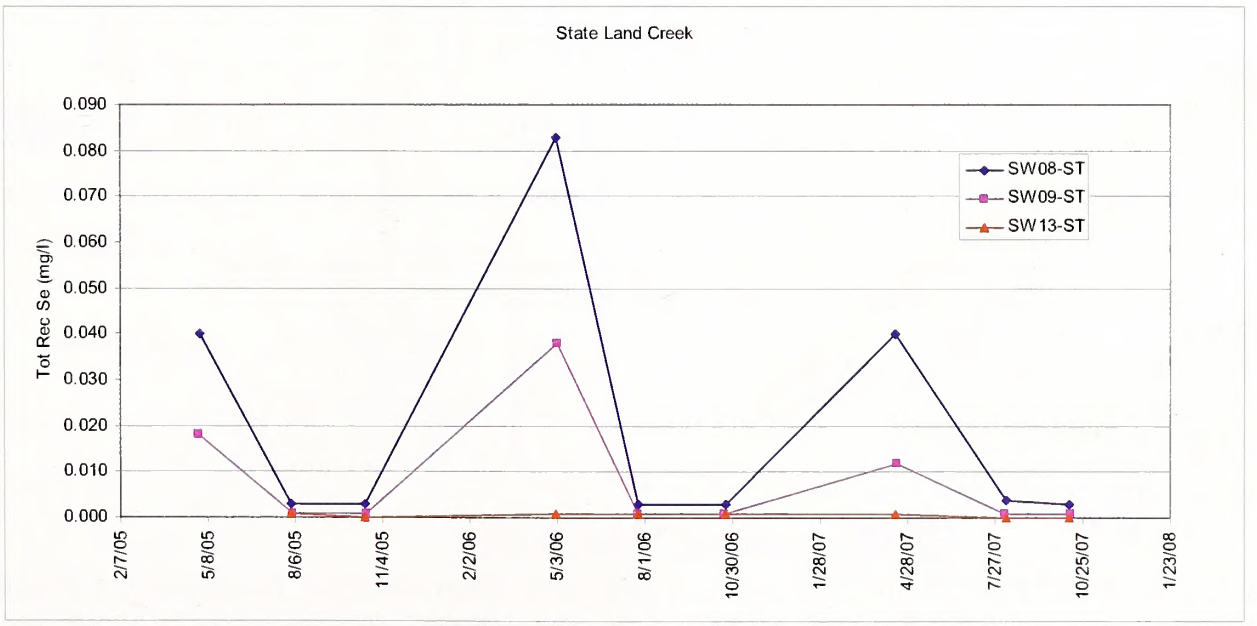


Figure 3.3-10 Total Recoverable Selenium Concentration for Baseline Monitoring of the Mainstem State Land Creek

Monitoring data collected by NewFields (2006) also indicate that the Mainstem, Upper Mainstem, and Tributary 1 of State Land Creek below the inactive Conda Mine are impacted by elevated selenium concentrations. These analyses are consistent with the sample collected by Weber (2006) that reported 0.0172 mg/L selenium at station GYC-11 (**Figure 3.3-11**). Elevated cadmium concentrations have also been reported at two stations on the Upper Mainstem of State

Land Creek (0.00089 to 0.0035 mg/L at SLCT2-2 and SLS2-2a). Samples from State Land Creek Tributaries 1 and 3 below the proposed Blackfoot Bridge project have consistently met all applicable water quality standards.

3.3.1.3.3 Wetland A Spring

Wetland A Spring is a perched fresh water spring that is tributary to State Land Creek. Baseline monitoring at station SW02-SP (**Figure 3.3-3**) indicates that the spring is a well-buffered, calcium-bicarbonate type water with low to moderate TDS (84 to 167 mg/L) and slightly alkaline pH (7.2 to 8.0). Water from the spring met all applicable water quality standards for the monitored parameters (Whetstone 2009a).

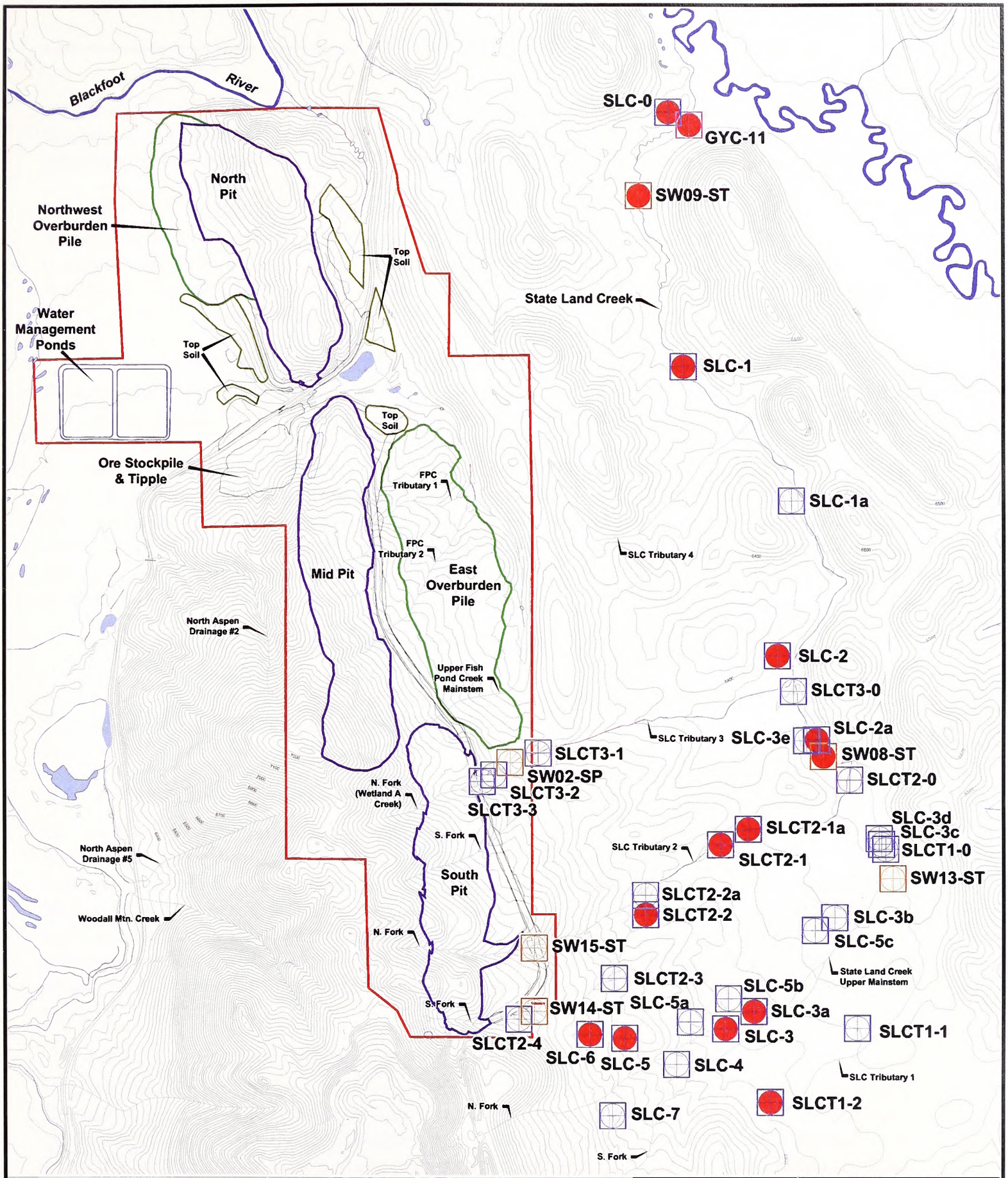
Table 3.3-6 Summary of Baseline Monitoring Results for COPCs in State Land Creek (Spring and Fall Events)

Parameter	Mainstem State Land Creek[1]			State Land Creek Tributary 2[2]		
	Minimum	Maximum	Mean	Minimum	Maximum	Mean
Sulfate (mg/L)	5	152	28	26	259	143
TDS (mg/L)	123	299	210	79	456	268
Cadmium (mg/L)	< 0.0001	0.0003	0.0001	0.0002	0.0015	0.0009
Iron (mg/L)	0.02	1.02	0.14	< 0.05	0.87	0.46
Manganese (mg/L)	< 0.005	0.120	0.024	< 0.005	< 0.005	0.005
Nickel (mg/L)	< 0.02	< 0.02	0.02	< 0.02	< 0.02	0.02
Phosphorus						
Total Recoverable Selenium (mg/L)	< 0.001	**0.101**	0.015	< 0.001	**0.983**	0.492
Selenium (mg/L)	< 0.001	**0.100**	0.015	< 0.001	**0.965**	0.483
Selenium IV (mg/L)	< 0.001	**0.007**	0.001	--	--	--
Selenium VI (mg/L)	< 0.001	**0.072**	0.010	--	--	--
Uranium						
Zinc (mg/L)	< 0.01	0.12	0.03	< 0.01	< 0.01	0.01

Notes:
Less than sign (<) indicates that the parameter was not detected in the referenced sample. The presented value is the detection limit.
Bolded numbers are measured values that do not meet Idaho cold water life water quality criteria.
The mean calculated using the reported detection limit for non-detect values.
-- not measured
[1] Stations SW08-ST, SW09-ST, and SW13-ST
[2] Stations SW14-ST and SW15-ST
Source: Whetstone 2009b

3.3.1.3.1 Fish Pond Drainage Water Quality

Water quality data for Fish Pond Drainage are available from baseline monitoring stations SW03-L, SW05-SP, and SW06-W. Station SW03-L monitors Fish Pond. Stations SW05-SP and SW06-W monitor Wetland C and Wetland G Springs, respectively (**Figure 3.3-3**). Fish Pond and the two springs have similar chemistry and are well-buffered, calcium-bicarbonate waters with low to moderate TDS (114 to 268 mg/L) and near neutral to alkaline pH (7.0 to 9.1). With the exceptions of pH and zinc, water in Fish Pond Drainage met all applicable standards during the Baseline Monitoring period,. The pH of Fish Pond (9.11) exceeded the standard of 9.0 in one sample during fall 2007. Zinc (0.09 mg/L) exceeded the calculated CMC (0.049 mg/L) and CCC



LEGEND

- PROJECT BOUNDARY
- BASELINE MONITORING STATION - RED CENTER INDICATES SELENIUM VALUES >0.005 MG/L
- MONITORING STATION FROM NEWFIELDS, 2006 - RED CENTER INDICATES SELENIUM VALUES >0.005 MG/L
- GYC MONITORING STATION - RED CENTER INDICATES SELENIUM VALUES >0.005 MG/L

Contour Interval = 20 ft.

NORTH

1,000' 0 1,000' 2,000'

BLACKFOOT BRIDGE PROJECT EIS

FIGURE 3.3-11
Monitoring Locations for
State Land Creek and Tributaries

ANALYSIS AREA: Caribou County, Idaho	
Date: 12/21/10	File: Project Area Map R2.dwg
Drawn By: SE	Layout: State Land Creek Monitoring

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(0.050 mg/L) at Wetland C Spring during the spring of 2005. The spring 2005 sample from Wetland C Spring had anomalously low hardness (33 mg $CaCO_3$/L), which resulted in very low calculated cold water aquatic life standard for zinc.

3.3.1.3.2 Wetland N Water Quality

Water quality at Wetland N is monitored at station SW01-W (**Figure 3.3-3**). The wetland contains well-buffered, calcium-bicarbonate water with moderate TDS (199 to 293 mg/L) and weakly alkaline pH (7.4 to 8.2). Water in Wetland N met all standards for cold water aquatic life during the baseline monitoring period.

3.3.1.3.3 Woodall Spring and North Woodall Spring Water Quality

Water quality for Woodall Spring and North Woodall Spring are available from baseline monitoring stations SW04-SP and SW07-SP (**Figure 3.3-3**). The springs issue along the Aspen Range Fault and have similar chemistries that are characteristic of deeply circulating groundwater in the Wells Formation (Whetstone 2009b). The springs discharge strongly buffered, calcium-bicarbonate water with weakly acidic pH (6.25 to 6.83) and moderately high TDS (426 to 729 mg/L). Bicarbonate (513 to 841 mg HCO_3/L) is the main constituent contributing to TDS. With the exception of pH, baseline water quality samples from the springs met cold water aquatic life standards. The pH of the springs is frequently below the minimum standard of 6.5.

3.3.1.3.4 Gardner Spring Surface Water Quality

Baseline water quality data for Gardner Spring are available from station SW16-SP (**Figure 3.3-3**). The spring is a well-buffered, calcium-bicarbonate type with low to moderate TDS (268 mg/L) and slightly alkaline pH (7.17). The spring water meets cold water standards for aquatic life.

3.3.1.4 Hydrogeologic Setting

Groundwater flows from areas of recharge at higher elevations to areas of discharge at lower elevations. This flow occurs in local-, intermediate-, and regional-scale systems, depending on topography, geology, and the continuity of the hydrostratigraphic units. With the exception of the Meade Peak Member of the Phosphoria Formation, significant groundwater flow systems occur in all geologic units at Blackfoot Bridge. The Meade Peak Member of the Phosphoria Formation generally has low permeability and acts as an aquitard that separates regional groundwater flow in the Wells Formation from smaller-scale groundwater systems in the overlying units (Ralston et al. 1977; Winter 1980).

3.3.1.4.1 Regional Groundwater Flow System

Regional studies of stream gain-loss patterns and spring discharges indicate that the Wells Formation is an areally extensive aquifer that participates in inter-basin transfers of groundwater (Ralston et al. 1977; Winter 1980; Ralston et al. 1983). Regional flow in the Wells Formation is generally northwest and moves from outcrop areas along Dry Ridge, Schmidt Ridge, and the Webster Range to discharge areas north and west of the project area (Maxim 2002b; Reed et al. 1984). Recharge also occurs along the crest of the Aspen Range, where the Wells Formation is exposed at the surface (**Figure 3.1-1**). The Grandeur Member participates in the regional flow system to the extent that it is present, but it is not a major component of the system.

Groundwater in the Wells Formation may be confined or unconfined depending on location. The Wells Formation is confined over a large area of the Phosphate District, where it is capped by low-permeable shales of the Meade Peak Member of the Phosphoria Formation. It may be unconfined where it forms the surface outcrop. The Meade Peak Member of the Phosphoria Formation is a regional aquitard (Ralston et al. 1983). Vertical transfer of water between the Wells Formation and the overlying units may occur where the Phosphoria Formation is absent or disrupted by faulting.

Flow paths in the Wells Formation are primarily bedding plane controlled. Discharge from the regional system occurs at springs and wetlands along extensional faults that truncate the Wells Formation on the western flank of the Aspen Range (Ralston et al. 1983). Woodall Spring, North Woodall Spring, and the wetlands west of the project area are all areas of discharge for the regional groundwater flow system. The regional system also discharges into Blackfoot River north of the project area via a series of riverbank springs and by upwelling through the streambed (**Figure 3.3-8**). The average gradient in the Wells Formation is estimated to be about 0.006 ft/ft northwest, roughly parallel to the dominant direction of fold axes (Maxim 2002b). Radiocarbon dates for fault-related springs on the eastern margin of the Blackfoot Lava Field indicate that the residence time for groundwater in the regional system is between 12,700 and 20,500 years (Ralston et al. 1983).

3.3.1.4.2 Groundwater Flow in the Blackfoot Lava Field

Basalt flows in the Blackfoot Lava Field form a basin-scale aquifer that is used for domestic, agricultural, and industrial water supply. In general, the basalt is a good to excellent aquifer with depths to water ranging from near surface to about 100 feet. Typical well yields from the basalt range from 200 to 3,500 gpm, with specific capacities of 3 to 3,500 gpm/ft (Dion 1974). Primary pathways for groundwater flow include joints, fractures, and contacts between successive lava flows. Zones with high transmissivity may be present at the top of lava flows and in areas with rubble, cinder, and scoria (Dion 1974). Conversely, soil horizons between basalt flows may be composed of stiff clay and have low permeability.

Well records from the IDWR (2007) indicate that groundwater flow west of the project area is south away from Blackfoot Reservoir (**Figure 3.3-12**). This pattern of groundwater flow matches water table maps of the Blackfoot Lava Field that have been prepared by Mansfield (1927) and Armstrong (1969). Groundwater in the basalt is generally unconfined (Dion 1974), but interbedded clayey soil horizons may create local confined or semi-confined conditions. Flowing wells with water levels above ground surface have been drilled in the basalt along the eastern edge of the lava field near Blackfoot Bridge and Conda (IDWR 2007). A soil horizon at the base of the basalt confines the Wells Formation near the north end of the project area.

Recharge to the Blackfoot Lava Field occurs by infiltration of precipitation, leakage from Blackfoot Reservoir, and by groundwater discharge into the basalt from sources outside of the basin (Dion 1974). Reports by Mansfield (1927), Armstrong (1969), and Dion (1974) indicate that construction of Blackfoot Reservoir in 1909 modified the direction of groundwater flow south of the reservoir. Prior to filling the reservoir, the direction of groundwater movement was presumably controlled by the surface water divide between China Hat and Woodall Spring (**Figure 3.3-12**), and flowed into the Blackfoot River Basin north of China Hat, and into the Bear River Basin south of China Hat. Currently, groundwater moves south from the reservoir toward

China Hat and flows below the surface water divide into the Bear River Basin (Dion 1974). An analysis of the hydrologic budget for the Blackfoot Lava Field indicates that discharge from the southern outlet of the basin (Soda Creek) is about 52 cfs greater than can be accounted for by the infiltration of precipitation and runoff (Dion 1974). The excess discharge from Soda Creek is attributed to seepage from the reservoir (12 cfs) and to a source from outside the basin (40 cfs). It is assumed that the extra-basinal source is the regional groundwater flow system in the Wells Formation.

3.3.1.4.3 Local- to Intermediate-Scale Groundwater Flow Systems

The Salt Lake, Thaynes, and Dinwoody Formations generally support groundwater flow systems with short to intermediate length flow paths (Ralston et al. 1977; Winter 1980). The formations are stratigraphically above the Phosphoria Formation and are separated from the regional system by the Meade Peak aquitard. Groundwater is also present in the Rex Chert, but previous investigations by Ralston et al. (1977, 1983) and Winter (1980) concluded that groundwater flow in the unit is limited and is only significant where the Rex Chert is fractured or faulted. Recent investigations suggest a different conclusion, however, and indicate that the Rex Chert may be moderately to highly permeable over a widespread area (Maxim 2002b; Whetstone 2002, 2003, 2005b, 2007a, 2008; Greiner 1977).

The Salt Lake Formation is not exposed in the project area but is present below the basalt on the west side of the Aspen Range Fault (**Figure 3.1-2**). Winter (1980) indicates that the formation is capable of supporting local- to intermediate-scale groundwater flow systems. The Salt Lake Formation is placed against the Wells Formation by the Aspen Range Fault west of the proposed project. The conceptual hydrologic model is that northwesterly flowing deep groundwater in the regional system (Wells Formation) is forced upward along the fault, in part by the lower permeability of the Salt Lake Formation relative to the Wells Formation. Groundwater in the Salt Lake Formation may be confined or semi-confined by clayey soil layers at the base of the basalt flows.

The Dinwoody Formation crops out along slopes and in the drainage east of the planned open pits (**Figure 3.1-1**). Numerous small springs and seeps issue from the Dinwoody Formation in Fish Pond Drainage and Beaver Pond Drainage. Recharge to the springs is by infiltration of precipitation on the surrounding watersheds. Flow paths are relatively short, as indicated by the low to moderate dissolved solids content of the spring water (**Section 3.3.1.2**). The depth to groundwater in the Dinwoody Formation ranges from a few feet to a few tens of feet below ground surface in the project area. The direction of flow in the unit is strongly controlled by bedding and topography with groundwater moving from upland recharge areas on slopes to lower discharge areas in drainages. Shallow groundwater in the Dinwoody Formation is unconfined. Confined or semi-confined conditions may exist at depth.

The Rex Chert crops out along the eastern edge of the proposed pits and dips to the east (**Figure 3.1-1**). Recharge to the unit occurs where it is exposed on the hillside. The Rex Chert participates in the local-scale flow system with the overlying Dinwoody Formation. Groundwater in the Rex Chert may be confined or unconfined depending on depth and location. The Rex Chert crops out along the eastern edge of the proposed pits and dips to the east (**Figure 3.1-1**). Recharge to the unit occurs where it is exposed on the hillside. The Rex Chert participates in the local-scale flow

system with the overlying Dinwoody Formation. Groundwater in the Rex Chert may be confined or unconfined depending on depth and location.

3.3.1.4.4 Groundwater Flow in Unconsolidated Deposits

Alluvial and colluvial deposits are present in drainages and along hillsides in the project area. Colluvium on hillsides is typically unsaturated. Alluvium and colluvium in drainages is generally saturated in the lower reaches but may be dry or seasonally saturated in the upper reaches. Unconsolidated deposits may either recharge bedrock groundwater or receive discharge from bedrock depending on the location and season. Groundwater in alluvium and colluvium may also be perched above the bedrock water table as is observed at Wetland A.

3.3.1.4.5 Groundwater Recharge

Recharge to groundwater occurs by infiltration of precipitation on topographically high areas. Discharge from groundwater occurs at springs, seeps, and in drainages in areas of lower elevation. Groundwater recharge or discharge may also occur along rivers, streams, and lakes depending on the elevation of the waterbody relative to the water table. Precipitation occurs primarily as snow, with the greatest accumulations occurring on east sides of ridges. West-facing slopes and valley floors receive less snow and have lower recharge potentials than east-facing slopes (Ralston et al. 1977). Flow paths between areas of recharge and discharge may range from long (regional flow systems) to short (local flow systems). The estimated recharge for the project area based on annual precipitation is summarized in **Table 3.3-7** (Buck and Mayo 2004; Whetstone 2009b).

Table 3.3-7 Estimated Recharge to Groundwater Recharge in Southeast Idaho

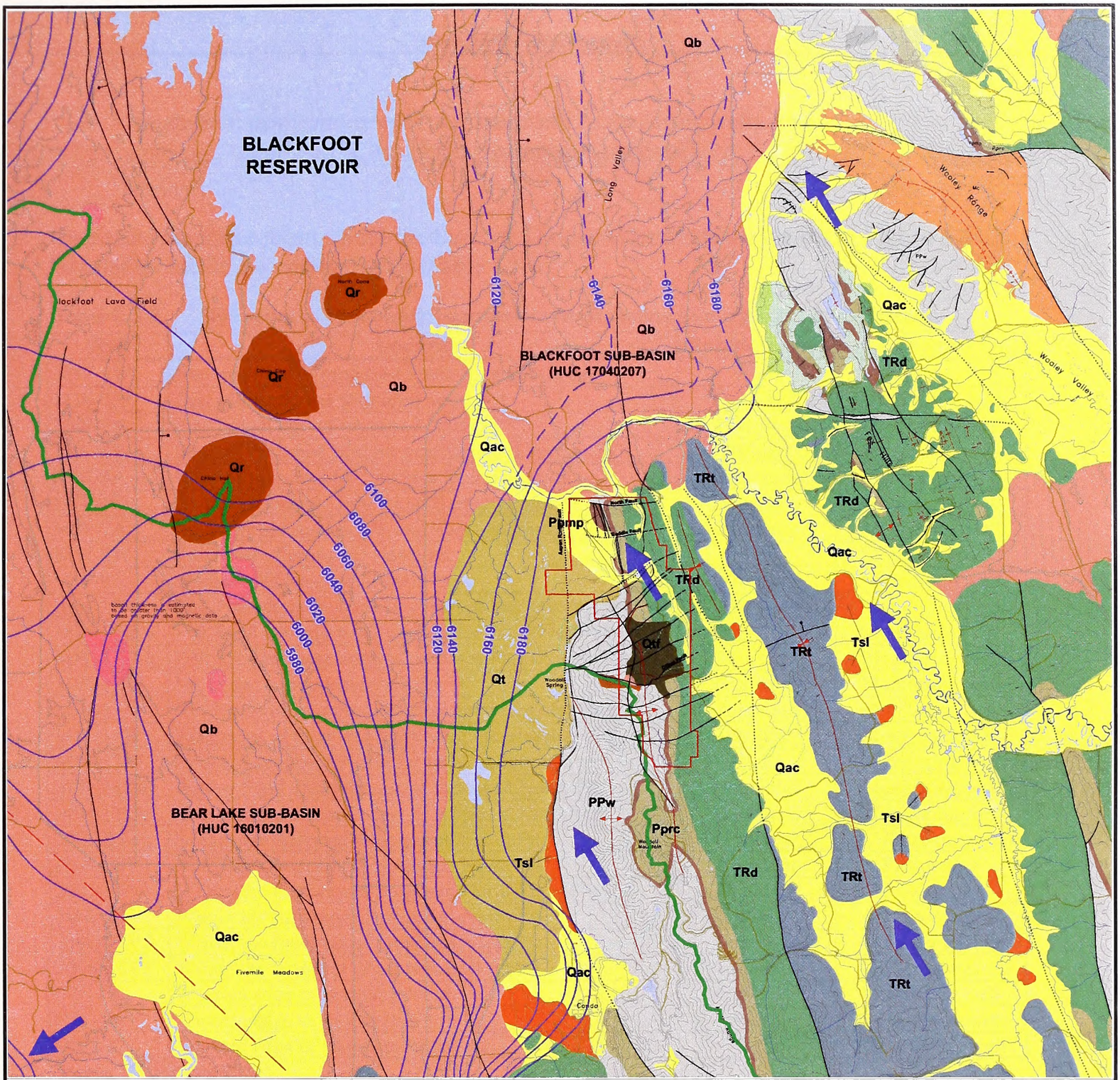
Annual Precipitation	Percent Recharge
0 to 12 in/yr	0
12 to 16 in/yr	4
16 to 20 in/yr	7
20 to 25 in/yr	11
25 to 30 in/yr	14
30 to 35 in/yr	18
> 35 in/yr	21

Source: Buck and Mayo 2004

3.3.1.5 Groundwater Data

Groundwater data for the project area were compiled from reports, maps, and databases prepared by the USGS, IDWR, and other public domain sources. Regional data were supplemented by site-specific baseline studies for the Blackfoot Bridge project that were completed between September 2005 and November 2008 (Whetstone 2009b). The baseline studies were performed under the direction of the BLM and IDEQ and included:

- Installation of 27 wells and piezometers in the project area;
- Quarterly monitoring (spring through fall) of groundwater levels and water quality from September 2005 to October 2007;
- Semi-annual monitoring (spring & fall) of groundwater levels and water quality in 2008;



LEGEND

- PROJECT BOUNDARY
- PERENNIAL STREAM OR RIVER
- INTERMITTENT STREAM
- RESERVOIR, LAKE OR POND
- FAULT (DOTTED WHERE CONCEALED, DASHED WHERE COVERED)
- SYNCLINAL AXIS
- ANTCLINAL AXIS
- WATER TABLE ELEVATION IN BASALT
- DIRECTION OF REGIONAL GROUND WATER FLOW
- WATERSHED DIVIDE BETWEEN MAJOR SUB-BASINS

MAP UNITS

- Qac ALLUVIUM AND COLLUVIUM
- Qt TRAVERTINE
- Qb BASALT
- Qr RHYOLITE DOME
- Qtf RHYOLITE TUFF
- Tsl SALT LAKE FORMATION
- TRt THAYNES FORMATION
- TRd DINWOODY FORMATION
- Pprc PHOSPHORIA FORMATION - REX CHERT MEMBER
- Ppmp PHOSPHORIA FORMATION - MEADE PEAK MEMBER
- PPw WELLS FORMATION / PARK CITY FORMATION - GRANDEUR MEMBER

Geology after Mansfield 1927; Onel and Platte 1980; and Carpenter 2009

NORTH

4,000' 0 4,000' 8,000'

BLACKFOOT BRIDGE PROJECT EIS

FIGURE 3.3-12
Water Table Map for Blackfoot Lava Field

ANALYSIS AREA: Caribou County, Idaho	
Date: 07/23/10	File: Water Table Map_with_Geology.dwg
Drawn By: SE	Layout: EIS

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- Single-well permeability tests performed in 11 monitoring wells; and
- A 72-hour aquifer test with observation wells in the Wells Formation near the proposed North Pit.

Well and piezometer locations for the Baseline Groundwater Study are shown in **Figure 3.3-13**. Installation details are summarized in **Table 3.3-8**.

Table 3.3-8 Summary of Wells and Piezometers for Baseline Groundwater Investigation

Well	Location	Geologic Unit	Type
MW-1W	Near junction of proposed South Pit and Mid Pit	Wells	Monitoring well
MW-2R	East (down dip) of proposed South Pit	Rex Chert	Monitoring well
MW-3A	East (down dip) of proposed South Pit	Alluvium	Monitoring well
MW-4W	West of proposed Mid Pit near Woodall Spring	Wells	Monitoring well
MW-5A	West of proposed Mid Pit near Woodall Spring	Alluvium/Fill	Monitoring well
MW-6D	East of proposed Mid Pit and East Overburden Pile	Dinwoody	Monitoring well
MW-7A	East of proposed Mid Pit and East Overburden Pile	Alluvium	Monitoring well
MW-8W	Southeast of proposed North Pit	Wells	Monitoring well
MW-9A	Southeast of proposed North Pit	Alluvium	Monitoring well
MW-10A	Fish Pond drainage north of proposed East Overburden Pile	Alluvium	Monitoring well
MW-11D a	Fish Pond drainage north of proposed East Overburden Pile	Dinwoody	Monitoring well
MW-11D b	Fish Pond drainage north of proposed East Overburden Pile	Dinwoody	Monitoring well
MW-12W	North end of proposed Mid Pit	Grandeur	Monitoring well
MW-13A	Northwest of proposed Northwest Overburden Pile	Alluvium	Monitoring well
MW-14W	Northwest of proposed Northwest Overburden Pile	Wells	Monitoring well
MW-17W	Between proposed North Pit and Blackfoot River	Wells	Monitoring well
MW-18Da	Beaver Pond drainage east of proposed North Pit	Alluvium	Monitoring well
MW-18Db	Beaver Pond drainage east of proposed North Pit	Dinwoody	Monitoring well
2006-05V2	Within the footprint of proposed North Pit	Grandeur	Piezometer
2006-33V1	Within the footprint of proposed North Pit	Grandeur	Piezometer
2006-35V1	Within the footprint of proposed North Pit	Grandeur	Piezometer
2006-37V1	Within the footprint of proposed North Pit	Wells	Piezometer
2006-37V2	Within the footprint of proposed North Pit	Grandeur	Piezometer
2006-38V1	Within the footprint of proposed North Pit	Grandeur	Piezometer
PW-1W	Western edge of proposed North Pit	Wells	Production well
OW-1W	Western edge of proposed North Pit	Wells	Observation well
OW2W	Western edge of proposed North Pit	Wells	Observation well

Source: Whetstone 2009a

3.3.1.5.1 Hydrologic Characteristics of Bedrock and Unconsolidated Deposits

Site-specific hydraulic conductivity, transmissivity, and storage data for bedrock and unconsolidated deposits in the project area were obtained from a 72-hour aquifer test in the Wells Formation and 11 single-well permeability tests. Additional hydrogeologic data for the project were also compiled from studies at other phosphate mines in the region. Hydraulic conductivity is the permeability of a rock mass or unconsolidated deposit to water. It is reported in units of distance over time (i.e., ft/day). Transmissivity is the rate at which water is transmitted through a unit width of an aquifer or confining bed under a unit hydraulic gradient and is equal to hydraulic conductivity multiplied by the thickness (b) of the aquifer or confining bed (i.e., ft^2/day). Storage is a dimensionless value that is defined as the volume of water an aquifer

releases or takes into storage per unit surface area of the aquifer per unit change in head. In a confined aquifer, storage values (S) are typically small (0.005 to 0.00005) and changes in storage are controlled by the expansion of water and compaction of the mineral skeleton in response to changes in pressure head (Freeze and Cherry 1979). Storage values for unconfined aquifers (specific yield [Sy]) are typically much larger (0.3 to 0.01) and reflect dewatering or filling of pore spaces as the water table rises or falls (Freeze and Cherry 1979). Storage in a fractured aquifer is best represented by a double porosity system composed of low-permeability matrix blocks with storage characteristics similar to specific yield and high-permeability fractures with low storage similar to a confined aquifer (Moench 1984).

3.3.1.5.2 Single-Well Permeability Tests

Short-duration single-well permeability tests were performed in 11 monitoring wells to provide data that could be used to calculate hydraulic conductivity for rocks and unconsolidated deposits in the project area. The testing procedure involved pumping the wells for approximately 1 hour while measuring the water level in the well. At the end of the pumping period, the water level in the well was allowed to recover and was monitored until it reached about 95 percent of the pre-pumping water level. Complete descriptions of the testing procedure and data analysis are presented in The Water Resources Baseline Characterization Report (Whetstone 2009a). The results of the tests are summarized in **Table 3.3-9**.

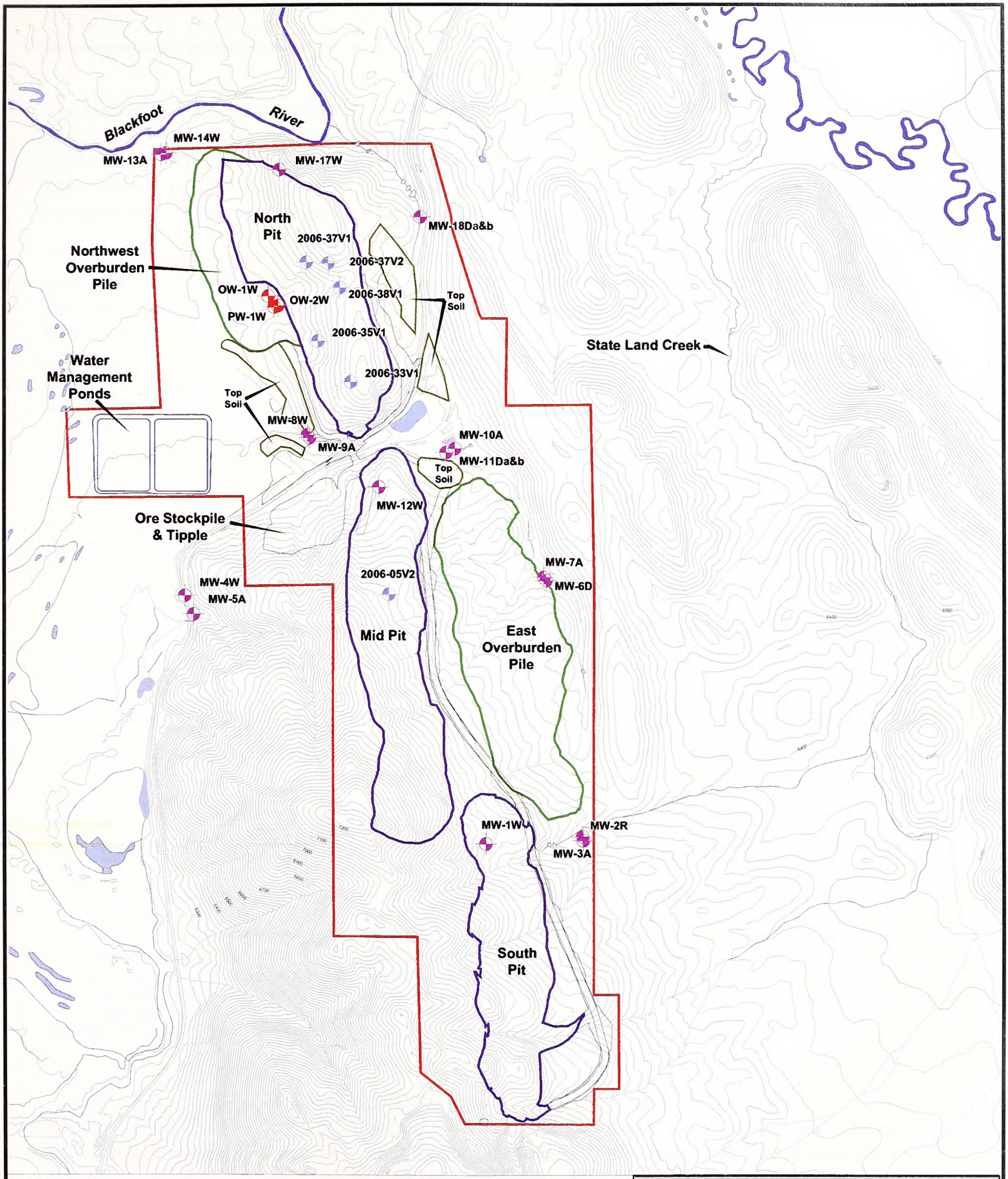
Table 3.3-9 Summary of Single Well Permeability Testing Data

Tested Well	Geologic Unit	Transmissivity (ft^2/d)	Hydraulic Conductivity (ft/d)
MW-1W	Grandeur	5,500	44
MW-2R	Rex Chert	57	0.23
MW-4W	Wells Formation	760	12
MW-5A	Alluvium/Fill	630	43
MW-6D	Dinwoody	2.3	0.02
MW-7A	Alluvium	18	3.0
MW-8W	Wells Formation	260	4.2
MW-9A	Alluvium	24	2.0
MW-10A	Alluvium	380	28
MW-11Db	Dinwoody	370	2.5
MW-13A	Alluvium	340	28

Source: Whetstone 2009a

3.3.1.5.3 Wells Formation Aquifer Test

An aquifer test was performed near the proposed North Pit to develop reliable estimates of transmissivity (T), hydraulic conductivity (K), and storage (S) for the Wells Formation. The test consisted of an abbreviated step-drawdown test and a 72-hour constant-rate discharge pumping test with observation wells (Whetstone 2009a). Three wells were installed for the aquifer test. The wells were completed in the upper portion of the Wells Formation and included pumping well PW-1W and observation wells OW-1W and OW-2W. Six other wells were also monitored during the test including MW-8W, 2006-33V1, 2006-35V1, 2006-37V1, 2006-37V2, and 2006-38V1 (**Figure 3.3-14**).



LEGEND

- PROJECT BOUNDARY
- PROPOSED OPEN PIT
- PROPOSED OVERBURDEN PILE
- PROPOSED TOPSOIL STOCKPILE
- BASELINE MONITORING WELL
- PIEZOMETER
- PUMPING WELL OR OBSERVATION WELL

Contour Interval = 20 ft.

NORTH

1,000' 0 1,000' 2,000'

BLACKFOOT BRIDGE PROJECT EIS

FIGURE 3.3-13
Baseline Groundwater Monitoring Stations

ANALYSIS AREA: Caribou County, Idaho	
Date: 12/21/10	File: Project Area Map R2.dwg
Drawn By: SE	Layout: Groundwater

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The step-drawdown test was performed to determine the maximum sustainable pumping rate for the constant-rate discharge test. The step-drawdown test consisted of pumping the production well (PW-1W) at three consecutively higher discharge rates until the water level in the well was drawn down to near the pumwel; w2p intake. The test results indicated that the maximum sustainable pumping rate for the constant-rate discharge test was 200 gpm.

The constant-rate discharge portion of the aquifer test was performed by pumping PW-1W at an average rate of about 200 gpm for 72 hours. Water levels were monitored in the production well and observation wells during pumping and for 3 days after the pump had been shut off. Drawdown in PW-1W approached steady-state conditions near the end of the pumping period at 144.98 feet. Water levels in the observation wells were still declining when the pump was shut off. The calculated values for transmissivity, hydraulic conductivity, and storage from the aquifer test are summarized in **Table 3.3-10**.

The results of the aquifer test also indicated:

- North-south trending faults near the pumping well that disrupt bedding are strong barriers to east-west groundwater flow; and
- East-west trending faults near the pumping well do not impede groundwater flow in a north-south direction.

Table 3.3-10 Hydrologic Values Calculated from North Pit Pumping Test

Parameter	Range
Transmissivity[1]	
Average	**4,000 to 9,000 ft^2/d**
Parallel to bedding	**32,000 to 72,000 ft^2/d**
Perpendicular to bedding	**500 to 1,100 ft^2/d**
Hydraulic Conductivity[1]	
Average	22 to 50 ft/d
Parallel to bedding	180 to 400 ft/d
Perpendicular to bedding	2.8 to 6.1 ft/d
Storage[2]	**0.0001 to 0.37**

Notes:

1 The high end of the presented ranges reflect the small-scale, or intrinsic, transmissivity and hydraulic conductivity of the aquifer near PW-1W excluding the effects of boundaries (i.e. faults and changes in stratigraphy or fracture density) that limit or reduce the availability of groundwater to the pumped well. The low end of the ranges reflect the large-scale or apparent transmissivity of the aquifer including the effects of north-south trending faults that disrupt the stratigraphic sequence and act as barriers to groundwater flow.

2 The lower range of calculated storage values (lower than about 0.001) are characteristic of fracture storage. Storage values greater than about 0.01 likely reflect specific yield from matrix blocks.

Source: Whetstone 2009b

3.3.1.5.4 Regional Hydraulic Conductivity, Transmissivity, and Storage Data

Regional hydraulic conductivity, transmissivity, and storage data were compiled for alluvium and the Dinwoody, Phosphoria, and Wells Formations. The data were developed from hydrologic studies at other mines in the Southeast Idaho Phosphate District and include results from single-well permeability tests (slug tests and short-duration slug tests) and pumping tests. Summary statistics for the regional data are presented in **Table 3.3-11**.

3.3.1.5.5 Groundwater Levels Near the Mid Pit, South Pit, and East Overburden Pile

Water level data from monitoring wells and piezometers indicate that the elevation of the regional groundwater table in the Wells Formation is approximately 6,160 to 6,200 feet (Whetstone 2009b). The planned elevation of the lowest portion of the bottom of the South Pit is 6,400 feet (P4 2008a), approximately 200 feet above the regional water table (**Figure 3.3-15**).

The proposed pit would intercept groundwater from the local-scale aquifer in the Phosphoria Formation. Exploration drilling indicates that groundwater is present in the Rex Chert and Meade Peak Members at elevations ranging from 6,433 to 6,507 feet (Whetstone 2009b). The topographic area east of the pit that is above the floor elevation of 6,400 feet would constrain the amount of groundwater that could be intercepted by the pit (**Figure 3.3-15**).

3.3.1.5.6 Overburden Pile

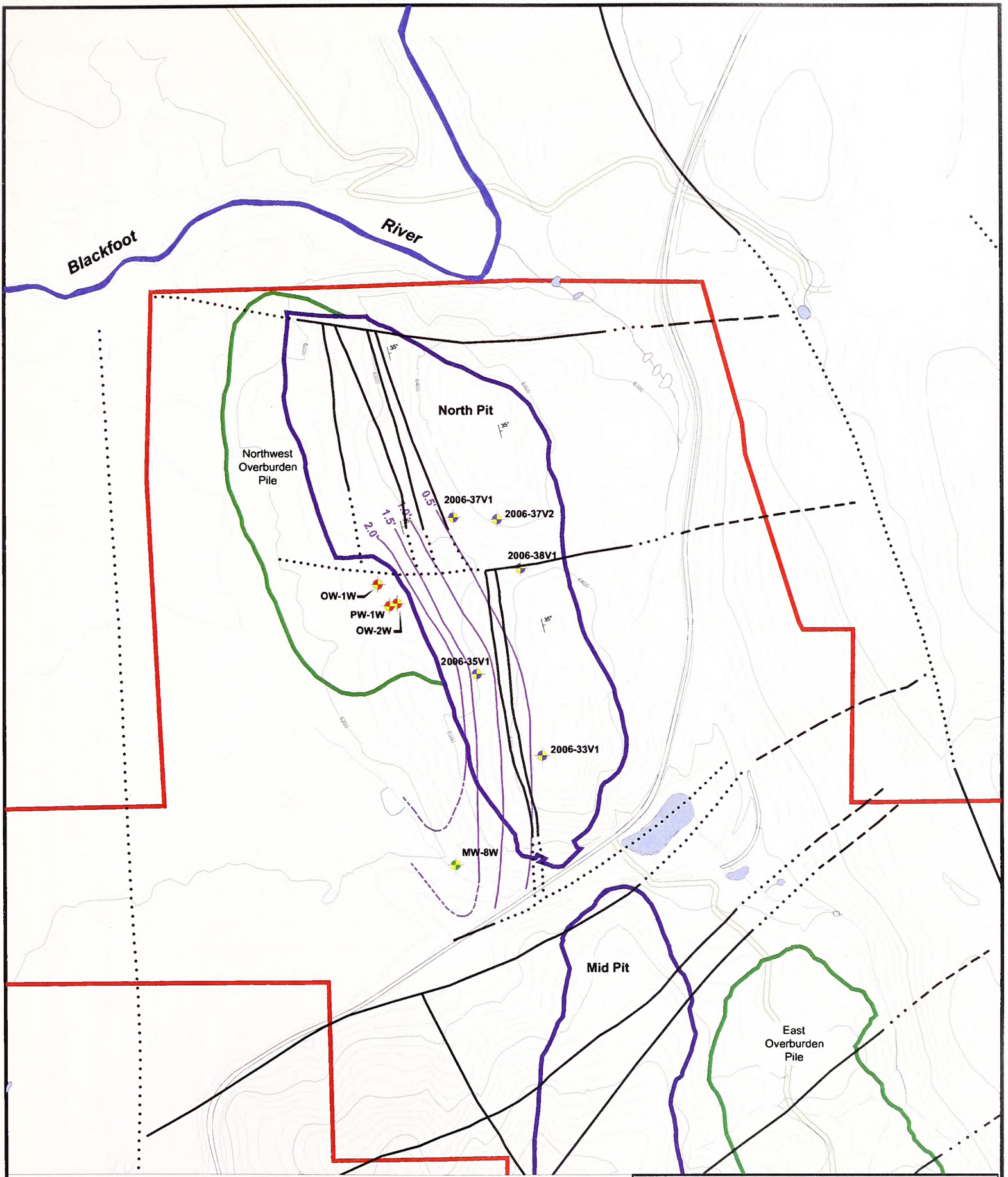
Water level data from monitoring wells and piezometers indicate that the elevation of the regional groundwater table in the Wells Formation is approximately 6,160 to 6,200 feet (Whetstone 2009b). The planned elevation of the lowest portion of the bottom of the South Pit is 6,400 feet (P4 2008a), approximately 200 feet above the regional water table (**Figure 3.3-15**). The proposed pit would intercept groundwater from the local-scale aquifer in the Phosphoria Formation. Exploration drilling indicates that groundwater is present in the Rex Chert and Meade Peak Members at elevations ranging from 6,433 to 6,507 feet (Whetstone 2009b). The topographic area east of the pit that is above the floor elevation of 6,400 feet would constrain the amount of groundwater that could be intercepted by the pit (**Figure 3.3-15**).

The floor of the Mid Pit would slope downward to the north with the lowest portion of the pit being excavated to an elevation of 6,160 feet (P4 2008a). Water level data from MW-12W and 2006-05V2 indicate that the north end of the pit would be about 20 feet below the regional water table (**Figure 3.3-15**). The elevation of the bottom of the Mid Pit at the south end would be about 6,540, and would be about 340 feet above the elevation of the regional water table. Similar to the South Pit, the Mid Pit would also intercept limited amounts of groundwater from local-scale aquifers in the Dinwoody and Phosphoria Formations. Data from monitoring well MW-1W indicate that a groundwater compartment with water levels above the proposed pit floor exists in the Wells Formation at the south end of the Mid Pit. The water level in the compartment varies from about 6,580 to 6,592 feet elevation, and is about 300 feet above the level of the regional water table. It is likely that the compartment is fault-related, possibly to the Offset Fault (**Figure 3.1-1**), but the mechanism supporting the high water level is poorly understood.

Groundwater in the Dinwoody Formation and alluvium near the toe of the EOP is relatively shallow. The depth to water as observed in monitoring wells MW-6D (Dinwoody) and MW-7A (alluvium) fluctuate seasonally between about 10 and 25 feet below ground surface. Groundwater levels track together in the two wells with an average downward gradient of about 0.01 ft/ft.

3.3.1.5.7 Groundwater Levels near the North Pit and Northwest Overburden Pile

Monitoring data indicate that the elevation of the regional groundwater table within the footprint of the proposed North Pit ranges from about 6,150 to 6,185 feet (**Figure 3.3-15**). The planned bottom elevation of the pit is about 6,075 feet (P4 2008a), and would be approximately 75 to 110 feet below the regional water table. The depth to groundwater in the alluvium near the NWOP is less than 10 feet as observed in monitoring well MW-13A.



BLACKFOOT BRIDGE PROJECT EIS

FIGURE 3.3-14
Well Location Map and Maximum Drawdown for Wells Formation Aquifer Test

ANALYSIS AREA: Caribou County, Idaho	
Date: 12/21/10	File: Pumping Test Figs R2.dwg
Drawn By: JC	Layout: EIS_Fig14

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Table 3.3-11 Summary of Regional Hydraulic Conductivity, Transmissivity, and Storage Data

Unit	Aquifer Property	Units	Number Of Tests	Minimum	Maximum	Averge	Median	Geometric Mean	Standard Deviation
Alluvium	Hydraulic Conductivity	(ft/day)	7	0.01	55	8.5	0.1	0.3	20.5
	Transmissivity	**(ft^2/day)**	1	3,200	3,200	3,200	3,200	3,200	N/A
	Storage Coefficient		0	N/A	N/A	N/A	N/A	N/A	N/A
Dinwoody	Hydraulic Conductivity	(ft/day)	0	N/A	N/A	N/A	N/A	N/A	N/A
	Transmissivity	**(ft^2/day)**	2	83	620	352	352	227	380
	Storage Coefficient		0	N/A	N/A	N/A	N/A	N/A	N/A
Rex Chert	Hydraulic Conductivity	(ft/day)	15	0.1	75.0	9.3	2.3	2.40	19.4
	Transmissivity	**(ft^2/day)**	10	154	12,000	1,842	600	661	380
	Storage Coefficient		5	0.0003	0.03	0.009	0.007	0.003	0.01
Meade Peak	Hydraulic Conductivity	(ft/day)	18	0.03	25	3.7	1.5	0.8	6.1
	Transmissivity	**(ft^2/day)**	12	6	2,000	239	43	50	564
	Storage Coefficient		3	0.001	0.001	0.001	0.001	0.001	N/A
Wells Formation	Hydraulic Conductivity	(ft/day)	9	0.08	9.9	2.0	0.73	0.79	3.2
	Transmissivity	**(ft^2/day)**	9	4	3,600	753	98	125	1,354
	Storage Coefficient		2	0.002	0.008	0.005	0.005	0.004	0.004

Source: Whetstone 2009b

Artesian conditions exist in the Wells Formation near MW-14W, where the potentiometric surface is about 37 feet above ground surface (**Figure 3.3-13**). The observed depth to groundwater in the adjacent alluvial well (MW-13A) has fluctuated between 3.12 and 8.70 feet below the top of the well casing (btoc). Similarities in the water chemistry between the two wells suggest significant upward transfer of water from the Wells Formation into the alluvium. The upward vertical gradient between the two wells is calculated to be about 0.5 ft/ft.

3.3.1.6 Chemical Characteristics of Groundwater

Idaho water quality standards for groundwater are contained in IDAPA 58.01.11 (IDEQ 2009b). Aquifers in Idaho are classified as Sensitive Resources, General Resources, or Other Resources based on the vulnerability of the groundwater, existing and projected beneficial uses of the water, existing water quality, and social and economic considerations. Groundwater classified as a Sensitive Resource receives the highest degree of protection, and applicable water quality standards may be stricter than those listed in IDAPA 58.01.11.200. Currently, the Rathdrum Prairie Aquifer near Spokane is the only listed Sensitive Resource in the State of Idaho (IDAPA, 58.01.11.300.1). All other aquifers are categorized according to IDAPA 58.01.11.300.02, which defines a General Resource as:

> *"All aquifers or portions of aquifers where there are activities with the potential to degrade groundwater quality of the aquifer, unless otherwise listed in subsection 300.01 or 300.03. Once an activity with the potential to degrade the groundwater quality of an uncategorized aquifer or portion of an aquifer is initiated, the uncategorized aquifer shall automatically become General Resource unless petitioned into the Sensitive Resource, or Other Resource category."*

No aquifers are currently listed as an Other Resource in the State of Idaho (IDAPA, 58.01.11.300.03).

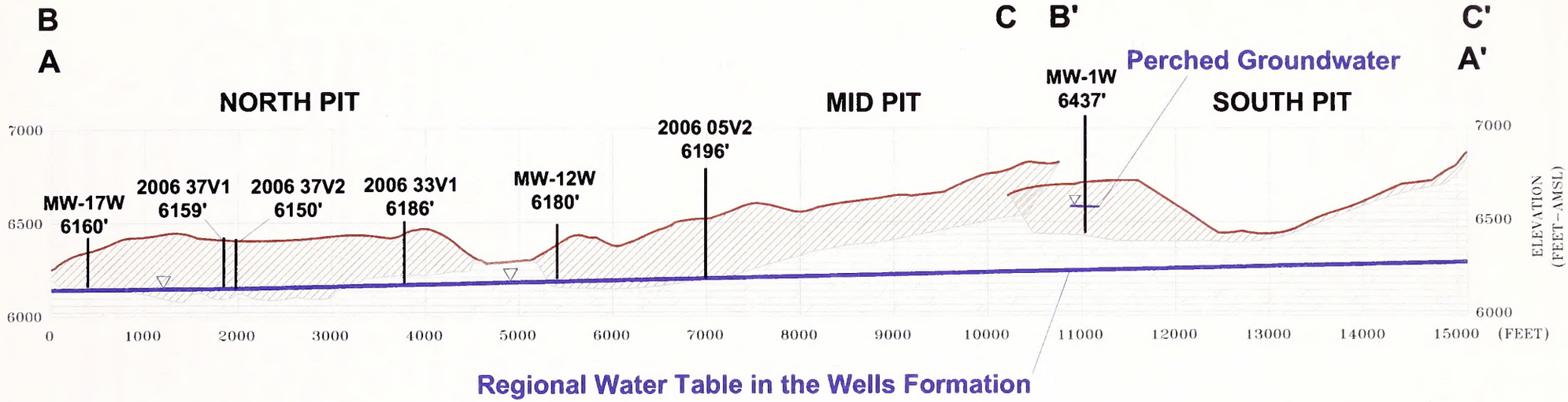
Based on the aquifer classification system described in the Idaho Administrative Code, groundwater in the project area is classified as a General Resource and is subject to numerical standards contained in section 58.01.11.200 and modified in subsection 200.03. Subsection 200.03 states:

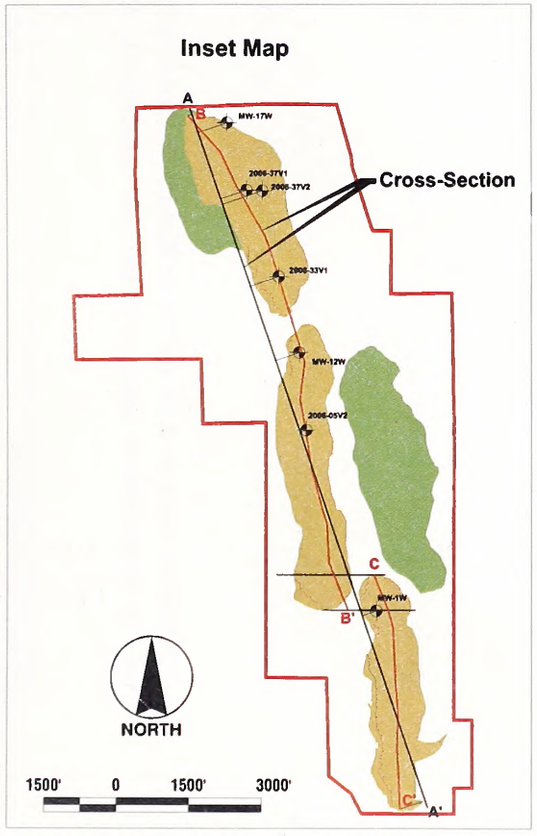
> *"If the natural background level of a constituent exceeds the standard in this section, the natural background level shall be used as the standard."*

In addition, IDAPA 58.01.11.400.06 provides that:

> *"Naturally occurring constituents found in groundwater within a specified area surrounding an active mineral extraction area, as determined by the Department, will not be considered contaminants as long as all applicable best management practices, best available methods or best practical methods, as approved by the Department, are applied."*

However, in the spring of 2008, IDEQ began a negotiated rulemaking process to clarify portions of the Ground Water Quality Rule to promote consistency in application of the rule to mining activities. The accepted rule addressed the following issues:





LEGEND

MW-17W 6160' — WELL ID, DEPTH TO WATER (FEET)

BLACKFOOT BRIDGE PROJECT EIS	
FIGURE 3.3-15 *Hydrologic Cross-Section Showing Regional Potentiometric Surface in the Wells Formation in Relation to the Proposed Open Pits*	
ANALYSIS AREA: Caribou County, Idaho	
Date: 12/21/10	File: Hydrologic Cross Section.dwg
Drawn By: EC	Layout: Hydrogeological Cross Section

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Adds definitions necessary to improve statewide consistency with interpretation and implementation of mining provisions of the Ground Water Quality Rule;

1. Develops a procedure and process to follow for setting the point(s) of compliance for ground water quality related issues at mining areas;
2. Ground water monitoring at mining areas;
3. Applicability of rule changes; and
4. Imposes a fee on mine operators making an application with the IDEQ to set the ground water quality point(s) of compliance.

The proposed rule was presented to the Idaho Board of Environmental Quality in the fall of 2008, approved and presented to the Idaho Legislature in the spring of 2009, where it was passed and is effective July 1, 2009.

The above quoted reference of IDAPA 58.01.11.400.06 was struck and replaced with 58.01.11.401.01, which states:

.01 Request for Setting Point(s) of Compliance. At the request of a mine operator, the IDEQ shall set a point of compliance, or points of compliance, at which the mine operator must meet the ground water quality standards as described in Subsection 150.01. If a request is not made, the mine operator must meet the ground water quality standards in ground water both within and beyond the mining area unless the Department establishes the points(s) of compliance consistent with Subsection 401.03. Mining activities must be managed using the level of protection appropriate for the aquifer category in accordance with Subsection 150.02 and Section 301.

Also applicable is section 58.01.11.401.03 -.04 that states:

.03 Setting the Point(s) of Compliance. The point(s) of compliance shall be set as close as possible to the boundary of the mining area, taking into consideration the relevant factors set forth in Subsections 401.03.i through 401.03.viii., but in no event shall the point(s) of compliance be within the boundary of the mining area. The mining area boundary means the outermost perimeter of the mining area (projected in the horizontal plane) as it would exist at the completion of the mining activity. The point(s) of compliance shall be set so that, outside the mining area boundary, there, is no injury to current or projected future beneficial uses of ground water and there is no violation of water quality standards applicable to any interconnected surface waters. The Department's determination regarding the point(s) of compliance shall be based on an analysis and consideration of all relevant factors including, but not limited to:

a. The hydrogeological characteristics of the mining area and surrounding land, including any dilution characteristics of the aquifer and any natural attenuation supported by site-specific data;
b. The concentration, volume, and physical and chemical characteristics of contaminants resulting from the mining activity, including the toxicity and persistence of the contaminants;

c. The quantity, quality and direction of flow of ground water underlying the mining area;

d. The proximity and withdrawal rates of current ground water users;

e. A prediction of projected future beneficial uses;

f. The availability of alternative drinking water supplies;

g. The existing quality of the ground water, including other sources of contamination and their cumulative impacts on the ground water; and

h. Public health, safety and welfare effects.

.04 Ground Water Monitoring and Reporting. The Department may require ground water monitoring and reporting whenever the Department sets the point(s) of compliance. The Department shall not require ground water monitoring that duplicates ground water monitoring required by other state or federal agencies as long as the mine operator provides the data to the Department.

a. A ground water monitoring system required under Subsection 401.04 shall be designed to;

   i. Represent the quality of background ground water that has not been affected by the mining activity; and

   ii. Represent the quality of ground water passing the points(s) of compliance in order to determine compliance with ground water quality standards or effectiveness of best management practices.

b. When practicable, indicator monitoring wells or other devices may be required. Such indicator wells and other devices shall not be used to determine compliance with the ground water quality standards, but instead may be used to evaluate modeling results, to predict the quality of ground water at the point(s) of compliance, or to determine the effectiveness of best management practices.

c. All monitoring wells shall be constructed (well depth, well screen size, well screen interval, gravel pack. Etc.) and developed so that ground water samples represent the quality of ground water that is relevant to current and future beneficial uses.

Groundwater standards are based on total concentrations.

Applicable groundwater quality standards for inorganic constituents for the Blackfoot Bridge project are presented in **Table 3.3-12**.

Baseline groundwater quality data for the project area were obtained from 17 monitoring wells that were sampled quarterly (excluding winter) between September 2005 and October 2007 and semi-annually (spring and fall) in 2008. Samples from the monitoring wells were analyzed for an extensive set of parameters including major ions, nutrients, and a suite of 20 metals (total and dissolved concentrations). Complete documentation for the Baseline Groundwater Monitoring Program is presented in the Water Resources Baseline Characterization Report (Whetstone 2009a).

Table 3.3-12 Idaho Groundwater Quality Standards for Inorganic Constituents

Groundwater Standards[1] (IDAPA 58.01.11)	Idaho Groundwater Standards (IDAPA 58.01.11)	
	Primary Standard	Secondary Standard
pH (s.u.)	—	6.5 - 8.5
Chloride (mg/L)	—	250
Fluoride (mg/L)	4	—
Nitrogen, nitrate (N mg/L)	10	—
Nitrogen, nitrite (N mg/L)	1	—
Nitrogen, nitrate/nitrite (N mg/L)	10	—
Sulfate (mg/L)	—	250
TDS (mg/L)	—	500
Aluminum (mg/L)	—	0.2
Antimony (mg/L)	0.006	—
Arsenic (mg/L)	0.01 (f)	—
Barium (mg/L)	2	—
Cadmium (mg/L)	0.005	—
Chromium (mg/L)	0.1	—
Copper (mg/L)	1.3	—
Iron (mg/L)	—	0.3
Lead (mg/L)	0.015	—
Manganese (mg/L)	---	0.05
Mercury (mg/L)	0.002	—
Selenium (mg/L)	0.05	—
Silver (mg/L)	—	0.1
Thallium (mg/L)	0.002	—
Uranium (mg/L)	0.03 (f)	—
Zinc (mg/L)	—	5

Notes:
— no standard
(f) indicates federal drinking water standard
Source: IDEQ 2009b

3.3.1.6.1 Water Quality in Alluvium

The chemical composition of alluvial groundwater varies depending on location and can be divided into two subsets:

1. Alluvial groundwater in project area drainages, including Wetland A (MW-3A), Fish Pond Drainage (MW-7A, MW-9A, and MW-10A), and Beaver Pond Drainage (MW-18Da).
2. Alluvial groundwater adjacent to the Aspen Range Fault (MW-5A and MW-13A).

Alluvial groundwater in project area drainages is a moderately buffered (85 to 320 mg HCO_3/L) calcium-bicarbonate water with circum neutral pH (6.7 to 7.6) and generally low TDS (131 to 297 mg/L). Metals concentrations in the water are typically below applicable groundwater standards, with the exceptions of total aluminum, iron, and manganese. Elevated total concentrations for the three metals during baseline monitoring were related to excess turbidity (0.2 to 200 NTU), which was induced by pumping the wells during sample collection (Whetstone 2009b). Dissolved concentrations for aluminum, iron, and manganese were typically

near or below detection limits and are considered to more accurately represent baseline water quality conditions for alluvial groundwater in the project area drainages.

Alluvial groundwater adjacent to the Aspen Range Fault is a strongly buffered (640 to 1,030 mg HCO_3/L) calcium-bicarbonate type water with slightly acidic pH (6.6 to 7.1) and moderately high TDS (592 to 898 mg/L). It is distinguished from other alluvial groundwater by high bicarbonate and TDS concentrations. Metals concentrations in alluvial water near the fault are typically below applicable groundwater standards, with the exceptions of total aluminum, total and dissolved iron, and total and dissolved manganese. The TDS content of the water during baseline monitoring also consistently exceeded the secondary standard of 500 mg/L. Total aluminum, iron, and manganese concentrations for baseline samples were affected by excess turbidity that was induced during sample collection and are not representative of background conditions (Whetstone 2009b). Elevated dissolved iron, manganese, and bicarbonate concentrations are representative of baseline conditions and reflect the contribution groundwater from the regional system that discharges into the alluvium along the Aspen Range Fault.

3.3.1.6.2 Water Quality in the Dinwoody Formation

Groundwater in the Dinwoody Formation is a moderately buffered (198 to 243 mg HCO_3/ L), calcium-bicarbonate water with weakly alkaline pH (7.5 to 7.8) and low TDS. Metals concentrations in the sampled water are generally low and met all applicable water quality standards during baseline monitoring with the exception of dissolved manganese (0.055 mg/L) in one sample from monitoring well MW-18Db (Whetstone 2009a).

3.3.1.6.3 Water Quality in the Rex Chert

Groundwater in the Rex Chert is moderately buffered (217 to 237 mg HCO_3/L), calcium-bicarbonate water with weakly alkaline pH (7.5 to 7.9) and low TDS. Metals concentrations in the sampled water are generally low and met all applicable water quality standards during baseline monitoring with the exception of selenium (0.057 mg/L dissolved and total) during the initial sampling round in MW-2R. The primary groundwater standard for selenium is 0.05 mg/L. Selenium concentrations in the well have generally declined since the initial sampling event, with reported dissolved concentrations ranging from 0.010 mg/L to 0.001 mg/L (Whetstone 2009a).

3.3.1.6.4 Water Quality in the Wells Formation / Grandeur Member

The chemical composition of groundwater in the Wells Formation / Grandeur Member varies by location and can be divided into two subsets:

1. Locally recharged groundwater with low to moderate TDS content (monitoring wells MW-1W, MW-8W, and MW-12W).
2. Deeply circulating groundwater from the regional flow system (monitoring wells MW-4W, MW-14W, and MW-17W).

Locally recharged water in the Wells Formation/Grandeur Member is distinguished from deeply circulating groundwater by its low to moderate TDS content (206 to 295 mg/L). Locally recharged groundwater is well-buffered (202 to 313 mg HCO_3/L), calcium-bicarbonate type water with circum neutral pH (6.74 to 7.69). Metals concentrations during baseline monitoring

were below applicable water quality standards with the exception of manganese in MW-12W, which ranged from 0.053 to 0.1 mg/L. Dissolved and total manganese concentrations in water from MW-12W were generally equal.

Deeply circulating groundwater in the Wells Formation / Grandeur Member is a strongly buffered, calcium-bicarbonate water with weakly acidic pH (6.09 to 6.64). It is characterized by its elevated TDS content (734 to 923 mg/L) and strong bicarbonate signature (771 to 1,081 mg HCO_3/L). Metal concentrations during baseline monitoring of the deep groundwater generally met groundwater quality standards with the exception of iron and manganese, which exceeded the standards in both total and dissolved forms. Total aluminum also exceeded the applicable standard of 0.2 mg/L for several samples collected from monitoring well MW-14W. The high total aluminum concentrations were related to excess turbidity and were not representative of background conditions. The TDS content of all samples exceeded the secondary standard of 500 mg/L. The pH of the deeply circulating water was also frequently below the minimum secondary standard of 6.5 (Whetstone 2009a).

3.4 SOILS

The primary environmental factors influencing soil development across the diverse mountainous landscape of the project area are bedrock and surface geology, slope, climate, and aspect. The steeply dipping geologic strata have contributed to mass soil and rock movement, and thereby influenced the continuity of soils on the flanks of the Aspen Range. Loess (windblown silt particles) from the Snake River plain has especially influenced pedogenesis on the leeward (east) side of the Aspen Range. A subordinate and more recent factor influencing soil development is vegetation, which controls the quantity and decomposition of plant detritus and affects the weathering of parent materials. Recovery of topsoil and growth medium for overburden capping and reclamation purposes is a key aspect of the Proposed Action.

3.4.1 Project Area Soils

3.4.1.1 Soil Survey Results

An Order II soil survey was conducted in the project area during 2004 and 2005 to identify, map, and describe the dominant soils (Greystone 2006b). The physiochemical properties of soils within the proposed disturbance area were characterized by collecting and analyzing soil samples. Sixteen soil complexes, two miscellaneous areas, and one NRCS mapping unit (Caribou County Survey area) were identified in the project area.

The soil survey encompassed the project area and included portions of Sections 22, 23, 26, 27, and 35, Township 7 South, Range 42 East. In addition, the Ballard Mine site was assessed separately to determine the potential for salvaging suitable soil from the alternative area proposed for disposal of excess overburden from the project area. The surface disturbance associated with the development and operations of the phosphate mine measures approximately 739 acres.

Figure 3.4-1 shows the project area, the soil map unit delineations, names and numbers, pedon locations, and the pedon locations where soil samples were collected (JBR 2003). **Table 3.4-1** describes the major map units and the physical parameters typically used to assess impacts to soil

resources and feasible soil management and handling options. Soil series comprising each map unit are also shown in **Table 3.4-1** and are discussed in detail in the soil survey report (Greystone 2006b). The genetic classifications and series assigned to the pedons described are provided in **Table 3.4-2**. **Table 3.4-3** contains the proposed surface disturbance by map unit.

3.4.1.1.1 Analytical Results

The following is a brief summary of analytical results from 92 samples collected at twenty sampling sites. The locations of samples collected for analysis are indicated in **Figure 3.4-1** (Greystone 2006b).

The topsoil suitability rating results are summarized in **Table 3.4-4**. The majority (83) of textures of the soil samples collected were rated as good. Eight were rated as fair, and one was rated as poor. The majority (65) of soil reactivity or pH sample were rated as good. Twenty-six were in the fair range of pH 5 to 6, and one was rated as poor (1B-P1, 45 to 60 inches) with a pH between 8.5 and 9.0. All samples analyzed were rated as good for electrical conductivity. Except for one sample (1B-P1, 45 to 60 inches), all samples analyzed were rated as good for sodium adsorption ratio (SAR). Therefore, the soils of the project area may be classified as non-saline and non-sodic. Only three samples (Vertine Series) were rated as unsuitable due to $CaCO_3$ percentages greater than 40 percent. Only one sample (1B-P1 45 to 60 inches) was rated as poor due to a $CaCO_3$ percentage between 15 and 40 percent. When considering the most limiting suitability for each rating, nine samples are rated as good for all properties, and 32 samples are rated as fair or better for all properties. Half (42) of the samples have at least one property rated as poor or unsuitable, mostly due to slope gradient or the amount of rock fragments present.

The total selenium concentrations of all samples analyzed were below the method detection limit of 5 mg/kg. The hot-water-soluble selenium concentrations of 90 samples were below the method detection limit of 0.01 mg/kg. The hot-water-soluble selenium concentration of one sample was 0.01 mg/kg and one was 0.02 mg/kg. The remaining total metal concentrations were within the normal range for soils (**Table 3.4-5**). Therefore, these soils may be considered non-seleniferous and do not appear to be enriched with the metals analyzed (arsenic, cadmium, copper, manganese, molybdenum, nickel, vanadium, and zinc). The cation exchange capacity (CEC) of 77 of the samples analyzed was above 20 meq per 100 grams, and the base saturation of all samples was sufficient to support plant growth. The organic matter content was generally between 1 to 3 percent in the subsoil and 3 to 6 percent in the surface horizons. The water content, at saturation, of all samples was between 25 to 80 percent. Geochemical results indicate that the majority of soils in the proposed disturbance are suitable growth medium that can be salvaged for reclamation of mine-related disturbances. However, soils with unsuitable topsoil ratings, such as high $CaCO_3$ percentages, should not be considered for use in reclamation.

3.4.1.1.2 Soil Salvage

The determination of suitability of a soil as a resource depends on the intended use of the soil. Soil intended for reclamation should have sufficient depth and quantity to permit economic salvage and be of suitable quality and texture. Soil intended for use as low-permeability barrier material should have appropriate engineering properties. Another consideration for salvage is the limited accessibility of equipment on steep slopes and rocky terrain.

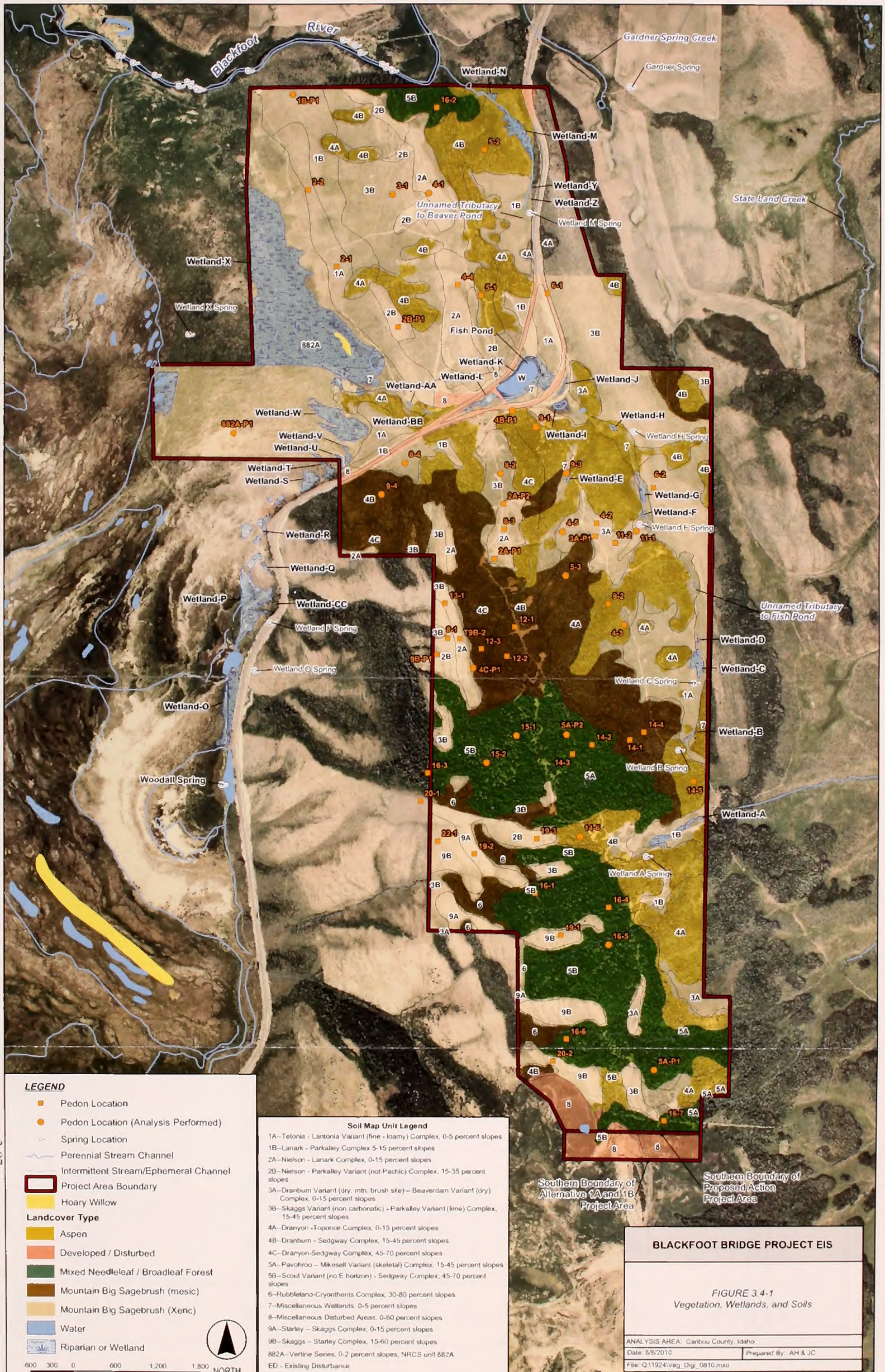
Blackfoot River
Gardner Spring Creek
Gardner Spring
Wetland-N
Wetland-M
Wetland-Y
Wetland-Z
Unnamed Tributary to Beaver Pond
Wetland M Spring
State Land Creek
Wetland-X
Wetland X Spring
Fish Pond
Wetland-K
Wetland-L
Wetland-AA
Wetland-J
Wetland-W
Wetland-BB
Wetland-H
Wetland H Spring
Wetland-I
Wetland-V
Wetland-U
Wetland-T
Wetland-S
Wetland-E
Wetland-G
Wetland-F
Wetland F Spring
Wetland-R
Wetland-Q
Wetland-P
Wetland-CC
Wetland P Spring
Unnamed Tributary to Fish Pond
Wetland-D
Wetland-C
Wetland C Spring
Wetland Q Spring
Wetland-O
Woodall Spring
Wetland-B
Wetland B Spring
Wetland-A
Wetland A Spring
Southern Boundary of Alternative 1A and 1B Project Area
Southern Boundary of Proposed Action Project Area
LEGEND
Pedon Location
Pedon Location (Analysis Performed)
Spring Location
Perennial Stream Channel
Intermittent Stream/Ephemeral Channel
Project Area Boundary
Hoary Willow
Landcover Type
Aspen
Developed / Disturbed
Mixed Needleleaf / Broadleaf Forest
Mountain Big Sagebrush (mesic)
Mountain Big Sagebrush (Xenc)
Water
Riparian or Wetland
600 300 0 600 1,200 1,800 Feet
NORTH
Soil Map Unit Legend
1A--Tetonia - Lantonia Variant (fine - loamy) Complex, 0-5 percent slopes
1B--Lanark - Parkalley Complex 5-15 percent slopes
2A--Nielson - Lanark Complex, 0-15 percent slopes
2B--Nielson - Parkalley Variant (not Pachic) Complex, 15-35 percent slopes
3A--Dranburn Variant (dry, mtn. brush site) – Beaverdam Variant (dry) Complex, 0-15 percent slopes
3B--Skaggs Variant (non carbonatic) - Parkalley Variant (lime) Complex, 15-45 percent slopes
4A--Dranyon -Toponce Complex, 0-15 percent slopes
4B--Dranburn - Sedgway Complex, 15-45 percent slopes
4C--Dranyon-Sedgway Complex, 45-70 percent slopes
5A--Pavohroo – Mikesell Variant (skeletal) Complex, 15-45 percent slopes
5B--Scout Variant (no E horizon) - Sedgway Complex, 45-70 percent slopes
6--Rubbleland-Cryonthents Complex, 30-80 percent slopes
7--Miscellaneous Wetlands, 0-5 percent slopes
8--Miscellaneous Disturbed Areas, 0-60 percent slopes
9A--Starley – Skaggs Complex, 0-15 percent slopes
9B--Skaggs – Starley Complex, 15-60 percent slopes
882A--Vertine Series, 0-2 percent slopes, NRCS unit 882A
ED - Existing Disturbance
W--Water
BLACKFOOT BRIDGE PROJECT EIS
FIGURE 3.4-1
Vegetation, Wetlands, and Soils
ANALYSIS AREA: Caribou County, Idaho
Date: 8/8/2010
Prepared By: AH & JC
File: Q:\1924\Veg_Digi_0810.mxd

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Table 3.4-1 Soil Map Unit Descriptions and Physical Parameters

Map Unit ID #	Map Unit	Map Unit Component	% of Map Unit[1]	Landform	Depth to Bedrock inches	Parent Material	Drainage[2]	Bulk Density (g/cm^3)	AWHC[3] in/in	Perm Class[4]	Hydro Soil Group[4]	Surface Runoff Class[5]	WEG[6]	SEH[7]	Root Restrition Depth[8]	Soil Depth Class[8]
1A	Tetonia-Lantonia Variant (fine-loamy) Complex, 0-5 percent slopes	Tetonia	50	Toe slopes and fan slopes	>60	Loess mantled colluvium and alluvium derived from Wells and Phosphoria Formations.	W	1.42-1.46	0.17-0.23	3	B	L	5	†	D	D
		Lantonia Variant	35					1.46	0.17-0.23	3	B	L	5-6	†	D	D
		Inclusions of Cummulic suborder in alluvial basins and soils with >35 percent rock fragments on convex slopes and knolls	15					†	†	†	†	†	†	†	†	†
1B	Lanark – Parkalley Complex, 5-15 percent slopes	Lanark	50	Fan slopes and basins	>60	Colluvium and alluvium derived from Wells and Phosphoria Formations, loess on concave and east-facing slopes.	W-MW	1.26-1.46	0.14-0.23	3-5	B-D	M-VH	6	L-H	D	D
		Parkalley	35					1.26-1.42	0.14-0.23	3-5	B-D	M-VH	5	L-M	D	D
		Dranyon and Greys on concave slopes with aspen/mtn brush	15					1.42-1.46	0.17 - 0.23	3	B	M	5	M-H	D	D
2A	Nielsen – Lanark Complex, 0-15 percent slopes	Nielsen	60	mountain summits, shoulders and upper sideslopes	18	Non-calcareous residuum and colluvium derived from Wells, Phosphoria and Woodside Formations. Loess on east-facing slopes below ridgelines.	W-MW	1.42-1.46	0.17 - 0.23	3	B	M	5	L	VS-S	VS-S
		Lanark	25		>60			1.26-1.46	0.14-0.23	3-5	B-D	M-VH	6	L-H	D	D
		Inclusions of deeper soil on concave upper mountain slopes. Rock outcrops along summits and ridges.	15		†			†	†	†	†	†	†	†	†	†
2B	Nielsen – Parkalley Variant (not Pachic) Complex, 15-35 percent slopes	Nielsen	50	mountain slopes below summits and ridge tops	18	Colluvium and residuum derived from non-calcareous sedimentary and intrusive volcanics	W	1.42-1.46	0.17 - 0.23	3	B	H	5	L	VS-S	VS-S
		Parkalley Variant	40		>60			1.26-1.42	0.14-0.23	3-5	B-D	H-VH	5	L-M	D-VD	D-VD
		Inclusions of deeper soil on concave slopes	10		>60			†	†	†	†	†	†	†	†	†
3A	Dranburn Variant (dry, mtn. brush site) – Beaverdam Variant (dry) Complex, 0-15 percent slopes	Dranburn Variant	50	south- to east-facing mountain sideslopes and basins	>60	Loess and colluvium derived from mixed sedimentary rock.	W-MW	1.26-1.46	0.14 - 0.23	3-5	B-D	M-VH	6	M-H	D-VD	D-VD
		Beaverdam Variant	35					1.2-1.42	0.13 - 0.23	3-6	B-D	M-VH	6	†	D-VD	D-VD
		Inclusions of shallow to moderately deep and skeletal soils on convex slopes near rock outcrops. Calcareous shallow soils bedrock knolls.	15		>10			†	†	†	†	†	†	†	†	S-MD
3B	Skaggs Variant (non-carbonatic) - Parkalley Variant (lime) Complex, 15-45 percent slopes	Skaggs Variant	60	concave mountain sideslopes and shoulders with mountain shrub	25	Colluvium and residuum derived from mixed sedimentary rock composed of Wells, Phosphoria, and Woodside Formations. On north- and east-facing slopes loess mantle present.	W	1.46-1.63	0.06 - 0.23	2-3	A-B	M-H	4L	†	MD	MD
		Parkalley Variant	25		†			†	†	†	†	†	†	†	†	S-MD
		Inclusions of shallow calcareous soils on limestone bedrock and shallow to moderately deep soils near outcrops.	15		>10			†	†	†	†	†	†	†	†	S-MD
4A	Dranyon - Toponce Complex, 0-15 percent slopes	Dranyon	60	mountain sideslopes, footslopes, basins and	>60	Eolian and colluvium derived from loess, shales, sandstone,	W-MW	1.42-1.46	0.17 - 0.23	3	B	M	5	M-H	D	D
		Toponce	25					1.2-1.42	0.13 - 0.23	3-6	B-D	M-VH	4-5	L-H	D-VD	D-VD
		Inclusions of Greys on concove toeslopes and clayey-	15					†	†	†	†	†	†	†	†	†

Table 3.4-1 Soil Map Unit Descriptions and Physical Parameters

Map Unit ID #	Map Unit	Map Unit Component	% of Map Unit[1]	Landform	Depth to Bedrock inches	Parent Material	Drainage[2]	Bulk Density (g/cm^3)	AWHC[3] in/in	Perm Class[4]	Hydro Soil Group[4]	Surface Runoff Class[5]	WEG[6]	SEH[7]	Root Restrition Depth[8]	Soil Depth Class[8]
		skelatal to fine soils on landslides		along drainages		limestone, and chert.										
4B	Dranburn - Sedgway Complex, 15-45 percent slopes	Dranburn Variant	50	mountain slopes and small valleys on east to north aspects	>60	Eolian and colluvium derived from loess and Phosphoria Formation.	W-MW	1.26-1.46	0.14 - 0.23	3-5	B-D	H-VH	6	M-H	D-VD	D-VD
		Sedgway	40					1.20-1.46	0.13 - 0.23	3-6	B-D	H-VH	4-6	L-M	D-VD	D-VD
		Inclusions of moderately deep soils on convex slopes and coarse textured soils on sandstone substrate.	10		>20			†	†	†	†	†	†	†	†	MD
4C	Dranyon – Sedgway Complex, 45 -70 percent slopes	Dranyon	50	steep east-facing mountain slopes	>60	Eolian and colluvium materials derived from shales, limestones, and sandstones landslide deposits and residuum derived from Phosphoria Formation.	W-MW	1.42-1.46	0.17 - 0.23	3	B	H	5	M-H	D	D
		Sedgway	40					1.20-1.46	0.13 - 0.23	3-6	B-D	H-VH	4-6	L-M	D-VD	D-VD
		Inclusions of soils on steep north-facing hillsides and soils with less than 45 percent slopes	10					†	†	†	†	†	†	†	†	†
5A	Pavorhoo – Mikesell Variant (skeletal) Complex, 15-45 percent slopes	Pavorhoo	45	mountain slopes on north aspects and conifer dominated forests	>40	Colluvium from mixed sedimentary sources and volcanic intrusives, loess mantle present on east-facing slopes.	W-MW	1.42-1.6	0.11-0.23	2-3	A-B	H-VH	3-5	L-M	D-VD	D-VD
		Mikesell Variant	40					1.32-1.42	0.14 - 0.23	3-4	B-D	H-VH	6	L-M	D-VD	D-VD
		Sedgway on upper convex sideslopes and Dranyon soils on concave slopes.	15		>60			See Map Unit 4A and 4B								
5B	Scout Variant (no E horizon) - Sedgway Complex, 45-70 percent slopes	Scout Variant	60	steep mountain slopes on north aspects	>60	Colluvium and residuum derived from sedimentary, volcanics, and mantles of loess.	W-MW	1.4-1.63	0.06-0.21	2-4	A-D	M-VH	2-3	L-M	MD-D	MD-D
		Sedgway	25					1.20-1.46	0.13 - 0.23	3-6	B-D	H-VH	4-6	L-M	D-VD	D-VD
		Inclusion of Rubbleland and loess-mantled rocky soils on upper convex mountain slopes and sandstone derived coarse textured soils with skeletal features	15		†			†	†	†	†	†	†	†	†	†
6	Rubbleland – Cryothents Complex, 30 – 80 percent slopes	Rubbleland	70	leeward sides of north-south ridges where snow-cornices form in the winter	<10	Residuum and colluvium derived from volcanic and sedimentary rock.	W	†	†	†	†	†	†	†	†	†
		Cryothents	30													
7	Miscellaneous Wetlands, 0-5 percent slopes	Miscellaneous Wetlands, 0-5 percent slopes	100	drainages, springs and livestock impoundments	†	Mixed alluvium.	P-MW	†	†	†	†	†	†	†	†	†
8	Miscellaneous Disturbed Areas, 0-60 percent slopes	Miscellaneous Disturbed Areas, 0-60 percent slopes	100	excavations and quarries	†	Residuum derived from shales, limestones, and chert from the Phosphoria Formation.	E-W	†	†	†	†	†	†	†	†	†
9A	Starley – Skaggs Complex, 0-15 percent slopes	Starley	55	south- to west-facing ridgetops and shoulders	10	Eolian loess and residuum derived from calcareous sandstones and	W	1.42	0.17-0.23	3	B	M	6	†	VS-S	VS-S
		Skaggs	30		25			1.46-1.63	0.06 - 0.23	2-3	A-B	L-M	4L	†	MD	MD
		Inclusions of rock outcrops and moderately deep to deep	15		†			†	†	†	†	†	†	†	†	S-D

Table 3.4-1 Soil Map Unit Descriptions and Physical Parameters

Map Unit ID #	Map Unit	Map Unit Component	% of Map Unit[1]	Landform	Depth to Bedrock inches	Parent Material	Drainage[2]	Bulk Density (g/cm^3)	AWHC[3] in/in	Perm Class[4]	Hydro Soil Group[4]	Surface Runoff Class[5]	WEG[6]	SEH[7]	Root Restrition Depth[8]	Soil Depth Class[8]
		soils on leeward sides of ridge tops				dolomite.										
9B	Skaggs – Starley Complex, 15-60 percent slopes	Skaggs	45	concave southwest-facing slope dominated by mountain shrub and convex slope where wind and water erosion are prevalent	25	Eolian loess and residuum derived from calcareous sandstones and dolomite.	W	1.46-1.63	0.06 - 0.23	2-3	A-B	M-H	4L	†	MD	MD
		Starley	40		10			1.42	0.17-0.23	3	B	H	6	†	VS-S	VS-S
		Inclusions of deeper soils on colluvium, concave and midslope with Douglas Fir and Aspen	15		†			†	†	†	†	†	†	†	†	†
882A	Vertine Series, 0-2 percent slopes, (NRCS unit 882A)	Travertine soils, NRCS MU 882A, 0-3 percent slopes	100	large basins between ranges	30	Alluvium and residuum composed of travertine.	P	1.4-1.6	0.11-0.21	2-4	A-D	VL-M	4L	L	S	S

Notes:
1 Percentage of components in map unit.
2 Drainage: E=excessively drained; W=well drained; MW=moderately well drained; P=poorly drained
3 AWHC = Available Water Holding Capacity
4 See explanation Table 8, footnote 2.
5 Surface Runoff Class: L=low; M=moderate; H=high; VH=very high
6 Wind Erodibility Group: 1 and 2 extremely severe; 3 and 4 high to moderately erodible; 4L=erodible; 5 and 6 slightly erodible; 7 and 8 very slightly erodible or not subject to erosion
7 Soil Erosion Hazard: K<0.25 = Low (L); 0.25<K<0.40 = Moderate (M); K>0.40 = High (H)
8 VS= very shallow (0-10 inches); S=shallow (10-20 inches); MD=moderately deep (20-40 inches); D=deep (40-60 inches); VD=very deep (>60 inches)
† Data not available

Source: Greystone 2006b

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Estimates of the soil bulk density (Bio-Form 2003), available water holding capacity (AWHC) (ND Extension Service 2004), permeability class (Rawls et al. 1982), and hydrologic soil group (Rawls et al. 1982) were based on the soil texture of the major components of each soil map unit. Procedures outlined in the *Soil Survey Manual* (USDA 1993a) were used to estimate surface runoff class, wind erodibility group (WEG), and root restriction depth. The estimated root-restricting depths were also based on observation of pedon characteristics, such as the presence of indurated layers or bedrock. For the purposes of this survey, WEG ratings of 1, 2, or 3 indicate that a soil is susceptible to soil blowing if cultivated or disturbed. WEG ratings for the different soils types are depicted in **Table 3.4-1**.

Soil erodibility factors (K-factors) were calculated based on the numerical representation of the nomographs typically used to calculate the erodibility of the fine earth fraction (Kf). This calculation involves the use of several variables including the percentage of silt and sand, soil organic matter, soil structure, and permeability. Kf was modified (Kw or K) according to the percentage (by volume) of rock fragments observed in the soil profile. The procedures and calculation used to estimate the soil erodibility factors are provided in the *National Soil Survey Handbook* (USDA 1993b). The higher the K value, the more susceptible the soil is to sheet and rill erosion by water. For the purposes of this EIS, the soil erosion hazard (SEH) rating, or susceptibility of a soil upon disturbance to water erosion, was based on calculated K (considering coarse fragments) as follows:

If $K < 0.25$, then SEH = low

If $0.25 < K < 0.40$, then SEH = moderate

If $K > 0.40$, then SEH = high

The SEH ratings for the different soil classifications are shown in **Table 3.4-1**. Erodibility factor calculations and input parameters are discussed and presented in tabular form in the soils report for the project area (Greystone 2006b).

Estimated volumes of salvageable Primary and Secondary Plant Growth Medium for each soil map unit are presented in **Table 3.4-6**. Volumes are based on available acreage and depth of each soil component and topsoil suitability ratings. PPGM is equivalent to an overall topsoil suitability rating of good or fair. Secondary Plant Growth Medium is equivalent to a topsoil suitability rating of poor or better, with a rock fragment content of 50 percent or less. Determination of salvageable soil volumes, including depth ranges of salvageable medium, is discussed in detail in the soils report for the project area (Greystone 2006b).

Approximately 2.5 million bcy of soil would be salvageable in the proposed disturbance within the project area for use as PPGM for reclamation. Additional soil salvage may be possible if marginal (secondary) soils are considered for overburden covers. An estimated 1.2 mlcy of marginal soils would be salvageable for overburden cover material (**Table 3.4-6**).

P4 proposes to salvage the fine-grained portions of soils within the project area for use as cap material over backfilled pits and overburden piles. The proposed cover designs require topsoil and weathered alluvium and these materials would be obtained on the project site from drainage basin bottoms (Greystone 2006b, O'Kane 2009a).

Table 3.4-2 Soil Series and Classification by Pedon Location

Pedon ID Number	Series	Soil Classification
2-1	Tetonia	Calcic Pachic Haplocryoll, coarse-silty, mixed, superactive
2-2	Lantonia Variant (fine-loamy)	Pachic Haplocryoll, fine-loamy, mixed, superactive
3-1	Parkalley Variant (lime)	Pachic Argicryoll, loamy-skeletal, mixed, superactive
4-1	Nielsen	Lithic Argicryoll, loamy-skeletal, mixed, superactive
4-2	Nielsen	Lithic Argicryoll, loamy-skeletal, mixed, superactive
4-3	Dranburn	Pachic Agricryoll, fine-loamy, mixed, superactive
4-4	*	Lithic Haplocryoll, loamy-skeletal, mixed, superactive
4-5	Toponce	Vertic Argicryolls, fine, smectitic
5-1	Parkalley Variant (fine-loamy)	Pachic Argicryoll, fine-loamy, mixed, superactive
5-2	Toponce	Vertic Argicryoll, fine, smectitic
5-3	Toponce	Vertic Argicryoll, fine, smectitic
6-1	Dranyon	Pachic Argicryoll, fine-loamy, mixed, superactive
6-2	Skaggs Variant (non carbonatic)	Calcic Haplocryoll, loamy-skeletal, mixed, superactive
8-1	Skaggs	Calcic Haplocryoll, loamy-skeletal, mixed superactive
8-2	Broadhead Variant (cryic)	Pachic Argicryoll, fine, smectitic, superactive
8-3	Nielsen	Lithic Argicryoll, loamy-skeletal, mixed, superactive
8-4	Lanark	Pachic Argicryoll, fine-silty, mixed superactive
9-1	Dranburn	Pachic Argicryoll, fine-loamy, mixed, superactive
9-2	Toponce	Vertic Argicryoll, fine, smectitic
9-3	Dranburn	Pachic Argicryoll, fine-loamy, mixed, superactive
9-4	Parkalley	Pachic Argicryoll, loamy-skeletal, mixed, superactive
11-1	Fury Variant (dry and cryic)	Cumulic Endoaquoll, fine-loamy, mixed, superactive
11-2	Nielsen Variant (non skeletal)	Lithic Argicryoll, fine- loamy, mixed, superactive
12-1	Dranyon	Pachic Argicryoll, fine-loamy, mixed, superactive
12-2	Dateman	PachicArgicryoll, loamy-skeletal, mixed, superactive
12-3	Sedgway	Alfic Argicryoll, loamy-skeletal, mixed, superactive
13-1	Starley	Lithic Haplocryoll, loamy-skeletal, mixed, superactive
14-1	Beaverdam Variant (lime)	Vertic Argicryoll, fine, smectitic
14-2	*	Pedon not sufficiently excavated to adequate classify soil with certainty.
14-3	Sedgway	Alfic Argicryoll, loamy-skeletal, mixed, superactive
14-4	Greybo	Pachic Argicryoll, fine-silty, mixed, superactive
14-5	Dranyon	Pachic Argicryoll, fine-loamy, mixed, superactive
14-6	Dranyon	Pachic Argicryoll, fine-loamy, mixed, superactive
15-1	Sedgway	Alfic Argicryoll, loamy-skeletal, mixed, superactive
15-2	Scout Variant (no E horizon)	Ustic Eutrocryept, loamy-skeletal, mixed, superactive
16-1	Scout	Ustic Eutrocryept, loamy-skeletal, mixed, superactive

Table 3.4-2 Soil Series and Classification by Pedon Location

Pedon ID Number	Series	Soil Classification
16-2	Sedgway	Alfic Argicryoll, loamy-skeletal, mixed, superactive
16-3	Scout Variant (sandy, no E horizon)	Ustic Eutrocryept, loamy-skeletal, mixed, superactive
16-4	Sedgway	Alfic Argicryoll, loamy-skeletal, mixed, superactive
16-5	Dranyon	Pachic Argicryoll, fine-loamy, mixed, superactive
16-6	Scout Variant (sandy, no E horizon)	Ustic Eutrocryept, loamy-skeletal, mixed, superactive
16-7	Sedgway	Alfic Argicryoll, loamy-skeletal, mixed, superactive
19-1	Starley Variant (less lime)	Lithic Haplocryoll, loamy-skeletal, mixed, superactive
19-2	Nielsen	Lithic Argicryoll, loamy-skeletal, mixed, superactive
19-3	Skaggs Variant (non carbonatic)	Calcic Haplocryoll, loamy-skeletal, mixed, superactive
20-1	Starley Variant (less lime)	Lithic Haplocryoll, loamy-skeletal, mixed, superactive
20-2	Skaggs Variant (non carbonatic)	Calcic Haplocryoll, loamy-skeletal, mixed, superactive
22-1	Starley Variant (less lime)	Lithic Haplocryoll, loamy-skeletal, mixed, superactive
1B-P1	Lanark	Pachic Argicryoll, fine-silty, mixed, superactive
2A-P1	Lanark	Pachic Argicryoll, fine-silty, mixed, superactive
2A-P2	Nielsen	Lithic Argicryoll, loamy-skeletal, mixed, superactive
2B-P1	Nielsen	Lithic Argicryoll, loamy-skeletal, mixed, superactive
3A-P1	Dranburn Variant (dry, mtn brush site)	Pachic Argicryoll, fine-loamy, mixed, superactive
4B-P1	Dranburn	Pachic Argicryoll, fine-loamy, mixed, superactive
4C-P1	Dranyon	Pachic Argicryoll, fine-loamy, mixed, superactive
5A-P1	Pavorhoo	Pachic Haplocryoll, fine-loamy, mixed, superactive
5A-P2	Mikesell Variant (skeletal)	Eutric Haplocryalf, clayey-skeletal, smectitic
9A-P1	Starley	Lithic Haplocryoll, loamy-skeletal, mixed, superactive
9B-P1	Skaggs	Calcic Haplocryoll, loamy-skeletal, mixed, superactive
882A-1P	Vertine-like	Oxyaquatic Haploxeroll, loamy, carbonatic frigid, shallow

* Unable to match pedon characteristics with recognized soil series.

Source: Greystone 2006b

Table 3.4-3 Proposed Surface Disturbance by Soil Map Unit

Map Unit ID	Map Unit Name	Disturbance Acres
4B	Dranburn - Sedgway Complex, 15 to 45 percent slopes	123.99
4A	Dranyon - Toponce Complex, 0 to 15 percent slopes	102.34
5B	Scout Variant (no E horizon) - Sedgway Complex, 45 to 70 percent slopes	80.80
3B	Skaggs Variant (non-carbonatic) - Parkalley Variant (lime) Complex, 15-45 percent slopes	79.06
5A	Pavorhoo – Mikesell Variant (skeletal) Complex, 15 to 45 percent slopes	61.50
1A	Tetonia-Lantonia Variant (fine-loamy) Complex, 0 to 5 percent slopes	55.81
2A	Nielsen – Lanark Complex, 0 to 15 percent slopes	42.17
4C	Dranyon – Sedgway Complex, 45 to 70 percent slopes	36.07
1B	Lanark – Parkalley Complex, 5 to 15 percent slopes	39.11
882A	Vertine Series, 0 to 2 percent slopes, NRCS unit 882A	56.88
3A	Dranburn Variant (dry, mountain brush site) – Beaverdam Variant (dry) Complex, 0 to 15 percent slopes	17.62
9B	Skaggs – Starley Complex, 15 to 60 percent slopes	6.26
2B	Nielsen – Parkalley Variant (not Pachic) Complex, 15 to 35 percent slopes	16.02
8	Miscellaneous Disturbed Areas, 0 to 60 percent slopes	2.87
6	Rubbleland – Cryothents Complex, 30 to 80 percent slopes	0.30
7	Miscellaneous Wetlands, 0 to 5 percent slopes	14.09
9A	Starley – Skaggs Complex, 0 to 15 percent slopes	0.28
W	Water	3.77
	Total	**738.9**

Source: Greystone 2006b

Table 3.4-4 Soils Suitability Data

Map Unit ID #	Sample ID and Depth Sampled	pH (Sat Paste) R[1]	E.C. @ 25°C R[1]	SAR R[1]	$CaCO_3$ R[1]	USDA Texture Class[2] R[1]	Slope Gradient[3] R[1]	Rock Fragments[3] R[1]	Cumulative Rating	Highest or Most Limiting Suitability Rating[1]	Average Suitability Rating[1]
3B	**3-1** 0-17"	1	1	1	1	1	3	2	10	3	1.4
	3-1 17-24"	1	1	1	1	1	3	3	11	3	1.6
	3-1 24-30"	1	1	1	1	1	3	3	11	3	1.6
	3-1 30-60"	1	1	1	1	1	3	4	12	4	1.7
2A	**4-1** 0-11"	1	1	1	1	1	2	4	11	4	1.6
	4-1 11-17"	1	1	1	1	1	2	4	11	4	1.6
3B	**4-5** 0-6"	1	1	1	1	1	2	1	8	2	1.1
	4-5 6-11"	1	1	1	1	1	2	1	8	2	1.1
	4-5 11-20"	1	1	1	1	2	2	1	9	2	1.3
	4-5 20-33"	1	1	1	1	2	2	1	9	2	1.3
	4-5 33-52"	1	1	1	1	2	2	3	11	3	1.6
	4-5 52-65"	1	1	1	1	2	2	4	12	4	1.7
4B	**5-3** 0-9"	1	1	1	1	1	2	1	8	2	1.1
	5-3 9-18"	1	1	1	1	1	2	1	8	2	1.1
	5-3 18-30"	2	1	1	1	1	2	1	9	2	1.3
	5-3 30-60"	1	1	1	1	2	2	1	9	2	1.3
3B	**8-2** 0-13"	1	1	1	1	1	1	1	7	1	1.0
	8-2 13-26"	1	1	1	1	1	1	1	7	1	1.0
	8-2 26-37"	1	1	1	1	1	1	1	7	1	1.0
	8-2 37-49"	1	1	1	1	1	1	1	7	1	1.0
	8-2 49-60"	1	1	1	1	2	1	1	8	2	1.1
1B	**8-4** 0-6"	1	1	1	1	1	2	1	8	2	1.1
	8-4 6-11"	1	1	1	1	1	2	1	8	2	1.1
	8-4 11-27"	1	1	1	1	1	2	2	9	2	1.3
	8-4 27-36"	1	1	1	1	1	2	2	9	2	1.3
	8-4 36-45"	1	1	1	1	1	2	1	8	2	1.1
4B	**9-1** 0-9"	2	1	1	1	1	2	1	9	2	1.3
	9-1 9-27"	2	1	1	1	1	2	1	9	2	1.3
	9-1 27-52"	1	1	1	1	2	2	2	10	2	1.4
4A	**9-2** 0-8"	2	1	1	1	1	1	1	8	2	1.1
	9-2 8-15"	2	1	1	1	1	1	1	8	2	1.1
	9-2 15-21"	1	1	1	1	1	1	1	7	1	1.0
	9-2 21-32"	2	1	1	1	2	1	1	9	2	1.3

Table 3.4-4 Soils Suitability Data

Map Unit ID #	Sample ID and Depth Sampled	pH (Sat Paste) R[1]	E.C. @ 25°C R[1]	SAR R[1]	$CaCO_3$ R[1]	USDA Texture Class[2] R[1]	Slope Gradient[3] R[1]	Rock Fragments[3] R[1]	Cumulative Rating	Highest or Most Limiting Suitability Rating[1]	Average Suitability Rating[1]
	9-2 32-44"	2	1	1	1	3	1	1	10	3	1.4
4B	**9-3** 0-9"	1	1	1	1	1	2	1	8	2	1.1
	9-3 9-21"	1	1	1	1	1	2	1	8	2	1.1
	9-3 21-41"	1	1	1	1	1	2	1	8	2	1.1
	9-3 41-53"	1	1	1	1	1	2	2	9	2	1.3
	9-3 53-60"	1	1	1	1	1	2	3	10	3	1.4
4B	**9-4** 0-11"	1	1	1	1	1	2	1	8	2	1.1
	9-4 11-17"	2	1	1	1	1	2	1	9	2	1.3
	9-4 17-23"	2	1	1	1	1	2	1	9	2	1.3
	9-4 23-38"	1	1	1	1	1	2	4	11	4	1.6
	9-4 38-48"	2	1	1	1	1	2	3	11	3	1.6
	11-1 0-9"	1	1	1	1	1	1	1	7	1	1.0
	11-1 9-15"	1	1	1	1	1	1	1	7	1	1.0
	11-1 15-27"	1	1	1	1	1	1	1	7	1	1.0
	11-1 27-60"	1	1	1	1	1	1	1	7	1	1.0
4B	**14-6** 0-7"	2	1	1	1	1	2	1	9	2	1.3
	14-6 7-19"	1	1	1	1	1	2	1	8	2	1.1
	14-6 19-42"	1	1	1	1	1	2	2	9	2	1.3
	14-6 42-55"	1	1	1	1	1	2	4	11	4	1.6
5B	**15-1** 0-9"	1	1	1	1	1	2	1	8	2	1.1
	15-1 9-15"	1	1	1	1	1	2	2	9	2	1.3
	15-1 15-25"	1	1	1	1	1	2	1	8	2	1.1
	15-1 25-41"	1	1	1	1	1	2	3	10	3	1.4
	15-1 41-60"	1	1	1	1	1	2	4	11	4	1.6
5B	**15-2** 0-5"	1	1	1	1	1	4	1	10	4	1.4
	15-2 5-13"	1	1	1	1	1	4	1	10	4	1.4
	15-2 13-33"	1	1	1	1	1	4	2	11	4	1.6
	15-2 33-44"	1	1	1	1	1	4	4	13	4	1.9
5B	**16-5** 0-5"	1	1	1	1	1	3	1	9	3	1.3
	16-5 5-16"	2	1	1	1	1	3	1	10	3	1.4
	16-5 16-31"	1	1	1	1	1	3	2	10	3	1.4
1B	**1B-P1** 0-7"	1	1	1	1	1	2	1	8	2	1.1
	1B-P1 7-16"	1	1	1	1	1	2	1	8	2	1.1

Table 3.4-4 Soils Suitability Data

Map Unit ID #	Sample ID and Depth Sampled	pH (Sat Paste) R[1]	E.C. @ 25°C R[1]	SAR R[1]	$CaCO_3$ R[1]	USDA Texture Class[2] R[1]	Slope Gradient[3] R[1]	Rock Fragments[3] R[1]	Cumulative Rating	Highest or Most Limiting Suitability Rating[1]	Average Suitability Rating[1]
	1B-P1 16-33"	1	1	1	1	1	2	1	8	2	1.1
	1B-P1 33-45"	1	1	1	1	1	2	1	8	2	1.1
	1B-P1 45-60"	3	1	3	3	1	2	1	14	3	2.0
4B	**4B-P1** 0-5"	2	1	1	1	1	2	1	9	2	1.3
	4B-P1 5-16"	2	1	1	1	1	2	1	9	2	1.3
	4B-P1 16-24"	1	1	1	1	1	2	1	8	2	1.1
	4B-P1 24-46"	1	1	1	1	1	2	2	9	2	1.3
	4B-P1 46-60"	1	1	1	1	1	2	4	11	4	1.6
4C	**4C-P1** 0-5"	1	1	1	1	1	4	1	10	4	1.4
	4C-P1 5-17"	2	1	1	1	1	4	1	11	4	1.6
	4C-P1 17-27"	2	1	1	1	1	4	1	11	4	1.6
	4C-P1 27-37"	2	1	1	1	1	4	2	12	4	1.7
	4C-P1 37-45"	2	1	1	1	1	4	2	12	4	1.7
	4C-P1 45-50"	2	1	1	1	1	4	2	12	4	1.7
5A	**5A-P1** 0-7"	2	1	1	1	1	3	2	11	3	1.6
	5A-P1 7-16"	2	1	1	1	1	3	2	11	3	1.6
	5A-P1 16-24"	2	1	1	1	1	3	1	10	3	1.4
	5A-P1 24-37"	2	1	1	1	1	3	2	11	3	1.6
	5A-P1 37-45"	2	1	1	1	1	3	4	13	4	1.9
5A	**5A-P2** 0-10"	2	1	1	1	1	2	3	11	3	1.6
	5A-P2 10-17"	1	1	1	1	1	2	4	11	4	1.6
	5A-P2 17-26"	1	1	1	1	1	2	4	11	4	1.6
	5A-P2 26-40"	2	1	1	1	1	2	4	12	4	1.7
882A	**882A** 0-4"	1	1	1	4	1	1	1	10	4	1.4
	882A 4-14"	1	1	1	4	1	1	1	10	4	1.4
	882A 14-29"	1	1	1	4	1	1	1	10	4	1.4

Sample Dates 8/24/04 through 8/30/04 and 9/13/05 through 9/20/05

Good = 1, Fair = 2, Poor = 3 Unsuitable = 4

[1] R = Soil Suitability Rating (see Greystone 2006b, Table 2)

[2] See expalantion of abbreviation in footnotes on (Greystone 2006b, Table 2).

[3] See pedon description (Greystone 2006b, Appendix A).

Source: Modified from Greystone 2006b

Table 3.4-5 Alkali Earth and Heavy Metals Soils Data

Map Unit ID #	Sample ID	Se (Hot H_2O sol) (mg/kg)	As (Total - HNO_3 digest) (mg/kg)	Cd (Total - HNO_3 digest) (mg/kg)	Cu (Total - HNO_3 digest) (mg/kg)	Mn (Total - HNO_3 digest) (mg/kg)	Mo (Total - HNO_3 digest) (mg/kg)	Ni (Total - HNO_3 digest) (mg/kg)	Se (Total - HNO_3 digest) (mg/kg)	V (Total - HNO_3 digest) (mg/kg)	Zn (Total - HNO_3 digest) (mg/kg)
3B	**3-1** 0-17"	<0.01	<5	5	25	348	<5	39	<5	68	158
	3-1 17-24"	<0.01	7	6	25	375	<5	40	<5	66	161
	3-1 24-30"	<0.01	<5	<5	23	403	<5	35	<5	58	126
	3-1 30-60"	<0.01	6	<5	19	378	<5	30	<5	56	105
2A	**4-1** 0-11"	<0.01	<5	<5	22	336	<5	30	<5	31	123
	4-1 11-17";	<0.01	<5	<5	19	275	<5	35	<5	31	113
3B	**4-5** 0-6"	<0.01	<5	<5	18	1130	<5	22	<5	42	82
	4-5 6-11"	<0.01	<5	<5	18	1410	<5	25	<5	44	77
	4-5 11-20"	<0.01	6	<5	26	1290	<5	28	<5	34	80
	4-5 20-33"	<0.01	6	<5	16	1380	<5	25	<5	44	74
	4-5 33-52"	<0.01	7	<5	17	632	<5	20	<5	39	70
	4-5 52-65"	<0.01	<5	<5	29	2410	<5	26	<5	28	91
4B	**5-3** 0-9"	<0.01	<5	<5	14	565	<5	13	<5	29	67
	5-3 9-18"	<0.01	<5	<5	12	655	<5	14	<5	30	53
	5-3 18-30"	<0.01	<5	<5	11	640	<5	15	<5	31	49
	5-3 30-60"	<0.01	<5	<5	11	437	<5	17	<5	41	56
3B	**8-2** 0-13"	<0.01	<5	<5	19	529	<5	19	<5	33	83
	8-2 13-26"	<0.01	<5	<5	18	463	<5	21	<5	35	84
	8-2 26-37"	<0.01	<5	<5	17	545	<5	21	<5	39	82
	8-2 37-49"	<0.01	<5	<5	17	482	<5	21	<5	40	80
	8-2 49-60"	<0.01	<5	<5	15	474	<5	24	<5	42	79
1B	**8-4** 0-6"	<0.01	<5	<5	16	565	<5	15	<5	35	56
	8-4 6-11"	<0.01	<5	<5	14	567	<5	17	<5	35	51
	8-4 11-27"	0.02	<5	<5	10	433	<5	18	<5	40	51
	8-4 27-36"	<0.01	<5	<5	11	453	<5	19	<5	40	50
	8-4 36-45"	<0.01	<5	<5	11	380	<5	18	<5	32	44
4B	**9-1** 0-9"	<0.01	<5	<5	17	1100	<5	24	<5	34	127
	9-1 9-27"	<0.01	<5	<5	16	866	<5	24	<5	35	107
	9-1 27-52"	0.01	<5	<5	18	431	<5	28	<5	44	109
4A	**9-2** 0-8"	<0.01	<5	<5	13	758	<5	15	<5	29	62
	9-2 8-15"	<0.01	<5	<5	10	691	<5	15	<5	27	49
	9-2 15-21"	<0.01	<5	<5	14	563	<5	17	<5	30	53

Table 3.4-5 Alkali Earth and Heavy Metals Soils Data

Map Unit ID #	Sample ID	Se (Hot H_2O sol) (mg/kg)	As (Total - HNO_3 digest) (mg/kg)	Cd (Total - HNO_3 digest) (mg/kg)	Cu (Total - HNO_3 digest) (mg/kg)	Mn (Total - HNO_3 digest) (mg/kg)	Mo (Total - HNO_3 digest) (mg/kg)	Ni (Total - HNO_3 digest) (mg/kg)	Se (Total - HNO_3 digest) (mg/kg)	V (Total - HNO_3 digest) (mg/kg)	Zn (Total - HNO_3 digest) (mg/kg)
	9-2 21-32"	<0.01	<5	<5	14	784	<5	22	<5	34	70
	9-2 32-44"	<0.01	<5	<5	13	681	<5	23	<5	33	71
4B	**9-3** 0-9"	<0.01	<5	<5	20	1240	<5	20	<5	32	84
	9-3 9-21"	<0.01	<5	<5	19	1110	<5	20	<5	32	77
	9-3 21-41"	<0.01	<5	<5	18	1060	<5	20	<5	36	75
	9-3 41-53"	<0.01	6	<5	13	1050	<5	18	<5	39	58
	9-3 53-60"	<0.01	8	<5	13	461	<5	16	<5	35	57
4B	**9-4** 0-11"	<0.01	<5	<5	13	595	<5	13	<5	22	44
	9-4 11-17"	<0.01	<5	<5	11	565	<5	14	<5	21	35
	9-4 17-23"	<0.01	<5	<5	8	342	<5	12	<5	18	28
	9-4 23-38"	<0.01	<5	<5	9	230	<5	13	<5	18	27
	9-4 38-48"	<0.01	<5	<5	9	300	<5	16	<5	23	32
7	**11-1** 0-9"	<0.01	<5	<5	22	848	<5	18	<5	32	115
	11-1 9-15"	<0.01	5	<5	22	877	<5	21	<5	35	111
	11-1 15-27"	<0.01	<5	<5	22	994	<5	21	<5	38	110
	11-1 27-60"	<0.01	<5	<5	22	1150	<5	22	<5	38	100
4B	**14-6** 0-7"	<0.01	5	<5	13	949	<5	19	<5	27	47
	14-6 7-19"	<0.01	<5	<5	14	910	<5	21	<5	29	47
	14-6 19-42"	<0.01	<5	<5	11	658	<5	19	<5	30	44
	14-6 42-55"	<0.01	<5	<5	6	137	<5	11	<5	17	42
5B	**15-1** 0-9"	<0.01	<5	<5	18	738	<5	54	<5	36	98
	15-1 9-15"	<0.01	<5	<5	16	681	<5	48	<5	36	89
	15-1 15-25"	<0.01	<5	<5	15	533	<5	54	<5	39	65
	15-1 25-41"	<0.01	<5	<5	17	471	<5	82	<5	48	53
	15-1 41-60"	<0.01	<5	<5	16	472	<5	88	<5	46	61
5B	**15-2** 0-5"	<0.01	<5	<5	25	763	<5	104	<5	52	64
	15-2 5-13"	<0.01	<5	<5	23	831	<5	97	<5	46	60
	15-2 13-33"	<0.01	<5	<5	22	692	<5	92	<5	47	55
	15-2 33-44"	<0.01	<5	<5	21	659	<5	104	<5	51	52
5B	**16-5** 0-5"	<0.01	<5	8	17	768	<5	27	<5	53	203
	16-5 5-16"	<0.01	<5	8	19	705	<5	31	<5	55	196
	16-5 16-31"	<0.01	<5	7	17	571	<5	31	<5	61	160

Table 3.4-5 Alkali Earth and Heavy Metals Soils Data

Map Unit ID #	Sample ID	Se (Hot H_2O sol) (mg/kg)	As (Total - HNO_3 digest) (mg/kg)	Cd (Total - HNO_3 digest) (mg/kg)	Cu (Total - HNO_3 digest) (mg/kg)	Mn (Total - HNO_3 digest) (mg/kg)	Mo (Total - HNO_3 digest) (mg/kg)	Ni (Total - HNO_3 digest) (mg/kg)	Se (Total - HNO_3 digest) (mg/kg)	V (Total - HNO_3 digest) (mg/kg)	Zn (Total - HNO_3 digest) (mg/kg)
1B	**1B-P1** 0-7"	<0.01	<5	<5	15	534	<5	14	<5	25	67
	1B-P1 7-16"	<0.01	<5	<5	15	527	<5	15	<5	25	62
	1B-P1 16-33"	<0.01	<5	<5	10	422	<5	15	<5	24	50
	1B-P1 33-45"	<0.01	<5	<5	10	450	<5	17	<5	26	49
	1B-P1 45-60"	<0.01	<5	<5	8	342	<5	12	<5	24	35
4B	**4B-P1** 0-5"	<0.01	<5	<5	14	529	<5	21	<5	27	85
	4B-P1 5-16"	<0.01	<5	<5	14	534	<5	21	<5	29	83
	4B-P1 16-24"	<0.01	<5	<5	13	584	<5	21	<5	28	83
	4B-P1 24-46"	<0.01	<5	<5	13	656	<5	23	<5	33	79
	4B-P1 46-60"	<0.01	6.3	<5	14	786	<5	27	<5	34	73
4C	**4C-P1** 0-5"	<0.01	5.0	<5	13	1390	<5	25	<5	18	59
	4C-P1 5-17"	<0.01	5.1	<5	13	1460	<5	29	<5	19	52
	4C-P1 17-27"	<0.01	5.5	<5	12	1290	<5	29	<5	20	50
	4C-P1 27-37"	<0.01	<5	<5	8	610	<5	21	<5	19	44
	4C-P1 37-45"	<0.01	<5	<5	7	415	<5	14	<5	20	40
	4C-P1 45-50"	<0.01	5.4	<5	6	231	<5	12	<5	18	39
5A	**5A-P1** 0-7"	<0.01	<5	<5	12	388	<5	26	<5	27	139
	5A-P1 7-16"	<0.01	<5	<5	14	388	<5	29	<5	28	138
	5A-P1 16-24"	<0.01	<5	<5	14	309	<5	29	<5	26	127
	5A-P1 24-37"	<0.01	<5	<5	12	242	<5	27	<5	26	107
	5A-P1 37-45"	<0.01	<5	<5	13	216	<5	29	<5	30	108
5A	**5A-P2** 0-10"	<0.01	<5	<5	16	628	<5	49	<5	28	67
	5A-P2 10-17"	<0.01	5.1	<5	15	526	<5	70	<5	32	65
	5A-P2 17-26"	<0.01	6.7	<5	15	510	<5	77	<5	41	63
	5A-P2 26-40"	<0.01	7.4	<5	16	398	<5	54	<5	46	73
882A	**882A** 0-4"	<0.01	<5	<5	<5	176	<5	<5	<5	10	16
	882A 4-14"	<0.01	<5	<5	<5	385	<5	<5	<5	4	<8.5
	882A 14-29"	<0.01	<5	<5	<5	180	<5	<5	<5	3	7

Sample Dates: 8/24/04 through 8/30/04
Source: Greystone 2006b

3.4.2 Soil Salvage Summary

In summary, there are few limitations to practical soil salvage in the proposed disturbance within the project area. These limitations include soil texture (e.g., clay content); soil textural modifiers (e.g., excessive coarse rock fragment content); and high $CaCO_3$ content, particularly erosive soil (e.g., those developed from loess), shallow soils, and those found on steep slopes. To confirm maximum utilization of the soil resource, substrate salvage should be coordinated with the planning and construction phases of mining operations. Approximately 2.5 mlcy of PPGM would be salvageable from the disturbance area, with an additional 1.2 mlcy of marginal soils available.

3.5 VEGETATION, RIPARIAN AREAS, AND WETLANDS

3.5.1 Vegetation Communities

Three dominant vegetation communities were identified in the project area: non-forested lands, forest uplands, and riparian and wetland areas. For the purposes of this discussion, "vegetation community" refers to a broad classification of vegetation type that can be further divided into "sub-communities", which are based on the Idaho Vegetation and Land Cover Classification System (Scott et al. 2002). "Land cover type" refers to a classification of non-vegetated land. Disturbed and open water land cover types were identified within the project area. The three dominant vegetation communities, associated sub-communities, and land cover types are shown on **Figure 3.4-1**. Based on vegetation community data collected in 2004 and field mapping efforts conducted in 2005, **Table 3.5-1** includes acreage estimates for the dominant vegetation communities, sub-communities, and land cover types. Acreages are only listed for these five vegetation communities, sub-communities, and land cover types because of the abundance of smaller microsites and overlap of subdominant communities within these larger vegetation communities and sub-communities. Although several additional sub-communities were identified throughout the project area, these subcommunities were not quantified because of their variability and relatively small acreages. At least ten vegetation communities occur within the three dominant vegetation communities, as described in the following sections. The non-forested land community includes the bitterbrush, mountain big sagebrush, and silver sage sub-communities. The forest uplands community includes the aspen, Douglas-fir, and mixed needleleaf/broadleaf forest sub-communities. Riparian and wetland communities include the graminoid and forb-dominated riparian, shrub-dominated riparian, mixed non-forest riparian, and shallow marsh sub-communities. A complete list of plant species identified during recent surveys is provided in Greystone (2006a). The following sections describe vegetation communities, sub-communities, and land cover types observed in the project area.

3.5.1.1 Non-Forested Land

The non-forested land vegetation community observed in the project area is occupied by bitterbrush, mountain big sagebrush, and silver sage vegetation sub-communities. The bitterbrush sub-community occurs as small pockets within the mountain big sagebrush sub-community. It often occurs near aspen and is dominated by bitterbrush, sagebrush, and snowberry. The mountain big sagebrush sub-community is the most common in the project area, and is found primarily at lower elevations on gentle slopes with southern and western aspects. Other sub-communities, including mixed needleleaf/broadleaf forest, bitterbrush, silver sage,

aspen, shrub-dominated riparian, and mixed non-forest riparian often intergrade with this sub-community. Mountain big sagebrush is the dominant species, with snowberry, serviceberry, chokecherry, and three-tip sagebrush occurring throughout. Snowberry, serviceberry, and chokecherry form a large component of the total cover on more mesic sites, while sagebrush forms a larger total cover on more xeric sites. This difference is also noted on **Figure 3.4-1**. Bitterbrush-dominated and silver sage-dominated patches often occur on microsites within this larger sub-community type. The silver sage sub-community is associated with drainages in mountain big sagebrush sub-communities. These are areas of increased moisture compared with the surrounding uplands, but without sufficient soil moisture to support wetland vegetation. They are dominated by silver sagebrush, with shrubby cinquefoil and snowberry forming a large portion of the total cover.

Table 3.5-1 Acreage Estimates for the Dominant Vegetation Communities, Sub-communities, and Land Cover Types

Vegetation Community or Land Cover Type	Vegetation Sub-Community	Acreages
Forest Uplands	Mixed Needleleaf/Broadleaf Forest (Mixed Conifer)	230
	Aspen	282
Non-forested Land	Mountain Big Sagebrush (Mesic)	192
	Mountain Big Sagebrush (Xeric)	657
Riparian or Wetland	N/A	72
Disturbed	N/A	32
Water	N/A	4
	Total	**1,469**

Source: Greystone 2006a

3.5.1.2 Forest Uplands

The forest upland vegetation community includes the aspen, Douglas-fir, and mixed needleleaf/broadleaf forests vegetation sub-communities. The aspen sub-community occurs as the climax community in many parts of the project area. Small stands are occasionally a transition between mountain big sagebrush sub-communities and mixed needleleaf/broadleaf forest. Aspen sub-communities typically occur on more mesic sites, and are sometimes associated with mixed non-forested riparian communities. Aspen dominates, with snowberry, serviceberry, and chokecherry forming a large proportion of the total cover.

The Douglas-fir sub-community is common at higher elevations of the project area and is a common subcomponent of mixed needleleaf/broadleaf forest. This sub-community occurs primarily on northern and eastern aspects under more mesic conditions and is dominated by Douglas-fir. The understory is often less dense than other forested types, with snowberry being the most common shrub. Mixed needleleaf/broadleaf forest can be found on all aspects and overlaps with mountain big sagebrush, aspen, Douglas-fir, and shrub-dominated riparian sub-communities. Douglas-fir and aspen dominate, with snowberry, serviceberry, and chokecherry dominating the understory. Canopy ranges from open to dense with most trees of intermediate age. Aspen-dominated and Douglas-fir-dominated sub-communities often occur on microsites within this larger sub-community.

Table 3.4-6 Summary of Soil Limitations, Salvage Depths, and Salvageable Volumes

Map Unit ID #	Map Unit Name	Map Unit Component	% of Map Unit[1]	Map Unit Area in Proposed Disturbance acres	Soil Depth Class inches	Primary Limitations	Range in Depth of Salvageable Primary Plant Growth Medium[2] inches	Average Depth of Salvageable Primary Plant Growth Medium[2] inches	Range in Depth of Salvageable Secondary Plant Growth Medium[3] inches	Average Depth of Salvageable Secondary Plant Growth Medium[3] inches	Estimated Volume of Salvageable Primary Plant Growth Medium within the Proposed Disturbance cubic yards	Estimated Volume of Salvageable Secondary Plant Growth Medium within the Proposed Disturbance cubic yards
1A	Tetonia-Lantonia Variant (fine-loamy) Complex, 0 to 5 percent slopes	Tetonia	50	27.9	40 to 60	clay	–	60	0	0	225,100	-
		Lantonia Variant	35	19.5		rock fragments		55	0	0	144,439	-
		Inclusions of Cummulic suborder in alluvial basins and soils with >35 percent rock fragments on convex slopes and knolls	15	8.4		poorly drained and rock fragments	0	0	0	0	-	-
1B	Lanark – Parkalley Complex, 5 to 15 percent slopes	Lanark	50	19.5	40 to 60	clay	7 to 60	40	9 to 20	15	105,109	39,416
		Parkalley	35	13.7		clay and rock fragments	6 to 30	20	25 to 54	40	36,788	73,576
		Inclusions of Dranyon and Greys on concave slopes with aspen/mtn brush.	15	5.9		clay and rock fragments	25 to 60	50	13 to 17	15	39,416	11,825
2A	Nielsen – Lanark Complex, 0 to 15 percent slopes	Nielsen	60	25.3	<20	bedrock and rock fragments	9 to 34	10	4 to 28	10	34,017	34,017
		Lanark	25	10.5	40 to 60	none	30 to 65	40			56,695	-
		Inclusions of deeper soil on concave upper mountain slopes.	10	4.2	40 to >60	bedrock and rock fragments	†	0	†	0	-	-
		Inclusions of Rock Outcrops along summits and ridges	5	2.1	<10	rock out crops and boulders	†	0	†	0	-	-
2B	Nielsen – Parkalley Variant (not Pachic) Complex, 15 to 35 percent slopes	Nielsen	50	8.0	<20	bedrock and rock fragments	9 to 34	10	4 to 28	10	10,769	10,769
		Parkalley Variant	30	6.4	40 to >60	clay and rock fragments	30 to 65	20	0	0	34,461	-
		Inclusions of deeper soil on concave slopes	10	1.6	>60	bedrock and rock fragments		0			-	-
3A	Dranburn Variant (dry, mtn. brush site) – Beaverdam Variant (dry) Complex, 0 to 15 percent slopes	Dranburn Variant	50	8.8	40 to >60	clay	11 to 52	30	4 to 28	10	35,534	11,845
		Beaverdam Variant	35	6.2	40 to >60	clay and rock fragments	12 to 26	20	0	0	16,582	-
		Inclusions of shallow to moderately deep and	10	1.8	10 to 40	rock fragments	20 to 40	20	10 to 20	10	4,738	2,369

Table 3.4-6 Summary of Soil Limitations, Salvage Depths, and Salvageable Volumes

Map Unit ID #	Map Unit Name	Map Unit Component	% of Map Unit[1]	Map Unit Area in Proposed Disturbance acres	Soil Depth Class inches	Primary Limitations	Range in Depth of Salvageable Primary Plant Growth Medium[2] inches	Average Depth of Salvageable Primary Plant Growth Medium[2] inches	Range in Depth of Salvageable Secondary Plant Growth Medium[3] inches	Average Depth of Salvageable Secondary Plant Growth Medium[3] inches	Estimated Volume of Salvageable Primary Plant Growth Medium within the Proposed Disturbance cubic yards	Estimated Volume of Salvageable Secondary Plant Growth Medium within the Proposed Disturbance cubic yards
		skeletal soils on convex slopes near rock outcrops										
		Inclusions of calcareous shallow soils bedrock knolls.	5	0.9	10 to 20	bedrock	0	0	0	0	-	-
3B	Skaggs Variant (non-carbonatic) - Parkalley Variant (lime) Complex, 15 to 45 percent slopes	Skaggs Variant	60	47.4	20 to 40	clay and rock fragments	0	0	4 to 22	8	-	51,020
		Parkalley Variant	25	19.8	†	†	†	0	†	0	-	-
		Inclusions of shallow calcareous soils on limestone bedrock	10	7.9	10 to 20	bedrock	0	0	10 to 20	10	-	10,629
		Inclusions of shallow to moderately deep soils near outcrops.	5	4.0	20 to 40	rock fragments	0	0	20 to 40	30	-	15,944
4A	Dranyon - Toponce complex, 0 to 15 percent slopes	Dranyon	60	61.2	40 to 60	clay and rock fragments	25 to 60	50	13 to 17	15	411,602	123,481
		Toponce	25	25.5	40 to >60	clay	21 to 41	30	9 to39	24	102,900	82,320
		Inclusions of Greys on concave toeslopes	10	10.2	†	†	†	0	†	0	-	-
		Inclusions of clayey-skelatal to fine soils on landslides	5	5.1	40 to 60	clay and rock fragments	40 to 60	30	0	0	20,580	-
4B	Dranburn - Sedgway Complex, 15 to 45 percent slopes	Dranburn	50	62.0	40 to >60	clay and rock fragments	11-52	30	4 to 28	10	250,047	83,349
		Sedgway	40	49.6	40 to >60	clay and rock fragments	4 to 40	18	7 to 47	18	120,022	120,022
		Inclusions of moderately deep soils on convex slopes	5	6.2	20 to 40	clay and rock fragments	20 to 40	30	0	0	25,005	-
		Inclusions coarse textured soils on sandstone substrate.	5	6.2	20 to 40	rock fragments	20 to 40	30	0	0	25,005	-
4C	Dranyon – Sedgway Complex, 45 to 70 percent slopes	Dranyon	50	18.0	40 to 60	clay and rock fragments	25 to 60	50	13 to 17	15	121,235	36,371
		Sedgway	40	14.4	40 to >60	clay, rock fragments and boulders	42 to 65	50	5 to 17	10	96,988	19,398
		Inclusions of soils on steep north-facing hillsides and soils with	10	3.6	†	†	†	0	†	0		

Table 3.4-6 Summary of Soil Limitations, Salvage Depths, and Salvageable Volumes

Map Unit ID #	Map Unit Name	Map Unit Component	% of Map Unit[1]	Map Unit Area in Proposed Disturbance acres	Soil Depth Class inches	Primary Limitations	Range in Depth of Salvageable Primary Plant Growth Medium[2] inches	Average Depth of Salvageable Primary Plant Growth Medium[2] inches	Range in Depth of Salvageable Secondary Plant Growth Medium[3] inches	Average Depth of Salvageable Secondary Plant Growth Medium[3] inches	Estimated Volume of Salvageable Primary Plant Growth Medium within the Proposed Disturbance cubic yards	Estimated Volume of Salvageable Secondary Plant Growth Medium within the Proposed Disturbance cubic yards
		less than 45 percent slopes										
5A	Pavorhoo – Mikesell Variant (skeletal) Complex, 15 to 45 percent slopes	Pavorhoo	45	27.7	40 to >60	clay and rock fragments	-	24	0	20	89,298	74,415
		Mikesell Variant	40	24.6	40 to >60	clay and rock fragments	4 to 46	20	4 to 38	20	66,147	66,147
		Inclusions of Sedgway on upper convex sideslopes	10	6.2	40 to >60	clay and rock fragments	4 to 40	18	7 to 47	20	41,342	12,403
		Inclusions of Dranyon soils on concave slopes.	5	3.1	40 to 60	clay and rock fragments	25 to 65	50	13 to 17	15	8,268	8,268
5B	Scout Variant (no E horizon) - Sedgway Complex, 45 to 70 percent slopes	Scout Variant	60	48.5	20 to 60	rock fragment and boulders	7 to 44	20	16 to 30	20	130,357	130,357
		Sedgway	25	20.2	40 to >60	clay, rock fragments and boulders	4 to 40	18	7 to 47	20	48,884	54,316
		Inclusion of Rubbleland and loess-mantled rocky soils on upper convex mountain slopes	10	8.1	<10	rock outcrops and boulders	0	0	0	0	-	-
		Inclusions of sandstone derived coarse textured soils with skeletal features	5	4.0	20 to -40	rock fragments	20 to 40	30	0	0	16,295	-
6	Rubbleland – Cryothents Complex, 30 to 80 percent slopes	Rubbleland	70	0.2	<10	rock outcrops and boulders shallow soils	0	0	0	0	-	-
		Cryothents	30	0.1	<10	shallow soils	0	0	[illegible]	0	-	-
7	Miscellaneous Wetlands, 0 to -5 percent slopes	Miscellaneous Wetlands, 0 to 5 percent slopes	100	11.4	variable	clay, porely drainage, not jurisdiction wetland	60 to 70	65			99,274	-
8	Miscellaneous Disturbed Areas, 0 to 60 percent slopes	Miscellaneous Disturbed Areas, 0 to 60 percent slopes	100	2.9	variable	gravel, bedrock in some areas and revegetated spoils	0	0	0	0	-	-
9A	Starley – Skaggs Complex, 0 to 15 percent slopes	Starley	55	0.2	<10	bedrock and rock fragments	0	0	4 to 22	12	-	248
		Skaggs	30	0.1	20 to 40	bedrock and rock fragments	0	0	4 to 29	8	-	90
		Inclusions of rock outcrops	10	0.03	<10	rock outcrops	0	0	0	0	-	-

Table 3.4-6 Summary of Soil Limitations, Salvage Depths, and Salvageable Volumes

Map Unit ID #	Map Unit Name	Map Unit Component	% of Map Unit[1]	Map Unit Area in Proposed Disturbance acres	Soil Depth Class inches	Primary Limitations	Range in Depth of Salvageable Primary Plant Growth Medium[2] inches	Average Depth of Salvageable Primary Plant Growth Medium[2] inches	Range in Depth of Salvageable Secondary Plant Growth Medium[3] inches	Average Depth of Salvageable Secondary Plant Growth Medium[3] inches	Estimated Volume of Salvageable Primary Plant Growth Medium within the Proposed Disturbance cubic yards	Estimated Volume of Salvageable Secondary Plant Growth Medium within the Proposed Disturbance cubic yards
		Inclusions of moderately deep to deep soils on leeward sides of ridgetops	5	0.01	20 to 60	bedrock and rock fragments	10 to 30	20	10 to 20	10	38	19
9B	Skaggs – Starley Complex, 15 to 60 percent slopes	Skaggs	45	2.8	20 to 40	bedrock and rock fragments	25 to 36	10	0	0	3,787	-
		Starley	40	2.5	<10	bedrock and rock fragments	0	0	0	0	-	-
		Inclusions of deeper soils on colluvium, concave and midslope with Douglas Fir and Aspen	15	0.9	20 to 40	bedrock and rock fragments	10 to 30	20	10 to 20	10	2,525	1,262
882A	Travertine soils, NRCS MU 882A, 0 to 3 percent slopes	Travertine soils, NRCS MU 882A, 0-3 percent slopes	100	56.9	<10	carbonates and travertine deposits	0	0	0	0	-	-

Notes:
1 Percentage of components in map unit.
2 Primary Plant Growth Medium = Suitability Ratings (See Table 2) of 1 or 2.
3 Secondary Plant Growth Medium = Suitability Ratings (See Table 2) of 3 or soil material with a suitability rating of ≤ 3 and a coarse rock fragment content of 50 percent or less.
† Data not available
Source: Greystone 2006b

3.5.1.3 Riparian and Wetland Areas

The riparian and wetland vegetation type includes the graminoid and forb-dominated riparian, shrub-dominated riparian, mixed non-forest riparian, and shallow marsh riparian vegetation sub-communities. These sub-communities are not mapped separately on **Figure 3.4-1**; rather, they are all listed as riparian and wetland areas. The shrub-dominated riparian and mixed non-forest riparian sub-communities dominate most of the wetlands in the project area.

3.5.1.4 Open Water

One small man-made pond (Fish Pond) and a stock pond were identified in the project area. Several smaller water bodies also occur in the project area, but are shallow enough to contain emergent vegetation, classifying them as a wetland (**Section 3.5-2**). Fish Pond is the only substantial water body in the project area (**Figure 3.4-1**).

3.5.1.5 Developed Land

This land cover type occurs in two primary areas within the project area. The first is the reclaimed Conda Mine at the southern end of the project area, which has been inactive since 1984. Though much of the area is vegetated with a mix of common reclamation species, some of the ground surface is bare and rocky. The second area is the disturbance associated with the private haul road. A smaller area north of the private haul road is also disturbed and devoid of vegetation. This site is used to store gravel, load livestock, and as vehicle parking (**Figure 3.4-1**).

3.5.2 Wetlands and Non-Wetland Waters of the U.S.

A delineation of potentially jurisdictional waters of the U.S., including wetlands, was performed at the Blackfoot Bridge site during June 2003 (JBR 2003) and again in October 2005 (JBR 2006). The project area was revisited to extend the original delineation area slightly to the south and to gather additional data, as requested by the USACE, as a part of their wetland verification process. The USACE has approved the jurisdictional determination of the project area. Wetlands O through W and an unnamed pond are not included in the jurisdictional determination because the project would not directly impact these waters. **Table 3.5-2** presents the wetlands that occur within the project area. The feature names correspond to the wetlands and non-wetland waters of the U.S. labeled on **Figure 3.4-1**. The survey area for the wetland delineation is larger than the project area, and thus, there are some differences between **Figure 3.4-1** and **Table 3.5-2**. Wetlands O, P, Q, R, S, T, CC, and the wetland area west of X are located outside the project area. The wetland survey identified 147.32 acres of wetlands and non-wetland waters of the U.S. within the project area. Of this total area, 140.54 acres appear to represent jurisdictional wetlands and waters of the U.S., while 6.78 acres appear to be isolated, non-jurisdictional wetlands. These isolated features occur in travertine depressions that are separated from the Blackfoot River or its tributaries by areas of higher ground supporting upland vegetation, and/or by low ridges of travertine rock. No jurisdictional wetlands or non-wetland waters of the U.S. were identified within the southeasternmost part of the project area. No defined channels were found in this area, though channel definition appears to begin in some drainages to the east of the survey area.

Wetlands were identified on tributaries to State Land Creek that drain the southeastern-central part of the area. State Land Creek and its tributaries are connected to the Blackfoot River. Accordingly, Wetland A in State Land Creek Tributary 3 would be jurisdictional.

Table 3.5-2 Wetlands and Waters of the United States

Feature (Location/Reach)	Area (acres)		Total Waters of the U.S. (including wetlands)	Total Potentially Jurisdictional Area (acres)
	Waters of the U.S.[1]	Wetlands		
Eastern Survey Area				
Wetland A - State Land Creek	0	1.12	1.12	1.12
Wetland B	0.018	0.07	0.088	0.088
Wetland C	0.016	0.86	0.876	0.876
Wetland D	0.293	0.02	0.313	0.313
Wetland E	0	0.08	0.08	0.08
Wetland F	0.004	0.04	0.044	0.044
Wetland G	0.015	0.43	0.445	0.445
Wetland H	0.016	0.08	0.096	0.096
Fish Pond Area				
Wetland I	0.016	0.36	0.376	0.376
Wetland J	0	0.15	0.15	0.15
Wetland K	2.82	3.27	6.09	6.09
Wetland L	0	0.67	0.67	0.67
Northeast Survey Area				
Wetland Z	0	0.03	0.03	0.03
Wetland Y	0.037	0.07	0.107	0.107
Wetland M	0.046	2.33	2.376	2.376
Wetland N	0	0.22	0.22	0.22
Western Survey Area				
Wetland O [2]	2.41	4.39	6.8	6.8
Wetland P	0	5.84	5.84	5.84
Wetland CC	0	0.01	0.01	0.01
Wetland Q	0	0.04	0.04	0.04
Wetland R	0	0.28	0.28	0.28
Wetland S	0	0.96	0.96	0 (isolated)
Wetland T	0	0.5	0.5	0 (isolated)
Wetland U	0	0.33	0.33	0 (isolated)
Wetland V	0	0.33	0.33	0 (isolated)
Wetland W	0	4.66	4.66	0 (isolated)
Wetland X	0.049	54.65	54.699	54.699
Wetland CC	0	0.01	0.01	0.01
Wetland BB	0.05	0.05	0.1	0.1
Wetland AA	0.06	0.03	0.09	0.09
Wetland Area West of Wetland X [3]	0	59.6	59.6	59.6
Total	**5.85**	**141.48**	**147.33**	**140.55**

Notes:
[1] Cited area of waters of the U.S. includes associated channel above or below referenced wetland. Area of waters includes associated wetland fringe bordering or within channel.
[2] Area of waters includes 2.04 acres of pond and 0.37 acre of flow channel.
[3] Includes 54.44-acre area of wetlands, 0.46 acre of swales and depression with hydrophytic vegetation and 4.70 acres of wetted 'ripple features' area.
Source: JBR 2003 and JBR 2006

A series of small springs occur near the eastern border of the project area along the unnamed tributary drainage of Fish Pond. Beaver dams have been constructed on the flows below several of these springs, creating a number of ponds, as well as areas of hydrophytic vegetation (Wetlands B through H). Surveys completed in 2005, followed a year with more precipitation

than the 2003 survey, and found evidence of channel definition connecting wetlands to the wetlands in Fish Pond and adjacent wetlands. Because Fish Pond and adjacent wetlands share a hydrologic connection with the Blackfoot River (via Wetland L and a channel continuing through Wetlands AA, BB, and X), the wetlands and non-wetland waters of the U.S. in the eastern part of the survey area have been identified as jurisdictional features. Intermittent evidence of incision by flowing water was found below Wetland E, suggesting this wetland is likely connected to downstream waters via short overland flow and is jurisdictional.

Much of the southwestern part of the project area west of P4's haul road has been identified as wetland or non-wetland waters of the U.S. Specifically, a pasture and a series of ponds west of the haul road, including a large pond in the extended project area, were identified as wetlands/non-wetland waters of the U.S. (Wetlands O and P, respectively). A large channel runs north-northwest from this area toward the Blackfoot River, and forms a jurisdictional connection with the Blackfoot River. Wetlands Q and R do not share a direct channel connection to flows that continue from Wetlands O and P toward the Blackfoot River. A series of large depressions is located between these two wetlands and the channel that runs north-northwest from the area of Wetlands O and P. These depressions represent a surface connection with the Blackfoot River, and they are considered jurisdictional.

To the north, Wetlands S, T, U, V, and W are ringed by travertine rock. There is no evidence of a defined channel or ordinary high water mark connection between these wetlands and the Blackfoot River or its tributaries. A number of small depressions are present to the west of Wetland W, but none of these features are continuous, and all are bounded by higher ridges of travertine rock supporting upland or non-indicator species. As noted above, at its closest point, the northwest corner of Wetland W is approximately 500 feet south of the willow-dominated Wetland X, and is separated from this wetland by intervening higher ground and travertine rock. At its closest point, the northwest corner of Wetland W is approximately 1,850 feet from the wetland "ripple features" identified in the northwestern corner of the survey area. Wetlands S, T, U, V, and W are believed to be isolated and potentially non-jurisdictional features. To the north of these isolated features, a large area of hydrophytic vegetation and some ponds (Wetland X) border the channel that drains Fish Pond and Fish Pond watershed.

A baseline soil survey was completed for the project area because the NRCS has not yet mapped this area (**Figure 3.4-1**) (Greystone 2006b). **Table 3.5-3** summarizes the soil map units in which wetland areas were found and describes the map units. The majority of the wetlands in the project area are located within Map Units 7 – Miscellaneous Wetlands or 882A – Vertine Series.

Because there is no applicable required assessment methodology in Idaho, the Montana Department of Transportation Wetland Assessment Method (MDT Method) was used to assign functional ratings to wetlands in order to support evaluation of permit applications under Section 404 of the Clean Water Act. The MDT Method has been revised periodically and is used for projects in Montana and elsewhere due to its value as a rapid, economical, repeatable assessment method that minimizes subjectivity (PBS&J 2008, Berglund 1999). An MDT Method Assessment was conducted on wetlands within the project area to determine functions and values of these wetlands. The MDT Method rates wetlands on various ecological functions and values including, but not limited to, habitat, flood attenuation and storage, production export and food chain support, recreational potential, and uniqueness. Additionally, the MDT Method of

ecological functions evaluation is heavily weighted on the characteristics of vegetation (P4 2008b).

Table 3.5-3 Description of Map Units Where Wetlands are Located within the Blackfoot Bridge Project Area

Map Unit	Map Unit Description
1A – Tetonia-Lantonia Variant (fine loamy) Complex, 0 to 5 percent	This map unit is found on toeslopes and fan slopes that formed in loess mantled colluviums and alluvium principally derived from the Wells and Phosphoria Formations. Elevations range from 6,100 to 6,400 feet. The soils are deep to moderately deep, well-drained, and moderately permeable.
1B – Lanark-Parkalley Complex, 5 to 15 percent slopes	This map unit is on fan slopes and in basins that formed in colluviums and alluvium derived from mixed sedimentary rocks of the Wells and Phosphoria Formations. The soils are deep to moderately deep, well-drained, and moderately permeable.
4B – Dranburn – Sedgway Complex, 15 to 40 percent slopes.	This map unit is found on mountain slopes and small valleys with east to north aspects that formed in eolian loess and colluviums materials predominantly derived from Phosphoria Formation. The soils in this unit are deep to very deep, moderately well to well-drained and moderately permeable.
7 – Miscellaneous Wetlands, 0 to 5 percent slopes	This map unit is found along drainages, springs and seeps, and impoundments that formed in alluvium derived from mixed deposits. The soils in this unit are deep to very deep, somewhat poorly to moderately well-drained, and slowly to moderately permeable.
882A – Vertine Series, 0 to 2 percent slopes	This map unit is found on the large basin to the west of the Aspen Range. These soils have formed in alluvium and residuum composed of travertine. The travertine substrate is brittle and porous. Vertine soils are shallow to fractured travertine bedrock, somewhat poorly drained. Permeability is moderately rapid.
Water	These areas are inundated with water.

Source: Greystone 2006b

Based on the MDT Method, wetlands can be rated as Category I, II, III, or IV.

Category I wetlands are of exceptionally high quality and generally rare to uncommon or are important from a regulatory standpoint. These wetlands can provide primary habitat for federally listed or proposed threatened or endangered species, represent a high quality example of a rare wetland type, provide irreplaceable ecological functions, exhibit exceptionally high flood attenuation capability, or are assigned high ratings for most of the assessed functions and values.

Category II wetlands are more common than Category I wetlands and provide habitat for sensitive plants or animals, function at very high levels for wildlife and fish habitat, are unique in the region, or are assigned high ratings for many of the assessed functions and values.

Category III wetlands are more common than Category II wetlands, generally less diverse, and often smaller and more isolated than Category I or Category II wetlands. They can provide many

functions and values, although they may not be assigned high ratings for as many parameters as are Category I and II wetlands.

Category IV wetlands are generally small, lack vegetative diversity, and have lower ratings for most functions.

All wetlands assessed within the project area were determined to be Category III wetlands. The highest functions for Wetlands AA, BB, B, C, D, E, F, G, H, I, J, and L were for groundwater discharge and sediment stabilization. These wetlands provide moderate values for wildlife habitat, flood attenuation, and production export (nutrient cycling). Wetland K (Fish Pond) provides the highest functional rating for groundwater discharge, short- and long-term water storage, and sediment stabilization. This wetland provides moderate values for special status species (documented habitat for the leopard frog and potential habitat for the western toad), wildlife habitat, flood attenuation, and production export (nutrient cycling).

3.5.3 Selenium in Vegetation

A number of plant species accumulate selenium to high levels that are toxic to grazing mammals. Plants that accumulate high levels of selenium are called indicator plants, because they require selenium and are often found in selenium-rich areas. Indicator plants include some milk-vetch species, prince's plume, and some woody asters. These indicator plants can accumulate up to 3,000 mg/kg selenium (USDA 2006).

Another category of plants includes the passive selenium accumulators. These plants do not require selenium but can accumulate up to 50 mg/kg. These passive selenium accumulators include crop plants such as western wheatgrass, barley, wheat, and alfalfa, as well as some native range species (USDA 2006). The third category of plants, the non-accumulators, is considerably larger and includes most of the common forage grasses (Raisbeck et al. 2006).

No studies have been done on baseline levels of selenium in vegetation growing in the Blackfoot Bridge project area. It is expected that baseline selenium concentrations in vegetation in the project area are similar to those measured at reference sites in other studies in the Southeast Idaho Phosphate District, generally less than 1 mg/kg (IDEQ 2003).

3.5.4 Noxious Weeds

Noxious weed populations occur throughout the project area. These populations are typically small and isolated. Some larger populations occur in areas that are heavily grazed. Four of the species on the Idaho Noxious Weed List are present: dalmation toadflax, whitetop, Canada thistle, and Scotch thistle. Dalmation toadflax is common to the west side of the North Pit area, while the other three species are typically found in clearings or near water and wetlands. There is potential for other noxious weed species to occur within the project area.

3.5.5 Fire Management

No complete fire history is readily available for the project area; however, general fire behavior and frequency can be summarized by characteristics of the vegetation communities in the project

area. The following fire ecology descriptions discuss general fire ecology and occurrence in the project area (BLM 2008a).

3.5.5.1 Aspen/Conifer and Dry Conifer

Aspen/Conifer and Dry Conifer are both classified as Fire Regime III (Hardy et al. 2001). Fire frequencies in the Aspen/Conifer mix range between 25 years and 100 years (63 years mid-range) with mixed severity (Loope and Gruell 1973). Fuel loads range from above 6 tons per acre. Pure stands of aspen are particularly susceptible to mortality of aboveground stems from fire, but aspen is well-adapted to regeneration by sprouting following fire (Jones and DeByle 1985, Mutch 1970). Specific site and climatic conditions are necessary before fires can ignite and spread, as aspen stands do not easily burn and often act as natural fuel breaks during wildland fires. Fires generally do not occur in young aspen stands. In older stands, during the warmest/driest months of the year, abundant fuel can lead to higher severity fires.

3.5.5.2 Low-Elevation Shrub

Historically, infrequent natural fires of stand replacement helped to maintain a mosaic of shrublands and perennial grasslands throughout the sagebrush steppe ecosystem. Pre-settlement stand-replacing fire frequencies for low-elevation shrub are estimated to vary from 60 to 110 years (85 years mid-range) for basin big sagebrush and Wyoming sagebrush types (Whisenant 1990, Peters and Bunting 1994, Miller 2001). Most sagebrush species are not fire-tolerant, except for the local genotype of three-tip sagebrush. Wyoming big sagebrush steppe cover types had low fuel loads (e.g., 200 to 900 pounds per acre) and were characterized by patchy fires that produced a mosaic of burned, recovering, or unburned lands (USDA 2008). Annual grass invasion has increased fine fuels, resulting in frequent large fires. Large fires impact the existing sagebrush steppe habitat and facilitate expansion of cheatgrass.

3.5.5.3 Wetland and Riparian

Natural fire is generally an infrequent occurrence in this vegetation type, though the dominant cover type adjacent to the riparian plant community usually dictates its natural/historical fire rotation. For those larger riparian areas, the natural/historical fire rotation is estimated to range from 200 to 300 years or more, and are thought to be stand-replacing when they occur.

3.6 TERRESTRIAL WILDLIFE

The vegetation communities and sub-communities described in **Section 3.5.1** provide habitats for the various wildlife species described in the following paragraphs. Non-forested communities composed mainly of sagebrush make up the majority of wildlife habitat in the project area (58 percent). Another 35 percent of the project area consists of forested habitat, which is composed of mixed conifer and aspen stands. Five percent of the project area consists of riparian, wetland, and aquatic habitats. The remaining 2 percent is occupied by disturbed and developed lands.

3.6.1 Mammals and Big Game

Several mammalian species are known to occur or may occur within the project area. These species include several members of the rodent family such as marmot; various bats; intermediate-sized species such as coyotes, badgers, bobcats, and mountain cottontails; and large mammals including mule deer, Rocky Mountain elk, moose, and mountain lion. The project area

is known to support several species considered big game (USGS et al. 1976). Elk and mule deer winter range stretches across the entire eastern portion of the project area (**Figure 3.6-1**). Winter is the most difficult season for big game species because it is a time of limited food and higher energy costs compared with the other seasons. Winter range refers to the habitat that big game species depend on to minimize their energy costs and increase their chances of survival during the most severe winter weather (Safford 2004). Other than the mapping of the winter range, there are no additional data on the elk and mule deer that use this area (Butterfield 2008).

3.6.1.1 Predators

A winter survey of carnivore species was performed to determine the presence of forest-dwelling predators (Greystone 2006c). The survey focused on determining the status of carnivore species in the project area including American marten, fisher, Canada lynx, and wolverine.

No tracks or individuals of the target species were observed in the project area during this survey. Red fox tracks and scat evidence of a predator kill were observed. One set of wolverine tracks was identified north of the project area near the Ballard Mine. One set of tracks, most likely mountain lion, was observed near the road, but an absolute determination could not be made. Coyote tracks were also observed in areas dominated by sagebrush and along forest/meadow ecotones.

3.6.1.2 Bats

Fourteen species of bats are known to occur in Idaho. The Idaho Conservation Data Center does not identify any bat species occurring in the project area (Stephens 2008). However, from analyzing bat species' habitat affinities and review of the (IDFG 1997), it was determined that the six species listed below have the potential to occur in the vicinity of the project area. Four of these species are BLM special status species (**Section 3.8**):

- Yuma myotis (*Myotis yumanensis*), BLM special status species;
- Little brown myotis (*Myotis lucifugus*);
- Long-eared myotis (*Myotis evotis*), BLM Special Status Species;
- Silver haired bat (*Lasionycteris noctivagans*);
- Townsend's big-eared bat (*Corynorhinus townsendii*), BLM Special Status Species; and
- Western small-footed myotis (*Myotis ciliolabrum*), BLM Special Status Species.

A bat survey was conducted in 2005 to characterize the occurrence of bats in the project area (Greystone 2006c). The survey included evaluating potentially suitable roosting habitats for bat presence and conducting bat mist netting in foraging habitats. Spruce and aspen forests were evaluated for the presence of bats. Observations were few and limited to unidentified calls and observations of individual flying bats. No caves, mine tunnels, or abandoned buildings that may provide highly suitable bat roosting habitats occur on the Blackfoot Bridge property. Bats feed primarily on flying insects, which typically occur in high densities over wetlands or riparian areas, making these preferred habitats for mist-netting bats. Based on the presence of insects and open water, three locations were selected for bat mist-netting and were surveyed over a period of

3 nights. One adult male little brown bat was captured, and several bats were observed feeding over open water and wetland areas.

The results of the survey indicate that the population of bats within the project area is relatively small. The low population of bats on the property is likely a function of two factors: lack of suitable roosting habitats and limited foraging opportunities. Individual bats were observed foraging for short periods over open water or wetland areas and then leaving the area. This implies that most bats that roost within the project area likely leave the area for the majority of their foraging activities. Expansive irrigated agricultural areas and wetlands occur in several areas adjacent to the project area, especially to the west, and likely provide the primary foraging areas for bats that roost within the project area. Considering the small population of bats, the limited foraging opportunities, and the limited roosting sites, it is likely that the project area does not support large populations of bats in the region (Greystone 2006c).

3.6.2 Birds

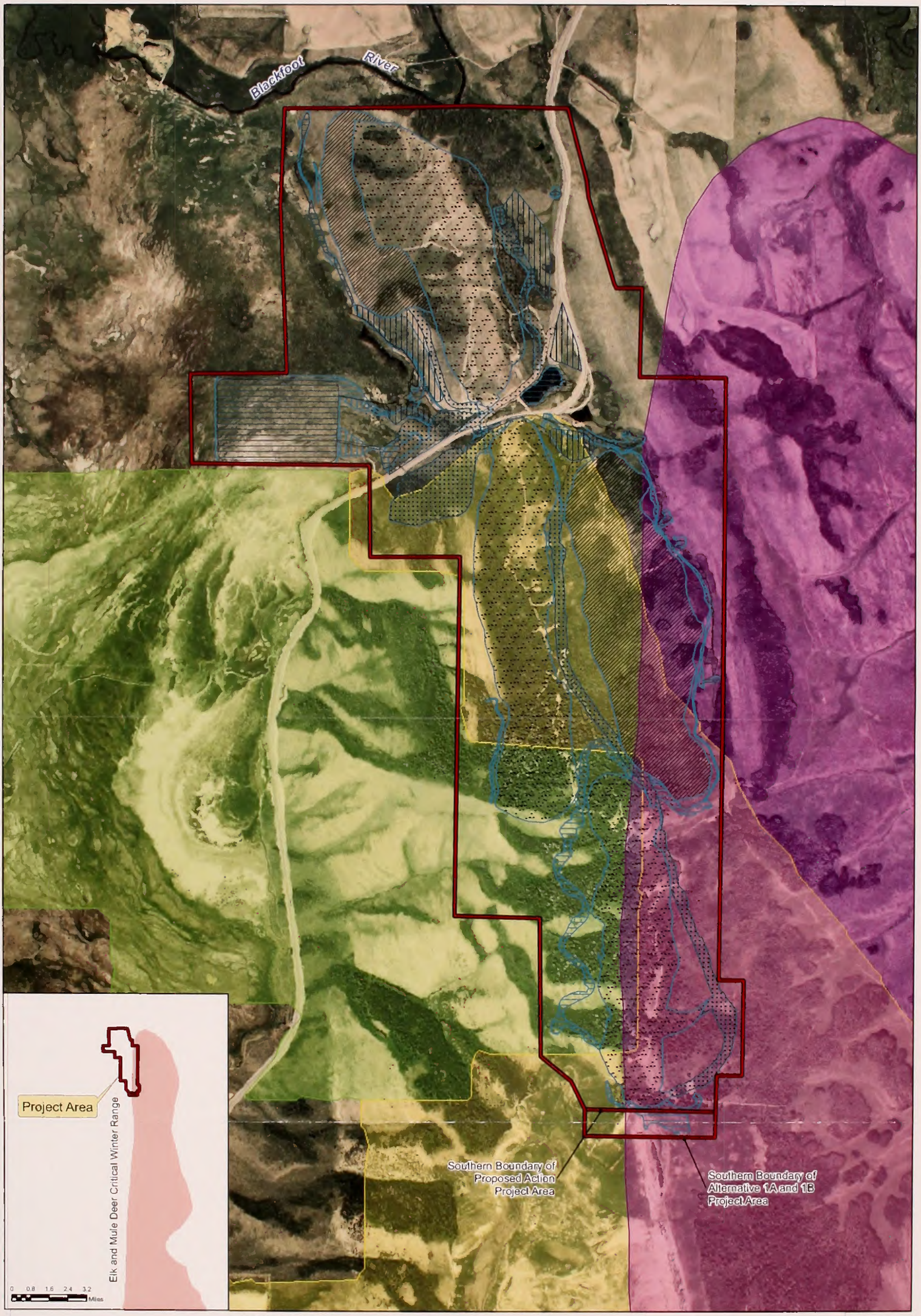
3.6.2.1 Raptors

The raptors that spend all or part of the year in Idaho include 13 species of owls, one species of vulture, and 18 species of hawk-like birds including falcons, eagles, buteos, accipiters, harriers, and osprey (BLM 2006a). Many raptors nest in large, sturdy-branched trees and/or cliff walls. Forested habitat in the project area suitable for nesting raptors is composed of mature aspen and mixed conifer forests.

Northern goshawk surveys were performed in 2004 (BLM 2004a) and 2005 (Greystone 2006c) in the project area. Methods included the use of a grid of calling stations and the tape-playback method. Agencies typically require 2 years of presence or absence surveys to determine the occurrence status of the northern goshawk. Two years of survey data are now available to support a determination of the status of the northern goshawk at the Blackfoot Bridge site. Surveys did not detect any goshawks, nor was any suitable goshawk nesting habitat identified in the project area. Suitable habitat typically consists of large, undisturbed, remote tracts of old-growth forest with closed canopies and an open understory (Graham et al. 1999).

A 2006 bald eagle nesting survey for the State of Idaho concluded that the bald eagle population is increasing, and a 2007 survey confirmed those findings (IDFG 2006a, Moulton 2008). In general, the number of nesting bald eagles has increased in the past 10 years within the BLM Pocatello Field Office area. It is believed that the population of bald eagles would increase with USFWS management guidelines followed on BLM lands (BLM 2006a).

A nesting pair of bald eagles was identified in the project area in 2002 shown on **Figure 3.6-2** (USFWS 2006a). The breeding pair has been monitored regularly since 2004 by a single observer from within a stationary vehicle parked on a pull-out on the haul road. The nesting pair has successfully fledged at least thirteen young since 2002. The pair has used one of three nests each year, other than 2006, to raise eaglets. Most recently, two eaglets successfully fledged in 2010 (Vice 2010). **Table 3.6-1** summarizes the nesting results for the pair of bald eagles from 2002 through 2010. Although no longer federally listed, the bald eagle remains protected under both the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act and is considered a special status species by the BLM.



BLACKFOOT BRIDGE PROJECT EIS

FIGURE 3.6-1
Big Game Cntical Winter Range and Grazing Allotments

ANALYSIS AREA: Caribou County, Idaho
Date: 9/25/2010 | Prepared By: AH & EC & JC
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Table 3.6-1 2002 – 2010 Bald Eagle Nesting Activity within the Project Area

Nesting Year	Nest	Successfulness
2002	Not known	Two eaglets fledged
2003	No observed nesting	No observed nesting
2004	Nest located closest to the haul road	Eaglet(s) fledged
2005	Nest located closest to the haul road	Eaglet(s) fledged
2006	Appeared to begin nesting on nest farthest from the haul road	Unsuccessful, pair did not nest
2007	Nest located closest to the haul road	Three eaglets fledged
2008	Middle nest	Two eaglets fledged
2009	Middle nest	Two eaglets fledged
2010	Nest located closest to the haul road	Two eaglets fledged

Source: USFWS 2006a, Vice 2007, Vice 2008, Vice 2009, Vice 2010

Bald eagles are opportunistic feeders and their diet can vary; however, they primarily feed on fish. When fish are not abundant, bald eagles will feed on waterfowl, small mammals, and carrion. The bald eagles within the project area primarily feed on fish that inhabit the Blackfoot River. They may also occasionally travel west to the Blackfoot Reservoir to feed, which has been identified by the Audubon Society as an Important Bird Area (USFWS 2006b). A golden eagle was observed in February 2005 near the haul road during winter surveys. Golden eagles are also protected under both the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. No nests are known to occur in the project area.

Surveys for BLM listed sensitive owl species, including the flammulated owl, boreal owl, and great gray owl were performed in 2005 (Greystone 2006c). Amplified calls of the flammulated owl, boreal owl, and great gray owl were played at calling stations in potentially suitable forested habitats. Three owl species, the flammulated owl, northern saw-whet owl, and the great-horned owl, were detected in aspen and Douglas-fir habitats within the Blackfoot Bridge project area. Additionally, a nesting long-eared owl was observed during clearances for drill roads.

3.6.2.2 Upland Game Birds

There are no known sage-grouse or sharp-tailed grouse leks within the project area (Moser 2008). There are a few leks with an unknown or historic status in the vicinity, as shown in **Table 3.6-2**. Sage-grouse habitat is mapped east of the project area and is shown on **Figure 3.6-2**.

During baseline avian surveys, thirteen survey stations were established within or adjacent to the project area to evaluate the potential for on-site vegetation to support sage grouse. Sage grouse were not observed in the project area during baseline studies and it was concluded that the marginal habitat in the project area is not generally suitable for sage grouse (Greystone 2006c). While conducting avian surveys, biologists flushed four sage-grouse from open sagebrush habitats with an eastern aspect on the east side of the Ballard Mine, located about a mile north of the project area. Nest searches were conducted in the vicinity of these observations; but no nests were found. Despite these individual observations confirming sage-grouse presence, no active leks or nests were identified (Greystone 2006c). The mixed shrub communities within the project area contain a mixture of mountain big sagebrush, snowberry, bitterbrush, and chokecherry, especially on more mesic sites (Greystone 2006a). In contrast, sage grouse typically use habitats dominated by sagebrush with a healthy understory of perennial grasses and forbs (Idaho Sage-grouse Advisory Committee 2006), which is more characteristic of the Ballard Mine site to the

north and the area of sage grouse habitat mapped to the east. No sharp-tailed grouse were detected during the avian survey (Greystone 2006c). Ruffed grouse were common throughout the project area. A number of male ruffed grouse were heard drumming; and one active ruffed grouse nest with 10 eggs was identified in the project area. Additionally, one blue grouse was detected while conducting other surveys (Greystone 2006c).

Table 3.6-2 Known Sage-Grouse and Sharp-tailed Grouse Leks in the Vicinity of the Project Area

Location (TRS*)	Status	Last Count (Date)
Sage-Grouse Leks		
7S, 42E, S36	Unknown	2001
6S, 42E, S27	Unknown	2000
7S, 43E, S21	Unknown	1988
8S, 43E, S6	Unknown	2001
6S, 42E, S35	Unknown	1980
8S, 43E, S4	Unknown	2002
7S, 44E, S7	Unknown	1971
Sharp-Tailed Grouse Leks		
7S, 43E, S21	Historic	N/A
7S, 43E, S27	Historic	N/A
6S, 42E, S36	Historic	N/A
7S, 44E, S30	Historic	N/A

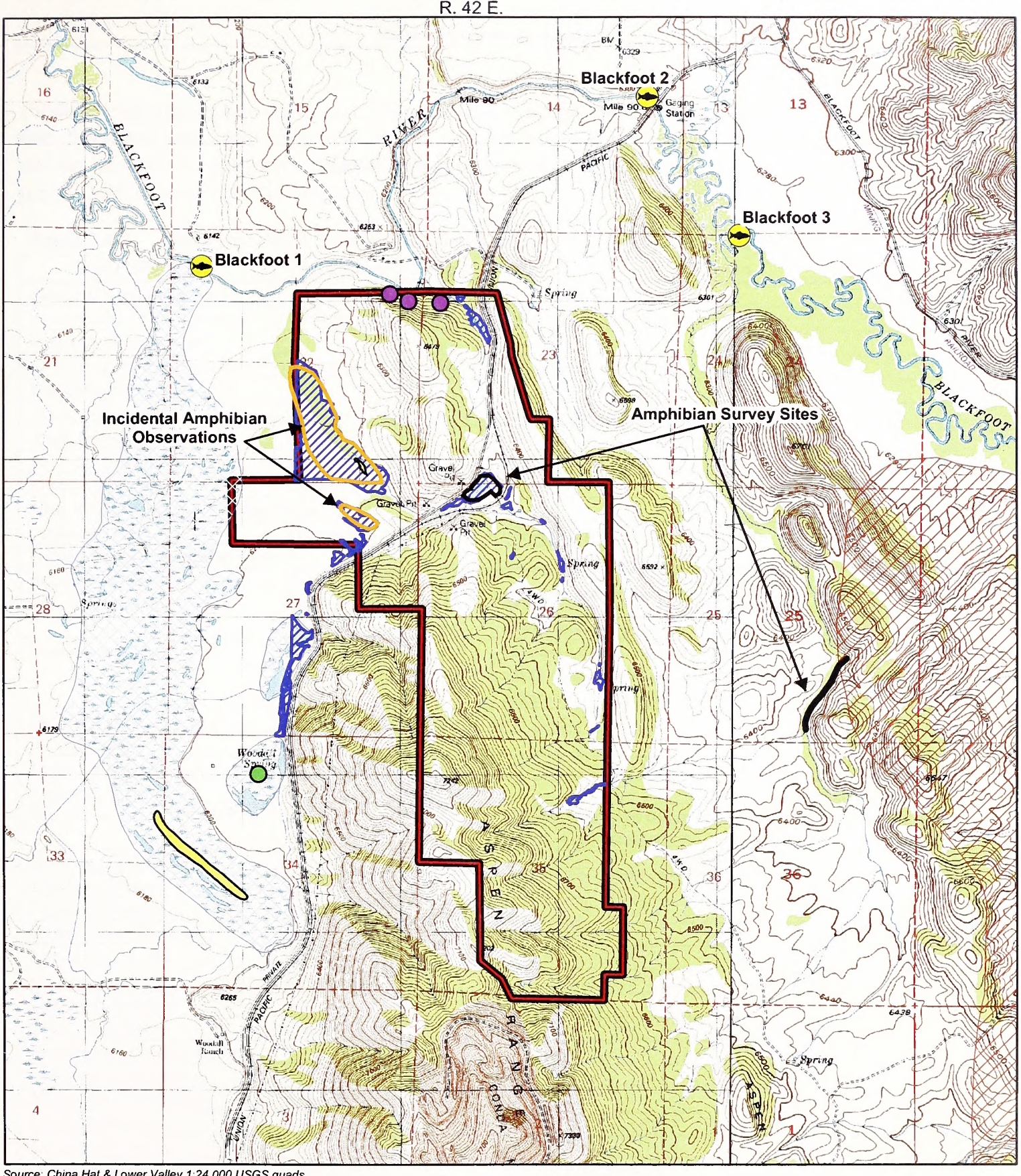
Notes:
TRS = Township, Range, Section
Source: IDFG 2008

3.6.2.3 Migratory Birds

With the exception of non-migratory game birds (e.g., grouse, pheasants) and certain non-native species, the MBTA of 1918 prohibits the "take" of any migratory bird or any part, nest, or egg of any such bird. "Take" is defined as to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner" (16 U.S.C. 703). Migratory birds include species that spend the winter in the southern latitudes and fly north to nest and fledge their young in the summer. Some migrate as far as from the Arctic Circle to the southern tip of South America. Others may only move from Idaho to Arizona (BLM 2006a).

Observations of species protected under the MBTA were recorded during other biological surveys within the project area (Greystone 2006c). **Table 3.6-3** lists the several species observed during field efforts conducted in the spring and summer of 2005.

During surveys conducted in 2005, 63 species of birds protected under the MBTA were identified, of which six species (willow flycatcher, olive-sided flycatcher, Brewer's sparrow, American white pelican, ferruginous hawk, and flammulated owl) are designated as special status species by the BLM (Greystone 2006b). Active nests for two BLM listed species were located within the project area including one bald eagle nest and two green-tailed towhee nests. Other active nests that were located include two red-tailed hawk nest, one mallard nest, one tree



Source: *China Hat & Lower Valley 1:24,000 USGS quads.*

LEGEND

- Aquatic Sampling Location
- Trumpeter Swan Observation
- Bald Eagle Nest
- Blackfoot Bridge Project Boundary
- Sage-grouse Key Habitat
- Hoary Willow Population
- Woodall Springs Conservation Site
- Amphibian Survey Site (August 2005)
- Incidental Amphibian Observations (May 2005)

NORTH

0 750 1,500 3,000 4,500 6,000
Feet

BLACKFOOT BRIDGE PROJECT EIS

FIGURE 3.6-2
Sensitive Species Occurrence and Aquatic Sampling Locations

ANALYSIS AREA: Caribou County, Idaho	
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swallow nest, one house wren nest, three American robin nests, one dusky flycatcher nest, and one dark-eyed junco nest. Active nests that were expected to occur in the project area, but could not be located or confirmed, include additional red-tailed hawk nests, a turkey vulture nest, a prairie falcon nest (a BLM listed species), and nests of several other migratory bird species.

Table 3.6-3 Migratory Bird Species Observed within the Project Area During 2005

Scientific Name	Common Name	Notes
Grebe (Podicipedidae)		
Aechmophorus occidentalis	Western grebe	Observed at Fish Pond
Pelicans (Pelecanidae)		
Pelecanus erythrorhynchos	American white pelican	Flocks observed flying in area
Geese/Ducks (Anatidae)		
Anas cyanoptera	Cinnamon teal	At least one pair observed at Fish Pond
Anas discors	Blue-winged teal	
Anas platyrhynchos	Mallard	Nest with 10 eggs
Branta canadensis	Canada goose	
New World Vultures (Cathartidae)		
Cathartes aura	Turkey vulture	Observed flying throughout area
Hawks/Eagles (Accipitridae)		
Accipiter cooperii	Cooper's hawk	
Aquila chrysaetos	Golden eagle	Observed in February 2005 near haul road during winter surveys
Buteo jamaicensis	Red-tailed hawk	One active nest south of Fish Pond; one active nest south of haul road and west of corrals; and at least two other unconfirmed nesting pairs.
Buteo lagopus	Rough-legged hawk	
Buteo regalis	Ferruginous hawk	
Buteo swainsoni	Swainson's hawk	
Circus cyaneus	Northern harrier	
Haliaeetus leucocephalus	Bald eagle	Nesting pair west of haul road and south of Blackfoot River, with one nestling.
Falcons (Falconidae)		
Falco mexicanus	Prairie falcon	
Falco sparverius	American kestrel	
Rails/Coots (Rallidae)		
Fulica americana	American coot	
Porzana carolina	Sora	
Cranes (Gruidae)		
Grus canadensis	Sandhill crane	
Sandpipers (Scolopacidae)		
Gallinago gallinago	Common snipe	
Numenius americanus	Long-billed curlew	
Gulls (Laridae)		
Larus californicus	California gull	
Doves (Columbidae)		
Zenaida macroura	Mourning dove	
Owls (Tytonidae/Strigidae)		
Aegolius acadicus	Northern saw-whet owl	
Asio flammeus	Short-eared owl	
Bubo virginianus	Great-horned owl	
Otus flammeolus	Flammulated owl	

Table 3.6-3 Migratory Bird Species Observed within the Project Area During 2005

Scientific Name	Common Name	Notes
Nightjars (Caprimulgidae)		
Phalaenoptilus nuttallii	Common poorwill	Vocalizations identified at the Ballard Mine, north of the project area
Hummingbirds (Trochilidae)		
Selasphorus platycercus	Broad-tailed hummingbird	
Woodpeckers (Picidae)		
Colaptes auratus	Northern flicker	
Picoides pubescens	Downy woodpecker	
Sphyrapicus nuchalis	Red-naped sapsucker	
Flycatcher (Tyrannidae)		
Contopus cooperi	Olive-sided flycatcher	
Contopus sordidulus	Western wood-pewee	
Empidonax oberholseri	Dusky flycatcher	Nest with three eggs found
Empidonax traillii	Willow flycatcher	Single calling male observed at Fish Pond
Sayornis saya	Say's phoebe	
Crows/Jays (Corvidae)		
Corvus corax	Common raven	
Cyanocitta stelleri	Steller's jay	
Pica pica	Black-billed magpie	
Swallows (Hirundinidae)		
Tachycineta bicolor	Tree swallow	Nest found in aspen stump
Chickadees (Paridae)		
Poecile atricapillus	Black-capped chickadee	
Nuthatches (Sittidae)		
Sitta carolinensis	White-breasted nuthatch	
Wrens (Troglodytidae)		
Troglodytes aedon	House wren	Nest found in aspen stump
Thrushes (Turdidae)		
Sialia currucoides	Mountain bluebird	
Turdus migratorius	American robin	Three nests found near haul road on Blackfoot Bridge property
Wood-warblers (Parulidae)		
Dendroica coronata	Yellow-rumped warbler	
Dendroica petechia	Yellow warbler	
Icteria virens	Yellow-breasted chat	Observed at Fish Pond
Tanagers (Thraupidae)		
Piranga ludoviciana	Western tanager	
Emberizids (Emberizidae)		
Junco hyemalis	Dark-eyed junco	Nest with four young found
Melospiza melodia	Song sparrow	
Pipilo chlorurus	Green-tailed towhee	Two nests with eggs found in sage near haul road
Pooecetes gramineus	Vesper sparrow	
Spizella breweri	Brewer's sparrow	
Spizella passerina	Chipping sparrow	
Zonotrichia leucophrys	White-crowned sparrow	
Cardinals (Cardinalidae)		
Pheucticus melanocephalus	Black-headed grosbeak	
Blackbirds (Icteridae)		
Agelaius phoeniceus	Red-winged blackbird	
Euphagus cyanocephalus	Brewer's blackbird	

Table 3.6-3 Migratory Bird Species Observed within the Project Area During 2005

Scientific Name	Common Name	Notes
Icterus bullockii	Bullock's oriole	
Molothrus ater	Brown-headed cowbird	
Sturnella neglecta	Western meadowlark	

Source: Greystone 2006c

3.6.3 Reptiles and Amphibians

Review of the *Atlas of Idaho's Wildlife* (IDFG 1997) indicates that there are eight reptile species that have the potential to occur in the project area. One of the eight species, the common garter snake, is a BLM special status species. The Idaho Conservation Data Center does not have data on collected or observed reptiles in the vicinity of the project area (Stephens 2008). **Table 3.6-4** summarizes the habitat preferences for reptile species that may occur in the project area.

A visual encounter and cover-turning survey for reptiles was conducted within the project area in 2005 and included surveying xeric shrublands, aspen forest, mixed needleleaf forest, barren land, riparian, and wetland habitat (Greystone 2006c). The surveys were conducted from May to August during other terrestrial wildlife transect survey efforts. Two species of reptiles were encountered during the surveys and include the western skink and the common garter snake. One western skink was identified in Township 7 South, Range 42 East, Section 27, and two garter snakes were observed in Township 7 South, Range 42 East, Section 22 and Township 7 South, Range 42 East, and Section 35.

Table 3.6-4 Habitat Preferences for Reptile Species that May Occur in the Project Area

Species	Habitat Preference
Sagebrush lizard (*Sceloporus graciosus*)	Found from sea level to about 10,499 feet, in areas with open ground and some low bushes, in sagebrush, manzanita and ceanothus brushlands, pinyon/juniper woodlands, and open pine and fir forests.
Western skink (*Eumeces skiltonianus*)	Found from sea level to about 8,202 feet in grasslands, chaparral, pinyon/juniper woodlands, and pine/oak and pine forests. Prefers open, wooded foothills and rocks, particularly rocky areas on dry hillsides or near streams. In Idaho, prefers rocky habitat with some moisture.
Rubber boa (*Charina bottae*)	Found from near sea level to about 9,843 feet, under rocks and logs, in woodlands, forests, chaparral, meadows, grassy areas, and wet and sandy edges of rocky streams. In Idaho, occupies both desert foothills and heavily forested mountains.
Racer (*Coluber constrictor*)	Found in open habitats ranging from deserts and agricultural areas to open woodlands and streamsides. Absent from forests and high mountains in Idaho.
Gopher snake (*Pituophis melanole*)	Found from lowlands to mountains, in deserts, prairies, brushlands, woodlands, open coniferous forests, farmlands, and marshes. Western populations occur from coastal grasslands and forests through deserts into montane forests. In Idaho, found in prairies, coniferous forests, and deserts, but absent from high mountains and dense forests.
Western terrestrial garter snake (*Thamnophis elegans*)	Found from sea level to 13,123 feet, in variety of habitats such as grasslands, shrublands, woodlands, and open areas in forests. Also found in wetlands near streams, ponds, and lakes (in Idaho, generally associated with marshes and water areas).

Table 3.6-4 Habitat Preferences for Reptile Species that May Occur in the Project Area

Species	Habitat Preference
Common garter snake (*Thamnophis sirtalis*)	Inhabits virtually any type of wet or moist habitat throughout range, but regional populations exhibit different preferences.
Western rattlesnake (*Crotalus viridis*)	Found from shrubby, coastal dunes to timberline, from prairie and desert edges to mountain forests, and along rocky stream courses. In Idaho, typically found on south-facing, unshaded rocky slopes.

Source: IDFG 1997

Most amphibians have complex life cycles (adults, eggs, and larvae that metamorphose into juveniles) that require habitats with standing/still water for at least part of the year. Review of the *Atlas of Idaho's Wildlife* (IDFG 1997) indicates that there are five amphibian species that have the potential to occur in the project area, of which two (the northern leopard frog and the boreal toad) are BLM special status species. The Idaho Conservation Data Center does not have data on collected or observed amphibians in the vicinity of the project area (Stephens 2008). **Table 3.6-5** summarizes the habitat preferences for amphibian species that may occur in the project area.

Table 3.6-5 Habitat Preferences for Amphibian Species that May Occur in the Project Area

Species	Habitat Preference
Boreal chorus frog (*Pseudacris maculate*)	From sea level to over 11,811 feet, in a wide variety of habitats such as desert springs and streams, meadows and woodlands, and in and around ponds, lakes, reservoirs, and slow-moving rivers and streams.
Great Basin spadefoot toad (*Spea intermontana*)	Found from sea level to about 9,160 ft, on shrub steppe, pinyon/juniper woodlands, and spruce/fir forests, but is restricted to shrub steppe habitats in the Northwest. Uses variety of temporary and permanent waters for breeding.
Northern leopard frog (*Rana pipiens*)	Usually found in permanent water containing rooted aquatic vegetation. Commonly inhabits wet meadows and fields, but may also be found in springs, slow streams, marshes, bogs, ponds, canals, reservoirs, and lakes.
Tiger salamander (*Ambystoma tigrinum*)	Found in virtually any habitat, providing there is nearby body of water suitable for breeding. In Idaho, suspected to be present in scattered populations throughout appropriate habitat of grasslands and shrub steppe.
Boreal toad (*Bufo boreas boreas*)	From sea level to over 11,811 ft, in wide variety of habitats such asbdesert springs and streams, meadows and woodlands, and in and around ponds, lakes, reservoirs, and slow-moving rivers and streams.

Source: IDFG 1997

Amphibian surveys were performed for the project area in August 2005 (Greystone 2006c). Fish Pond and State Land Creek were surveyed for amphibians and any amphibians observed during the fish survey at Blackfoot River were also noted. Potential amphibian habitats were examined including pools, water body margins, grass meadows, short-emergent wetlands, and rock outcrops. Results of the survey included visual observations of the northern leopard frog and tiger salamander, as well as auditory detection of the boreal chorus frogs in Wetland X. Fish Pond had the highest concentration of amphibians, with 21 adult northern leopard frogs and five larval tiger salamanders recorded. Ten northern leopard frogs were identified along State Land

Creek in a ⅓ mile stretch below the confluence of State Land Creek and another creek entering from the west. Northern leopard frogs were also observed during the fish survey at the Blackfoot River sample location, just northeast of the project area.

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3.7 FISHERIES AND AQUATIC RESOURCES

3.7.1 Aquatic Species

Information from the IDFG Conservation Center Database indicates that the following fish species are known to occur in the Blackfoot River in the vicinity of the project area (Stephens 2008):

- Yellowstone cutthroat trout (*Oncorhynchus clarki lewisi*);
- Rainbow trout (*Oncorhynchus mykiss*);
- Leatherside chub *(Gila copei);*
- Brook trout (*Salvelinus fontinalis*);
- Cutthroat trout (*Oncorhynchus clarki*); and
- Utah sucker (*Catostomus ardens*).

The Yellowstone cutthroat trout and leatherside chub are BLM special status species. The Yellowstone cutthroat trout had been petitioned for listing under the Endangered Species Act, but a finding of "not warranted" has been made on the listing petition, which means that the USFWS determined that federal protection of the species was not warranted under the Endangered Species Act. In August of 2009 the USFWS made a positive 90-day finding that the leatherside chub was warranted for federal listing under the Endangered Species Act and a status review is underway at this time to determine if a listing is warranted.(74 FR 41649, Aug. 18, 2009).

The Blackfoot River, its tributaries, and the Blackfoot Reservoir play an integral role in the life history and ecology of the Yellowstone cutthroat trout. Mature Yellowstone cutthroat trout from the reservoir ascend the Blackfoot River, mainly in May, and enter upper tributaries or the main river channel to spawn in late May and June. Most of the progeny of both fluvial and adfluvial Yellowstone cutthroat trout rear in Blackfoot River tributaries for varying periods of up to 2

years. Many juvenile Yellowstone cutthroat trout then migrate to Blackfoot Reservoir until they are ready to return to the Blackfoot River to spawn. Other juveniles migrate from tributaries to the river where they rear to adulthood (IDFG 2007a). Data provided by the IDFG indicates that Yellowstone cutthroat trout utilize the Blackfoot River in the vicinity of the project area throughout the year (IDFG 2008).

The Blackfoot Dam was constructed in 1909 on the Blackfoot River, blocking access of Yellowstone cutthroat trout from the lower Blackfoot River and Snake River. Lack of adequate spawning area below Blackfoot Dam and water management practices have suppressed viable migratory cutthroat populations in this river segment. Blackfoot River Yellowstone cutthroat trout were able to succeed above the dam by utilizing adfluvial migration and rearing patterns in the reservoir, switching from fluvial patterns (Thurow et al. 1988).

According to the BLM (2006a), the Yellowstone cutthroat trout fishery in the Blackfoot Reservoir and the mainstem above the reservoir has been greatly affected from 3 years of drought (from 2003 to 2006). In addition to these drought conditions, another factor that may contribute to the trend in adfluvial Yellowstone cutthroat trout spawners is avian predation, particularly by the American white pelican. Monitoring of American white pelicans on Gull Island in the Blackfoot Reservoir documented an increase in nests from 676 in 2002 to 1,400 in 2005 and 2006. Bird scars observed on migrating Yellowstone cutthroat trout became a concern in 2003. The rapid increase in numbers of American white pelicans at the Blackfoot Reservoir may be a factor in the rapid decline in the adfluvial population of Yellowstone cutthroat trout in recent years (IDFG 2007a, Sallabanks 2008). According to the IDFG (2007a), counts of spawning Yellowstone cutthroat trout migrating upstream in the Blackfoot River above the Blackfoot Reservoir decreased from 902 in 2002 to 20 in 2006, while the number of pelican nests in the Blackfoot Reservoir increased from 676 to 1,274 in that same period.

A baseline study of aquatic resources in the project area was performed and included sampling of fish populations, descriptions of fish habitat, and sampling of benthic macroinvertebrates within the Blackfoot River (Greystone 2006d). The Blackfoot River flows along the north edge of the project area and represented the only flowing water within the project area boundaries during the time of the survey. Fish Pond, an area dominated by beaver ponds, and a stock pond represent the only other areas within the project area that contain water other than wetlands and springs (**Figure 3.4-1**). Additionally, an unnamed tributary to State Land Creek flows eastward from the project area into State Land Creek, which flows north to the Blackfoot River.

Three locations on the Blackfoot River north of the project area were sampled by electrofishing (**Figure 3.6-2**). The sample sites were chosen for their locations relative to the project area. Two of the sites were selected downstream of the project area (disturbance sites), and one site was selected upstream from the project area (control site). Each of the reaches sampled were 100 meters long. The Rosgen stream-type for the sample sites were characterized as C3 meandering, with a shallow gradient with point-bars, and a riffle/pool bed morphology that is composed primarily of cobble.

A total of 1,189 fish were caught, representing nine species. The following species were captured:

- White sucker (*Catostomus commersonii*);
- Longnose dace (*Rhinichthys cataractae*);
- Redside shiner (*Richardsonius balteatus*);
- Common carp (*Cyprinus carpio*);
- Speckled dace (*Rhinichthys osculus*);
- Mottled sculpin (*Cottus bairdi*);
- Yellowstone cutthroat trout (*Oncorhynchus clarki lewisi*);
- Rainbow trout (*Oncorhynchus mykiss*); and
- Cutbow trout (*hybrid of cutthroats and rainbow trout*).

Fish are abundant in the sampled areas of the Blackfoot River; however, the dominant species are primarily the non-game fish listed above. Trout are present, but not in large numbers (Greystone 2006d). Trout-spawning habitat exists in the sampled areas, and trout populations were largest near the confluence of the Blackfoot River and State Land Creek.

Macroinvertebrate population data were collected at all the Blackfoot River sampling stations. Dominant macroinvertebrate taxa found at the sample sites include true flies, beetles, mayflies, caddisflies, and snails. Metrics of macroinvertebrate populations indicate that the sample areas contain good to very good water quality with the possibility of slight organic pollution, probably caused by human and livestock use. Diversity and evenness, including taxa composition, indicate a system that is presently slightly adversely affected by impacts. Surrounding land use, primarily grazing, may be affecting sedimentation and organic inputs to the Blackfoot River north of the project area.

State Land Creek is a perennial stream that originates on the east side of the Aspen Range below Woodall Mountain and flows northward to its confluence with the Blackfoot River above the P4 haul road (**Figure 3.4-1**). Tributaries to State Land Creek drain the southeastern portion of the project area below the South Pit. State Land Creek also receives flow from drainages that are tributaries to the reclaimed Conda Mine above the project area. State Land Creek was not flowing during the aquatic survey, and therefore, was not sampled for fish (Greystone 2006d). A review of stream fish data (StreamNet 2009) does not indicate that fish inhabit State Land Creek. Information supplied by the IDFG's Conservation Database Center for fish data in the project area supports this conclusion. However, a study on selenium concentrations in State Land Creek documented the presence of speckled dace (Hamilton and Buhl 2003). It is probable that other fish species may inhabit State Land Creek, but collected fish data are not well reported.

Fish Pond, a man-made pond, has never contained Yellowstone cutthroat trout. In the past, P4, with the approval of the IDFG, introduced rainbow trout to Fish Pond; however, due to fishing and winterkill, this population did not survive (BLM 2004a).

3.7.2 Existing Selenium Concentrations

Selenium is a concern in the environment due to its toxic and bioaccumulative properties. The primary point of impact on fish is the egg, which receives selenium from the female's diet and

stores it until hatching, where deformity and death may occur. Adult fish can survive selenium contamination and appear healthy despite massive reproductive failure (Lemly 1999).

The legal cold water aquatic life quality standards for selenium are described in **Table 3.3-3**. The standards for selenium concentration in surface water do not easily translate into concentrations in fish tissue, however, and there is no legal standard for fish tissue. The EPA has proposed a draft revised water quality criterion for selenium, which, due to its bioaccumulative properties, is expressed as a concentration of the pollutant in whole-body fish tissue rather than a concentration in the water. The draft freshwater chronic criterion is 7.91 micrograms per gram (µg/g) dry weight. If fish tissue sample concentrations exceed 5.85 µg/g during summer or fall, the EPA recommends monitoring fish during the winter to determine if selenium exceeds 7.91 µg/g (EPA 2004).

A study on selenium disposition in cold water ecosystems suggests that selenium uptake and bioaccumulation behave differently in cold water riverine ecosystems than in a warm water lacustrine environment. The study investigated selenium distribution within the upper Blackfoot River watershed and collected samples at 27 monitoring stations. Biomagnification was not observed. Tissue concentration of selenium in the food chain (benthic macroinvertebrates, forage fish, and salmonids) did not increase at each level (Narloch et al. 2002).

Whole-body fish tissue data were collected by Simplot, the IDFG, and Greater Yellowstone Coalition in 2007. Samples were collected from background sites (Brush Creek, Crow Creek, Deer Creek, and Slug Creek) and control sites (Boulder Creek, Browns Creek, South Fork Deer Creek, Horse Creek, Stump Creek, Timber Creek, and South Fork Tincup). Background sites are located in non-impacted stream segments that flow through the selenium-rich Phosphoria Formation, and control sites are located in non-impacted stream segments that do not flow through the Phosphoria Formation. The whole-body selenium concentrations were higher at the background sites than the control sites, with the median concentrations of 4.1 and 2.8 µg/g, respectively. At the background sites, 4 percent of the whole-body selenium concentrations exceeded the EPA draft guidelines of 7.91 µg/g, while at the control sites, none of the whole-body fish selenium concentrations exceeded the 7.91 µg/g guideline (Parametrix 2009).

Additional data collected from mining-impacted sites in the phosphate region in 2007 revealed whole-body selenium concentrations in trout averaging 11.4 µg/g, which exceeds the EPA draft guideline of 7.91 µg/g (IDFG 2007b). Whole-body selenium concentrations in trout in the Blackfoot River averaged 12.9 µg/g, and selenium levels in sculpin (*Cottus* sp.) tissue averaged 22.9 µg/g (IDFG 2007b). Overall, selenium concentrations in fish tissues from the Blackfoot River ranged from 7.41 to 32 µg/g (IDFG 2007b).

Hamilton and Buhl (2003) investigated the occurrence of selenium and other trace elements in water, sediment, aquatic plants, aquatic invertebrates, and fish at nine locations in the Blackfoot River watershed, two of which are near the project area. The following sites were sampled:

- Little Blackfoot River (6.8 miles from the project area);
- Upper Angus Creek (6.1 miles from the project area);
- Blackfoot River gaging station (0.9 mile from the project area);

- State Land Creek (0.8 mile from the project area);
- Smoky Creek (20.7 miles from the project area);
- Upper Georgetown Creek (20.1 miles from the project area);
- Lower Georgetown Creek (20.8 miles from the project area);
- Deer Creek (22.5 miles from the project area); and
- Crow Creek (22.9 miles from the project area).

The Blackfoot River gaging station sample site was located just upstream of the crossing of the Blackfoot River by P4's private haul road and the railroad tracks, accessed from Blackfoot River Road. The land on either side of the Blackfoot River was occupied by grass and sagebrush and supported moderate grazing.

The State Land Creek sample site was located about 0.75 mile from the private haul road at a point near the USGS gaging station, accessed from Blackfoot River Road. The site was approximately 0.31 mile above the confluence with the Blackfoot River and about 4 miles downstream of the inactive Conda Mine. The sample collection area was in a generally open area of forbs, grass, and sparse pine trees with some grazing.

Baseline monitoring of the Blackfoot River water quality at the Blackfoot River gaging station indicates that metal concentrations are generally below applicable water quality standards, with the exception of selenium, which exceeded the CCC (the highest concentration to which aquatic life can be exposed for 4 days) of 0.005 mg/L during spring sampling in 2005, 2006, and 2007. Water quality data from the USGS monitoring station indicate that selenium concentrations in the Blackfoot River are cyclic and generally exceed the CCC aquatic life standard for 1 to 3 weeks each spring before decreasing to below the standard during the remainder of the year (IDEQ 2007).

The Hamilton and Buhl 2003 study found geometric mean selenium concentrations in whole-body fish to be high at the Blackfoot River and State Land Creek (11.5 to 15.2 µg/g). Selenium concentrations in fish were correlated to selenium concentrations in aquatic plants and aquatic invertebrates, but not in sediments. In general, selenium concentrations in young-of-year fish were similar to those in sub-adult fish. Of the waterbodies sampled in the study, the highest selenium concentration was found in State Land Creek, and the second highest was found at the Blackfoot River. Consequently, State Land Creek seemed to standout as a potentially highly impacted stream (Hamilton and Buhl 2003).

The Hamilton and Buhl 2003 study also found high selenium concentrations in aquatic invertebrates at State Land Creek and the Blackfoot River (9.3 to 10.8 µg/g). The selenium concentrations in invertebrates were correlated with those in aquatic plants, but not with sediments. Much of the selenium in invertebrates was believed to likely come from the food web transfer from detritus, which had been reported as the important route of uptake by aquatic invertebrates and fish (Hamilton and Buhl 2003). Bioaccumulation of selenium through the food web from invertebrates to higher trophic organisms, such as fish, has been reported by several investigators (Hamilton and Buhl 2003).

The study by Hamilton and Buhl (2003) concluded that selenium contamination of the Blackfoot River and its tributaries is most likely adversely affecting aquatic resources, especially early life stages of fish. The large number of samples in the study with substantial selenium concentrations above the proposed toxic whole-body threshold in the study (4 µg/g) suggested that fish populations have accumulated elevated selenium concentrations similar to aquatic plants and benthic invertebrates. Additionally, the investigators concluded that forage fish and salmonids probably pose a hazard from dietary selenium toxicity to predatory fish and fish-eating wildlife (Hamilton and Buhl 2003).

A fourth study sampled fish tissue collected in the Blackfoot River during 2000, 2001, 2002, 2005, and 2006. The collected samples showed a range of selenium concentrations of 8.79 µg/g to 19.00 µg/g (GYC 2006).

Table 3.7-1 summarizes the results of selenium analysis in whole-body fish from the studies discussed above.

Several studies that investigated selenium toxicity in fish found that mortality rates and incidence of deformities increased with increasing egg or body tissue selenium concentrations (Lemly 1997; Van Kirk and Hill 2007; Rudolph et al. 2008; NewFields 2009b). Hardy (2009) observed no effects of dietary selenium in terms of toxicity to growing fish and reproductive impairment at the levels of dietary selenium used in the study. Canton and Baker (2008) suggest that natural history factors, such as migration, immigration or emigration of fish, competition between fish species, and food sources, are also important when determining if patterns observed in fish populations are selenium related. These studies are described in more detail in **Chapter 4**.

Table 3.7-1 Whole-Body Fish Selenium Concentrations

Study	Data Collection (years)	Background Sites*	Control Sites**	Impacted Sites	Blackfoot River/State Land Creek
GYC (2006)	2000, 2001, 2002, 2005, and 2006	N/A	N/A	1.8 to 52.3 µg/g (mean N/A)	8.79 to 19.00 µg/g (mean N/A)
Hamilton and Buhl (2003)	2003	3.5 to 13.4 µg/g (9.2 µg/g)	N/A	5.8 to 15.2 µg/g (9.8 µg/g)	10.9 to 15.2 µg/g (12.6 µg/g)
IDFG 2007(b)/ Parametrix 2009	2007	1.5 to 10.0 µg/g (4.5 µg/g)	0 to 6.8 µg/g (3.1 µg/g)	2.7 to 37.2 µg/g (12.0 µg/g)	7.41 to 32.0 µg/g (16.0 µg/g)

Notes:
Values presented as ranges, with means in parentheses.
* Background sites are non-impacted stream segments that flow across the Phosphoria Formation.
** Control sites are non-impacted stream segments that do not flow across the Phosphoria Formation.
Source: Hamilton and Buhl 2003, Parametrix 2009, IDEQ 2007b, GYC 2006

3.8 THREATENED, ENDANGERED, AND SPECIAL STATUS SPECIES

3.8.1 Threatened or Endangered Species

A list of federally listed species for the project area was obtained from the USFWS. As of August 11, 2010, there is one species protected under the ESA that may occur in the vicinity of the project area, the gray wolf (Canis lupus). The gray wolf is listed as a experimental nonessential population in the portion of Idaho south of Interstate 90. The wolverine is a

candidate for listing under the ESA that has the potential to occur in the project area. No other federally threatened, endangered, or candidate species of animals or plants known to occur in the vicinity of the project area. The following are the closest known federally listed or candidate species to the project area: the gray wolf, the wolverine, the Canada lynx, the northern leatherside chub, and the greater sage-grouse.

Gray wolves were virtually extirpated from the western United States by the 1930s (USFWS 1994). In 1973, the northern Rocky Mountain wolf subspecies was listed as endangered, and in 1978, all gray wolves south of Canada (except those in Minnesota) were listed as endangered. In 1995 and 1996, gray wolves were reintroduced in the Greater Yellowstone area. Concurrently with reintroduction, the status of the gray wolf within this area was changed from endangered to experimental nonessential, under section 10j of ESA. In 2008, the USFWS issued a final rule designating wolf populations in Wyoming and portions of Montana, Idaho, Oregon and Washington as a Distinct Population Segment (DPS) and delisting the gray wolf in that DPS. In July of 2008 the Federal District Court of Montana granted a temporary injunction in response to a lawsuit filed by several parties which effectively temporarily relisted the gray wolf and in October of 2008 the court remanded the matter back to the USFWS for review. This reinstated wolves to their former status under the ESA. The USFWS then issued a revised final rule delisting wolves within the Northern Rocky Mountain DPS, except in Wyoming. Following this delisting, a U.S. District Court decision reinstated federal ESA protections for gray wolves in the Northern Rocky Mountain DPS on August 5, 2010. Therefore, gray wolves in southeastern Idaho are once again protected under the ESA as a experimental nonessential population.

As of 2009 (the latest year for which data are available), there are no established wolf packs within 40 miles of the project area (IDFG 2010; USFWS et al. 2010). Individuals or small groups of wolves may occasionally pass through the project area, but IDFG wolf sighting data from 2005 to 2009 suggest this would be a rare occasion (IDFG 2010). Most wolf sightings within 15 miles of the project area have been in the more heavily forested region to the east (IDFG 2010). Wolves are habitat generalists and use a variety of habitats including coniferous forest, montane meadow, and shrub steppe; however, they tend to remain in areas with minimal exposure to humans (USFWS et al. 2010). Because the project area already receives disturbance from humans associated with the haul road, railroad, and transmission line, it is likely that wolves tend to avoid the area.

The North American wolverine (*Gulo gulo luscus*) is a candidate species under the ESA, meaning that protection under the ESA is warranted, but listing is precluded by the need to address other higher priority species (USFWS 2010). Historically, North American wolverines were distributed throughout the northern part of the continent, although the current distribution is significantly reduced. In Idaho, wolverines primarily inhabit the mountains in the northern and central part of the state, though they are also present in the Greater Yellowstone Ecosystem (Predator Conservation Alliance 2001).

Wolverines are solitary carnivores and range widely in search of food (Copeland 1996). As a result, wolverines are generally hard to survey for and occurrence records are relatively low near the project area. No wolverine occurrences are known to have been documented within the project area, however, wolverines have been documented in the vicinity. One set of wolverine tracks was identified north of the project area near the Ballard Mine during winter carnivore

surveys in 2005 (Greystone 2006c). No wolverine tracks were observed in the project area during this study.

Wolverines prefer coniferous forest habitat and tend to avoid grasslands and shrublands (Copeland et al. 2007, Copeland 1996). In total, there are 512 acres of forested habitat that may be used by wolverines within the project area. However, much of this habitat is "patchy", and there is a general lack of contiguous coniferous habitat (which is the habitat typically used by wolverines [Copeland et al. 2007, Copeland 1996]). Also, the project area may be at the lower elevational range for this species in Idaho; a study in central Idaho found that wolverines prefer elevations above 7,200 feet (Copeland et al. 2007). Nonetheless, wolverines may intermittently travel through patchy forests in the project area in search of carrion and other food sources if unavailable in other portions of their home range. Based on their solitary nature and large home range size, it is likely that only one or two individuals would occupy the project area at any one time.

The Canada lynx is listed as occurring in Caribou County, but according to the USFWS, neither the species nor critical habitat is present within the Blackfoot Bridge project area (Arena 2008). There are no other known proposed species or critical habitat in Caribou County (Greystone 2006c).

The northern leatherside chub, has been documented in the Blackfoot River, east of the project area near the confluence of Snake River and Blackfoot River (Maret and Ott 2002), but has not been documented in any fish collection surveys for the project. The northern leatherside chub was petitioned for listing under the Endangered Species Act (ESA) and received a draft positive 90-day finding, meaning that there is substantial information to indicate that listing the northern leatherside chub under the ESA may be warranted. On August 18, 2009 the USFWS published a notice of 90-day petition finding which initiated a status review of 29 species, including the northern leatherside chub, to determine whether listing is warranted. To ensure that the review is comprehensive, the USFWS is soliciting scientific and commercial information regarding the northern leatherside chub. The USFWS is required to complete a 12-month status review of the northern leatherside chub which will determine whether the petition action is warranted. If the USFWS determines that the petition action is warranted, it generally will propose a rule to list the species under the ESA and take public comment on the proposal. The USFWS may also determine that the petition action is not warranted. Therefore, the northern leatherside chub currently is not protected under the ESA, but has the potential to be protected in the future. No critical habitat has been designated for the northern leatherside chub or other species in the project area.

The greater sage-grouse was observed less than 3 miles north and east of the project area during field baseline studies. The USFWS determined that the greater sage-grouse warrants protection under the ESA; however, the USFWS has determined that proposing the species for protection is precluded by the need to take action on other species facing more immediate and sever extinction threats. Therefore, the greater sage-grouse has been placed on the list of species that are candidates for ESA protection. As such, the USFWS will review the status of the greater sage-grouse annually, as it does with all candidate species (USFWS 2010).

3.8.2 BLM Special Status Species

The BLM special status species include those species officially listed, proposed for listing, or candidates for listing as threatened or endangered under the ESA; species of special concern; and species designated by the BLM State Director as sensitive. The BLM Special Status Species Management Manual requires that sensitive species be managed so they will not need to be listed as proposed threatened or endangered, with the same level of protection as candidate species. In accordance with the BLM policy, no actions that are authorized, funded, or carried out by the BLM will contribute to the need for sensitive or candidate species to be federally listed (BLM 2006a).

There are five ranking types for special status species, with two slightly different protocols for plants and animals (**Table 3.8-1**).

Table 3.8-1 BLM Special Status Species Ranking

Type	Vegetation Category	Wildlife Category
1	Threatened, Endangered, Proposed, and Candidate Species	Threatened, Endangered, Proposed, and Candidate Species
2	Rangewide/Globally Imperiled Species – High Endangerment	Range-wide/Globally Imperiled Species
3	Rangewide/Globally Imperiled Species – Moderate Endangerment	Regional/State Imperiled Species
4	Species of Concern	Peripheral Species
5	Watch List	Watch List

Source: BLM 2006a

The BLM special status animal species with the potential to occur in the project area was determined by review of the Idaho BLM special status animal species list (IDFG 1997). **Table 3.8-2** summarizes which species have the potential to occur in the project vicinity, habitat preferences, and if the species has been documented in the project area.

Table 3.8-2 BLM Special Status Animal Species that Do/May Occur in the Vicinity of Project Area

Species	Habitat Preferences	Documentation in Project Area
Type 1		
Bald Eagle (*Haliaeetus leucocephalus*) *(Note the BLM special status classification for the bald eagle has not been reclassified since it was federally delisted.)*	Forested areas adjacent to fish-bearing waterbodies	One breeding pair with three nests documented in the northern portion of the project area
Type 2		
American White Pelican (*Pelecanus erythrorhynchos*)	Open water	Observed during field baseline studies and documented by Idaho Conservation Data Center
Pygmy Rabbit (*Brachylagus idahoensis*)	Low- and mid-elevation shrub	None
Greater Sage-grouse (*Centrocercus urophasianus*)	Low- and mid-elevation shrub, and dry conifer	Observed >3 miles north and east of the project area during field baseline studies
Northern Leopard Frog (*Rana pipiens*)	Riparian	Observed during field baseline studies

Table 3.8-2 BLM Special Status Animal Species that Do/May Occur in the Vicinity of Project Area

Species	Habitat Preferences	Documentation in Project Area
Yellowstone Cutthroat Trout (*Oncorhynchus clarki bouveri*)	Water	Documented in project area
Type 3		
Townsend's Big-eared Bat (*Plecotus townsendii*)	All habitats near water with appropriate roosting habitat such as nearby cliffs, rocks, snags, and cave features	None
Trumpeter Swan (*Cygnus buccinator*)	Open water	IDFG data documented observation adjacent to the project area
Peregrine Falcon (*Falco peregrinus anatum*)	Riparian, cliffs	None
Prairie Falcon (*Falco mexicanus*)	Low- and mid-elevation and shrub mountain, cliffs	Observed during field baseline studies
Northern Goshawk (*Accipiter gentilis*)	Dry conifer, aspen-conifer mix, and wet/cold conifer	None
Ferruginous Hawk (*Buteo regalis*)	Low- and mid-elevation shrub, especially on cliffs	Observed during field baseline studies
Columbian Sharp-tailed Grouse (*Tympanuchus phasianellus columbianus*)	Seedings (perennial grasses), mountain shrub, and riparian	None
Black Tern (*Chlidonias niger*)	Marsh/wetlands	Documented by Idaho Conservation Data Center
Flammulated Owl (*Otus flammeolus*)	Dry conifer and aspen-conifer mix	Observed during field baseline studies
Calliope Hummingbird (*Stellula calliope*)	Aspen-conifer mix and riparian	None
Williamson's Sapsucker (*Sphyrapicus throideus*)	Dry conifer, aspen/aspen conifer mix and wet/cold conifer	None
Willow Flycatcher (*Empidonax trailii*)	Riparian	Observed during field baseline studies
Hammonds's Flycatcher (*Empidonax hammondii*)	Dry conifer, aspen-conifer mix, and wet/cold conifer	None
Olive-sided Flycatcher (*Contopus borealis*)	Dry conifer and wet/cold conifer	Observed during field baseline studies
Sage Sparrow (*Amphispiza belli*)	Low- and mid-elevation shrub	None
Brewer's Sparrow (*Spizella breweri*)	Low- and mid-elevation shrub	Observed during field baseline studies
Common Garter Snake (*Thamnophis sirtalis*)	Dry conifer, aspen/aspen conifer mix, mountain shrub, and riparian	Observed during field baseline studies
Western Toad (*Bufo boreas*) – Northern Rocky Mountain Group only	From sea level to more than 11,811 feet in wide variety of habitats such as desert springs and streams, meadows and woodlands, and in and around ponds, lakes, reservoirs, and slow-moving rivers and streams.	None
Leatherside Chub (*Cila copei*)	Water	None
Type 4		
Kit Fox (*Vulpes velox*)	Low- and mid-elevation shrub	None
Uinta Chipmunk (*Tamias umbrinus*)	Found at about 6,560 to 11, 155 feet in coniferous forests, often near logs and brush in open areas, and at edge of forests.	Documented by Idaho Conservation Data Center
Type 5		
Yuma Myotis (*Myotis yumanensis*)	Upland and lowland habitats, usually found near open water	None

Table 3.8-2 BLM Special Status Animal Species that Do/May Occur in the Vicinity of Project Area

Species	Habitat Preferences	Documentation in Project Area
Long-eared Myotis (*Myotis evotis*)	Typically found in forested areas, but also found in shrublands, meadows, wooded streams, and reservoirs, roosts near water	None
Long-legged Myotis (*Myotis volans*)	Montane coniferous forests, riparian	None
Western Small-footed Myotis (*Myotis ciliolabrum*)	Mountainous, wooded areas	None
Swainson's Hawk (*Buteo swainsoni*)	Forested or shrub areas adjacent to riparian zones	Observed during field baseline studies
Blue Grouse (*Dendragapus obsurus*)	Coniferous forests, mostly open with a mix of deciduous trees and shrubs	Observed during field baseline studies
Long-billed Curlew (*Numenius americanus*)	Open, recently grazed shrub steppe	Observed during field baseline studies
Wilson's Phalarope (*Phalaropus tricolor*)	Freshwater marshes and wet meadows	None
Northern Pygmy-owl (*Glaucidium gnoma*)	Dense forests or open woodlands in foothills and mountains	None
Great Gray Owl (*Strix nebulosa*)	Coniferous and hardwood forests, or second growth habitat	None
Short-eared Owl (*Asio flammeus*)	Prairies, meadows, tundra, moorlands, marshes, savannas, dunes, fields, and open woodlands	Observed during field baseline studies
Boreal Owl (*Aegolius funereus*)	Mixed conifer, spruce/fir, Douglas-fir, and aspen stands	None
Western Burrowing Owl (*Speotyto cunicularia*)	Sagebrush steppe and agricultural lands	None
Red-naped Sapsucker (*Sphyrapicus nuchalis*)	Coniferous/deciduous forests that include aspen and cottonwood	Observed during field baseline studies
Cordilleran Flycatcher (*Empidonax occidentalis*)	Riparian woodlands, aspen forests, coniferous forests, shrub steppe	None
Pinyon Jay (*Gymnorhinus cyanocephalus*)	Pinyon/juniper woodlands, scrub oak, sagebrush	None
Sage Thrasher (*Oreoscoptes montanus*)	Sagebrush steppe	None
Green-tailed Towhee (*Pipilo chlorurus*)	Thickets, chaparral, shrublands, riparian scrub	Observed during field baseline studies
Brewer's Blackbird (*Euphagus cyanocephalus*)	Shrub, riparian woodlands, aspen parklands, cultivated lands, marshes, human habitation areas	Observed during field baseline studies
Cassin's Finch (*Carpodacus cassinii*)	Open, montane coniferous forests	None

Sources: Greystone 2006c, ICDC 2009

BLM special status plants that have the potential to occur within the project area were determined from review of the Pocatello Field Office list of the BLM sensitive plant species and the habitat preferences for each of these species. After reviewing the species' habitat requirements, nine sensitive plant species were determined to potentially occur in the project area (Greystone 2006a). These species and their associated habitats are described in **Table 3.8-3**.

Table 3.8-3 BLM Special Status Plant Species that Do/May Occur in the Vicinity of the Project Area

Species	Habitat Preference	Documentation in Project Area
Hoary willow (*Salix candida)*	Wet, hummocky, quaking swamp/meadows or fens, with low shrubs (*Salix planifolia and Salix candida dominate*) occupying the hummocks, and sedges (*Carex aquatilis, C. rostrata and others*) dominating in the standing water between hummocks. Soil typically consists of a layer of peat 1 decimeter or more thick, overlying wet silty muck more than 1 meter deep. Known sites are located in broad, open valley bottoms with mountain sagebrush and low sagebrush on the upland. Hoary willow has a close affinity with calcareous fens.	Observed during field baseline study in the project area
Birchleaf mountain-mahogany (*Cercocarpus montanus)*	Normally found on warm, dry, rocky ridges or plateaus on all exposures, but primarily western or southern aspects.	None
Idaho sedge (*Carex parryana ssp. Idahoa)*	Usually found in narrow transition zones between wet meadow vegetation of *Juncus balticus*, *Carex microptera*, and *Eleocharis* spp. and upland vegetation dominated by *Artemisia cana* and *Elymus trachycaulus*.	None
Purple meadow-rue (*Thalictrum dasycarpum)*	Moist woods and meadows.	None
Spotted joe pye weed *(Eupatorium maculatum var. bruneri)*	Swamps and other moist open places.	None
Meadow milkvetch (*Astragalus diversifolius)*	Moist soils in alkaline meadows with flat or hummocky topography supporting graminoid or medium-height shrub vegetation. Associated species may include *Juncus balticus, Poa secunda, Leymus cinereus, Spartina gracilis, Senecio debilis, Phlox kelsyi, Glaux maritima, Sarcobatus vermiculatus*, and *Potentilla fruticosa.*	None
Foothill sedge (*Carex tumulicola)*	Grasslands, open slopes, and dry meadows.	None
Green needlegrass *(Nassella viridula (=Stipa viridula))*	Habitat is fairly common, occupying canyon bottoms and flats in the Artemesia zone.	None
Western sedge (*Carex occidentalis)*	Occasional to frequent in dry habitats, generally at middle elevations, but extending upward to subalpine or alpine areas.	None

Source: Greystone 2006a

One BLM sensitive plant species was observed in the project area. A population of hoary willow was identified in Wetland X in the northwestern portion of the project area (**Figure 3.4-1**). The population consists of at least 37 individuals in a 2,167-square-meter area. No other occurrences of this species were observed outside of this location within the project area. However, habitat exists for this species throughout Wetland X, and there is potential for it to occur beyond the current population boundary. There is also a population of hoary willow outside of the project area, located to the southeast in Section 34 (**Figure 3.6-2**) (BLM 2006a).

Suitable habitat for the Idaho sedge occurs in Township 7 South, Range 42 East, Section 22. Despite apparently suitable habitat, no occurrences of Idaho sedge were observed during surveys conducted in 2005 (Greystone 2006a).

3.9 VISUAL RESOURCES

Scenic landscapes contribute to the quality of life for local communities, and can provide economic benefits to communities when they provide high quality, scenic settings for outdoor recreation experiences. Tourism, including opportunities for outdoor recreation, is an important part of the Caribou County economy.

The project area for visual resources includes all of the area within and outside of the mine site that would provide views of project activities. Visual resources vary by location and include existing natural features including vegetation, water features, landforms and geology, and human-made elements.

3.9.1 BLM Visual Resource Management System

The BLM Pocatello Field Office Draft RMP and EIS describes the management of public lands administered by the Pocatello Field Office in southeastern Idaho. The overall planning goal for all visual resources, as identified in that document, is to maintain scenic qualities consistent with the management of resources and uses. The objective for the goal is to manage visual resources according to established guidelines for Visual Resource Management (VRM) classes. Management actions to implement the objective and meet the goal include: 1) manage public lands according to the VRM class designations; 2) use the visual resource contrast rating system during project-level planning to determine whether or not proposed activities meet VRM objectives; and 3) identify mitigation measures to reduce visual contrasts with rehabilitation actions identified to address landscape modifications on a case-by-case basis.

The BLM is responsible for confirming that the scenic values of public lands are considered before allowing uses that may have negative visual impacts. A visual contrast rating process is used for this analysis, which involves comparing the project features with the major features in the existing landscape including landform and water features, vegetative features, and structural features. For a potential management activity on public lands, the VRM system is used to analyze potential visual impacts and apply visual design techniques to confirm that surface-disturbing activities are in harmony with their surroundings. VRM classes, which range from Class I to Class IV, are used as indicators to determine whether actions would be consistent with established objectives for preserving the visual value or scenic quality of the landscape.

The visual resources of public lands within and in close proximity to the mine site have been assigned to VRM Class IV by the BLM Pocatello Field Office. The Class IV objective is to provide for management activities that require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high.

As described by the BLM, the visual impact analysis involves determining whether the potential visual impacts from proposed surface-disturbing activities or developments would meet the management objectives established for the area, or whether design adjustments would be

required. A visual contrast rating process is used for this analysis, which involves comparing the project features with the major features in the existing landscape. The affected environment would describe the landscape setting of the project area and identify existing features, such as landform and water features, vegetative features, and structural features. Key viewing areas, visual exposure, and sensitivity to changes in the landscape would also be identified. Lease stipulations were reviewed to identify any visual resource stipulations that would supplement the BLM's VRM objectives.

3.9.2 Landscape Character Description

Landscape character creates a "sense of place" and describes the image of an area. The Blackfoot Bridge Mine site, which is the land area within the proposed project area boundary, would be located along the east margin of the Blackfoot Lava Field, at the base of and partially within the northern extent of the Aspen Range. The mine site to the south of the haul road, which crosses through the site at the base of the Aspen Range, is on upper and lower east-facing slopes of the Aspen Range. The Blackfoot River is in close proximity to the north boundary of the mine area. The project area contains hilly terrain, the elevation of which ranges from 6,160 feet amsl at the Blackfoot River Valley floor to more than 7,240 feet amsl at the crest of the Aspen Range. The project area is bound by the peaks and upper slopes of the Aspen Range along the west side to the south and southeast of the mine area and by the Fox Hills to the east and northeast of the mine site. The landscape to the northeast consists of the flat to rolling terrain of the Blackfoot River Valley and the lava field. There are no naturally occurring distinguishable exposed soils and rock outcrops within the project area.

The rolling ridges of the project area are covered with a mixture of vegetation. The northern aspects, along higher ridges, are vegetated with conifer-aspen, and the foothills are vegetated with sagebrush interspersed with aspen. The valley bottoms are a mix of sagebrush and grass. Intermittent drainages in the mine area drain east and north to the Blackfoot River. The Blackfoot River drainage, north of the mine site, has dense vegetation that is riparian in the drainage bottom and coniferous on the upper slopes of the Aspen Range.

The existing landscape character of the mine site does not contain landforms that are unique to the region. The vegetation patterns, which consist of conifer-aspen, sage, and grasses, are also common to the region. There are no outstanding water characteristics or cultural features within the project area.

3.9.2.1 Existing Visual Modifications

The characteristic landscape within and around the project area is predominantly natural and rural in character. Land uses that provide the rural component of the landscape character include summer grazing, logging, and mining. Man-made features related to grazing consist of corrals, fences, roads, and stock-watering ponds. Modifications related to phosphate production dominate the landscape to the south of, but adjacent to, the project area. The inactive Conda Mine disturbance occupies an estimated 1,504 acres. The active Conda Phosphate Plant is a large complex to the southwest of the project area. P4's Elemental Phosphorus Plant is located at Soda Springs, Idaho.

The project area's landscape exhibits some modification of the natural character from past mineral exploration, including drilling and trenching, and from facilities related to current mining operations located outside of the mine site. A paved haul road used to transport ore from an active mining area to P4's Elemental Phosphorous Plant crosses through the project area. Paralleling this road is a railroad and a high-power transmission line.

3.9.3 Key Viewing Areas

Key viewing areas include all critical locations where the proposed mine site would be visible to the public. There are only a limited number of these, and they are described below. Typical key viewing areas include travel corridors, key vista points, recreation areas, and residential areas.

Views of the project area are limited from any potential viewing areas that are visited or otherwise used by the public, as the project area is surrounded by mountain ranges and rugged terrain. However, the northern portion of the project area is on the relatively flat valley bottom between the Blackfoot River and the haul road, and is exposed to views from areas to the northwest. The project area includes portions of the Blackfoot River, the Blackfoot River Special Recreation Management Area (SRMA), State Highway 34, and three volcanic domes (China Hat, China Cap, and North Cone) to the east of State Highway 34, at the south end of Blackfoot Reservoir. Blackfoot River Road, the haul road, and Trail Canyon Road are travel routes that provide access to the mine area. Kermit Park (formerly Blackfoot River Park) is located on Blackfoot River Road about 1.5 miles northwest of the proposed mine site, as shown on **Figure 3.9-1**.

The Blackfoot River SRMA contains 14,720 acres of public lands along a 34-mile segment of the Blackfoot River and along Wolverine Creek. The portion of the SRMA closest to the mine site is the Blackfoot Reservoir. Developed recreation sites in the SRMA include the Blackfoot Reservoir Campground (formerly Dike Lake Campground) (PLIC 2008), which is located at the south end of the Blackfoot Reservoir, approximately 4 miles northeast of the proposed mine site. The China Cap and North Cone domes block views of the mine site from the campground.

Kermit Park is located next to the Blackfoot River approximately 0.5 mile northwest of the mine site boundary east of State Highway 34 on Blackfoot River Road. The park provides fishing access to the Blackfoot River. There are no intervening landforms in views from the park towards the proposed mine site; however, the park is lower in elevation than the proposed mine site, and dense, relatively tall willows block views of most of the proposed mine site.

Residences in the project area with limited views of the proposed mine site are located on State Highway 34 north of the junction with Blackfoot River Road. There are only four or five residences with views of this area, and some of these are used seasonally. Views toward the proposed mine site would be very similar to the views experienced by visitors to Kermit Park.

3.9.3.1 Key Observation Points

Two Key Observation Points (KOPs) were selected to represent views of the proposed mine site as seen by the public on travel corridors and recreation areas.

KOP 1 is located at the junction of State Highway 34 and China Cap Road. China Cap Road provides access to the China Hat geological site. The KOP represents viewers who would have a concern for scenic quality as seen from the Bear Lake-Caribou Scenic Byway (State Highway 34), visitors to the geological site, and other motorists traveling on the highway. The KOP faces southeast and provides a view of the northwest portion of the proposed mine site, as shown on **Figure 3.9-2**.

KOP 2 is located just east of Kermit Park on Blackfoot River Road. The view is to the south-southeast as seen by motorists on the road and visitors to the park. Most of the proposed mine site is screened by the low ridge shown on Figure 3.9-3 and the lower slopes of the Aspen Range.

3.9.4 Viewer Sensitivity

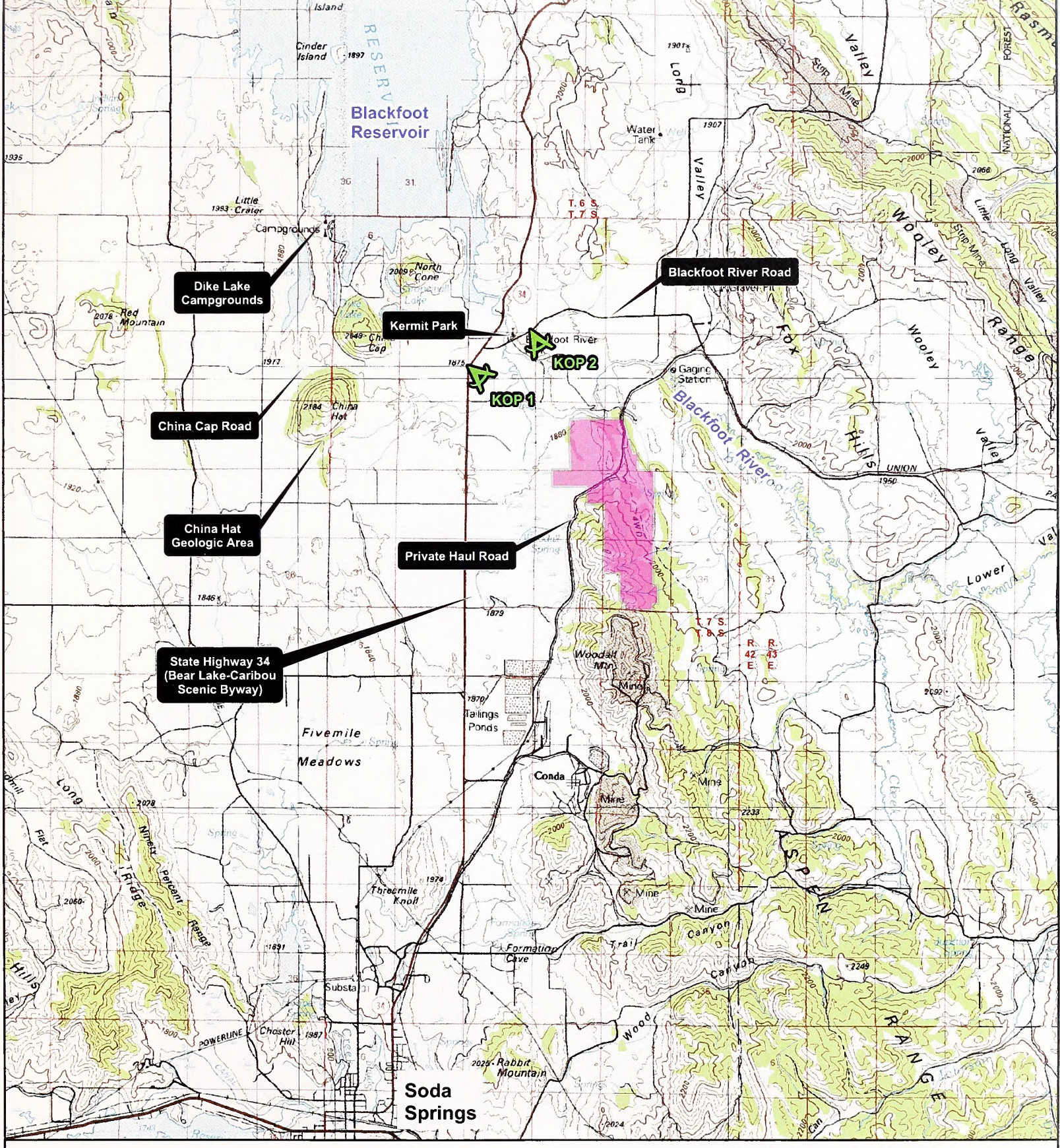
Sensitivity levels measure public concern for scenic quality. Public lands are assigned high-, medium-, or low-sensitivity levels by analyzing the various indicators of public concern. Factors that are considered in assigning visual sensitivity levels include type of users, amount of use, public interest, adjacent land uses, and the occurrence of special areas that may be protected for scenic values.

Public use of the BLM, county, and private roads within the project area is low for most of the roadways, with motorists falling into the categories of local ranchers and residents, and mine personnel on the haul road. Hunters may also use the roads for access to public lands during seasonal hunting activities. Other recreational users would include sightseers on State Highway 34 and Blackfoot River Road, picnickers at Kermit Park (Blackfoot River County Park), recreationists at the SRMA, and hikers at the summit of China Hat. Most recreation users would have a high level of concern for the scenic quality of the landscape setting. In general, residents and other users of the region are accustomed to viewing existing mineral resource development, but could be sensitive to increased levels of development. Residents with potential views of mine operations are likely to have a high level of concern for scenic quality and changes in the characteristic land use.

In general, many motorists on State Highway 34 and Blackfoot River Road who are passing through the viewshed would likely have relatively low levels of concern for changes in the landscape within the mine site, primarily because the mine site would be within the viewshed of a motorist for a relatively brief period of time, the mine site would be located more than 1 mile from motorists on the roads, and it would not likely draw the attention of many motorists. Some recreational sightseers on State Highway 34 and the Blackfoot River Road may have a high-sensitivity level to any changes in visual quality. As stated above, there are only four or five residences located in this area.

3.10 LAND USE AND ACCESS

The Blackfoot Bridge study area includes the project area and adjacent land that is accessed by roads that also access the project area. The roads include Blackfoot River Road east of the junction with State Highway 34, the haul road between the Conda phosphate operations to the south and Blackfoot River Road, and Trail Canyon Road.



Source: USGS 1:100,000 Soda Springs Quadrangle

LEGEND

BLACKFOOT BRIDGE MINE AREA

NORTH

1 0.5 0 1 2

Miles

BLACKFOOT BRIDGE PROJECT EIS

FIGURE 3.9-1
Recreation Areas and Key Observation Points

ANALYSIS AREA: Caribou County, Idaho	
Date: 6/16/2009	File: I:\..\1924\KOP.mxd
Prepared By: JG	

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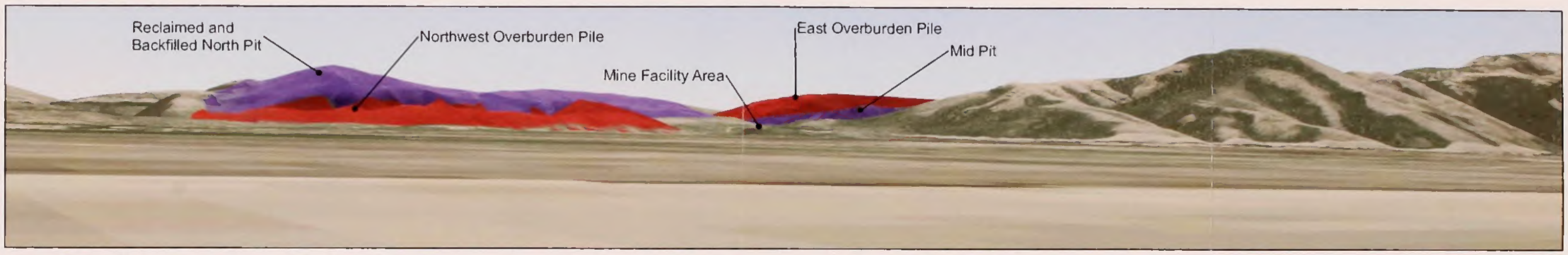
KOP 1: Existing Condition
KOP 1 is located at the junction of State Highway 34 and China Cap Road. The KOP faces southeast and provides a view of the northwest portion of the mine site.



Digital Terrain Model
This model is an interim step that uses GIS to place facilities in the landscape. The pits are shown as purple, and the overburden piles are shown as red. The model depicts the contours of the terrain in year 16, prior to reclamation for some of the mine site. The North Pit will be completely reclaimed prior to year 16.

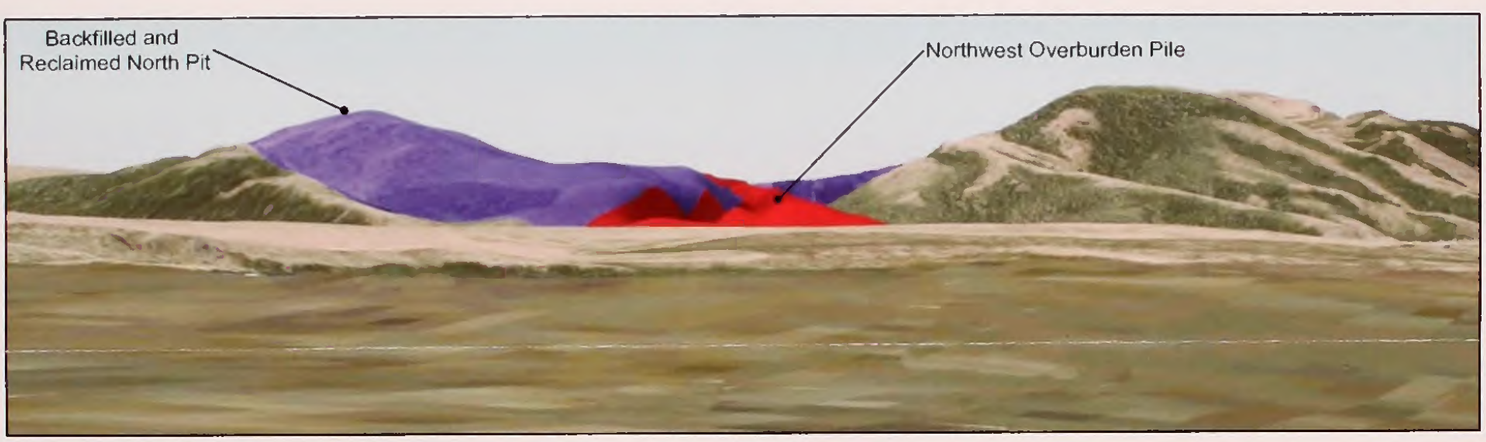
KOP 1: Simulation
The North Pit and Northwest Overburden Pile are visible from the KOP. The north part of the Mid Pit and East Overburden Pile are also visible. Views of the South Pit are blocked by intervening terrain. The pits are shown in the simulation as a dark brown color. The overburden piles are shown as a light brown color.

BLACKFOOT BRIDGE PROJECT EIS

FIGURE 3.9-2
Key Observation Point 1

ANALYSIS AREA: Caribou County, Idaho	
Date: 6/29/2009	File: 1924\Simulation_KOP1.mxd
Prepared By: JG	Layout: Simulation_KOP1.pdf

KOP 2: Existing Condition
KOP 2 is located east of Kermit Park on the Blackfoot River Road. The view faces south-southeast towards the mine site.



Digital Terrain Model
This model is an interim step that uses GIS to place facilities in the landscape. The pit is shown as purple, and the overburden pile is shown as red. The model depicts the contours of the terrain in year 16, prior to reclamation for some of the mine site. The North Pit will be completely reclaimed prior to year 17.

KOP 2: Simulation
The North Pit and adjacent Northwest Overburden Pile would be visible from the KOP. Views of the South Pit are blocked by intervening terrain. The pit is shown as a dark brown color, and the overburden pile is shown as a light brown color.

BLACKFOOT BRIDGE PROJECT EIS

FIGURE 3.9-3
Key Observation Point 2

ANALYSIS AREA: Caribou County, Idaho	
Date: 6/29/2009	File: 1924\Simulation_KOP2.mxd
Prepared By: JG	Layout: Simulation_KOP2.pdf

3.10.1 Ownership

The project area encompasses 1,469 acres of land and the total disturbance from the Proposed Action would be approximately 739 acres. The project area contains private and federally owned surface. The land ownership of the proposed disturbance area includes 76 acres of federally owned surface administered by the BLM. Private surface, which accounts for 663 acres of disturbed area, is owned by six private landowners. Most of the private surface (744 acres) within the project area is currently owned by P4. The remaining 504 acres are owned by the J.R. Simplot Company, Torgesen Ranch, Anderson, Dredge, and Keetch 61 Ranch. The privately owned surface is on split-estate land with minerals administered by the BLM.

The project area is within the Aspen Range Known Phosphate Lease Area (KPLA). Two Federal Phosphate Leases (I-05613 and I-013709) are associated with the project. The project area is divided by P4's existing paved haul road, used to transport ore from the active mining area to P4's Soda Springs Elemental Phosphorus Plant. Paralleling this road is the Union Pacific Railroad's Dry Valley Branch, used to access mine facilities in the Wooley and Dry Valley areas, including a high-power transmission line owned by Rocky Mountain Power. The proposed mine would occupy areas on both sides of the road, rail, and power line corridor.

3.10.2 Grazing Management

The Taylor Grazing Act of 1934 created grazing districts throughout the west. Grazing districts are further divided into grazing allotments in order to provide for the orderly administration and proper grazing use of public lands. Allotments may include private, state, USFS, or public lands, or a combination thereof. Two grazing allotments fall within the project area: Woodall Mountain and Woodall Springs (**Table 3.10-1**). Both allotments include private and BLM-administered land. Most of the southern portions of the project area are covered by these two allotments (**Figure 3.6-1**).

Table 3.10-1 Grazing Allotments

Allotment Name	Allotment Number	Number and Class of Livestock/Season of Use	Animal Month Units (AMUs)	Total Acres/BLM acres	Acres in Project Area
Woodall Mountain[1]	04554	3,000 sheep May 16 to September 30	63 Sheep; 153 Sheep Suspended	1,611/ 1,186	491
Woodall Spring[2]	04338	400 Cattle May 15 to September 30	57 Cattle	6,883/ 420	226

Notes:
[1] BLM 2006a
[2] BLM 2008b

The Draft BLM Pocatello RMP (BLM 1987) livestock grazing objective B-LG-1.2 is intended to maintain a thriving ecological balance and multiple use management consistent with Idaho Standards for Rangeland Health. To meet this objective, Action B-LG-1.2.8 of the RMP identifies allotments that would be closed indefinitely to sheep grazing due to elevated levels of selenium in water and plants. Approximately 1,180 acres (or 71 percent) of the 1,670-acre Woodall Mountains grazing allotment are closed indefinitely to sheep grazing due to elevated

levels of selenium in water and plants. The RMP specifies that this closure would remain in place until selenium can be reduced to acceptable levels through containment or capping.

3.10.3 Recreation

3.10.3.1 Recreation Use and Management

Public lands administered by the BLM Pocatello Field Office provide a wide variety of year-round dispersed recreational opportunities. Dispersed activities, such as hunting, fishing, and other outdoor activities, account for most recreation uses in Caribou County. The study area for the analysis of impacts to recreation use and management is the mine site (project area) within the project area boundary, and lands that provide recreation opportunities accessed by roads which also provide access to the project area from State Highway 34. These roads include the Blackfoot River Road, the haul road (private access only), and Trail Canyon Road. However, there is limited public access opportunity on land adjacent to the project area. This public land is isolated, with no public access without trespass.

There is little developed recreation in the study area, which is located along the northern extent of the mountainous Aspen Range and in the flat, expansive Blackfoot Lava Field. The Blackfoot River is close to the north boundary of the mine area. The developed site nearest to the mine is Kermit Park (formerly Blackfoot River Park), located about 1.5 miles northwest of the project area. The park provides fishing access to the Blackfoot River. Other developed recreation in the general vicinity of the study area includes facilities at the Blackfoot Reservoir Campground (formerly Dike Lake Campground), located 3 miles to the northwest of the project area. The China Hat geological site, located approximately 3 miles west of the project area, does not provide developed facilities. These sites are depicted on **Figure 3.9-1**.

A broad spectrum of dispersed recreation occurs year-round on state and federal lands in the county. The major recreational uses of the BLM Pocatello planning area include, but are not limited to, fishing, hunting, camping, off-highway vehicle (OHV) use, mountain biking, hiking, horseback riding, cross-country skiing, wildlife viewing, pleasure driving, snowmobiling, and motorized and non-motorized boating. Numerous four-wheel-drive roads traverse the area and provide opportunities for dispersed activities. Most recreation on public lands in the county is concentrated in the SRMA, which includes Blackfoot Reservoir Campground (formerly Dike Lake Campground) and several camps along the Blackfoot River downstream from the Government Dam.

Recreation uses in the study area consist primarily of sightseeing, fishing, dispersed camping, and hunting. Recreation use is generally light until the hunting season, primarily because of limited public access.

Hunting is a major recreation and treaty right use of the study area. The general big game hunting seasons occur from late August through mid-December, depending on the method. Elk, deer, moose, and game birds occur in suitable habitat throughout the study area. The IDFG manages big game populations in hunt units. The study area is within hunt unit 76. Hunters with private landowner permission enter the area near the proposed mine from the Blackfoot River Road to the north and from Trail Canyon Road to the south.

There is a great variety of year-round fishing opportunities in southeast Idaho. Most fishing within or near the study area occurs on the nearby Blackfoot River and the Blackfoot Reservoir. The Shoshone-Bannock Tribes have reserved treaty rights that they exercise to fish on unoccupied public lands in the area.

State Highway 34 north of Soda Springs is part of the Bear Lake-Caribou Scenic Byway. This route is shared by the Pioneer Historic Byway. Both were designated as Idaho State Scenic Byways by the Idaho Transportation Department (ITD). The byway provides views of the project area, as discussed in the visual resources affected environment section.

3.10.3.2 Special Designations

Public land in the BLM Pocatello Field Office planning area with special designations include Wilderness study areas, Areas of Critical Environmental Concern (ACECs), Research Natural Areas, Watchable Wildlife Areas, Wild and Scenic Rivers, and Historic Trails. None of these areas occur within the project area or the study area. The nearest area with a special designation is the Formation Springs Research Natural Area, which is located 6 miles south-southwest of the project area.

3.10.4 Existing Land Uses

The Shoshone-Bannock Tribes have reserved treaty rights, which they exercise to hunt, fish and gather on unoccupied public lands in the study area. The existing land uses within the study area include commercial mining, timber, domestic livestock grazing, and dispersed recreation. The current and historical land use for both the federal and state lands within the project area is primarily rangeland used for livestock grazing.

Previous disturbances in the project area include extensive exploration activities dating back to 1956 (BLM 2004b). Exploration for mining purposes included drilling and trenching. The total number of drill holes in the project area is unknown; however, 43 exploratory holes were drilled between 2004 and 2006. There were 14 trenches excavated in the Blackfoot Bridge area (BLM 2004b). An estimated 70 percent of exploration activities that occurred in 2005 to 2006 occurred in forested areas consisting of mixed subalpine forest, mixed conifer/deciduous forest, aspen stands, or lodgepole forest.

The inactive Conda Mine is adjacent to the southern boundary of the project area. The mine site extends over a 1,700-acre area, most of which (about 1,500 acres) is disturbed. This area was mined for phosphate by various operators between 1906 and 1984. The Conda Mine site included a town site and a mill in addition to underground and surface mine workings. J.R. Simplot Company acquired the mine in 1960 and operated it until 1984. Currently, there is no active mining at the site, and the Town of Conda no longer exists. In 2008, the J.R. Simplot Company entered into an agreement with state and federal agencies to investigate contamination at the Conda Mine. Parties to the AOC are J. R. Simplot Company, IDEQ, EPA, and BLM. The AOC outlines how the site will be investigated under state law and the federal CERCLA regulations. The agreement requires the J.R. Simplot Company to perform an RI/FS to look for and assess contamination from mining and the town site and to evaluate the associated threats to human health and the environment. It also requires that possible cleanup alternatives be identified and evaluated. The final RI/FS work plan for the Conda Mine was submitted to the

agencies in September 2008 (NewFields 2008). Site investigations for the RI/FS are currently ongoing.

The Conda Phosphate Plant, owned by Agrium Inc., is located southwest of the project area, and is also accessed by the haul road. The plant produces phosphate fertilizers from phosphate ore obtained from Agrium's Dry Valley Mine, located about 15 miles north of the production facility. The ore is shipped to the plant by rail between the months of April and November each year (Agrium 2008). The railroad crosses through the project area along the haul road.

Approximately 93 percent of the BLM Pocatello Field Office planning area is open to grazing by either cattle or sheep (BLM 2006a). The public lands within the project area are currently used for livestock grazing under the Woodall Spring and Woodall Mountain grazing allotments. Woodall Spring allotment is permitted for 57 Animal Unit Months (AUMs), and is used for grazing cattle. One AUM is equal to the amount of forage used to support one cow and one calf for 1 month (approximately 800 pounds of forage). Woodall Mountain is permitted for 216 AUMs; however, 153 AUMs are suspended, so that there 63 active AUMs on this allotment, which is used for grazing sheep. The season of use for both allotments is May 16 through September 30.

3.10.5 Land Use Planning and Controls

The BLM Pocatello Resource Area Office administers approximately 613,800 acres of surface land in the Pocatello Resource Area, as well as federal mineral leases within the project area. Conditions for approval and mitigation measures may be applied to all federal mineral leases in the mine area. A lease is an authorization to possess and use public land for a fixed period of time. A phosphate lease conveys the exclusive rights to explore for and extract the phosphate resources contained in the lease, subject to existing laws and regulations. The term of a phosphate lease is indeterminate and is in effect as long as rents, royalties, and other lease requirements are met.

There are no other land use authorizations including rights-of-way and permits. There are no lands in the project area or adjacent lands accessed by existing project area roads that are special designation/management areas, or areas that are designated high priority for disposal.

3.10.5.1 Caribou County Land Use Planning

The majority of the study area is on private lands. Land use controls for private lands in Caribou County include the *Caribou County 2006 Comprehensive Plan* (Plan) and the Caribou County Zoning Ordinance (Ordinance). The Land Use Plan element of the *Caribou County 2006 Comprehensive Plan* provides a framework within which to make land use decisions that would guide the intended use of the land in the planning area. None of the goals specifically guide development of mineral resources on split-estate lands (Caribou County 2006).

The county zoning districts map shows that the study area is within the Agriculture Natural Resource (ANR) zoning district (Caribou County 2008). According to the Caribou County Zoning Ordinance, the ANR zoning district is to maintain agricultural land and that land with natural resources including range, farming, and forestry lands. Industrial or commercial occupancies are not allowed in this district. Mineral extraction operations are not included in the

list of allowable uses of the ANR district. The Ordinance indicates that the Planning and Zoning Commission would decide the status of any use that is not specifically mentioned (Caribou County 2008). However, mineral extraction on split-estate lands is regulated by the BLM.

3.10.6 Access and Transportation

The study area is served by a well-developed regional road system that provides ready access from Soda Springs, which is located about 11 road-miles southwest of the proposed mine site. The primary route to access the study area is State Highway 34, which connects to Soda Springs and U.S. Highway 30 to the south. The highway north of Soda Springs is a two-lane paved road that connects to Blackfoot River Road. Blackfoot River Road connects to a private and gated unnamed road that extends southeast from the Blackfoot River Road at Kermit Park to the project area. The project area can be also be accessed from the private haul road, which connects to State Highway 34 north of Soda Springs, and accesses the Conda operations to the south of the project area (**Figure 3.9-1**). This haul road is for private access only. State Highway 34 also provides access to the Blackfoot Reservoir west of the study area and to Gray's Lake National Wildlife Refuge, north of the study area.

3.11 CULTURAL RESOURCES

Cultural resources include archaeological and historical manifestations of past human activity and traditional cultural concerns. These resources may be important for their associations with events or persons important in cultural tradition or history; may be important manifestations of art, architecture, or typical traditional patterns; or may be likely to yield important information regarding past technologies, settlement patterns, subsistence strategies, or other research questions important in history or prehistory. Primarily under the mandates of NEPA (NEPA, P.L. 91-190; 40 U.S.C. 1500-17.7; 42 U.S.C. 4321-61) and the National Historic Preservation Act (NHPA, P.L. 95-515; P.L. 102-575; 16 U.S.C. 470-470t) and their principal implementing regulations (40 CFR Part 1 and 36 CFR Part 800), federal agencies are required to consider the effects of actions that they undertake, fund, or sanction on important cultural resources. Significant cultural resources are defined as sites, objects, or districts that are eligible for or listed on the National Register of Historic Places (NRHP) under the Criteria for Eligibility (36 CFR Part 60.4). Additional laws and regulations including, but not limited to the Archaeological and Historic Preservation Act (P.L. 93-291; 16 U.S.C. 469-469c), the Federal Land Policy and Management Act (PL 94-579), the American Indian Religious Freedom Act (AIRFA; P.L. 95-341; 42 USC 1996 and 1996a; 43 CFR Part 7), the Archaeological Resources Protection Act (P.L. 96-95; 16 U.S.C 470aa-470mm; P.L. 100-555; P.L. 100-588), and the Native American Graves Protection and Repatriation Act (P.L. 101-601; 104 Stat. 3048; 25 U.S.C. 3001; 43 CFR Part 10) may apply to the consideration of certain resources. In general, the preferred alternative for treatment of significant cultural resources is avoidance and protection.

3.11.1 Prehistoric Context

Southeastern Idaho is in the Snake and Salmon River culture area of the northern Great Basin (Butler 1986). The project area is in the Central Rocky Mountains at the edge of this culture area, and comparative materials of the Mountain Tradition must also be considered. The prehistory of the region is typically divided into three broad periods: (1) Paleoindian; (2) Archaic; and (3)

Protohistoric. Each of these periods is characterized by distinct artifact types and by different settlement and subsistence patterns. The distinguishing characteristics of each of these periods are discussed below.

Paleoindian Period (ca. 12,000 to 7,800 years ago). The Paleoindian Period is divided into two sub-periods based on hafted biface technologies and evidence of subsistence patterns. These periods are the Llano or Fluted Point (ca. 12,000 to 10,500 years ago) and the Plano (ca. 10,500 to 7,800 years ago). The best-known hafted bifaces or point types of the Llano sub-period are the Clovis and Folsom fluted points. Clovis and Clovis-like points have been found at a number of sites in southeastern Idaho, but not in securely radiocarbon dated contexts. Clovis points predate Folsom and in other areas, including the Big Horn Basin of Wyoming, have been found in association with late Pleistocene mammoth remains. Folsom points are often associated with late Pleistocene forms of bison, somewhat later than the mammoth remains. They have been found in well-dated deposits at Owl Cave in southeastern Idaho, as well as a number of surface sites. The Plano Period, which spanned nearly 3 millennia, is comparatively well represented in southeastern Idaho. This period is represented by a wide range of large point styles that are distinct from the earlier fluted points. The fauna associated with these sites are more diverse than is typical of Llano sites, but includes modern and early Holocene forms of bison.

Archaic Period (ca. 7,800 to 300 years ago). The Archaic Period is distinguished from the Paleoindian Period by distinctive stemmed (Pinto series) and notched (Bitterroot Side-notched and Elko series) point types and evidence of a broader resource base. The shift from the larger lanceolate-shaped points of the Paleoindian to smaller-stemmed and notched points is believed to be related to a change in hafting technology. Ground-stone artifacts and small animal remains are also found at many sites, suggesting use of a wider range of resources. The Archaic Period is subdivided into three sub-periods: (1) Early Archaic (7,800 to 4,500 years ago); (2) Middle Archaic (ca. 4,500 to 1,300 years ago); and (3) Late Archaic (ca. 1,300 to 300 years ago). These cultural periods are characterized by biface technologies and shifts in patterns of settlement and subsistence. The Early Archaic is marked by the appearance of distinctive large side-notched and bifurcate-stemmed points. The typical point types include Bitterroot Side-notched, Pinto series, and Elko series. There is no evidence of a substantial shift in subsistence practices. Groups remain highly mobile and retain a focus on hunting large game, similar to the earlier Paleoindian Period. The Middle Archaic is marked by an increase in the frequency of bifurcate-stemmed (Pinto and Gatecliff series), large corner-notched (Elko series), and lanceolate (Humboldt series) points, and a decrease in the frequency of Bitterroot Side-notched. Earth oven features are also commonly associated with sites of this period. Later, in the Middle Archaic, large corner-notched points and small point types become more abundant. The Late Archaic Period is marked by ceramics and small triangular and side-notched points. At least two cultural groups, the Fremont and the Shoshonean, are represented by these remains. Many contemporary Fremont groups in Utah are horticulturalists, and ceramics are often thought of as a marker of sedentary horticulturalists. However, current evidence indicates that the northern Fremont were hunter-gatherers. Shoshonean occupation is marked by brown-ware ceramics, desert side-notched points, and Cottonwood triangular points. These Numic cultural groups were also mobile hunter-gatherers with ceramics.

Protohistoric Period (ca. 300 years ago to historic). The Protohistoric Period is marked by the influence of the European market system and the appearance of European artifacts. One of the

most conspicuous influences on cultural change was the horse. The horse made new hunting techniques possible and increased the potential range of hunting forays. At the same time, the demands of horse herds for water and forage limited potential settlement locations. The Shoshonean horse cultures of the Protohistoric Period in this region were the predecessors of the historic Shoshone and Bannock. As in other regions, conflicts between encroaching Euroamericans and indigenous cultures led to displacement of the indigenous cultures and establishment of the reservation system. The Fort Hall and Wind River Reservations were established in 1867 and 1868. Even though the native groups have relinquished legal ownership of the lands outside the reservations, they continue to actively use the lands and resources to the extent possible, retain traditions and connections with the lands and maintain connections with sacred sites. These sacred sites include burials, rock art, monumental rock features, natural features, rock structures or rings, sweat lodges, timber and brush structures, eagle traps, and prayer and offering localities. Much of the landscape itself figures prominently in the identity and traditions of the native groups, and sacred places are not necessarily defined by archaeological remains.

The phosphate resource that has been targeted for mining occurs in the Meade Peak Member of the Permian-aged Phosphoria Formation, which is overlain by the Rex Chert Member of the same formation. Chert and porcellanite facies of the Phosphoria Formation farther east in the Bighorn and Pryor Mountains produce distinctive cherts and porcellanites that were highly valued by prehistoric populations as raw material for manufacturing stone tools. In general, the chert and porcellanite that occurs in the chert facies of the Phosphoria Formation in extreme western Wyoming, Utah, and southeastern Idaho is fossiliferous and impure (Miller 1991). These western varieties of Phosphoria cherts have not been identified in archaeological assemblages. Cultural resource inventories in the project area have not identified any culturally modified Phosphoria chert or porcellanite. Evidently, the chert and porcellanite in these deposits that were reasonably accessible to primitive technology was not of adequate quality to be attractive for stone tool manufacture.

3.11.2 Historic Context

The earliest documented accounts of Euroamericans in southeastern Idaho are of fur trappers and explorers in the early 1800s. By the 1840s, emigrants to the West Coast were following the trails identified by the earlier explorers and fur trappers. The Hudspeth Cutoff of the Oregon and California Trail passed through Soda Springs. In the 1860s, Mormon pioneers established settlements in southeastern Idaho. The discovery of gold in the Idaho panhandle in 1861 brought an influx of miners, and a regional mining boom continued into the 1890s. From 1870 to 1920, Soda Springs was a major supply point for mining camps in the Caribou Mountain area. With the building of the transcontinental railroad in the 1860s, railroad workers entered the region. Tie hack camps supplied ties for the transcontinental railroad, and the timber industry supplied the mines and the growing towns. Even though the timber resources of southeastern Idaho are not as abundant as in other parts of the state, they have played a key role in the development of the region. Cattlemen entered the region in the 1860s to supply the mines and eastern markets. Although sheep had been brought into the region along the emigrant trails, large herds were not established in Caribou County until the 1890s. The mining opportunities and railroad construction also attracted Chinese emigrants, and later, Japanese. Some homesteading took

place in southeastern Idaho in the 1890s and early 1900s, but many of those homesteads failed in the 1920s and 1930s and reverted to federal control.

3.11.3 Previous Studies and Known Resources

A baseline cultural resources inventory was completed for the Blackfoot Bridge Mine project (Juell 2004). The study included a records search and overview and a report of pedestrian survey of the lease area. The pedestrian survey covered most of the proposed mine permit area. In 2007, two small blocks of land (83 acres) were added to the project, and in 2008, an additional two blocks (15 acres) were added. Both of these additional areas were surveyed by the BLM Pocatello Field Office Archaeologist (Lapp 2007, 2008).

The pre-field records search for the baseline cultural resources inventory identified no previous cultural resource inventories and no previously recorded cultural resource sites within 1 mile of the project area (Juell 2004). Researchers did find four single-page reconnaissance reports prepared for portions of the lease area in 1975. The baseline pedestrian surveys located and recorded six cultural resource sites within the project area. The sites consisted of one large prehistoric camp (10CU260), one small prehistoric lithic scatter (10CU262), one isolated prehistoric artifact (10CU261), one historic land survey marker (10CU258), one historic farming and ranching site (10CU259), and one cobble wall of undetermined age (10CU263). One of these sites (10CU260) was recommended eligible for the NRHP. Two sites were recommended potentially eligible and further evaluation was recommended. The remaining three sites were recommended not eligible. The BLM and the Idaho State Historic Preservation Office (SHPO) concurred that site 10CU260 is eligible, that sites 10CU259 and 10CU263 are potentially eligible, and that sites 10CU258 and 10CU262 are not eligible. In addition, SHPO recommended that the isolated prehistoric artifact (10CU261) remain unevaluated until tested. Site 10CU259 contains artifacts and materials indicating use from the 1920s through the 1940s and is located within the homestead parcel patented by Bernard Latrille in 1927. This site may include the areas of improvement used to secure the homestead patent. Site 10CU260 is a large prehistoric camp that includes chipped stone tools, ground stone artifacts, fire-cracked rock (FCR), processed and burned animal bone, and freshwater shell fragments. The site extends beyond the lease area and was not fully defined. No temporally diagnostic materials were identified, but the well-preserved bone and shell were interpreted as indicating a Late Prehistoric component. Site 10CU263 is a cobble wall located on the side of a ridge overlooking a steep draw. The orientation and setting of this feature were interpreted as indications that this may have been a hunting blind. The additional small surveys (Lapp 2007, 2008) found no historic properties or other cultural resources. Further evaluation was completed for sites 10CU259. 10CU261 and 10CU263 (Späth 2009). These sites were recommended to be not eligible and the BLM and SHPO concurred. The Lapp (2008) survey included most of the additional acreage for Alternatives 1A and 1B in the south end of the project area. A small area of private land that has not been surveyed (less than 10 acres) is on extremely steep, west-facing slopes that have a very low potential for in situ cultural resources. Slopes this steep (greater than 30 percent grade) are generally excluded from survey.

3.12 TRIBAL TREATY RIGHTS AND INTERESTS

The NHPA and its implementing regulations (36 CFR 800) require consultation with federally recognized Indian tribes to identify traditional cultural properties and consider potential effects on such properties as a result of a federal undertaking. In addition, AIRFA, Executive Order (E.O.) 13175: Consultation and Coordination with Indian Tribal Governments, and E.O. No. 13007: "Indian Sacred Sites" contain requirements for consulting with tribes on the potential effects of federal actions on Tribal interests. Traditional Cultural Properties (TCPs) are cultural sites of religious or cultural importance that may also be eligible for the NRHP because of their importance in the traditions and cultural identity of a cultural group. Areas of traditional use may include areas used to gather plants, animals, or fish for subsistence or for ceremonial or medicinal purposes. The National Register Bulletin No. 38 provides guidance for identification and evaluation of such TCPs and traditional use areas.

In addition, in the 1868 Fort Bridger Treaty, between the United States and the Shoshone and Bannock Tribes, the Tribes reserved the right to hunt, fish, gather, and exercise other traditional uses and practices on unoccupied federal lands. In addition to these rights, the Shoshone and Bannock Tribes have the right to graze Tribal livestock and cut timber for Tribal use on those lands of the original Fort Hall Reservation that were ceded to the federal government under the Agreement of February 5, 1898, ratified by the Act of June 6, 1900. The project area is not within the area ceded to the federal government under the Agreement of February 5, 1898.

The federal government has a unique trust relationship with federally recognized American Indian Tribes including the Shoshone and Bannock Tribes. The BLM has a responsibility and obligation to consider and consult on potential effects to natural resources related to the Tribes' treaty rights, uses and interests under the federal laws, executive orders, and treaties noted above. Resources or issues of interest to the Shoshone and Bannock Tribes that could have a bearing on their traditional use or treaty rights include Tribal historic and archaeological sites, sacred sites and TCPs, traditional use sites, fisheries, traditional use plant and animal species, vegetation (including noxious and invasive, non-native species), air and water quality, wildlife, access to lands and continued availability of traditional resources, land status, and the visual quality of the environment (additional information is provided for these resources in other resource sections of this chapter). The BLM recognizes the Shoshone-Bannock Tribes Policy for Management of Snake River Basin Resources including the Tribes' determination to pursue and promote efforts to restore the Snake River systems and affected unoccupied lands to a natural condition, and their desire to ensure the protection, preservation, and enhancement of tribal treaty rights and interests. The BLM is engaged in government-to-government consultation with the Tribes.

3.13 SOCIAL AND ECONOMIC CONDITIONS

This section describes the existing socioeconomic structure of Caribou County and the Town of Soda Springs including population, economy, housing, and community services. Available socioeconomic data were collected from local and state government sources. The primary sources of information were various Idaho Department of Commerce (IDC) and U.S. Census data.

Counties in southeast Idaho and western Wyoming are expected to provide a portion of the workforce at the Blackfoot Bridge Mine. Therefore, Caribou County Bear Lake County to the south of Caribou County, Bannock County to the west, and Lincoln County in Wyoming to the east comprise the analysis area for socioeconomic resources. The analysis focuses in greater detail on Caribou County because the proposed mine site is located in Caribou County, and the majority of effects to existing social and economic conditions would occur in the county including effects to community services and fiscal impacts. The majority of population and employment effects would occur in Caribou County because it is likely that the majority of mine employees would reside in the county.

The communities located nearest to the mine site are the City of Soda Springs (the Caribou County seat) and the Town of Grace, which is located 8 miles southeast of Soda Springs. Mining and related industries comprise the economic base of the county, and are a major source of employment for workers residing in both communities. The two communities are the largest in Caribou County, and together account for nearly 60 percent of the population in the county. Cities with the easiest access to Soda Springs and the mine site are located along U.S. Highway 30. These include Montpelier and Pocatello. The City of Montpelier in Bear Lake County is nearly 30 miles southeast of Soda Springs on U.S. Highway 30. Pocatello is located nearly 60 miles northwest in Bannock County. Several small communities along the highway and connecting roads are within a 1- to 1.5-hour commuting distance of the mine site.

3.13.1 Population

Historically and currently, population trends in the analysis area have been tied to resource development, particularly mining and agriculture.

Caribou County has lost and gained population in the last 20 years, reflecting the fluctuations of mining and agriculture in the local economy. In the years between 1980 and 1990, the population of the county decreased by 19.9 percent. The population grew to 7,304 people in 2000, an increase of 4.9 percent over the 1990 population (IDC 2007), but was still 16 percent less than the 1980 population. By 2007, the population declined by 6.1 percent, a marked contrast to the nearly 16 percent growth in the State of Idaho. The overall decline between 1990 and 2007 was due to downturns in agriculture and mining industries. Population changes over time are shown in **Table 3.13-1**. Population fluctuations in Bear Lake County have followed a similar pattern. Bear Lake County experienced steeper declines in population than Caribou County, primarily because of mine closures. According to the IDC (2007) and Idaho Department of Labor (2008a, 2008b), populations fluctuated in Bannock, Bear Lake, and Caribou Counties because the loss of family-wage jobs forced people to find suitable employment elsewhere.

Soda Springs is the largest community in the county, accounting for 40.4 percent of the county population in 2007 (U.S. Census 2008a). The urban population in the county is nearly 64 percent of the total population. Population density in the county is sparse at 3.8 persons per square mile. Caribou County had one of the lowest growth rates in Idaho between 2000 and 2007, ranking 39th out of Idaho's 44 counties (U.S. Census 2008a).

The City of Montpelier accounted for 40.4 percent (2,370) of the Bear Lake County population in 2007. The city lost nearly 15 percent of the population between 2000 and 2007.

Table 3.13-1 Population Growth in Analysis Area Counties and the State of Idaho, 2000 - 2007

	1990		2000		2007	
	Population	Growth (%)	Population	Growth (%)	Population	Growth (%)
State of Idaho	1,006,734	-	1,293,953	28.5	1,499,402	15.9
Caribou County	6,963	-	7,304	4.9	6,862	-6.1
Soda Springs	3,111	-	3,381	8.7	3,098	-8.4
Grace	973	-	990	1.7	941	-4.9
Bear Lake County	6,084	-	6,411	5.4	5,863	-8.5
Montpelier	2,656	-	2,785	4.9	2,370	-14.9
Bannock County	66,026	-	75,565	14.4	79,925	5.8
Fort Hall Reservation[1]	5,114	-	5,762	12.7	NA	NA
Pocatello	46,080	-	51,605	12.0	54,572	5.7
Lincoln County, WY	12,625	-	14,573	15.4	16,171	11.0

Note:
[1] Includes reservation and trust lands. Many of the individuals on the Tribal census may also be included in the census figures for Bannock County and surrounding areas.
Source: Idaho Department of Labor 2008a; U.S. Census 2010a, 2010b (Fort Hall Reservation)

Caribou County's 2007 demographic estimate (U.S. Census 2008a) indicates that the majority of the residents are between the ages of 20 and 64 years, which is the age group that comprises most of the county labor force. The median age is 39.5. In addition, residents of Caribou County comprise a fairly homogenous population, with a very low percentage of minorities. There are only minor variations in the age distribution and racial characteristics of the counties in the analysis area. **Table 3.13-2** illustrates the age distribution for each county in the analysis area.

Table 3.13-3 illustrates the racial distribution in the counties in the analysis area. The 2007 population of each county is predominantly white, as shown in **Table 3.13-3** (U.S. Census 2008a). Minority groups in most of the analysis area constitute a small percentage of the total population. The Fort Hall Indian Reservation in Bannock County, north of Pocatello, accounts for the greater proportion of the American Indian racial group shown for Bannock County relative to the other counties in the analysis area, as shown in **Table 3.13-3**. There were no other areas identified in the analysis area that consisted of predominantly minority populations.

Table 3.13-2 Age Distribution in Analysis Area Counties (2007)

	Caribou County		Bear Lake County		Bannock County		Lincoln County, WY	
Age	Number	% of Total	Number	% of Total	Number	% of Total	Number	% of Total
0-4	482	7.0	389	6.6	7,213	9.0	1,264	7.8
5-19	1,526	22.2	1,362	23.2	18,061	22.6	3,444	21.3
20-44	1,872	27.3	1,514	25.8	27,785	34.8	5,008	31.0
45-64	1,965	28.6	1,633	27.9	18,638	23.3	4,469	27.6
65+	1,017	14.8	965	16.5	8,228	10.3	1,986	12.3

Source: U.S. Census 2008a

The U.S. Census in 2000 included an estimate of the number of people of all ages in poverty for Caribou County. Approximately 694 people, or 9.6 percent of the total population, had incomes below the poverty level in the county in 2000. In 2005 (the most recent year data are available at

the county level), an estimated 782, or 11.2 percent of the 2005 population of 6,954, had incomes below the poverty level. There were no concentrations of residents below poverty level identified in the county; however, rural populations in southeast Idaho generally experience higher rates of poverty than urban areas (IRP 2006).

3.13.2 Economy and Employment

According to the Idaho Financial Management Division (IDFM 2008), the 1980s ushered in a long economic expansion in the state. Non-farm employment has expanded every year since 1987, resulting in a large population increase of nearly 29 percent from 1990 to 2000. The economic expansion results from ongoing structural changes in Idaho's economy. However, in Caribou County, the economy continues to depend on traditional resource industries. Mining, agriculture, and manufacturing experienced downturns in the late 1990s, but have shown some recovery based on employment increases in the late 2000s.

Historically, the mining sector has been characterized by boom-bust cycles, which reflected the downturns and upswings of the mining industry. Tourism has increased in the last decade, which has contributed to diversification of the economy, adding employment in various service and trade sector businesses (Idaho Department of Labor 2008b). Gains and losses in sector employment between 1997 and 2007 indicate that the county economy continues to increase in diversity and is less dependent on natural resource industries. The largest employment sectors in 2007 were manufacturing, government, and mining. The largest gains in employment between 1997 and 2007 were in financial activities and business and professional services. The total number of workers employed in the county increased by more than 6 percent between 1997 and 2007; however, the number of workers employed in the construction, mining, and manufacturing sectors decreased in 2007 from 1997 levels, and the overall share of total employment by these sectors also declined. Manufacturing in Caribou County is dependent on the mining sector, as it includes phosphate products manufactured within the county that are produced from phosphate ore mined in the county. The mining industry in Caribou County employs workers from surrounding counties in southeast Idaho and counties in neighboring Wyoming. The employment and labor force characteristics summarized for Caribou County include county residents who may be employed outside of the county, and do not reflect the number of workers from neighboring counties. **Table 3.13-4** summarizes the number of employees and average annual wages for economic sectors in all counties of the analysis area. The average annual wage in Caribou County is substantially higher than the average wage in Bear Lake and Bannock Counties, which reflects a larger proportion of jobs in the mining industry. Although current mining operations in Caribou County draws from the Lincoln County, Wyoming labor force, the employment spread and annual wages in Lincoln County reflect the close proximity to Jackson, Wyoming, which provides high-paying construction jobs relative to construction employment in southeast Idaho.

Employment opportunities in the tourism and recreation industries are seasonal, consisting of employment related to hunting in late summer/fall months and in other seasonal recreation industries. Employment opportunities in the agriculture industry are also seasonal. Agricultural employment declined for part of the last decade, but saw increases starting in 2004 in crop production and cattle ranching. In 2007, unemployment rates ranged from a low of 2.4 percent in November to a high of 3.1 percent in July. The unemployment rate has declined from a high of

7.5 percent in 1994 to the 2007 unemployment rate of 2.8 percent, a result of the increasing diversity of economic sectors providing employment in the county that offsets the fluctuations in mining and agriculture industries. The overall trend has been a decrease in the unemployment rate; however, a high of more than 6.0 percent all occurred in 1998 and 2002-2004. The 2007 unemployment rate for Caribou County (2.8 percent) is only slightly higher than the unemployment rate of 2.7 percent for the State of Idaho. **Table 3.13-5** summarizes labor force characteristics for all counties in the analysis area between 1997 and 2007.

The Caribou County economy is heavily dependent on phosphate mining and manufacturing and agriculture. The February 2008 unemployment rate of 2.1 percent is an indicator of improving employment conditions, which include ongoing new phosphate mining operations and increasing diversity in the economy (Idaho Department of Labor 2008a). Increased tourism over the last decade has attracted growth in the service and trade sectors, contributing to the reduction in unemployment.

In Bannock County, mining operations decreased in the last decade, leading to a loss in relatively high-paying jobs in the county. However, food manufacturing and construction activity increased because of the construction of manufacturing facilities that have relocated to the county.

Job losses in nearby Caribou County in 2003, where many Bear Lake County residents worked, contributed to a rise in unemployment and the consequent loss in population. Many Bear Lake County residents are currently employed in occupations related to large gas and oil exploration firms operating in neighboring Utah and Wyoming. The employment rates do not reflect economic conditions that have resulted in the loss of relatively high-paying jobs in the mining industry in the early part of the decade. A general shift towards jobs that pay lower wages led to an increasing number of workers holding more than one job to maintain an acceptable living standard (IHFA 2001). However, by 2007, mining employment increased in Caribou County, reflecting increasing opportunities in the phosphate mining industry.

P4 is a subsidiary of Monsanto Company, which is the largest of Caribou County's phosphate mining and manufacturing businesses. P4's mine, quarry, and manufacturing plant employs approximately 375 full-time direct employees and an additional 395 full-time, part-time, and temporary contract employees. P4 employees commute from distances as far north as Idaho Falls, Idaho and as far south as Smithfield, Utah.

The majority of jobs at P4 facilities are classified in the areas of mining, manufacturing, and construction. Pay rates at P4 average $64,333, which is more than three times the average annual household income in Caribou County of $20,619.

3.13.3 Housing

The U.S. Census annual estimates for housing estimates a total of 3,270 housing units in Caribou County in 2007, which is an increase of 2.4 percent from the Census 2000 housing unit estimate of 3,188 (U.S. Census 2008b). There were 3,597 housing units in Bear Lake County in 2007. Housing characteristics are not provided for the 2007 housing unit estimates, but are included in the Census 2000, and are summarized in **Table 3.13-6**. Census 2000 estimates that 2,034 units, or 63.8 percent, are owner-occupied. Of the total units in 2000, 1,505 housing units are in Soda Springs, and 389 units are in Grace.

Table 3.13-3 Racial Composition in Analysis Area Counties (2007)

Race	Caribou County		Bear Lake County		Bannock County		Lincoln County, WY	
	Population	% of Total	Population	% of Total	Population	% of Total	Population	% of Total
White	6,766	98.6	5,760	98.2	74,329	93.0	15,806	97.7
Black or African American	5	0.1	20	0.3	643	0.8	30	0.2
American Indian or Alaskan Native	17	0.2	40	0.7	2,429	3.0	105	0.6
Asian	12	0.2	7	0.1	1,043	1.3	42	0.3
Native Hawaiian or Other Pacific Islander	11	0.2	3	0.1	153	0.2	8	0.0
Two or More Races	51	0.7	33	0.6	1,328	1.7	180	1.1
Totals	6,862		5,863		79,925		16,171	
Hispanic or Latino*	313	4.6	193	3.3	4,430	5.5	588	3.6

Note:
* Hispanic or Latino Persons may be of any race and are considered an ethnic group rather than a racial group.
Source: U.S. Census 2008a

Table 3.13-4 Employment and Wages by Economic Sector in Caribou, Bear Lake, Bannock, and Lincoln Counties 2007

Economic Sector	Caribou County		Bear Lake County		Bannock County		Lincoln County, WY	
	Average Employment	Average Wages	Average Employment	Average Wages	Average Employment	Average Wages	Average Employment	Average Wages
Total Employment (Covered)	3,216	$40,038	1,636	$22,098	34,892	$29,015	5,553	$44,557
Agriculture	104	$19,150	ND	ND	97	$22,627	22	$20,396
Mining	358	$46,584	ND	ND	26	$41,980	679	$76,109
Construction	251	$46,471	65	$30,054	2,012	$28,975	1,827	$62,363
Manufacturing	692	$78,809	55	$22,085	2,529	$49,113	260	$27,540
Trade, Utilities, & Transportation	51	$23,714	412	$20,758	6,289	$26,203	948	$24,473
Information	22	$16,733	ND	ND	758	$29,970	135	$33,967
Financial Activities	152	$33,563	55	$23,109	1,793	$37,162	127	$32,215
Professional and Business Services	150	$28,436	81	$31,354	5,374	$22,866	215	$43,007
Educational and Health Services	103	$17,102	67	$19,241	3,290	$28,589	271	$15,369
Leisure and Hospitality	132	$7,548	197	$7,764	3,621	$10,638	535	$8,617
Other Services	50	$15,689	35	$13,625	778	$23,351	113	$19,856
Government	683	$26,740	635	$26,441	8,327	$35,893	1,668	$36,227

Source: Idaho Department of Labor 2008b, Bureau of Labor Statistics 2009, Northwest Area Foundation 2008

Table 3.13-5 Labor Force Characteristics in Caribou, Bear Lake, Bannock and Lincoln Counties

	1997				2000				2007			
	Caribou	Bear Lake	Bannock	Lincoln (WY)	Caribou	Bear Lake	Bannock	Lincoln (WY)	Caribou	Bear Lake	Bannock	Lincoln (WY)
Total Labor Force	3,259	2,646	38,619	6,356	3,287	2,987	38,397	7,357	3,332	3,071	40,130	8,844
Employed	3,067	2,527	36,606	5,964	3,124	2,847	36,633	7,072	3,237	3,004	39,048	8,597
Unemployed	192	119	2013	392	163	140	1763.6667	285	94	67	1082.25	247
Unemployment Rate	5.9	4.5	5.2	6.2	4.9	4.7	4.5932508	3.9	2.8	2.2	2.6968714	2.8

Source: Idaho Department of Labor 2008b, 2008c; Wyoming Department of Employment 2009

The available housing stock was slightly greater in Bear Lake County; however, a greater percentage of available homes were seasonal homes, with a correspondingly higher rental vacancy rate.

The Soda Springs Community Review (IRP 2007) was developed to provide recommendations and resources for future planning efforts in the city. The review provides an evaluation of housing in Soda Springs, which comprises most of the available housing stock near the proposed Blackfoot Bridge Mine site. The review identified housing as one of the community barriers contributing to the recruitment and retention of workers. Agrium and P4 reported that close to 50 percent of their workforce reside outside of the county. A lack of housing choice was identified as one factor contributing to the high number of people working, but not living, in Soda Springs. Existing housing stock can be characterized as degraded. The review recommended a Soda Springs/Caribou County Housing Summit that would explore options and strategies for bringing new housing into the community.

Table 3.13-6 Housing Characteristics in Caribou and Bear Lake Counties

	Caribou	Bear Lake
Total Housing Units (2007)	3,270	3,597
Owner Occupied Units1	2,034	1,878
Renter Occupied Units1	526	381
Homeowner Vacancy Rate (percent) 1	2.2	2.8
Rental Vacancy Rate (percent) 1	28.9	12.8

Note:
[1] Most recent occupancy and vacancy data if from 2000 Census
Source: U.S. Census 2008b

3.13.4 Community Services

There are three school districts in Caribou County and one district in Bear Lake County. Communities near the project area are served by two school districts: the Soda Springs District #150 and the Grace District #148. There are five schools in the Soda Springs District #150 with a 2007 fall enrollment of 930 students. According to the Soda Springs Community Review, the Soda Springs School District recently adopted a 4-day school week, which was implemented as a cost containment strategy. In the Grace District #148, there are three schools with a 2007 fall enrollment of 464 students (IDE 2008). The nearest adult education is provided through the College of Southern Idaho, a community college in Twin Falls, or Idaho State University in Pocatello.

The Caribou County Sheriff's Department in Soda Springs and the Idaho State Highway Patrol provide law enforcement for Caribou County. The Sheriff's Department also provides a volunteer group for search and rescue. Law enforcement in Soda Springs is provided by the Soda Springs Police Department, which employs a staff of seven full-time officers (IDC 2006). The Sheriff's Office opened new jail facilities in Soda Springs in 2005 (CCSO 2008).

Fire protection services in Soda Springs are provided by the Soda Springs Fire Department, which is manned by a combination of paid and volunteer personnel (IDC 2006). Fire protection in Grace is provided by a volunteer fire department (GCC 2008). Caribou County also has a

volunteer fire department that serves the areas outside of Soda Springs and Grace and would also assist either of the city fire departments.

The Caribou County Hospital and Nursing Home in Soda Springs provides comprehensive health care facilities, including a full-service hospital with 27 beds, emergency care, industrial testing, and 24-hour ambulance service. The hospital also provides a 43-bed skilled nursing home. There are also a variety of health practitioners and specialists in the area (CMH 2008).

The Rocky Mountain Power Company provides residential electricity in Caribou County. Each community has a water transmission and distribution system. Water system service in rural Caribou County is supplied primarily by wells or other authorized suppliers.

Soda Springs is served by its own wastewater treatment facility. The Town of Grace has a sewage disposal facility that is capable of providing treatment for a population of 2000, more than double the current population. The landfill nearest to the communities is the Caribou County Landfill located near Grace.

3.13.5 Public Finance

Public finance activities, lease fees, taxes, and other fees paid to the federal, state, and local entities, impact Caribou County, the State of Idaho, and the federal government. None of the proposed facilities are located within Bear Lake, Bannock, or Lincoln Counties.

The taxes and royalties assessed on mineral development and production are an important source of revenue for the State of Idaho and local governments including Caribou County. The mining industry pays rent, royalties, and bonuses on federal leases, mine license taxes to the State of Idaho, and local property taxes on production equipment.

Property taxes on P4-owned property generate approximately $600,000 annually. P4 contractor property accounts for another $550,000, and property of P4 employees is assessed to generate another $664,000. These numbers total for a combined annual property tax impact of approximately $1.8 million to the county and are allocated on an annual basis to the various departments and programs.

P4 property taxes are the single largest fiscal component of a phosphate industry that is responsible for 52 percent of the revenue in the tax base of Soda Springs School District #150. In addition to property taxes, P4 pays approximately $1.3 million annually in royalties, fees, and other taxes, of which 90 percent goes to schools and 10 percent goes to Caribou County. Each of these taxes is distributed among federal, state, and local governments according to varying formulae.

There are currently three active phosphate mines in Idaho, all located in Caribou County east and northeast of Soda Springs. Blanchard (2002) listed the Dry Valley Mine, the Smoky Canyon Mine, the Enoch Valley Mine, and the South Rasmussen Mine as active at that time, but also listed the Enoch Valley Mine as in the process of closure. The majority of receipts from mining fees, leases, and permits that originate in Caribou County are from phosphate mining production. Revenues earned by the State of Idaho from phosphate royalties and phosphate leases also originate in Caribou County (Minerals Management Service 2008). In Fiscal Year (FY) 2007,

the total reported royalty, including rents and bonuses, revenue from phosphate operations in Idaho was $2,297,912.

A mine license tax of 1 percent is collected by the state for the value of ores mined or extracted. In FY 2007, the state collected revenues of $3,569,792 from the mine license tax, an increase of 781.8 percent from the 2006 revenues of $404,811 (ISTC 2008a).

Property taxes are levied by Caribou County on facilities and/or improvements constructed by companies. The average 2000 tax rate for rural areas in Caribou County was 1.034 percent (ISTC 2008b).

3.14 ENVIRONMENTAL JUSTICE

U.S. Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations) directs federal agencies to assess whether the Proposed Action or alternatives would have disproportionately high and adverse human health or environmental impacts on minority and low-income populations.

The Blackfoot Bridge Mine site is located in a sparsely populated rural area of Caribou County. No distinct population groups have been identified in proximity to the proposed mine expansion site. The Fort Hall Indian Reservation is more than 25 air miles west of the mine site. The nearest community is Soda Springs, 10 road miles southwest of the site.

The 2000 U.S. Census provides population characteristics for Census Tracts, which contain Block Groups that are further divided into blocks. The blocks are the smallest Census area that contains the race characteristics of the population in Caribou County and that contain poverty level information. The proposed mine site area contains all or a portion of three blocks (Blocks 3013, 3014, and 3017) within Block Group 3 of Census Tract 9602 in Caribou County; however, there are no poverty data for individual blocks within each Block Group. Block Group 3 contains the mine site, as well as a portion of south-central Caribou County east of State Highway 34, south of the Blackfoot River, and west of Slug Creek including part of the city of Soda Springs.

Caribou County was selected to be the geographic area to compare the demographic data for the population in the affected Block Group. This determination was based on the need for a larger geographic area encompassing the affected Block Group in which equivalent quantitative resource information is provided. The population characteristics of the Block Group are compared with county population characteristics to determine whether there are concentrations of minority or low-income populations in the Block Group relative to the county.

According to the 2000 U.S. Census, the population of the three blocks within Block Group 3 totaled 1,860 people (U.S. Census 2008c). There were no minority populations in the three blocks. Given that the population of the county decreased in the years between the 2000 census and 2007, it is not likely that the 2007 population within the blocks is substantially different from 2000 levels. Block Group 3 has a smaller percentage (6.8 percent) of people living below the poverty level than Caribou County (9.6 percent) (U.S. Census 2008d). The majority of the population in Block Group 3 resides in Soda Springs.

CHAPTER 4

ENVIRONMENTAL CONSEQUENCES

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ENVIRONMENTAL CONSEQUENCES

This chapter discusses anticipated direct and indirect effects of the Proposed Action, Alternatives, and the No Action Alternative. This chapter also describes the Irreversible and Irretrievable Commitment of Resources, and the Residual Impacts from the Proposed Action and Alternatives. As described in **Chapter 1**, the Proposed Action is a lease modification to Phosphate Lease I-05316 and mining of phosphate reserves associated with the Blackfoot Bridge Mine Project.

Impacts are described in terms of context (site-specific, local, or regional effects), duration (short- or long-term), and intensity (negligible, minor, moderate, or major). The thresholds of change for the intensity of an impact are defined as:

- **Negligible** - the impact is at the lowest levels of detection;
- **Minor** - the impact is slight, but detectable;
- **Moderate** - the impact is readily apparent; and
- **Major** - the impact is a severe or adverse impact or of exceptional benefit.

In order to provide the agencies with flexibility in selecting actions out of the many alternatives, the action alternatives are analyzed individually in this chapter. Some of the alternatives are broken down into their components, which are also analyzed separately in this chapter. The Agency Preferred Alternative, identified in **Section 2.6**, is Alternative 1A because it employs measures to satisfy regulatory requirements and reduce potential environmental impacts on regional water quality.

The environmental impacts of each component and alternatives are presented in two ways in the following sections of this chapter. First, the actual impact of each component or alternative when compared to the baseline condition is presented. In most cases, this is the same as the comparison of the impact with the No Action Alternative. Additionally, the impacts are compared with the Proposed Action to provide the reader with an analysis of how the component or alternative would differ from the action proposed by P4.

The potential direct, indirect, and cumulative effects associated with issuance of the lease modification would result in development of the mine on the 300 acres included in the proposed lease modification. Potential impacts described for the proposed mine development would represent the impacts that would occur on land included in the lease modification.

4.1 GEOLOGY, MINERALS, AND PALEONTOLOGY

Issues:

- The depletion of geologic (phosphate) resources; stability of landscape; relocation of rock from original setting.
- The alteration of natural topography.
- The depletion of paleontological resources.

4.1.1 Direct and Indirect Impacts

The primary impact indicators for geologic, mineral, and paleontological resources are the total bcy of ore and overburden mined. The primary indicators for topography are acres of original topography disturbed and lengths and heights of highwalls and road cuts remaining after reclamation is completed.

4.1.1.1 Proposed Action

4.1.1.1.1 Mineral and Geologic Resources

Mineral resources would be directly affected by removal of phosphate ore and overburden. The phosphate resources developed under the Proposed Action would be available to fulfill regional and national demands for this commodity. Under the Proposed Action, deeper phosphate resources remaining after mining in the North, Mid, and South Pits would be uneconomic to remove at the current anticipated prices. Backfilling mined pits would further reduce the potential for future development of these resources. If phosphate prices do increase substantially in the future and the remaining resources are deemed economically recoverable, development may be limited by the need to enlarge the pits and strip additional overburden in addition to removing backfill. If mining did proceed, development of the phosphate resource would eventually be limited by the lease boundaries. Excavations for ore pads, haul roads, and other facilities would have comparatively minor impacts on geologic resources.

Mine Pits

Under the Proposed Action, geologic and mineral resources in the North, Mid, and South Pit areas would be directly affected by the removal of phosphate ore and overburden. Removal of 91 million bcy of overburden would be a long-term, major, local effect on these resources. All phosphate ore recovered from the project area would be transported to the tipple facility for shipment to P4's processing facilities at Soda Springs. Estimated volumes of resources that would be directly affected by pit excavation under the Proposed Action are summarized in **Table 4.1-1**.

Table 4.1-1 Disturbed Volumes of Geologic Resources by Geologic Unit

Geologic Unit	Overburden (percent)	Ore (percent)	Total Volume (million bcy)
Phosphoric Formation			
Rex Chert Member	32.4	0	29.2
Meade Peak Member	Proprietary	100	Proprietary
Alluvium	11.3	0	10.2
Wells Formation/Park City Formation - Grandeur Member	22.1	0	19.9
Rhyolite Tuff	1.0	0	0.9
Total Overburden Volume (bcy)			91
Total Ore Volume (bcy)			Proprietary

Note:
Bcy = Bank Cubic Yard
Source: P4 2009c

Haul Roads

Construction of the haul road outside the South Pit could potentially disturb areas of the Phosphoria and Dinwoody Formations. However, the presence of deep to moderately deep soils in this portion of the project area indicates that impacts would be negligible. The effects on alluvium, colluvium, and rhyolite tuff deposits caused by construction of haul roads in other parts of the project area are considered to be negligible.

Overburden Piles

Under the Proposed Action, construction of the NWOP and EOP would indirectly affect mineral resources by limiting access to said resources. No economically valuable minerals are known to exist under the NWOP. Phosphate resources do exist under the proposed EOP; however, they are at depth (**Figure 3.1-3**), and economic recovery of these resources in the future is unlikely. Impacts to mineral resources due to the construction of the proposed overburden piles are considered to be negligible.

Miscellaneous Facilities

Construction of ore crushing and loading facilities, topsoil stockpiles, railroad crossing, and water control features would directly affect areas of alluvium, colluvium, and travertine deposits. The railroad crossing would require approximately 57,000 cubic yards of fill material. Additionally, borrow material for construction of the WMP1 and WMP2 would consist of limestone materials from either an area located just west of the south end of the North Pit (where the topsoil pile and haul road would be located) or from the southern portion of the Mid Pit. Impacts are considered negligible because these geologic units are widespread through southeastern Idaho, not unique to the project area, and not economically or scientifically important.

Reclamation

Under the Proposed Action, the majority of materials necessary for reclamation are topsoils. Impacts to these resources are discussed in **Section 4.4**. The "Simple 1" cover system proposed for the segregated Meade Peak overburden in the EOP would require approximately 56,000 cubic yards of "weathered alluvium." Because units sampled for cover system modeling include alluvium, loess, colluvium, and residuum, these materials contain a range of textural properties (e.g., grain size distribution, **Table 2.3-3**). By constraining excavation to drainage bottoms, P4 would be specifically targeting alluvium for use in the cover system and also minimizing variation in the material properties of the cover system. Impacts to geologic resources would be moderate, local, and long-term because these resources would be permanently relocated.

4.1.1.1.2 Topography and Stability

Existing topography would be affected under the Proposed Action by the removal of ore, relocation of overburden, and construction of ore staging areas. **Figure 2.3-1** shows the proposed mine facility layout including pits, overburden disposal facilities, and miscellaneous facilities. **Table 2.3-1** identifies the acreage that would be disturbed under the Proposed Action. A total of 739 acres of existing topography would be modified under the Proposed Action including haul roads and topsoil stockpiles. Approximately 74 percent of the overburden volume would be used as pit backfill, reducing the topographic impacts of the open pits. Final reclamation topography is

shown on **Figure 2.3-3**. The location of "weathered alluvium" removed for reclamation is included within the disturbance area for the pits and overburden piles, and impacts to topography would be minimized by the Reclamation Plan.

North Pit

Developing the North Pit and the external overburden pile would require modification of 169 acres of existing topography, not including haul roads. Mining would remove the crest and west flank of the existing knolls north of the haul road. The NWOP would essentially fill in and smooth out the existing topography west of the North Pit. Backfilling the North Pit would initiate in year 7, culminate in year 13, and ultimately approximate the topography of existing landforms. Local topographic impacts of the NWOP would result in extending and widening the ridge that currently exists in the proposed North Pit area. The extension would generally result in widening the natural ridge.

Mid Pit

Development of the Mid Pit would result in modifying 132 acres of existing topography, not including external overburden fill and haul roads. Direct impacts to topography would occur along the crest and east flank of the Aspen Range from Fish Pond, south for approximately 6,000 feet. Backfilling in the Mid Pit would begin in year 5 and conclude in year 14. Final reclamation topography would duplicate the existing northeast-facing slopes through most of the Mid Pit and the minor flat-topped ridge above the existing gravel pit at the north end of the Mid Pit. Some of the minor drainages currently in the Mid Pit area would be mimicked by backfill topography. Steep areas would remain in the area of the highwall on the west edge of the Mid Pit. Based on the extent of initial disturbance and scope of reclamation, impacts to topography in the area of the Mid Pit would be evident during mining and would approximate pre-mining topography after reclamation except along the west edge of the pit.

South Pit

Developing the South Pit would require modification of 106 acres of existing topography, not including external overburden fill and haul roads. Direct impacts to topography would occur along the east flank of the Aspen Range south of the Mid Pit. Backfilling in the South Pit would begin in year 15 and would finish during or shortly after year 17. The South Pit would be partially backfilled and graded to form slopes that are consistent with existing topography. Within the pit, the partial backfill would cover the Meade Peak Member in the pit crotch and would be sloped to the west, allowing runoff to flow across the backfill and infiltrate into the Wells Limestone. Ultimately, the impacts to topography would be the disturbance of existing ridge-and-gully topography and the creation of a 200+ foot deep pit approximately 94 acres in size. Reclamation would restore a portion of the South Pit to original topography. The remaining portion would be reclaimed as an open pit with vegetated bottom and residual highwalls.

East Overburden Pile

Construction of the EOP would result in modifying 141 acres of existing topography. Under the Proposed Action, the EOP would remain in place after portions of it were used to partially backfill the South Pit. Most notably, an area of flat to rolling topography adjacent to the Mid Pit would be modified into a north-south trending oblong plateau, with an elevation of approximately 6,660 feet amsl – approximately 300 feet above the existing topography.

Reclamation of the surface of the EOP would result in a stable slope configuration that would be graded to blend with adjacent, undisturbed landscape.

Haul Roads

Construction of a haul road from the south end of the South Pit to the north end of the Mid Pit and two haul roads along the east and west sides of the North Pit would require modification of 53 acres of existing topography. To maintain adequate gradients, road cuts would need to be excavated along portions of the roads to ensure slope stability and prevent landslides. Approximately 2 acres of road cuts would not be reclaimed. Because the Proposed Action would reclaim the majority of these roads at the end of mining operations, original topography of this portion of the project site would be restored.

There would be slope stability considerations associated with the haul/access roads outside of the mine panels. Landslide-prone soils were identified by Greystone (2006b). These areas were mapped for use in development plans for the haul/access roads. Cutslope stability hazard ratings for road construction were assigned to soil families as applicable. The volume of rock affected by road cuts along a haul road would be minimized by the design and are relatively minor compared to the volume of rock disturbed by mining operations.

Miscellaneous Facilities

Construction of the ore pad, tipple loop and loadout, and equipment yard would require modification of 34 acres of existing topography adjacent to the existing haul road. Most of the excavation would be on the south side of the road. All but 2.6 acres of areas occupied by road and service facilities would be fully reclaimed under the Proposed Action after mining operations have concluded (**Table 2.3-8**). Construction of the topsoil piles would require modification of 36 acres of existing topography. Because all of the topsoil would be utilized during reclamation, topsoil stockpile sites would be reclaimed to approach pre-mining conditions. Water control features (e.g., ponds, ditches) are expected to occupy 67 acres of the project area. Each of these facilities would be reclaimed after mining has ceased (**Table 2.3-8**).

4.1.1.1.3 Paleontology

Paleontological resources are non-renewable resources that can become exhausted. Although fossils are rarely one-of-a-kind, a limited number of specimens are preserved in any geologic formation, and these cannot be used for scientific study if damaged, destroyed, or removed without proper scientific documentation. Ground-disturbing activities could result in a loss of resources or scientific values, unless field survey documents (and removes for study, where necessary) any important paleontological resources that could be affected under the Proposed Action or alternatives. However, the Proposed Action and Alternatives 1A and 1B may also uncover fossil resources that may not otherwise be exposed and make them available for study. The type of impacts to paleontological resources (e.g., potential destruction during ground-moving operations and exposure to weathering) would be similar under each of the action alternatives. The scale of impacts to paleontological resources would be greater under the Proposed Action and Alternatives 1A and 1B, compared to the No Action Alternative, due to volumes of rock that would be disturbed.

Impacts to paleontological resources could occur from the disturbance of the millions of bcy of phosphate ore from the Phosphoria Formation (Meade Peak Member) or 91 million bcy of

overburden from the Phosphoria Formation (Meade Peak and Rex Chert Members), Wells Formation/Grandeur Member of the Park City Formation, rhyolite tuff, and alluvium during mining operations (**Table 4.1-1**). Other geologic units would be impacted by construction of roads and ancillary facilities. Invertebrate fossils in the Dinwoody Formation may be considered scientifically significant. Vertebrate fossils (e.g., Heliocoprion) are considered to be scientifically significant and have moderate to low potential to occur within the Meade Peak Member. Invertebrate fossils from the other geologic units, including the Fishscale Marker bed, are not considered important or restricted to the Blackfoot Bridge Mine area, and are likely to be found throughout the outcrop areas of these formations in southeastern Idaho and adjacent areas.

Due to the low probability of encountering scientifically significant paleontological resources during mining operations, potential effects, such as damaging or destroying important paleontological resources, are not likely to occur under the Proposed Action or alternatives; however, appropriate agency requirements would be implemented. Both surface and subsurface invertebrate fossils could be damaged or destroyed during ground-disturbing activities. Impacts to paleontological resources under the Proposed Action would be negligible, local, and permanent. Discovery of vertebrate fossils or dense accumulations of invertebrate fossils would result in suspension of operations in that area until the appropriate BLM representative, typically the project inspector or Authorized Officer (AO), is notified. The BLM or designated paleontologist will evaluate the discovery and identify what course of action should be taken.

4.1.1.2 Alternative 1A – GCLL Cover System Over Core Materials in EOP and Overburden in Pits

Under the revised Alternative 1A, a low-permeability GCLL cover would be placed over the North, Mid and South Pits and 86 acres within the EOP covering the 35 acres of segregated Meade Peak overburden. Expanded use of the GCLL and Simple 1 cover systems under Alternative 1A would require an increase of about 1 million bcy of cover material for construction compared to the Proposed Action. The source of this additional material would be within the disturbance footprint of the proposed pits and overburden piles. Replacing the Simple 1 cover system with the GCLL cover system across the entire EOP under Alternative 1B would require the same volume of "weathered alluvium" for construction as under Alternative 1A. A modified water management system and other design modifications would also be incorporated, as well as a slightly increased disturbance area. Effects to other geologic, mineral, topographic, and paleontological resources would be similar in scale and extent as under the Proposed Action.

4.1.1.3 Alternative 1B – GCLL over the Entire EOP and Overburden in Pits

Replacing the Simple 1 cover system with the GCLL cover system across the entire EOP under Alternative 1B would require the same volume of "weathered alluvium" for construction as under Alternative 1A. Alternative 1B would place the GCLL cover system over the entire 141 acres of the EOP in addition to the 296 acres of backfilled pits. Thus, impacts to geologic, mineral, topographic, and paleontological resources are expected to be the same as under Alternative 1A.

4.1.1.4 No Action Alternative

Under the No Action Alternative, mining phosphate ore would not be approved under the 2008 Revised Mine Plan currently submitted by P4. P4 would not be allowed to proceed with mining of ore until mining and reclamation plans deemed acceptable by the BLM are developed and

approved. Therefore, there would be no impacts to geologic, mineral, topographic, and paleontological resources. Under the No Action Alternative, the federal phosphate leases would not be developed under this FEIS; however, this does not preclude future development of the federal phosphate leases under a different mine plan.

4.1.2 Irreversible and Irretrievable Commitment of Resources

Under the Proposed Action and alternatives, removal of phosphate ore from the Blackfoot Bridge Mine would represent an irreversible and irretrievable commitment of resources. Similarly, removal of alluvial and associated materials to meet cover system requirements would result in relocation of this material from its natural setting to a new landscape position associated with specific mine components. Relocation of these materials would be irreversible and irretrievable. These resources represent a small percentage of total resources available for future use in southeastern Idaho.

Impacts to the local natural topographic conditions under the Proposed Action and the alternatives would be irreversible and irretrievable. Reclamation activities would restore some disturbed sites to topographic contours that mimic pre-mining conditions and reduce permanent impacts to local topography. Disturbed areas that are not backfilled would remain as long-term impacts to topography.

Any loss of paleontological resources that occurred under the Proposed Action or alternatives would likely be negligible and would be considered irreversible and irretrievable. Any paleontological resources discovered and properly documented by the agencies during operations would not be lost.

4.1.3 Unavoidable Residual Adverse Impacts

Unavoidable residual adverse impacts to mineral resources under the Proposed Action and Alternatives 1A and 1B include the reduction of available phosphate resources. Unreclaimed highwalls and water management facilities and reclaimed overburden piles would represent long-term modifications of local topography. Because there is no way to predict the occurrence of paleontological resources in the subsurface, all impacts resulting from ground-moving activities would be residual and unavoidable under the Proposed Action and Alternatives 1A and 1B. Unavoidable adverse impacts would be expected to be equal under the Proposed Action and Alternatives 1A and 1B, and greater than under the No Action Alternative.

4.1.4 Mitigation Measures

Measures to maximize the ratio of recovered ore to overburden, reduce geotechnical stability concerns, decrease sediment transport and erosion, and decrease leaching and transport of geologic materials are incorporated into project design features, BMPs, and proposed reclamation plans. These measures also are designed to minimize the impacts to local topography. Additional mitigation measures are not deemed necessary.

As part of the mine plan approval process for federal phosphate lease development, BLM requires surveys of all areas where ground-disturbing activity is proposed when important paleontological resources are known to occur. Although potentially important invertebrate fossils

may occur in the Dinwoody Formation within the project area, extensive vegetative cover and a lack of bedrock outcrop minimizes the potential for locating these resources during a survey. The presence of thick soils formed on various geologic units, including the Dinwoody Formation, also reduces the potential for impacts to fossils. Because no additional important paleontological resources are expected to be encountered, no survey is anticipated. Mine plan conditions of approval require protection and prompt reporting of paleontological resources discovered during project activities. Operations must be suspended or moved to protect the discovery until the discovery and mitigation are evaluated.

4.2 AIR RESOURCES, CLIMATE AND NOISE

Issue (Air):

- The potential for emission of air pollutants, including those associated with particulate matter from mining operations and mine traffic on haul roads and access roads.

Issue (Climate):

- Emissions from construction and operation of the project could result in release of CO_2, which has been implicated in climate change.

Issue (Noise):

- The potential for noise impacts at sensitive receptors due to mine operations, mine traffic on haul and access roads, and blasting.

4.2.1 Direct and Indirect Impacts

4.2.1.1 Proposed Action

4.2.1.1.1 Air Resources

The Proposed Action would result in impacts to air quality as a result of mining construction and operational activities. Impacts to air quality include fugitive dust and gaseous emissions that would occur during drilling, blasting, excavation, materials handling, ore crushing and screening, and vehicle operations.

Particulate Emissions from Fugitive Dust Emissions

Particulate matter with a particle diameter of 10 micrometers and smaller (PM_{10}) size range is the measure of dust particulates that are considered respirable. P4 has implemented several measures to control fugitive dust emissions that could result from mining operations. These measures include use of water sprays at the ore crushing and screening operations, use of water sprays or chemical dust suppressants to minimize dust generation from vehicle/equipment traffic on roadways and exposed areas, implementation of a phased mining approach such that excavation, haulage of ore and overburden, placement of materials in overburden piles, backfilling of pits, and capping of overburden and backfill would be timed to minimize the amount of acreage and material exposed to wind and water erosion. The ore and overburden averages approximately 8 percent moisture when extracted. The level of moisture content reduces fugitive dust during mining.

Construction activities, including construction of a haul truck-railroad crossing; ore stockpile area, tipple, and conveying system; ore truck turnaround loop and yard area; water management facilities; and modifying a portion of the main power line, would result in short-term, intermittent impacts to air quality. P4 would use water spray or chemical binding agents on all roads to control fugitive dust.

Estimates of fugitive dust emissions were prepared as part of P4's air quality permit requirements and include emissions from stationary sources. Calculations were prepared using emission factors from EPA's AP-42 (EPA 1995). Stationary sources include screens and crushers. Actual controlled PM_{10} emissions from screens and crushers are estimated to be 0.9 tons per year. Additional fugitive dust sources of PM_{10} emissions are listed in **Table 4.2-1**.

The EPA has established national air quality standards for $PM_{2.5}$ and the proposed location is not designated as non-attainment $PM_{2.5}$. The estimated emissions of $PM_{2.5}$ from fugitive dust and point sources are included in **Table 4.2-1**. However, $PM_{2.5}$ impacts were not assessed for air quality permits because Idaho has not yet incorporated $PM_{2.5}$ permitting requirements into the Idaho State Implementation Plan (SIP). $PM_{2.5}$ analyses were addressed by analyses performed outside of the air permitting process. Additionally, fugitive emission levels associated with these sources would not increase over current levels resulting from operation of equipment at P4's South Rasmussen Mine. As operations cease at the South Rasmussen Mine, equipment would be reassigned to development of the Blackfoot Bridge Project. Similar levels of fugitive emissions would occur during mining of the Blackfoot Bridge Project compared to the South Rasmussen Mine.

Table 4.2-1 Total PM_{10} and $PM_{2.5}$ Annual Emissions

Source	PM_{10} Emissions		$PM_{2.5}$ Emissions	
	Actual Emissions (tons/yr)	Potential to Emit (tons/yr)	Actual Emissions (tons/yr)	Potential to Emit (tons/yr)
Crushers/Screeners	0.9	7.1	0.1	0.5
Dozers	3.3	13.3	0.3	1.3
Blasting and Drilling	2.0	16.1	0.6	5.6
Wind Erosion	27.4	27.4	4.1	4.1
Miscellaneous	1.0	7.9	0.2	1.2
Paved Roads	0.6	0.6	0.1	0.1
Unpaved Roads	26.8	51.4	2.7	5.1
Generator	0.9	0.9	0.9	0.9
Total	62.9	124.7	9.0	18.8

Source: IML 2010a

Table 4.2-1 presents estimates of actual controlled PM_{10} and $PM_{2.5}$ emissions and potential to emit annual emissions for the Blackfoot Bridge Mine. Potential to emit emissions represent an annual maximum operation if mining were to be continuous 24 hours a day and 7 days per week (8,760 hours per year) and includes maximum emission calculations for handling, throughput, and vehicle miles traveled without implementation of any controls.

Actual controlled emissions represent planned mining operations and include calculations of actual handling, throughput, vehicle miles traveled, and hours per year with the implementation of controls. Under the Proposed Action, mining would take place 24 hours per day and 7 days per week. Controlled emission calculations include a 50 percent control factor for unpaved roads

in response to operation of watering trucks, 90 percent control efficiency for paved roads, and 50 percent reduction in drilling emissions due to watering controls and lower speed limits.

Actual controlled emissions for PM_{10} are estimated to be 62.9 tons per year. The mine is not one of 28 listed sources where fugitive emissions are counted toward being a major source. Therefore, the project would not be considered a major source.

Selenium impacts from fugitive dust are not anticipated. Areas of exposed soil during mining operations would be backfilled. Selenium-impacted soil would be controlled, segregated, and covered. The non-segregated overburden would be encapsulated in the EOP. The non-segregated overburden would contain only trace amounts of selenium.

Air dispersion modeling of PM_{10} emissions conducted as part of the State of Idaho air permitting process demonstrates that the proposed mine would not cause an exceedance of the National Ambient Air Quality Standard for PM_{10}. In addition to the modeling required for the mine's air permit, an air dispersion modeling analysis for $PM_{2.5}$ emissions (IML 2010a) demonstrates that the proposed mine would not cause an exceedance of the National Ambient Air Quality Standard for $PM_{2.5}$.

All Federal Class I Areas are more than 100 km from the proposed project area. Because of the distance to the Class I Areas and because the proposed project is not a "major" facility, the air quality impacts to these Federal Class I Areas do not require evaluation for regional haze, visibility, and air impacts.

Emissions from Fuel Combustion

Based on annual fuel consumption of 1.2 million gallons diesel and 24,000 gallons of gasoline, the emissions in **Table 4.2-2** would result for nitrogen oxide (NO_x), SO_2, CO, volatile organic compounds (VOCs), PM_{10}, and $PM_{2.5}$.

Table 4.2-2 Emissions from Fuel Combustion and Explosives

Component	NO_x (lb/yr)		CO (lb/yr)	SO_2 (lb/yr)	PM_{10} (lb/yr)	$PM_{2.5}$[5] (lb/yr)	VOCs (lb/yr)
Diesel[1]	On Road	130,000	520,000	80	1,700	1,600	43,000
	Off Road	270,000	330,000	6,200	15,000	14,500	17,000
Gasoline[2]	120		2,900	9	--	--	86
Generator[3]	60,000		32,000	9,100	1,900	1,800	3,800
Explosives[4]	9,300		37,000	1,100	--	--	
Total (lb/yr)	470,000		920,000	16,000	19,000	18,000	64,000
Total (tons/yr)	235		460	8.0	9.5	9.0	32

Notes:

1 Diesel consumption = 30 percent on road; 70 percent off road; Tier III emission standards – data from www.dieselnet.com. Offroad diesel is Cat 777D-fuel cons. = 0.05 gal/hp = 46.9 gal/hr. On-road diesel is either a Mac or Kenworth truck with an average economy of 5 mpg – 10 gal/hr burn rate.

2 Gasoline consumption based on vehicles with average fuel economy of 16 mpg; gasoline emissions from www.dieselnet.com. Tier 2, Bin 8 @ 50,000 miles.

3 P4's Application for Permit to Construct (Rev 1), 2010

4 Explosives data from AP-42. Does not include fugitive dust emissions.

5 $PM_{2.5}$ emissions assumed to be 97 percent of PM_{10} emissions. (EPA. Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling – Compression-Ignition, Office of Air and Radiation, EPA420-P-04-009, April 2004.)

(all results rounded)

Source: P4 2009d, IML 2010a, IML 2010b

Because the combustion of fuels can produce fine particulates, it can be assumed that the PM_{10} emissions could be in the $PM_{2.5}$ size range. P4 is not required to monitor for these constituents associated with mobile sources during the development and mining of the proposed project. Emission levels associated with these sources would not increase over current levels resulting from operation of equipment at P4's South Rasmussen Mine. As operations cease at the South Rasmussen Mine, equipment would be reassigned to development of the Blackfoot Bridge Project. Similar levels of fuel consumption would occur during mining of the Blackfoot Bridge Project compared to the South Rasmussen Mine.

Indirect Impacts

Indirect impacts to air quality include fugitive and mobile source emissions from hauling phosphate ore to the processing plant owned and operated by P4 in Soda Springs and air emissions from the processing plant. Phosphate ore is hauled to the processing plant in dedicated ore trucks operating on a dedicated haul road. The ore trucks are diesel powered and would travel a total of 91,429 miles per year. Annual tailpipe emissions from the ore trucks operating on the haul road are summarized in **Table 4.2-3**.

Table 4.2-3 Ore Truck Tailpipe Emissions

Pollutant	Potential to Emit (tons/yr)
PM_{10}	0.13
CO	1.72
NO_x	0.65
SO_2	0.24
$PM_{2.5}$	0.13

Source: IML 2010b

Emissions to the air from the processing plant in Soda Springs include point sources generally related to beneficiation of the ore and production of elemental phosphorus, as well as fugitive emissions generally related to various raw material and product handling activities. Actual emissions to the air from the processing plant in Soda Springs during 2009, as reported by P4 pursuant to State of Idaho emission reporting regulations and Section 313 of the Emergency Planning & Community Right-to-Know Act (EPCRA) are summarized in **Table 4.2-4**.

Table 4.2-4 Emissions from Soda Springs Plant, 2009

Pollutant	Fugitive Sources	Point Sources	Total
PM_{10} (tons)	94	420	514
$PM_{2.5}$ (tons)	12	406	420
CO (tons)	51	8,400	8,500
NO_x (tons)	0.14	1,600	1,600
SO_2 (tons)	130	1,200	1,300
VOC (tons)	1.8	0.82	2.7
Radionuclides (ci)	0.00	0.65	0.65
Arsenic (lbs)	5.3	520	530
Cadmium (lbs)	1.3	6,400	6,400
Chromium (lbs)	160	5,800	5,900
Copper (lbs)	24	330	350
Lead (lbs)	3.5	610	610
Manganese (lbs)	24	200	220

Table 4.2-4 Emissions from Soda Springs Plant, 2009

Pollutant	Fugitive Sources	Point Sources	Total
Mercury (lbs)	0.03	510	510
Nickel (lbs)	29	630	660
Selenium (lbs)	4.5	5,400	5,400
Vanadium (lbs)	800	96	900
Zinc (lbs)	120	84,000	84,000
Carbonyl Sulfide (lbs)	0.00	4,300	4,300
Hydrogen Cyanide (lbs)	0.00	13,000	13,000
Hydrogen Fluoride (lbs)	2,900	407	3,300
Phosphine (lbs)	0.00	3,900	3,900
Phosphorus (lbs)	3.8	830	830
Sulfuric Acid Mist (lbs)	3,300	39,000	42,000

Note:
(all results rounded)
Source: P4 EPCRA 313 Report

Where required, all emissions that represent indirect impacts are fully permitted by the State of Idaho. Under the Proposed Action, such emissions would not be expected to change from current conditions and, therefore, would not have a significant impact.

4.2.1.1.2 Climate Change

Mining involves combustion of diesel and gasoline, which contribute CO_2 to the atmosphere. Projected fuel consumption for the proposed Blackfoot Bridge Project would be 1.2 million gallons diesel and 24,000 gallons gasoline annually. This fuel volume equates to approximately 13,000 tons/year production of CO_2. This volume of fuel consumption and emissions would not represent an increase over current levels associated with P4's mining operations in Idaho. Estimated GHG emissions attributable to electricity use at the new mine are approximately 3,300 tons/year for the onsite generator and approximately 1,400 tons/year attributable to indirect emissions associated with purchased electricity. As described in **Section 2.3.7**, P4 mining operations at the South Rasmussen Mine would begin to cease as development of the proposed Blackfoot Bridge Project is initiated and equipment associated with the South Rasmussen Mine operation is transferred to the Blackfoot Bridge Project.

Similarly, the P4 processing plant in Soda Springs would be expected to continue operations at existing levels, including potential indirect estimated annual emissions of GHG (approximately 652,000 tons estimated emissions in 2009). Estimated annual indirect emissions of GHG related to hauling ore from the mine to the processing plant are approximately 1,400 tons, which would be slightly less than the emissions from the existing haul road from the South Rasmussen Mine because of the shorter distance from the proposed project to the processing plant.

The GHG emissions from the Blackfoot Bridge Mine operations are expected to be approximately the same as those from the current operations at the South Rasmussen mine. The projected CO_2-equivalent emissions from fuel consumption directly associated with the mining operations, fuel consumption to produce electricity for the mine facilities, and fuel consumption to transport ore to the processing plant would be approximately 17,700 tons (16,050 metric tons) annually. This level of emissions is below the reference level of 25,000 metric tons per year of CO_2-equivalent emissions recommended by CEQ (2010) as meaningful for disclosing and

analyzing direct GHG emissions associated with a Federal action. In addition to the fact that these emissions would essentially replace the current emissions from the South Rasmussen Mine, it is unlikely that the GHG emissions from this mine can be meaningfully linked to specific climatic changes or regional trends in climate change.

In Idaho, the total CO_2 emissions from all combustion sources are approximately 37 million metric tons (IDEQ 2008). Mining in Idaho represents less than 1 percent of total CO_2 emissions from industrial sources (IDEQ 2008). To date, CO_2 emissions from a facility of this size are not regulated under any Idaho or federal laws or regulations, and no Idaho or federal air quality standard has been developed for this component of atmospheric gas.

The assessment of GHG emissions and climate change is in its formative phase; therefore, it is not yet possible to know with confidence the net impact to climate, making such analysis uncertain. The lack of scientific tools designed to predict climate change on regional or local scales limits the ability to quantify potential future impacts, and modeling such impacts would be cost-prohibitive. Per the above, the agencies have evaluated the existing credible scientific evidence, but information relating to the precise impacts of the project on climate change, and of climate change on the project, is unavailable. Based on available information, the Proposed Action's contribution to climate change would be negligible.

4.2.1.1.3 Noise Resources

Sensitive noise receptors include residential areas, schools, and hospitals. The nearest sensitive receptors are located north and west of the project area off of State Highway 34. One residence is located north of the junction of State Highway 34 and Blackfoot River Road, and the other residence is located on the west side of State Highway 34 approximately 1 mile south of the same junction. Both residences are located approximately 1.5 miles from the project boundary. Other residences are located several miles south of the project area toward Soda Springs. The EPA has identified outdoor levels of 55 dBA as desirable to protect against noise interference and annoyance. EPA defines the guideline as L_{dn} of 55 for outdoors in residential areas, farms, and other outdoor areas where people spend widely varying amounts of time and other places in which quiet is a basis for use. The guideline is L_{eq} of 55 for outdoor areas where people spend limited amounts of time, such as school yards, and playgrounds (EPA 1978). Outdoor sites are generally unacceptable if exposed to sound levels of 70 dBA L_{eq} or greater (EPA 1978). Noise levels at the nearest sensitive receptors would be low. The area is rural and undeveloped. Intermittent traffic from State Highway 34 would contribute to existing noise at the receptors. Based on **Table 4.2-5**, existing noise levels are predicted to be between 39 and 51 L_{dn}.

Table 4.2-5 Measured Sound Levels for Applicable Noise Sources

Source	Leq* (dBA)	Lmax (dBA)	Distance from Source
Access Road Traffic	47.4	66.6	120 feet from edge of road
Open Pit Mining	81.7	85.9	130 feet from drill
Haul Truck Traffic	70.4	87.5	120 feet from haul truck
Blasting	NA	74.4	3,200 feet from blast
Conveyor	70.0	71.1	40 feet from conveyor

Note:
* 15-minute timeframe
dBA - decibels
Source: BLM and USFS 2008

Noise levels at other operating phosphate mines in the area would represent typical noise levels for the proposed project. Noise levels were measured at the Smoky Canyon Mine (BLM and USFS 2007). Measured noise levels are summarized in **Table 4.2-5** and represent noise levels that could result from the Proposed Action, as similar equipment would be used.

To calculate the impact of a point source, the noise levels are mathematically propagated using the Inverse Square Law of Noise Propagation (Harris 1991). This formula states that noise decreases by approximately 6 dBA with every doubling of the distance from the source. Using this formula, noise from typical mining activities shown in **Table 4.2-6** can be predicted at various distances. This is a conservative formula, as additional attenuation also occurs due to atmospheric adsorption, ground attenuation, and blocked line of sight. Therefore, the levels here may overestimate the noise of each source at the distances listed.

Table 4.2-6 Predicted Noise Levels for Applicable Noise Sources

Source	Leq	Distance from Source Measurement	Doubling Distance (feet)					
			240	480	960	1,920	3,840	7,680
Access Road Traffic	47.4	120 feet from edge of road	41.4	35.4	29.4	23.4	17.4	11.4
Open Pit Mining	81.7	130 feet from drill	75.7	69.7	63.7	57.7	51.7	45.7
Haul Truck Traffic	70.4	120 feet from haul truck	64.4	58.4	52.4	46.4	40.4	34.4
Source	Lmax	Distance from source	6,400	12,800	25,600	51,200	102,400	204,800
Blasting	74.4*	3,200 feet from blast	68.4	62.4	56.4	50.4	44.4	38.4
Source	Leq	Distance from source	80	160	320	640	1,280	2,560
Conveyor	70	40 feet from conveyor	64	58	52	46	40	34

Note:
* Blasting estimates are based on a maximum value recorded during blasting.
Source: Harris 1991

The effect of multiple noise sources is not a simple addition, but rather a logarithm. For example, if two identical and adjacent sources each produce a noise level of 65 dBA at 50 feet from the source, the total noise produced by both sources would be 68 dBA at 50 feet.

Based on doubling distances of the L_{eq}, sensitive noise receptors would not be impacted by noise generated at the mine. Even without attenuation of noise by natural and man-made barriers, noise levels would be below the EPA guideline of 55 dBA for each source at a distance less than 1.5 miles (7,920 feet). The L_{eq} for access road traffic, 47.4 dBA at 120 feet, is below the EPA guideline of 55 dBA for acceptable environmental noise. Noise from open pit mining is estimated to be below 55 dBA at a distance between 1,920 and 3,840 feet, and noise from haul traffic and a conveyor is estimated to be below 55 dBA at a distance between 480 and 960 feet.

A L_{eq} for blasting is not typically used as a measurement. Instead, an L_{max} was used to determine a noise estimate. This estimate does not account for natural attenuation of noise when blasting is occurring below grade in the pit and additional attenuation of noise due to natural topography and vegetation. Topographic and vegetative features would further decrease noise levels. Blasting is estimated to occur 120 times per year and only during daylight hours. Noise impacts from blasting would be short-term and moderate.

4.2.1.2 Alternatives 1A and 1B – Capping of Overburden and Backfilled Areas

Potential impacts to air quality, climate and noise under Alternative 1A would be the same as impacts under Alternative 1B. Alternatives 1A and 1B would include components of the Proposed Action with the addition of the GCLL to prevent selenium leaching to groundwater and a modified water management system. The two alternatives differ in the total area to receive this type of GCLL cover (**Section 2.4.1**). Construction of cover materials would result in an increase in impacts to air quality for all criteria pollutants due to increased vehicle traffic on unpaved roads and materials handling activities. Conversely, covering disturbed areas would reduce emissions of fugitive dust from wind erosion and would reduce impacts to air quality from PM_{10} and $PM_{2.5}$. The vegetative cover would reduce fugitive dust. Overall, potential impacts to air quality under Alternatives 1A and 1B would be expected to increase slightly compared to impacts to air quality under the Proposed Action, while potential impacts to climate under Alternatives 1A and 1B would be expected to be the same as under the Proposed Action. Likewise, energy requirements and conservation potential of Alternatives 1A and 1B would be expected to be the same as the Proposed Action.

As stated in **Section 4.2.1.1.2**, potential contribution to global climate change that may be associated with emission of CO_2 would not change from current levels.

Potential impacts of noise under Alternatives 1A and 1B would be the same as for the Proposed Action. Construction of cover materials would result in a temporary increase to noise due to increased vehicle and materials handling activities. Overall, impacts resulting from noise under Alternatives 1A and 1B would be expected to increase slightly compared to those described under the Proposed Action. Noise levels would not be expected to exceed 55 dBA at sensitive noise receptors.

4.2.1.3 No Action Alternative

Under the No Action Alternative, air emissions from the Proposed Action would not occur, and impacts to air quality and climate would remain at ambient levels. Additionally, the No Action Alternative would result in declining impacts to regional air quality over time, as the South Rasmussen Mine would also be depleted and closed.

Under the No Action Alternative, indirect impacts to air quality are not expected to change, unless the processing plant closes under the No Action Alternative. However, P4 holds a number of other mining leases and other interests in phosphate ore reserves that could and would be expected to be developed to provide raw material to the processing plant in Soda Springs for continued operations. In most such cases, the existing haul road would continue to be used.

Under the No Action Alternative, noise associated with the Proposed Action would not occur, and ambient noise levels would remain in the area. Under the No Action Alternative, the federal phosphate leases would not be developed under this FEIS; however, this does not preclude future development of the federal phosphate leases under a different mine plan.

4.2.2 Irreversible and Irretrievable Commitments of Resources

The Proposed Action and Alternatives 1A and 1B would have an irretrievable commitment of air quality resources during the life of the project. There would be no irreversible commitment of air

quality resources as a result of the Proposed Action, Alternative 1A or 1B, or the No Action Alternative.

4.2.3 Unavoidable Residual Adverse Impacts

Emission estimates assume control practices. Following project completion, impacts to air quality and climate would be reduced and expected to return to pre-project levels. The Proposed Action and Alternatives 1A and 1B would not result in unavoidable residual adverse effects to air quality or climate.

Following project completion, impacts from noise would be reduced and expected to return to pre-project levels (ambient conditions). The Proposed Action and Alternatives 1A and 1B would have no unavoidable residual adverse effects to area noise levels.

4.2.4 Mitigation Measures

For all mining alternatives, dust would be controlled on roads and mining areas as specified in **Section 2.3.9.2**. Specifically, fugitive dust would be mitigated using the following controls:

- Watering unpaved roads;
- Using dust suppressants, such as magnesium chloride or calcium chloride, where and when practical;
- Using liquid dust suppressants on all blasting hole drilling operations; and
- Using hoods, containment chutes, and sprays, as necessary, at tipple crusher and screen areas.

Project design features, including a phased approach and cover materials, would also reduce impacts from air emissions.

Project design features, including a phased approach, would reduce noise impacts. As mining progresses below grade, the walls of the pit would absorb and attenuate noise. There is additional natural topographic screening between mining operations and sensitive noise receptors.

For all mining alternatives, noise mitigation measures would include maintaining equipment exhaust systems and engine sound controls to manufacturers' specifications and limiting blasting to daylight hours.

4.3 WATER RESOURCES

Issues:

- Project-related changes in the volume and timing of surface water runoff which could affect flow patterns of project area drainages.
- Increases in suspended sediment, turbidity, and COPCs, including selenium in streams, ponds, and springs, which could negatively impact surface water quality accessed by humans, wildlife, and aquatic organisms or cause noncompliance of the waterbodies with applicable water quality standards.

- Reductions in groundwater to streams, ponds, and springs which could affect water availability to humans, wildlife, and aquatic organisms.
- Changes in depth to groundwater caused by the construction of mine facilities or dewatering of the pits, which could affect water availability to springs and wells.
- Increases in chemical loading to groundwater downgradient from mine facilities, which could negatively impact water quality in wells, springs, or streams and cause noncompliance of the groundwater with applicable water quality standards.

Potential impacts to water resources were evaluated using numerical models to estimate seepage rates from the proposed mine facilities and to simulate the transport of COPCs in groundwater and surface water. The models were based on data and analysis presented in Whetstone (2010a). Supporting documentation for the numerical models and the water resources impact evaluation are presented in the Groundwater Modeling Report (ARCADIS 2010), cap and cover design reports (O'Kane 2009a and 2009b; O'Kane and Benson 2009), and Revised Source Term Development Report (Whetstone 2010b).

4.3.1 Direct and Indirect Impacts

4.3.1.1 Proposed Action

4.3.1.1.1 Conceptual Hydrologic Models for Mine Facilities

Ore Stockpile

The ore stockpile would be located on the south side of the existing haul road (**Figure 2.3-1**) and would have the capacity to store 0.8 million tons of ore over a 6-acre footprint (stockpile only, excluding loadout facilities, truck turnaround, etc.). The ore stockpile would vary in size as ore is mined and processed, but would be present for the life of the mine. All material in the stockpile would be removed at the end of mining. The ore stockpile area would include other associated facilities and features (hoppers, feeders, screening and crushing plant, tipple and truck loading areas) and is expected to encompass approximately 22 acres.

Precipitation falling on the stockpile would either evaporate, runoff, or infiltrate. Runoff from the facility would be controlled using BMPs (P4 2008a) and would be routed to CP2 (**Figure 2.3-8**). The surface of the stockpile would not be vegetated or capped and would change constantly as material is either added or removed. Infiltration moving through the stockpile would leach TDS, sulfate, cadmium, manganese, selenium, and phosphorus (as phosphate) at levels of potential regulatory concern (Whetstone 2009b). Nitrate, nitrite, and ammonia are common constituents associated with blasting and could also be mobile in seepage from the facility. Seepage leaving the bottom of the stockpile would move downward through the unsaturated Wells Formation to the water table. The depth to groundwater below the proposed facility would be 75 to 100 feet. Seepage concentrations in the unsaturated Wells Formation could be attenuated by chemical reactions including adsorption and precipitation. Likely chemical reactions include the precipitation of the cadmium carbonate mineral otavite (Fuller and Davis 1987; Zachara et al. 1993) and the adsorption of selenium to clay, carbonate, and iron surfaces (Hayes et al. 1987; Balistrieri and Chao 1990; Rajan 1979). Seepage entering groundwater would be transported north in the Wells Formation toward surface recharge points along Blackfoot River. Seepage concentrations may be attenuated along the flow path by mixing with groundwater, and possibly

by precipitation and adsorption. Column leaching tests suggest limited selenium release under saturated conditions (Whetstone 2009b). Manganese and sulfate are expected to remain mobile in groundwater, but some attenuation of manganese could occur by adsorption onto the carbonate matrix of the aquifer. A conceptual diagram showing the release of solutes from the ore stockpile is shown on **Figure 4.3-1**.

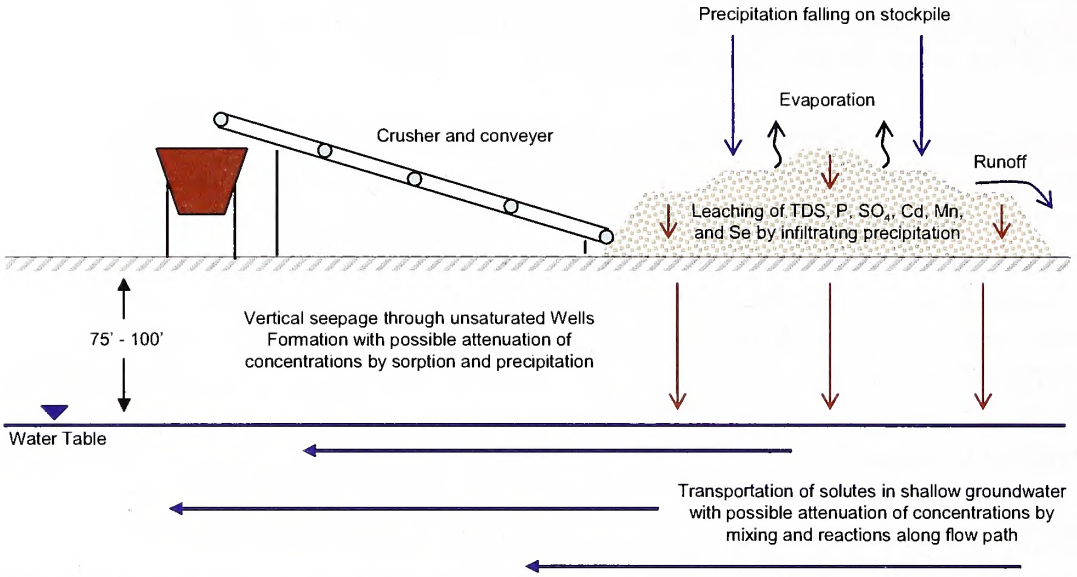


Figure 4.3-1 Conceptual Diagram Showing Runoff, Infiltration, and Solute Transport from the Ore Stockpile (Looking East)

Northwest Overburden Pile

The NWOP would be located approximately 655 feet south of Blackfoot River (**Figure 2.3-1**). The NWOP would contain approximately 2.8 million bcy of overburden including alluvium (21.7 percent), Rex Chert (48.0 percent), and Wells Formation/Grandeur Member of the Park City Formation (30.3 percent). Construction of the NWOP would begin in the second year of mining and would be complete by year 7. The final surface of the overburden pile would be configured to resemble the surrounding topography and would be capped with a base cover (as defined in **Section 2.3.4**). The overburden pile would be a permanent feature that would remain in place after the end of mining.

Precipitation falling on the NWOP would run off, infiltrate, or evapotranspire. Runoff from the facility would report to NWP1, NWP2, NWP3, and NWP4, where it would infiltrate, evaporate, or, if the water quality meets standards, be allowed to flow into Wetland X. If runoff from the NWOP does not meet water quality standards, it would be pumped from the water control ponds to WMP1 and WMP2 for disposal. BMPs, such as berms and silt fences, would be used to reduce suspended sediment and turbidity in water released from the pond. Precipitation that infiltrates into the NWOP would move downward through the pile and leach TDS, sulfate, cadmium, manganese, phosphorus (as phosphate), uranium, and selenium at levels of potential regulatory concern (Whetstone 2009b). Nitrate, nitrite, and ammonia are common constituents associated with blasting and could also be mobile in seepage from the NWOP. Infiltrating water could either flow to springs and seeps at the toe of the pile or continue to move downward through unsaturated alluvium and bedrock (Wells Formation) to the water table. The depth to groundwater below the western edge of the facility would be 5 to 10 feet. Attenuation of COPCs in the unsaturated substrate below the overburden pile is not expected to be significant because

of the short flow path to the water table. Seepage entering groundwater would be transported northward in alluvium, basalt, and the Wells Formation toward surface exit points along the Blackfoot River. Metal concentrations may be attenuated by mixing with groundwater and possibly by precipitation and adsorption (Fuller and Davis 1987; Zachara et al. 1993; Hayes et al. 1987; Balistrieri and Chao 1990; Rajan 1979). Column leaching experiments suggest limited selenium mobility under saturated conditions (Whetstone 2009b). Manganese, sulfate, and uranium are expected to remain mobile in groundwater, but some attenuation of manganese could occur by adsorption onto carbonate minerals in the aquifer. Uranium also adsorbs to mineral surfaces (clay and iron) under some circumstances, but given the high carbonate content of the receiving groundwater (Whetstone 2010a) it is more likely to form complexes that remain in solution (Wazne et al 2003; Tsunashima et al. 1981). A conceptual diagram illustrating the release of solutes from the NWOP is shown on **Figure 4.3-2**.

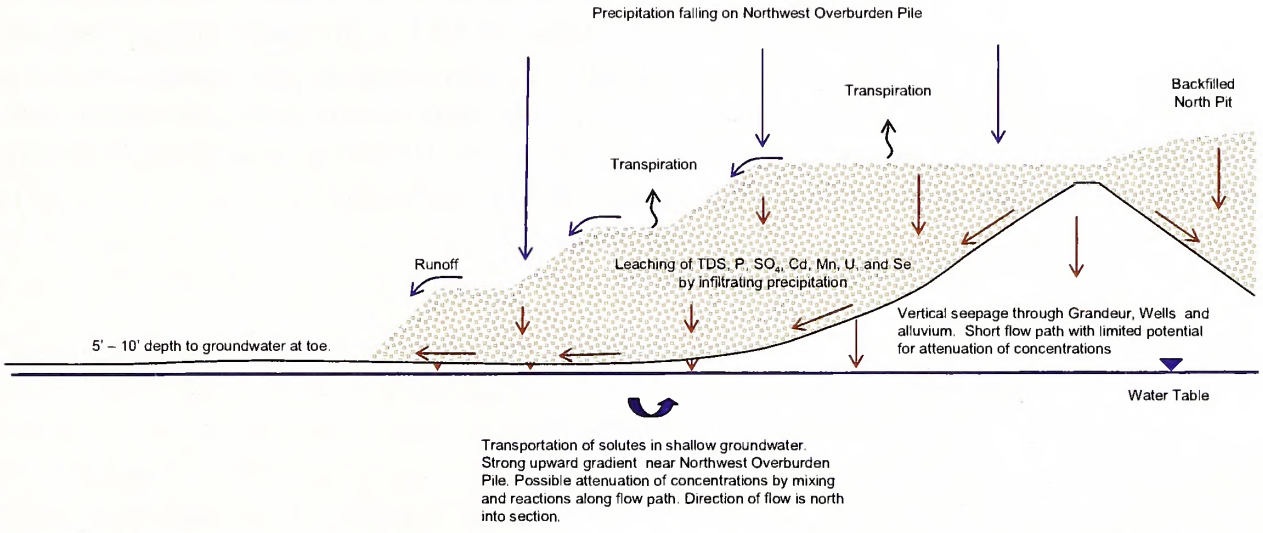


Figure 4.3-2 Conceptual Diagram Showing Runoff, Infiltration, and Solute Transport from the Northwest Overburden Pile (Looking North)

East Overburden Pile

The EOP would be located in the drainage above Fish Pond (**Figure 2.3-1**). The EOP would contain approximately 20.3 million bcy of overburden including alluvium (11.7 percent), Rex Chert (32.5 percent), Meade Peak (33.4 percent), and Wells Formation/Grandeur Member of the Park City Formation (22.4 percent). The Meade Peak overburden would be segregated and placed in the center of the EOP to limit its exposure to air and water. Construction of the EOP would begin in the first year of mining and would be complete by year 6. The final surface of the overburden pile would be configured to resemble the surrounding topography and would be capped using the base cover for the non-segregated overburden and the Simple 1 cover for the segregated Meade Peak overburden. The EOP would be a permanent feature that would remain in place after the end of mining.

Precipitation falling on the EOP would run off, infiltrate, or be evapotranspired. Runoff from the facility not meeting surface water standards would flow north in the drainage to the diversion ditch above Fish Pond, where it would be routed to settling pond CP2 (**Figure 2.3-8**). Stormwater meeting surface water would be sent to Fish Pond and ultimately to CP1 for possible flow to Wetland X under a NPDES permit. Precipitation that infiltrates into the EOP would move downward through the pile and leach TDS, sulfate, cadmium, manganese, nickel,

phosphorus (as phosphate), uranium, and selenium at levels of potential regulatory concern (Whetstone 2009b). Nitrate, nitrite, and ammonia are common constituents associated with blasting and could also be mobile in seepage from the EOP. Infiltrating water could either flow to springs and seeps at the toe of the pile or continue to move downward through unsaturated colluvium and bedrock (Dinwoody Formation) to the water table. The depth to groundwater below the EOP would vary from about 100 feet on the western side of the facility to about 10 to 25 feet at the east and north edges of the pile. The potential for attenuation of seepage concentrations in the unsaturated substrate below the overburden pile is highest in the areas with the longest flow paths. Attenuation mechanisms in the unsaturated zone may include precipitation and adsorption. Seepage entering groundwater would be transported east and north in alluvium and bedrock (Dinwoody Formation). Several small springs and wetlands exist in the unnamed tributary to Fish Pond. The springs are fed by groundwater that is recharged on the overlying slopes. It is likely that seepage in groundwater from the EOP would exit at springs a short distance downgradient from where it entered the groundwater system. Metal concentrations in groundwater and spring flows may be attenuated by precipitation, adsorption, and by anaerobic bacteria (Fuller and Davis 1987; Zachara et al. 1993; Hayes et al. 1987; Balistrieri and Chao 1990; Rajan 1979; Wazne et al. 2003; Tsunashima et al. 1981). A conceptual diagram illustrating the release of solutes from the EOP is shown on **Figure 4.3-3**.

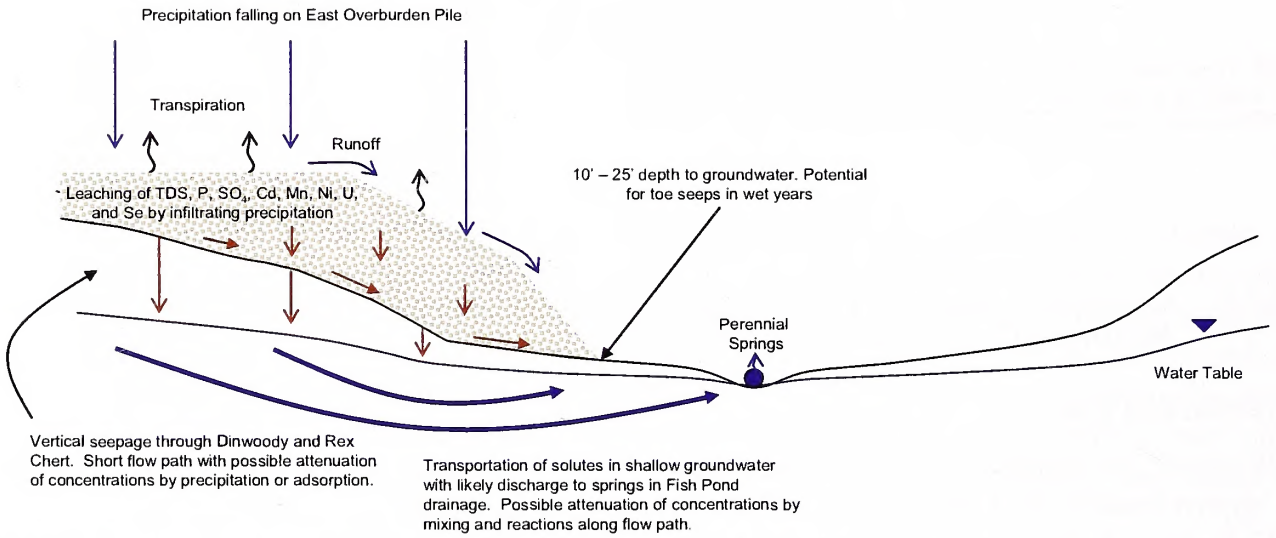


Figure 4.3-3 Conceptual Diagram Showing Runoff, Infiltration, and Solute Transport from the East Overburden Pile (Looking North)

North Pit and Backfill

The North Pit would be approximately 655 feet south of the Blackfoot River (**Figure 2.3-1**). Excavation of the pit would start during year 3 and would be complete in year 13. The bottom of the pit would be at an elevation of about 6,080 feet, which is approximately 80 feet below the regional water table (Whetstone 2009a). Backfilling of the pit would start in year 7 and be complete by year 14. A total of 37.6 million bcy of material would be backfilled into the North Pit including tuff (0.5 percent), alluvium (10.8 percent), Rex Chert (32.6 percent), Meade Peak (33.2 percent), and Wells Formation/Grandeur Member of the Park City Formation (22.9 percent). The backfilled pit would be configured to resemble the surrounding topography and would be capped with a base cover.

Excavation below about 6,160 feet elevation would require that water levels in the regional aquifer be lowered to accommodate the mining operation. The North Pit would have intermittent mining below the water table during years 6 through 9 and years 12 and 13. The estimated duration of groundwater inflow into the pit during any given year would range from 49 to 96 days with pumping from the pit sump gradually increasing to a maximum discharge rate of about 1,600 gpm (ARCADIS 2010). The pit would be dewatered using in-pit sumps excavated to a level below the active mining horizon. Groundwater collected in the pits would be pumped to the water management ponds. Groundwater levels in the regional aquifer near the pit would fluctuate in response to dewatering activities for the mine pit. Pumping for pit dewatering would also temporarily reduce the amount of groundwater that flows to the Blackfoot River north of the project area. At the end of mining in year 13 and after backfilling of the pit, groundwater levels would rebound to near the pre-mining elevation of 6,160 feet in the backfill. The maximum thickness of the saturated backfill in the North Pit would be about 80 feet. Groundwater in the saturated backfill would leach TDS, cadmium, iron, phosphorus (as phosphate), and manganese at concentrations of potential regulatory concern. Nitrate, nitrite, and ammonia are common constituents associated with blasting and could also be mobile in seepage from the facility. Column tests indicate relatively low leaching potential for selenium in the saturated zone (Whetstone 2009b). Groundwater flow in the saturated backfill would be primarily north toward the Blackfoot River. The majority of the groundwater flow moving through the saturated backfill would ultimately flow to the river.

Precipitation falling on the North Pit backfill would either run off, infiltrate, or evapotranspire. Runoff from the west side of the facility would report to ponds CP1, NWP1, NWP2, NWP3, and NWP4 where, if the water quality meets standards, it would infiltrate, evaporate, or be released into Wetland X. If runoff from the North Pit backfill does not meet water quality standards, it would be pumped to WMP1 and WMP2 for disposal. Runoff from the north and east sides of the facility would report to the Blackfoot River, Wetlands M and N, and pond NEP1. BMPs, such as berms and silt fences, would reduce suspended sediment and turbidity in runoff from the backfill. Precipitation that infiltrates through the cover would move downward through the unsaturated backfill and leach TDS, sulfate, cadmium, iron, manganese, nickel, phosphorus, uranium, selenium, and zinc at levels of potential regulatory concern (Whetstone 2009b). Upon reaching the water table, unsaturated seepage would mix with groundwater in the upper portion of the saturated backfill and move horizontally north toward surface exit points along the Blackfoot River. Groundwater flow in and out of the backfilled pit would be primarily through the Wells Formation/Grandeur Member of the Park City Formation. Some seepage may also move into the Rex Chert and flow north toward the Blackfoot River. Metal concentrations may be attenuated in the saturated zone by mixing with groundwater and possibly by precipitation and adsorption (Fuller and Davis 1987; Zachara et al. 1993; Hayes et al. 1987; Balistrieri and Chao 1990; Rajan 1979; Wazne et al. 2003; Tsunashima et al. 1981). A conceptual diagram illustrating the release of COPCs from the North Pit Backfill is shown on **Figure 4.3-4**.

Mid Pit and Backfill

The Mid Pit would be located south of the paved haul road (**Figure 2.3-1**). Excavation of the pit would start during the first year of mining and would be complete in year 14. The bottom of the pit would slope downward to the north with a minimum elevation of about 6,160 feet. The south end of the pit would be about 380 feet higher than the north end with a bottom elevation of 6,540 feet.

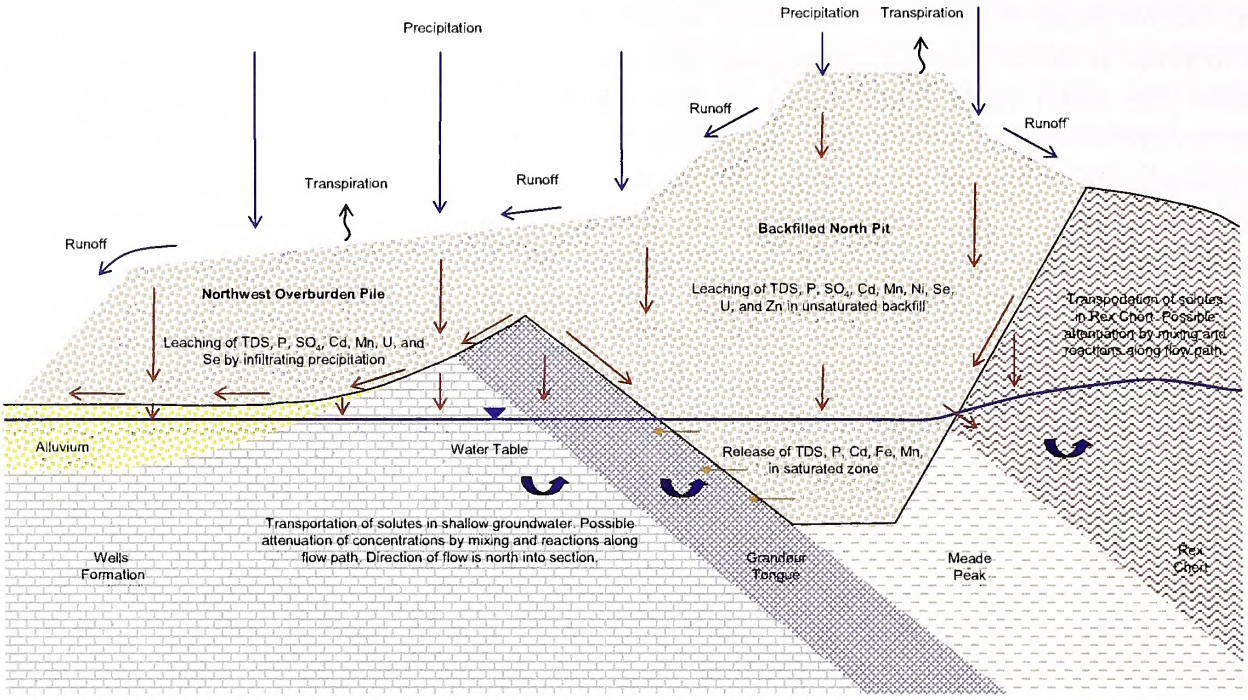


Figure 4.3-4 Conceptual Diagram Showing Runoff, Infiltration, and Solute Transport for the North Pit (Looking North)

The excavation for the Mid Pit would intersect the regional groundwater table near the north end and isolated groundwater near the south end. The north end of the pit would be completed about 20 feet below the regional water table (**Figure 3.3-15**). The bottom of the mid-section of the pit would be near the local water table, and the south end of the pit would be about 50 feet below the local groundwater level. Groundwater levels in the southern and mid-sections of the Mid Pit are elevated above the regional base level of 6,180 to 6,200 feet and do not represent the water level of the regional aquifer (Whetstone 2009a). Conceptually, groundwater at the south end of the pit is limited in extent and would be drained quickly. Sustained inflow would be small (approximately 1 to 2 gpm), resulting from recharge of precipitation on the local watershed (Whetstone 2009c). Excavation below about 6,180 feet elevation at the north end of the pit in year 5 would result in groundwater inflow to the open pit. Groundwater inflow to the pit would be collected in a sump excavated below the mining level and pumped to the water management ponds for disposal. The estimated duration of pumping from the sump would be 22 days during year 5 at an average discharge rate of about 450 gpm (ARCADIS 2010). At the end of mining and backfilling, groundwater levels would rebound to near the pre-pumping level.

The Mid Pit would be partially backfilled with a 75-foot-wide strip of the footwall (Wells Formation/Grandeur Member of the Park City Formation) exposed on the west side and a 50- to 100-foot-wide strip of hanging wall (Rex Chert) exposed on the east side. The areas of the exposed footwall and hanging wall would total about 10 acres and 12 acres, respectively. Backfilling of the Mid Pit would start in year 5 and would be complete by year 15. A total of 21.6 million bcy of material would be backfilled into the Mid Pit. Backfilled material would include tuff (2.0 percent), alluvium (11.5 percent), Rex Chert (31.9 percent), Meade Peak (33.5 percent), and Wells Formation/Grandeur Member of the Park City Formation (21.0 percent). The backfilled pit would be capped with a base cover. The maximum thickness of the saturated backfill would be about 20 feet at the north end of the pit. Groundwater in the saturated backfill would leach TDS, cadmium, iron, manganese, nickel, and phosphorus (as phosphate) at levels of

potential regulatory concern. Nitrate, nitrite, and ammonia are common constituents associated with blasting and could also be mobile in seepage from the facility. Column tests indicate relatively low leaching potential for selenium in the saturated zone (Whetstone 2009b). Groundwater flow through the saturated backfill would be northward, parallel to the strike of bedding.

Precipitation falling on the Mid Pit backfill would run off, infiltrate, or evapotranspire. Precipitation and runoff that infiltrates through the cover would move downward through the unsaturated backfill and leach TDS, sulfate, cadmium, manganese, nickel, selenium, phosphorus (as phosphate), and uranium at levels of potential regulatory concern (Whetstone 2009b). Nitrate, nitrite, and ammonia are common constituents associated with blasting and could also be mobile in seepage from the facility. Upon reaching the water table, unsaturated seepage would mix with groundwater and would move generally northward in the Rex Chert and Wells Formation/Grandeur Member of the Park City Formation. Seepage reporting to the water table in the Rex Chert may also flow eastward for a short distance toward the center of the unnamed tributary to Fish Pond and flow to the surface in springs and wetlands. Metals concentrations may be attenuated in the saturated zone by mixing with groundwater and possibly by precipitation and adsorption (Fuller and Davis 1987; Zachara et al. 1993; Hayes et al. 1987; Balistrieri and Chao 1990; Rajan 1979; Wazne et al. 2003; Tsunashima et al. 1981). A conceptual diagram illustrating the release of solutes from the middle and southern sections of the Mid Pit is shown on **Figure 4.3-5**. The conceptual model for north end of the pit is similar to that shown for the North Pit on **Figure 4.3-4**.

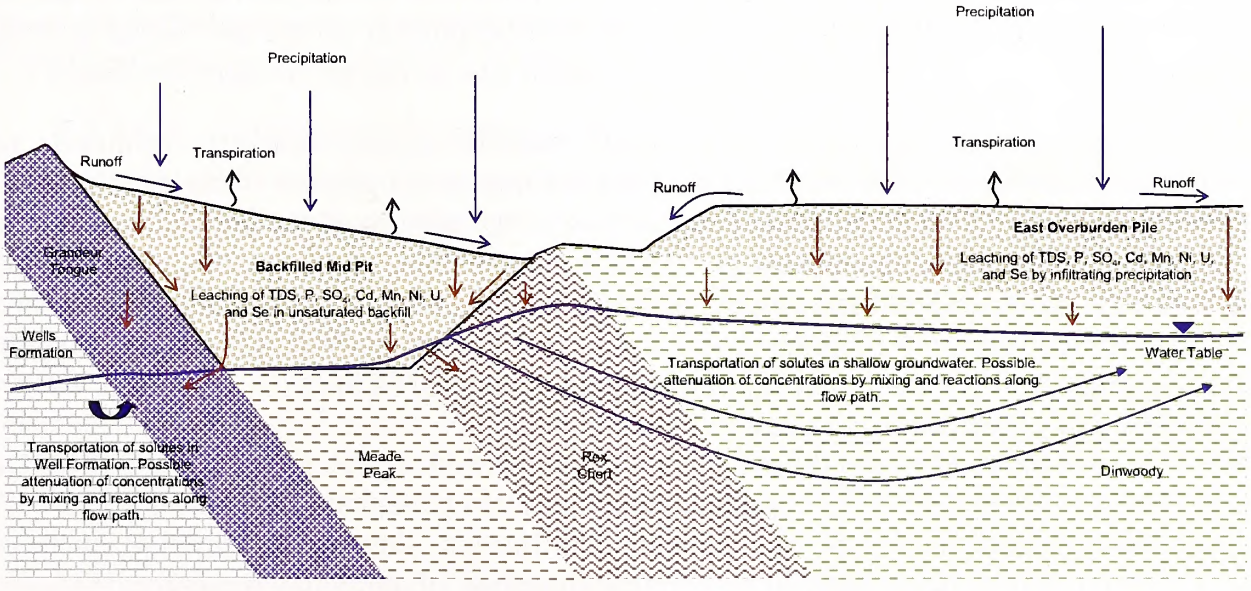


Figure 4.3-5 Conceptual Diagram Showing Runoff, Infiltration, and Solute Transport for the Mid Pit (Looking North)

South Pit and Backfill

Excavation of the South Pit would start in year 10 and be completed in year 17. The bottom of the South Pit would have a minimum elevation of about 6,420 feet. The excavation would intersect groundwater in the alluvium in the upper reaches of the drainage for Wetland A and also in bedrock at an elevation between 6,580 and 6,500 feet. Bedrock groundwater in the South Pit is elevated above the regional base level of 6,180 to 6,200 feet and does not represent the

regional potentiometric surface (Whetstone 2009b). Bedrock groundwater is limited in areal extent and would be drained quickly during mining. Sustained inflow would be small (approximately 1 to 2 gpm), resulting from recharge of precipitation on the local watershed (Whetstone 2009b). Alluvial groundwater in the Wetland A drainage is the source for Wetland A.

Excavation of the South Pit would intercept groundwater and surface water sources for Wetland A and would reduce or eliminate flow to the wetland. Upon completion of mining and reclamation, surface water flow to the wetland would be restored, but alluvial groundwater flow from the source area west of the pit would not be fully restored. The South Pit would be partially backfilled and areas of the footwall (Wells Formation/Grandeur Member of the Park City Formation) and hanging wall (Rex Chert) would be left exposed at the ground surface. Areas of exposed footwall and hanging wall would total about 31 acres and 11 acres, respectively. The outcrop of the Meade Peak in the floor of the pit would be covered with limestone or tuff backfill to eliminate exposure of the unit at the surface and to help prevent the formation of seasonally ponded conditions. Backfilling of the South Pit would be complete within 1 year of the cessation of mining. A total of 8.0 million bcy of material would be backfilled into the South Pit including tuff (3.5 percent), alluvium (9.1 percent), Rex Chert (31.4 percent), Meade Peak (34.7 percent), and Wells Formation/Grandeur Member of the Park City Formation (21.3 percent). Limestone and chert with low selenium content would be used to cover the exposure of the Meade Peak Member in the partially backfilled portion of the pit. Backfill containing Meade Peak overburden would be limited to the northern portion of the pit which would be completely backfilled. The partially backfilled portion of the South Pit would be capped with a base cover and would be sloped toward the hanging wall (west). The fully backfilled portion of the pit would also be capped with the base cover, but the surface would be sloped east to run off toward Wetland A.

Precipitation falling on the pit walls and partial backfill would run off, infiltrate, or evapotranspire (**Figure 4.3-6**). It is estimated that approximately 70 percent of the precipitation falling on the exposed pit walls would run off and report to the bottom of the pit, where it would infiltrate through Wells Formation/Grandeur Member of the Park City Formation or partial backfill (Whetstone 2009c). SPLP tests (Whetstone 2009b) indicate that runoff from the pit walls is likely to have COPC concentrations at levels below regulatory concern. The backfill would also receive runoff from a 15 acre area of slope above the south end of the pit.

Precipitation that infiltrates through the fully backfilled portion of the pit would leach TDS, sulfate, cadmium, manganese, nickel, selenium, phosphorus (as phosphate), and zinc at levels of potential regulatory concern (Whetstone 2009b). Infiltration through the partial backfill (limestone and tuff) would leach cadmium and zinc at levels of potential regulatory concern (Whetstone 2009b). Nitrate, nitrite, and ammonia are common constituents associated with blasting and could also be mobile in seepage from the facility. Upon reaching the water table, the unsaturated seepage would mix with groundwater and would move generally north parallel to the strike of bedding. Metals concentrations may be attenuated in the saturated zone by mixing with groundwater and possibly by precipitation and adsorption (Fuller and Davis 1987; Zachara et al. 1993; Hayes et al. 1987; Balistrieri and Chao 1990; Rajan 1979; Wazne et al. 2003; Tsunashima et al. 1981). A conceptual diagram illustrating the release of solutes from the South Pit is shown on **Figure 4.3-6**.

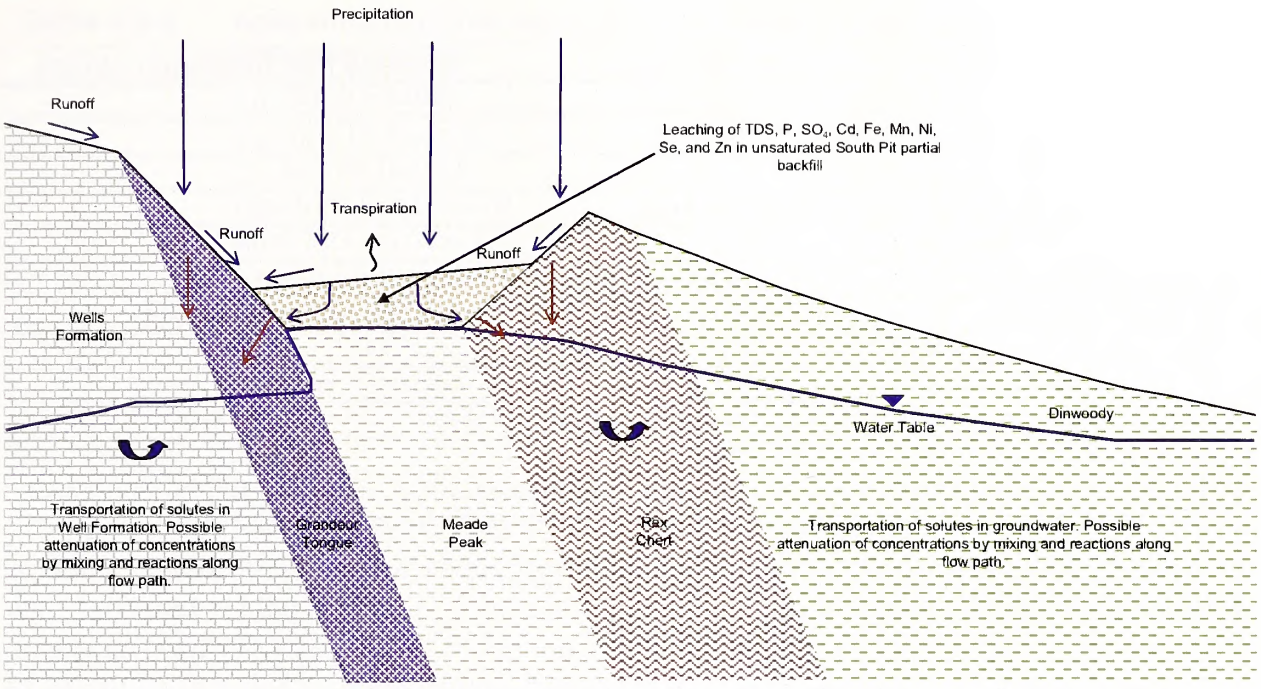


Figure 4.3-6 Conceptual Diagram Showing Runoff, Infiltration, and Solute Transport for the South Pit (Looking North)

4.3.1.1.2 Numerical Models

Numerical models were developed to quantify seepage from the proposed mine facilities and to evaluate the loading and transport of COPCs in groundwater and surface water. The models were based on hydrologic and geochemical data from site-specific baseline studies (Whetstone 2009a, 2009b) and conceptual hydrologic models.

4.3.1.1.3 Infiltration and Seepage Modeling

Seepage through overburden piles and backfills for the Proposed Action and Alternatives 1A and 1B were evaluated using one-dimensional and two-dimensional finite-element models (O'Kane 2009a and 2009b; O'Kane and Benson 2009). The software, VADOSE/W, was developed by Krahn (2007) and is used to evaluate the infiltration of precipitation through cap and cover systems over unsaturated soil materials. Input for the model included material properties for covers (porosity, permeability, and thermal data), climatic data (precipitation, temperature, relative humidity, wind speed, and solar radiation), and vegetation data (type, growing season, potential evapotranspiration, and wilting point). The model uses numerical solutions that account for the effects of seasonal surface storage, ground frost, snowmelt, runoff, infiltration, evapotranspiration, vegetative growth, soil moisture storage, lateral subsurface drainage, and leakage through various types of soil and geosynthetic covers.

The modeling was performed to predict the quasi-steady-state seepage through the cover systems. Seepage that infiltrates below the covers is assumed to move downward through the unsaturated zone and eventually report to the water table. Average net infiltration rates were calculated for different slope orientations (**Table 4.3-1**). North-facing slopes are modeled to have the highest infiltration rates because of higher snow accumulation, and lower net solar radiation during winter months. East-facing slopes are modeled to have higher infiltration rates than west-facing slopes because of drifting snow.

Table 4.3-1 Modeled Net Infiltration Rates

Cover Type	Slope Aspect	Average Net Infiltration (in/yr)
Base Cover	West and South	0.3
	East	1.5
	North	6.2
Simple 1 Cover	West and South	0.1
	East	0.8
	North	5.7
GCLL Cover	West	0.001
	East	0.001
	North	0.002
	South	0.001
	Flat	0.001

Note: One-dimensional models were used for the base and Simple 1 covers and only west, east and north slope aspects were evaluated, a two-dimensional model was prepared for the GCLL cover and north, south, east, west and flat slope aspects were simulated.
Source: Whetstone 2009b; O'Kane 2009a and 2009b; O'Kane and Benson 2009

Average infiltration rates for the Proposed Action were calculated for each of the planned overburden piles and backfills based on the area-weighted percentage of each slope aspect for the facilities (**Table 4.3-2**). To be conservative, the average infiltration rate for east- and west-facing slopes was used to represent flat areas, and west-facing slopes were used to represent southern aspects. Flat areas are expected to have snow accumulations similar to west-facing slopes, but a greater percentage of the runoff is expected to infiltrate. Using the average infiltration for the east- and west-facing slopes to represent flat areas results in a higher infiltration rate than for west-facing slopes, and accounts for the increased infiltration. South-facing slopes would have snow accumulations similar to west-facing slopes but would receive greater solar radiation. The use of west-facing slopes to represent south-facing slopes is conservative because higher solar radiation and evaporation on south-facing slopes would result in a smaller percentage of infiltrating runoff. Infiltration through the ore stockpile was not modeled numerically, and it was conservatively assumed that seepage from the facility would be equal to 6 inches per year for use in the groundwater contaminant fate and transport model. Area-weighted infiltration rates for mine facilities under the Proposed Action are presented in **Table 4.3-3**.

Table 4.3-2 Slope Aspect Percentages for Mine Facilities under the Proposed Action

Slope Aspect	North Pit (%)	Mid Pit (%)	South Pit Full Backfill (%)	South Pit Partial Backfill (%)	EOP Non-Meade Peak Overburden (%)	EOP Meade Peak Overburden (%)	NWOP (%)
North	14.7	13.0	0.0	0.0	6.1	0.0	3.7
South	10.0	2.8	28.0	0.0	1.9	0.0	13.2
East	20.6	69.3	50.7	0.0	62.3	30.5	0.0
West	32.7	5.7	0.0	100.0	25.7	0.0	78.1
Flat	22.0	9.2	21.3	0.0	4.0	69.5	5.0
Totals	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: P4 2008a

Table 4.3-3 Area-weighted Average Infiltration Rates for Mine Facilities under the Proposed Action

Mine Facility	Infiltration (in/yr)
North Pit Backfill	1.5
Mid Pit Backfill	2.0
South Pit Full Backfill	1.0
South Pit Partial Backfill	0.3
EOP Non-Meade Peak Overburden	1.4
EOP Segregated Meade Peak Overburden	0.6
NWOP	0.5
Ore Stockpile	6.0

Source: Whetstone 2009b, ARCADIS 2010

4.3.1.1.4 Groundwater Flow and Solute Transport Modeling

A three-dimensional groundwater flow and contaminant transport model (groundwater model) was prepared to evaluate the potential impacts to water resources from the proposed mining operation (ARCADIS 2010). The model was prepared using the software MODFLOW-SURFACT (HydroGeologic 1996). MODFLOW-SURFACT is a finite-difference groundwater modeling package, which is functionally identical to the USGS MODFLOW code, with several enhancements that improve its numerical stability and ability to solve matrices with steep gradients.

The groundwater model covers an area of approximately 27 square miles (**Figure 4.3-7**). The north-south axis of the model extends from Woodall Mountain to the Blackfoot Reservoir. The east-west axis extends from Highway 34 in the Blackfoot Lava Field to the Blackfoot River watershed divide along Fox Hills. Twelve model layers are used to simulate the folded and faulted geologic strata that form the groundwater flow system. The model includes representations of the Wells Formation/Grandeur Member of the Park City Formation, Phosphoria Formation (Meade Peak and Rex Chert Members), Dinwoody Formation, Thaynes Formation, Salt Lake Formation, basalt, rhyolite, and alluvium (**Figure 4.3-8**). Hydrologically important faults are also simulated according to the conceptual hydrogeologic model presented in **Section 3.3.2**. Specifically, the Aspen Range Fault is represented as a conduit for upward movement of groundwater from the deep regional system to surface exit points along its trace (Woodall Spring, North Woodall Spring, and other springs and wetlands west of the project area). Smaller northwest-trending faults in the proposed North Pit area are simulated to have low permeability across the fault planes, as demonstrated in the North Pit pumping test (Whetstone 2009a). Other faults within the model domain do not have well-documented hydrologic characteristics, and they are simulated to have permeabilities that are similar to the surrounding rocks.

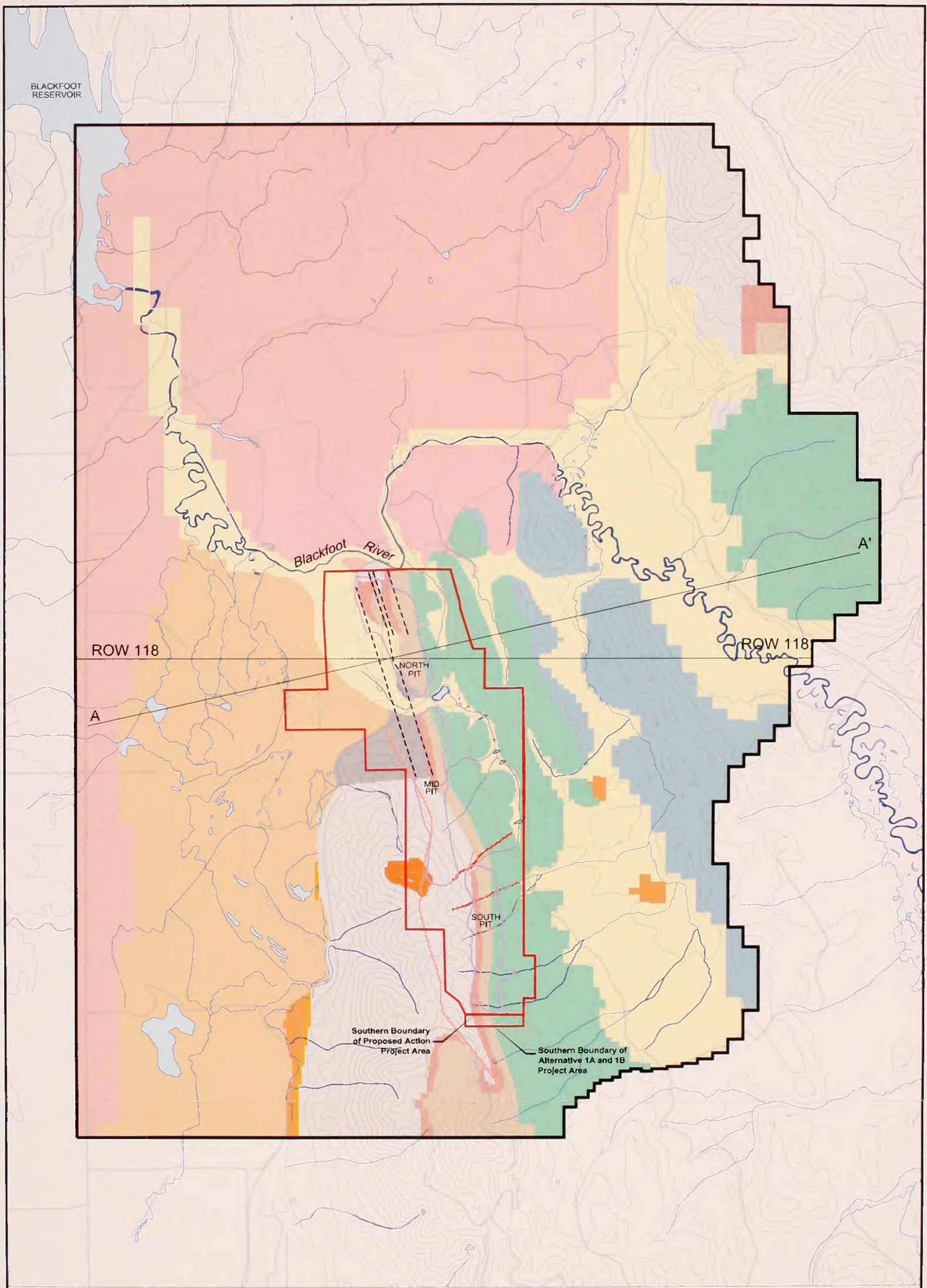
Input values for permeability, storage, and porosity are distributed in the groundwater model by lithology. The Mead Peak Member is simulated as an aquitard having a permeability of about 0.001 foot per day (ft/d). The other formations are simulated to have moderate to high permeability (0.1 to 56 ft/d), consistent with site-specific testing and other regional hydrologic data (Whetstone 2009a; ARCADIS 2010). Modeled specific storage values range from 0.00001 to 0.000001 and reflect differences in rock type and confining conditions (confined versus unconfined). Porosity values ranged from 10 percent for alluvium to 1 percent for fractured bedrock.

Water is simulated to enter or leave the model by several mechanisms, including:

- Flow in the regional groundwater system - Flow enters the model from the southeast and exits to the northwest. The average gradient for the regional system was specified at 0.006 foot/foot.
- Recharge from precipitation - Recharge is variably distributed in the model to account for differences in elevation, topography, and slope aspect. Infiltration of precipitation through mine facilities was modeled using values from the VADOSE/W model (O'Kane 2009a and 2009b; O'Kane and Benson 2009).
- Evapotranspiration (ET) - Wetland and pond areas are simulated as areas of relatively high ET that remove water from the model.
- Blackfoot River - The River is simulated as a surface water feature that either adds or removes water from the model, depending on water levels in the adjacent cells. The river adds water to the model where the groundwater level is below the river level. It removes water from the model where the groundwater level is above the river level.
- Streams - Streams are simulated as features that remove water from the model if the groundwater level is above the elevation of the stream bed. Streams are modeled as dry if the groundwater level is below the stream bed.
- Springs - Springs are simulated as features that remove water from the model if the groundwater level is above the elevation of the ground surface.
- Pumping - Water is removed from the model by pumping from wells and sumps in the North Pit and Mid Pit areas.

The groundwater model was prepared in three steps including an initial steady-state simulation that was calibrated to the existing (pre-mining) condition, a transient simulation that was calibrated to reproduce the observed drawdowns from the North Pit pumping test, and predictive simulations that evaluate the potential physical and chemical changes that could occur to groundwater and surface water from the proposed mining operation. The steady-state simulation was calibrated to match groundwater levels in baseline monitoring wells and flows to springs and seeps. Data from the gain-loss surveys on the Blackfoot River were also used to calibrate the steady-state model. The transient simulation used the steady-state run as the starting point. The transient model simulated the 72-hour aquifer test that was performed in the Wells Formation near the North Pit (Whetstone 2006a). Calibration of the transient model was an iterative process requiring simultaneous recalibration of the steady-state model to the adjusted input parameters. A complete discussion of the calibration procedures and results for the Blackfoot Bridge groundwater model is presented in ARCADIS (2010).

Predictive simulations were performed for the Proposed Action. The predictive runs used the final calibrated steady-state model as the starting condition and simulated mining and reclamation activities as they progressed from the initial excavation through reclamation and closure. The mine plan indicates that intermittent pumping from sumps would be required to dewater portions of the North Pit and Mid Pit between years 5 and 13. Dewatering of the pits is simulated using drain cells that are set at the elevations of the pit floors when mining would



LEGEND

- PROJECT BOUNDARY
- PROPOSED OPEN PIT
- ACTIVE MODEL DOMAIN BOUNDARY
- HORIZONTAL FLOW BARRIER

DESCRIPTION OF GEOLOGIC UNIT HYDROGEOLOGIC ZONE:

Qal	ALLUVIUM AND COLLUVIUM	TRt	THAYNES FORMATION
Qt	TRAVERTINE	TRd	DINWOODY FORMATION
Qb	BASALT	Pprc	PHOSPHORIA FORMATION - REX CHERT MEMBER
Qr	RHYOLITE DOME	Ppmp	PHOSPHORIA FORMATION - MEADE PEAK MEMBER
Tsl	SALT LAKE FORMATION		ASPEN RANGE FAULT
PPw	WELLS FORMATION / GRANDEUR TONGUE		
Mb	BRAZIER LIMESTONE		

Note: Model layer 1 represents the top layer of the model (ground surface)

NORTH

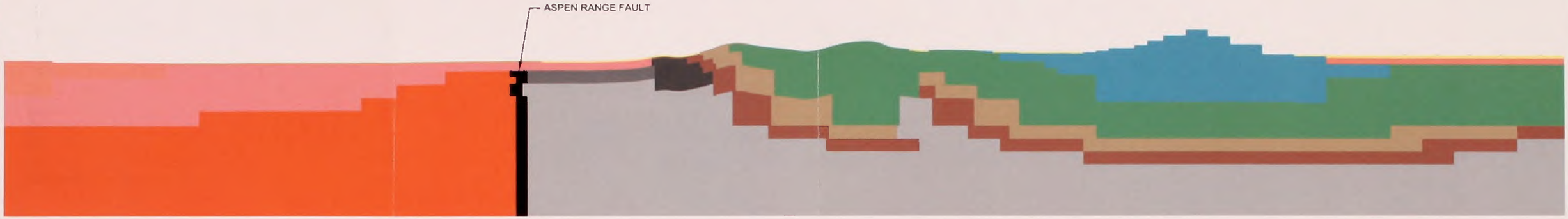
1500 Ft 0 1500 Ft 3000 Ft

BLACKFOOT BRIDGE PROJECT EIS

FIGURE 4.3-7
Hydrogeologic Zones
Model Layer 1

ANALYSIS AREA: Caribou County, Idaho	
Date: 08/08/10	File: Lay1_K.dwg
Drawn By: MTH	Layout: Layout1

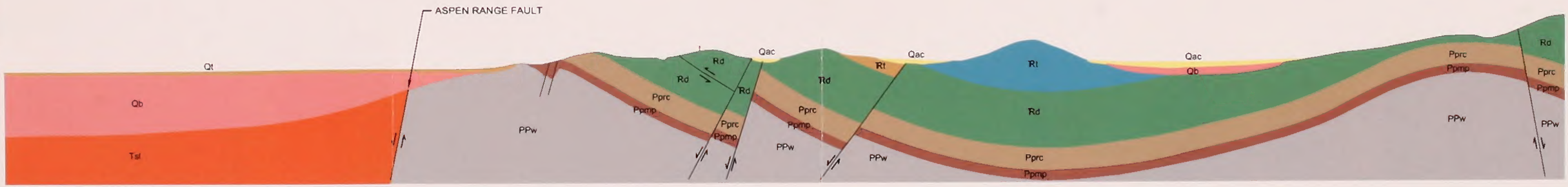
Model Cross-Section Row 118



Geologic Cross-Section A-A'

A

A'



-750 0 750 1500

Scale (ft) -no vertical exaggeration

Description of Geologic Unit Hydrogeologic Zones

Qac	ALLUVIUM AND COLLUVIUM	TRt	THAYNES FORMATION	PPw	WELLS FORMATION / GRANDEUR TONGUE
Qt	TRAVERTINE	TRd	DINWOODY FORMATION	Mb	BRAZIER LIMESTONE
Qb	BASALT	Pprc	PHOSPHORIA FORMATION - REX CHERT MEMBER		FAULT
Tsl	SALT LAKE FORMATION	Ppmp	PHOSPHORIA FORMATION - MEADE PEAK MEMBER		

Cross-section lines shown on Figure 4.3-7

BLACKFOOT BRIDGE PROJECT EIS

FIGURE 4.3-8

Model and Geologic Cross-Section A-A'

ANALYSIS AREA: Caribou County, Idaho	
Date: 02/24/11	File: Cross Sections B-B C-C D-D.dwg
Drawn By: SE	Layout: Cross Sections B

occur below the water table. Drain cells remove water from the model if the calculated water level in the cell is above the elevation specified for the drain. The simulated duration of dewatering ranges from 2 to 98 percent longer than the duration of mining to account for dewatering in advance of the excavation and for the increase in storage capacity of the excavation as water levels rebound after the cessation of pumping (ARCADIS 2010).

Chemical loading to groundwater would occur by two broad mechanisms including the leaching of COPCs from overburden and ore by infiltrating precipitation and by direct leaching of COPCs from backfill by groundwater. Seepage infiltrating through external overburden piles, pit backfills, and stockpiled ore (sources) is modeled as recharge (a volume of water with specified concentration) that is applied to the water table over the footprints of the modeled facilities. Direct leaching of backfill by groundwater is simulated as a chemical mass load with negligible volume applied in the areas of the pits that would be excavated below the water table. The simulated timing of the sources reflects the proposed construction schedule described in **Section 2.3.4**.

Modeled seepage concentrations for overburden, backfill, and stockpiled ore are based on the results of the column leaching and MWMP tests (Whetstone 2009b) and are simulated using a pore-volume approach where concentrations change with time as successive pore volumes of water move through the overburden and stockpiled ore. All of the modeled COPCs were assumed to behave conservatively in groundwater without attenuation by adsorption, precipitation, or other chemical reactions.

A schedule showing the simulated pore volume times for the Proposed Action is presented in **Table 4.3-4**. Modeled concentrations for COPCs in seepage and leachates from overburden, backfill, and stockpiled ore are presented in **Tables 4.3-5** and **4.3-6**. A complete description of how the modeled seepage and leachate concentrations were derived is presented in the *Source Term Development Report* (Whetstone 2010b).

Table 4.3-4 Pore Volume Times for Modeled Source Terms for the Proposed Action

Facility	Pore Volume Time (years)
North Pit Backfill (unsaturated)	263
North Pit Backfill (saturated)	14
Mid Pit Backfill (unsaturated)	135
Mid Pit Backfill (saturated)	5
South Pit Full Backfill (unsaturated)	162
South Pit Partial Backfill (unsaturated)	560
EOP Non-Meade Peak Overburden (unsaturated)	120
EOP Segregated Meade Peak Overburden (unsaturated)	434
NWOP (unsaturated)	154
Ore Stockpile (unsaturated)	n/a

Source: Whetstone 2010b

Predictive contaminant fate and transport simulations were prepared for each of the COPCs identified by the column tests (cadmium, iron, manganese, nickel, phosphorus, selenium, sulfate, TDS, uranium, and zinc) under the Proposed Action. Nitrate, nitrite, and ammonia were not modeled because they are typically by-products of blasting and blasted rocks were not available

for the column tests. Mobility of nitrogen species at levels exceeding regulatory standards has not been an issue commonly associated with overburden seepage in the Southeast Idaho Phosphate District. The durations of the simulations range from 200 to 350 years based on time required for each constituent to reach its maximum concentration in groundwater flowing to the Blackfoot River north of the project area. Complete descriptions of the predictive model runs are presented in the *Groundwater Modeling Report* (ARCADIS 2010). Model results and predicted impacts to water resources from the Proposed Action are presented in the following sections.

Table 4.3-5 Modeled Seepage Concentrations from Unsaturated Sources (mg/L) for the Proposed Action

	Pore Volume	Ore Stockpile	Non- Meade Peak Overburden	Segregated Meade Peak Overburden	ROM Overburden North Pit and Mid Pit Backfill	ROM Overburden South Pit Backfill	Selectively Handled Limestone South Pit Backfill
Cadmium	1	0.0063	0.0014	0.0040	0.0022	0.0040	0.0015
	2	0.0039	0.0009	0.0019	0.0009	0.0015	0.0008
	3	0.0034	0.0007	0.0015	0.0008	0.0016	0.0007
Iron	1	0.05	0.06	0.08	0.09	0.06	0.0005
	2	0.05	0.07	0.05	0.06	0.07	0.0004
	3	0.05	0.06	0.05	0.06	0.06	0.0004
Manganese	1	0.100	0.251	0.227	0.398	0.343	0.02
	2	0.015	0.047	0.019	0.083	0.061	0.003
	3	0.009	0.036	0.007	0.043	0.026	0.002
Nickel	1	0.03	0.03	0.04	0.06	0.11	0.0074
	2	0.02	0.02	0.02	0.02	0.02	0.0030
	3	0.02	0.02	0.02	0.02	0.02	0.0028
Phosphorus	1	0.02	0.10	0.02	0.03	0.02	0.13
	2	0.01	0.29	0.04	0.05	0.07	0.32
	3	0.00	0.25	0.02	0.07	0.06	0.28
Selenium	1	0.130	0.175	1.127	0.753	1.361	0.0021
	2	0.018	0.034	0.185	0.108	0.188	0.0003
	3	0.011	0.015	0.085	0.067	0.123	0.0002
Sulfate	1	166	270	691	490	794	9
	2	56	64	149	95	174	2
	3	31	45	75	70	146	1
Total Dissolved Solids	1	536	713	1,276	998	1,354	280
	2	263	296	424	330	425	100
	3	228	229	257	246	344	75
Uranium	1	0.03	0.04	0.03	0.03	0.03	0.0028
	2	0.03	0.03	0.03	0.03	0.03	0.0025
	3	0.03	0.03	0.03	0.03	0.03	0.0025
Zinc	1	0.04	0.02	0.02	0.06	0.16	0.23
	2	0.02	0.01	0.01	0.01	0.02	0.06
	3	0.02	0.01	0.01	0.01	0.01	0.05

Source: Whetstone 2009c

The uncertainty associated with groundwater model results was assessed by evaluating the sensitivity of model predictions to changes in the input values (ARCADIS 2010). The results of the analysis are presented in the Groundwater Modeling Report (ARCADIS 2010) and indicate that the predicted concentrations of COPCs in groundwater that may recharge the Blackfoot

River are most sensitive to the simulated mass of COPCs released from the mine facilities. Model predictions were relatively insensitive to changes in the input hydraulic parameters for the Wells Formation.

Table 4.3-6 Modeled Leachate Concentrations from Saturated Backfill (mg/L) for the Proposed Action

Pore Volume	1	2	3	4	5	6	7	8	9
Cadmium	0.0020	0.0009	0.0010	0.0011	0.0012	0.0010	0.0008	0.0007	0.0005
Iron	0.26	0.21	0.21	0.21	0.21	0.19	0.19	--	--
Manganese	1.350	0.944	0.852	0.807	0.757	0.683	0.605	0.524	0.440
Nickel	0.10	0.05	0.03	0.02	0.02	0.02	0.02	--	--
Phosphorus	0.03	0.04	0.05	0.05	0.06	0.07	0.07	--	--
Selenium	0.003	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Sulfate	260	124	54	33	15	10	6	5	5
TDS	537	338	221	185	153	141	132	--	--
Uranium	0.03	0.03	0.03	0.03	0.03	0.03	0.03	--	--
Zinc	0.08	0.01	0.01	0.01	0.01	0.01	0.01	--	--

Source: Whetstone 2009c

Although chemical loading rates can be estimated from bench-scale column leaching tests, uncertainty exists because scale-dependent factors, such as the volume and frequency of infiltration, residence time of pore water, presence of preferential flow pathways, and the percentage of flushed surfaces, exert control over seepage concentrations from field-scale mine facilities (Whetstone 2009c). Column and MWMP leaching tests are considered to be the best tool currently available for the estimation of COPC concentrations in seepage from the proposed mine facilities. The column and MWMP leachates have similar chemistry to the observed water quality from overburden seeps and springs in the Southeast Idaho Phosphate District (Whetstone 2009c), but uncertainty associated with using laboratory-scale tests to predict seepage concentrations from field-scale facilities is difficult to quantify. Because the predictions of the groundwater model are sensitive to the input concentrations of the source terms, uncertainty associated with the source terms should be considered when evaluating the results of the model. As a general rule of thumb, the model results should not be interpreted as absolute numerical values, but rather in broader terms with the simulated scenarios being either unlikely to have impacts at levels of regulatory concern, likely to have impact at or near levels of regulatory concern, or as being likely to have impacts above levels of regulatory concern.

4.3.1.1.5 Impacts to Surface Water Resources

Impacts to Runoff Areas

Precipitation falling on disturbed areas associated with the Proposed Action would infiltrate, evapotranspire, or be retained in sediment runoff and water control ponds. The water control ponds would be designed to contain the runoff from the projected 100-year, 24-hour storm event. This means that runoff from the disturbed areas would be retained during mining and would not contribute to storm flow in the surrounding drainages as would normally occur under the baseline condition. Essentially, the disturbed areas would be removed from the watershed of a given drainage, thereby potentially reducing runoff volumes and peak flows during mining until reclamation is completed and the retention basins are removed. The greater the percentage by which the watershed area is reduced, the greater the reduction in flows. Therefore, the percent

reduction in the contributing watershed is used to estimate the percent reduction in stream flow that could occur from the proposed activities. These numbers should be used to compare alternatives rather than as absolute numbers representing changes in stream flows.

Surface water flow in tributary drainages for State Land Creek, unnamed tributary to Fish Pond, unnamed tributary to Beaver Pond, and the Blackfoot River would be affected by the Proposed Action. The mine pits, diversion ditches, haul roads, and ponds would capture surface water runoff during mining. Backfilling of the pits would be concurrent with mining, and the area of the open pits that would capture runoff during any given year would be limited. Runoff from disturbed areas and newly reclaimed areas would be retained in the water control ponds and would be removed from the watershed. This would result in a reduction in runoff reporting to streams and rivers. The haul road would also capture runoff for the area between the South Pit and the road. Runoff that collects against the haul road fill would be allowed to evaporate. Annual runoff volumes for the North Pit and Mid Pit areas were estimated in the *Revised Mine Water Management Plan* (P4 2009a) and are summarized in **Table 4.3-7.**

The South Pit would be partially backfilled and would continue to capture runoff from an area of 123 acres in the State Land Creek drainage after reclamation. The total area of the State Land Creek drainage is 2,828 acres. The runoff area that would be removed from State Land Creek by the partially backfilled South Pit would represent about 4.3 percent of the total drainage area. The State Land Creek drainage would not have disturbances associated with external overburden and would receive runoff from 5 acres of capped backfill.

Table 4.3-7 Estimated Runoff (acre-ft/yr) that would Report to the Water Control Ponds under the Proposed Action

Year	Unnamed Tributary Above Fish Pond	North Aspen Area # 1	Unnamed Tributary below Fish Pond and North Pit Area # 2	Beaver Pond Drainage
1	46.9	7.1	22.6	12.9
2	56.5	10.0	25.3	14.3
3	58.8	9.6	25.3	14.3
4	82.9	9.6	24.7	14.3
5	78.3	9.6	23.7	14.3
6	83.7	14.1	22.5	14.3
7	58.3	14.2	38.0	13.2
8	65.8	11.8	22.1	13.2
9	56.7	11.4	34.0	16.2
10	55.3	11.4	40.3	14.8
11	55.3	11.4	34.2	16.7
12	60.9	11.4	30.7	16.8
13	62.6	13.8	30.7	16.8
14	54.9	12.1	42.9	18.3
15	54.9	12.1	39.9	17.1
16	54.5	12.1	39.8	17.7
17	75.2	12.1	35.6	17.2

Note:
Refer to Figure 3.3-2 for drainage area locations
Source: Whetstone 2009b; P4 2009a; P4 2010c

The proposed Mid Pit and EOP would affect the runoff characteristics of the unnamed tributary above Fish Pond during mining and after reclamation. Water from an area of about 153 acres

above the EOP would be diverted north along the western edge of the EOP toward Fish Pond. Runoff from this area currently flows though Wetlands F, G, and H (**Figure 2.3-8**). The runoff area above Wetland H is about 401 acres. The diversion would result in a 41 percent reduction in runoff flowing through the wetlands.

Mining of the North Pit would temporarily remove runoff areas that report to the Blackfoot River and the unnamed tributary containing Beaver Pond. The total area of the excavation would be 123 acres, but the runoff area that would be removed from the drainages at any given time would be smaller because the pit would be backfilled and reclaimed as mining advances. The final reclaimed surface of the backfilled North Pit would alter the location of the drainage divide and would permanently add 13 acres (10 percent increase) to the runoff area for the drainage containing Beaver Pond. The runoff area reporting to the Blackfoot River along the west side of the project area would be reduced by the same amount, but the total runoff area reporting to the Blackfoot River below the project area would remain unchanged because drainage containing Beaver Pond is tributary to the Blackfoot River.

All disturbed areas under the Proposed Action are in drainages that are tributaries to the Blackfoot River. The total mine disturbance area would be about 739 acres. The total drainage area of the Blackfoot River above the project area is about 384,000 acres. The Proposed Action would result in an estimated 0.2 percent reduction in total runoff reporting to the Blackfoot River below the project area during mining. Reclamation of the mine facilities would restore all but 123 acres of the partially backfilled South Pit to the contributing runoff area of the watershed. The reduction in runoff area to the Blackfoot River, after final reclamation, would be 0.03 percent of the total watershed area above the project.

Impacts to Peak Flows

Haul and access roads have the potential to affect peak flows through two primary mechanisms. First, the road drainage network that would consist of in-slope ditches and cross-drains could alter peak flows and accelerate runoff by increasing drainage density, extending the stream network, and causing small-scale trans-basin diversions (Furniss et al. 2000). The Proposed Action would minimize this potential to the extent possible by reducing the amount of hydrologically connected roads. Hydrologically connected roads are defined as "any road segment that, during a design runoff event, has a continuous surface flow path between any part of the road prism and a natural stream channel" (Furniss et al. 2000). Second, if a stream crossing or culvert cannot pass all stream flow, either because it is blocked or the design event is exceeded, the flow may overtop the crossing or culvert, flow down the road, and be redirected to a tributary channel other than the intended one, which could result in locally higher peak flows, head cutting, and erosion (Furniss et al. 1997). The *Revised Mine Water Management Plan* (P4 2009a) addresses this concern by designing all ditches, culverts, crossings for the 100-year, 24-hour storm event.

Impacts to Channels

Runoff from temporary and permanent overburden storage areas, pit backfills, haul roads, PPGM storage areas, and other disturbed areas would increase the potential for erosion and subsequent sediment loading into State Land Creek, the unnamed tributaries above Fish Pond, the unnamed tributary to Beaver Pond, and the Blackfoot River. In addition to naturally occurring soil and

geologic materials, magnesium chloride used for dust suppression could be entrained, as well as with eroded sediment from roads.

Sediment loading in downstream waterbodies would be controlled by directing on-site surface water flow into water control ponds. Because runoff from overburden storage is a primary concern, water from the EOP and NWOP would be directed into a series of water control ponds adjacent to the overburden piles. Four water control ponds would be located on the east side of the EOP along the unnamed tributary to Fish Pond. Five water control ponds would be located west of the NWOP to constrain flow to Wetland X and the Blackfoot River. Two water control ponds would be located near the ore pads, and one pond east of North Pit in the Beaver Pond watershed. In addition, water management ponds WMP1 and WMP2 would be used to store sump water, water pumped from the pits, and water that does not meet surface water standards. A series of culverts and ditches would be used to collect and direct water to the water management ponds. Sediment collected in the water control ponds would be periodically dredged and placed in the pit backfill.

Stream channels for the unnamed tributary to Beaver Pond and unnamed tributary to Fish Pond would be impacted by the Proposed Action. Both drainages would have water control ponds constructed within their existing channel, and rock fill would be placed in unnamed tributary to Fish Pond. The water control ponds would alter the natural flow patterns of the channels. Dams in the drainages would decrease the typical flow velocity of the streams. The location of the Mid Pit and EOP could also impact flow dynamics in the unnamed tributary to Fish Pond. Under existing conditions, storm and snow melt runoff from the crest of the Aspen Range flows east down numerous gullies into the unnamed tributary to Fish Pond. The construction of Mid Pit would limit the amount of runoff that reaches the mainstem of the drainage. Also, the proximity of the EOP to the unnamed tributary to Fish Pond replaces a gently sloping lower flank of the Aspen Range with the steeper east slope of the EOP. The combined impact of Mid Pit and the EOP on flow to unnamed tributary to Fish Pond would result in lower runoff quantities reaching the creek above Wetland H, but at higher velocity.

Impacts to Stream and Spring Flows

The Proposed Action would have direct impacts to surface water flows in Wetland A, the unnamed tributary to State Land Creek, the unnamed tributary to Fish Pond, Woodall Springs, and Blackfoot River.

Wetland A and the Unnamed Tributary to State Land Creek

Excavation of the South Pit would intercept groundwater and surface water sources for Wetland A and would reduce or eliminate flow to the wetland. Upon completion of mining and reclamation, surface water flow to the wetland would be restored, but alluvial groundwater flow from the source area west of the pit would not be fully restored. It is possible that reduced water availability would decrease the size of the Wetland A or cause it to go dry.

The drainage that supplies water to Wetland A spring has an area of approximately 82 acres. The South Pit would intercept 77 acres of the drainage. Assuming that the flow from the spring is directly proportional to the source area of the water supply, the Proposed Action would result in a 94 percent decrease in alluvial groundwater to the spring. Observed flows from the spring

ranged from 0.02 to 0.51 cfs during the baseline monitoring period. Upon completion of backfilling and reclamation, surface water runoff from 73 acres of the drainage above Wetland A spring would be restored (P4 2009a). The net loss in surface water runoff area above Wetland A spring would be 4 acres, which is 4 percent of the total drainage area.

Unnamed Tributary to Fish Pond

The Proposed Action would affect springs and intermittent flows in the unnamed drainage above Fish Pond during mining and after reclamation. Ponds EP1, EP2, EP3 and EP4, the diversion ditch, and rock fill would alter the natural surface water flow and wetland systems. Approximately 27,600 cubic feet of rock fill would be placed in the channel to establish a drainage layer that would transmit water and eliminate direct surface exposure of wildlife to the water source. The water in the drainage layer would report to either Fish Pond or CP1 during mining and to Fish Pond after reclamation. Accumulation of fine-grained sediment in the pore spaces of the fill is expected to decrease the permeability of the drainage layer over time, and springs and wetlands may re-establish in the drainage at some point after reclamation.

The Proposed Action would result in reduced flow reporting to Fish Pond during mining and after reclamation. Excavation of the pit would capture a portion of the recharge that normally infiltrates to the shallow groundwater system. The captured recharge would infiltrate into the regional groundwater system in the Wells Formation and would not be available for groundwater or spring flow. After reclamation, recharge to the shallow groundwater system in the drainage would be less than during the pre-mining condition because infiltrating precipitation from the backfilled Mid Pit would continue to report to the Wells Formation, and the cover system on the EOP would reduce infiltration over the footprint of the facility.

Results from the groundwater model indicate that post-reclamation groundwater flow in the unnamed tributary would be about 23 percent lower than the baseline condition. Water from an area of about 153 acres above the EOP would be diverted north along the western edge of the EOP toward Fish Pond. Runoff from this area currently flows through Wetlands F, G, and H (**Figure 2.3-8**). The diversion ditch for the South Pit would also capture 28 acres of runoff area and route it to the Wetland drainage. Diversion of runoff from the area above the EOP and the ditch capture area would further reduce surface water availability by 45 percent in the drainage above Wetland H.

Blackfoot River and other Waterbodies

Dewatering of the North Pit and Mid Pit to facilitate mining below the water table would temporarily reduce groundwater and spring flow to the Blackfoot River north of the project area. Pumping from the pits would occur from 0 to 96 days during any given year between years 5 and 13. The dewatering pumping rates would range from about 0.04 cfs to 3.49 cfs. At the cessation of pumping, groundwater flow to the river would return to the pre-mining level. Groundwater entering the pits would originate from the Wells Formation, and the reductions in groundwater recharge and spring flow would be primarily limited to the section of river near the surface exposure of the Wells Formation directly north of the proposed North Pit. Modeled reductions in groundwater flow to the Blackfoot River from pit dewatering are presented in **Table 4.3-8** and on **Figure 4.3-9**. The locations of modeled reaches for the Blackfoot River are shown on **Figure 4.3-10**. Modeling results indicate that flows from Woodall Spring and North Woodall Spring

would be decreased by a maximum 0.3 cfs by mine dewatering (**Figure 4.3-9**). The estimated average flow from the spring complex is 25 to 30 cfs. The temporary maximum reduction in flow would be about 1 to 1.2 percent of the total flow from the springs.

Table 4.3-8 Modeled Groundwater Depletion to Blackfoot River from Mine Dewatering

Year	Days Pumping for Pit Dewatering	Dewatering Pumping Rate (cfs)	Reduction in Groundwater Flow to Blackfoot River During Pumping (cfs)	Total Annual Reduction in Groundwater Flow to Blackfoot River (acre-ft/yr)
5	22	1.06	0.12	5.2
6	69	2.62	0.92	125.9
7	50	2.86	0.94	93.2
8	49	0.52	0.29	28.2
9	71	0.86	0.51	71.8
12	54	0.04	0.04	4.3
13	96	3.49	1.12	213.3

Source: Whetstone 2009b

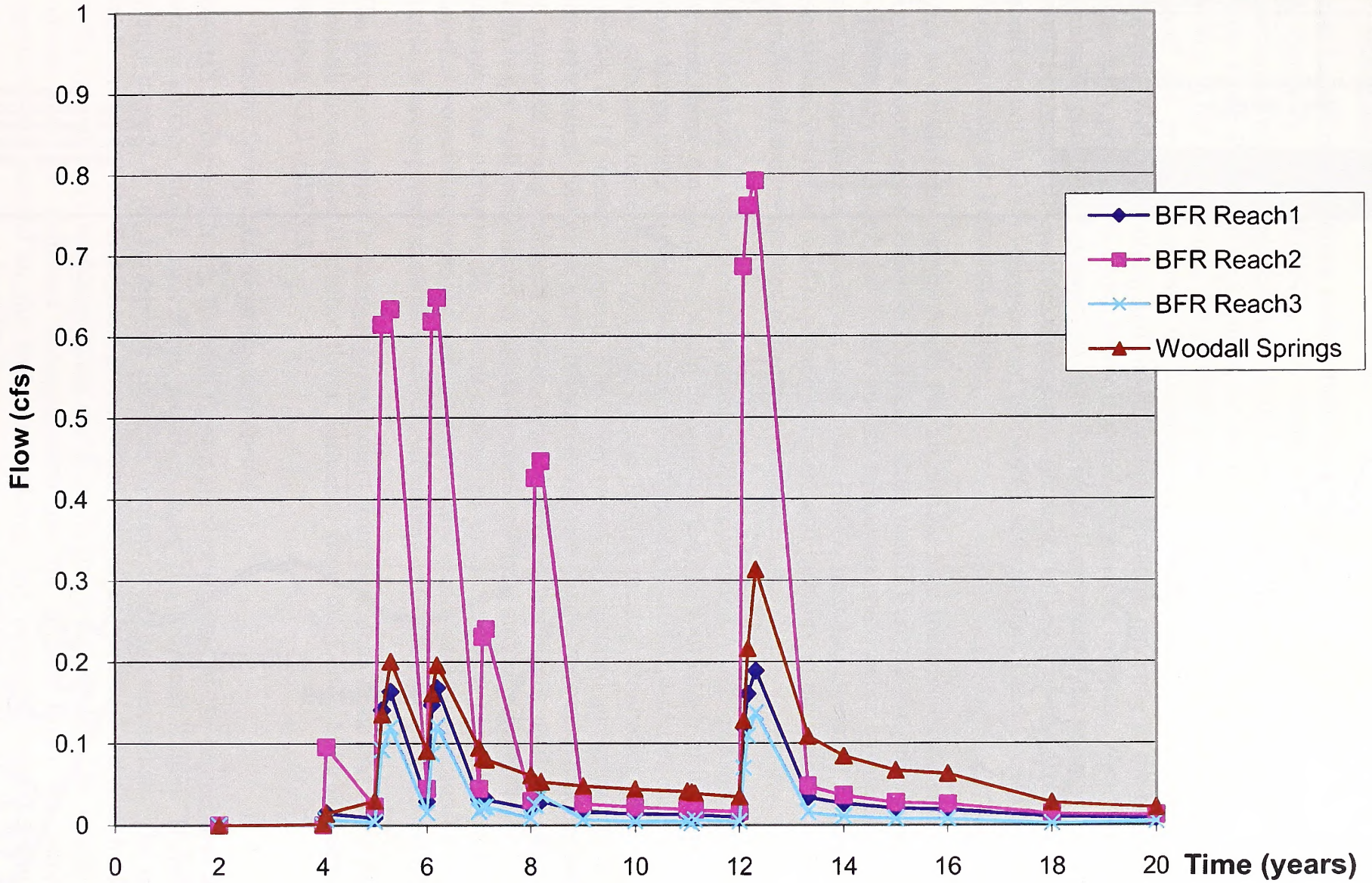
The groundwater model indicates that dewatering activities would have negligible impacts (approximately 1 percent) to flows for other surface water features in the project area. Springs in the unnamed drainage above Fish Pond and Beaver Pond drainage issue from the Dinwoody Formation and are hydraulically separated from dewatering of the Wells Formation by the Meade Peak Member aquitard.

Impacts to Water Quality

The Proposed Action has the potential to impact water quality in streams, springs, and ponds near the project area. Potential impacts to surface water quality include increases in suspended sediment and turbidity, as well as chemical loading of COPCs.

Wetland A

Excavation of the South Pit under the Proposed Action would disrupt the source of groundwater for Wetland A spring and greatly reduce or eliminate flows from the spring. Because groundwater reporting to the spring would be intercepted by South Pit, adverse water quality impacts would not occur. After reclamation, the portion of the drainage above Wetland A would be restored, and runoff from the area above the South Pit would flow across the 830-foot length of the capped backfill. The cover design under the Proposed Action would include at least 4 feet of chert or limestone overlain by 18 inches of topsoil. The cover would be vegetated and graded to a stable slope to prevent erosion. Sediment in the drainage below the reclaimed pit would be managed using sediment fences, straw bales, or geotextiles until the vegetative cover is sufficiently well established to prevent excess sediment and turbidity in runoff. The cover would prevent contact of the runoff with backfill. Water quality of the runoff is expected to meet applicable surface water quality standards. Runoff from the Proposed Action is not expected to result in additional loading of COPCs to Wetland A. It is possible, however that reduced water availability would decrease the size of the Wetland A or cause it to dry up completely.



BLACKFOOT BRIDGE PROJECT EIS

FIGURE 4.3-9
Predicted Baseflow and Springflow Depletion

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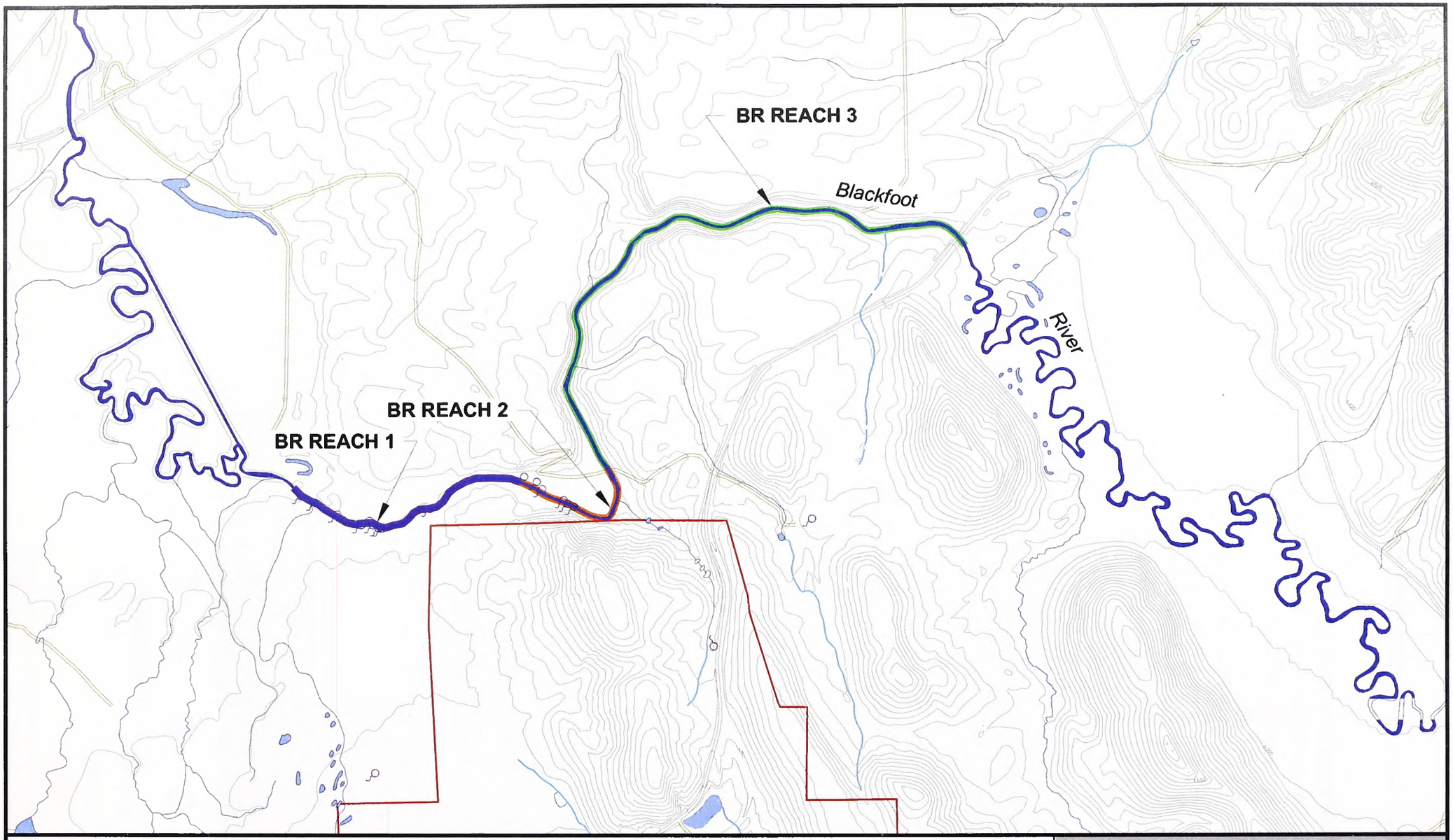
Date: 07/07/10	File: Pre-Baseflow-Springflow.dwg
Drawn By: MTH	Layout: Model



LEGEND

- PROJECT BOUNDARY
- BLACKFOOT RIVER REACH 1
- BLACKFOOT RIVER REACH 2
- BLACKFOOT RIVER REACH 3
- SPRING LOCATION

Contour Interval = 20 ft.

NORTH

1,000' 0 1,000' 2,000'

BLACKFOOT BRIDGE PROJECT EIS

FIGURE 4.3-10
Locations of Modeled Reaches for Blackfoot River

ANALYSIS AREA: Caribou County, Idaho	
Date: 12/22/10	File: BFR Reach Figure.dwg
Drawn By: SE	Layout: Reach Locations

State Land Creek

State Land Creek receives surface flow from tributaries SLC#2 and SLC#3 that originate near the South Pit (**Figure 3.3-2**). The South Pit would be partially backfilled, and no external overburden would be placed in the State Land Creek watershed. Runoff from the disturbed area of the South Pit would be captured by the pit during mining and would not be released to the surface. After reclamation, the partially backfilled portion of the pit would continue to capture runoff and precipitation over its footprint. The partial backfill would be sloped toward the footwall (Wells Formation), and runoff and precipitation reporting to the bottom of the pit may temporarily pond in the crotch where it would evaporate or infiltrate. Water that infiltrates would eventually percolate downward through the Wells Formation to the regional water table, where it would be transported northward parallel to the strike of bedding. The results of the groundwater model do not indicate transportation of COPCs toward State Land Creek from any of the mine facilities under the Proposed Action.

Prior to development of the South Pit, an outside haul road would be constructed that would provide a downgradient barrier to surface water runoff from the Pit Area. Temporary impacts to water quality in State Land Creek and its tributaries could occur by increased sediment yield from the disturbance area of the haul road. BMPs, including sediment fences, straw bales, or geotextiles, would be used to reduce sediment and turbidity in the runoff. The haul road would be reclaimed and revegetated at the end of mining.

After reclamation, a portion of the drainage above Wetland A would be restored, and runoff from the area above the South Pit would flow across the 830-foot length of the capped backfill. The cover design under the Proposed Action would include at least 4 feet of chert or limestone (with low selenium content as specified by the Environmental Monitoring Plan – **Appendix A**) overlain by 18 inches of topsoil. The cover would be vegetated and graded to a stable slope to prevent erosion. Sediment in the tributaries to State Land Creek below the reclaimed pit would be managed using sediment fences, straw bales, or geotextiles until the vegetative cover is sufficiently well established to prevent excess sediment and turbidity in runoff reporting to the drainage. The cover would prevent contact of the runoff with backfill. Water quality of the runoff is expected to meet applicable surface water quality standards. Runoff from the Proposed Action is not expected to result in additional loading of COPCs to water in State Land Creek.

The proposed project is located downgradient from the Conda Mine and along the groundwater flowpath toward the Blackfoot River. Influence from the Conda Mine is discussed further in **Sections 5.3.3** and **5.3.5**.

Woodall Spring and North Woodall Spring

Woodall Spring and North Woodall Spring are located west of the project area and would not receive surface runoff from areas disturbed under the Proposed Action. Therefore, no water quality impacts to the springs are expected to occur from this mechanism. The two springs are major exit points for the regional groundwater system, and potential chemical loading of COPCs to the springs were evaluated using the groundwater water model. The results of the model indicate that the dominant transport direction for COPCs from the mine facilities is approximately parallel to the strike of bedding, and negligible water quality impacts are projected for the springs from the Proposed Action (ARCADIS 2010).

Wetland X

Wetland X is located west of the project area and would receive surface runoff and seepage in shallow groundwater from the ore stockpile area under the Proposed Action. Numerical modeling indicates that selenium concentrations in shallow groundwater directly below the stockpile are expected to be greater than 0.005 mg/l during mining, but selenium and other COPCs are not predicted to exceed regulatory standards in either the stockpile area or Wetland X (ARCADIS 2010).

Beaver Pond Drainage

An 8-acre area of the North Pit would be excavated in the drainage containing Beaver Pond. The North Pit would be completely backfilled, and a larger runoff area from the backfill (21 acres) would report to the drainage after reclamation. Impacts to water quality in the drainage could occur by increased sediment yield from the disturbed area during excavation and backfilling of the North Pit. BMPs, including water control pond NEP1, silt fences, straw bales, or geotextiles, would be used to prevent excess sediment and turbidity in runoff from entering Wetlands M and N. The reclaimed surface of the backfill would be vegetated and graded to a stable slope to prevent erosion. Sediment load and turbidity in runoff from the capped and reclaimed backfill would be similar to the pre-mining condition.

Under the Proposed Action, the cover design for the North Pit would include at least 4 feet of chert or limestone (with low selenium content as specified by the Environmental Monitoring Plan - **Appendix A**) overlain by 18 inches of topsoil. The cover would prevent contact of the runoff with backfill and the water quality of the runoff is expected to meet applicable surface water quality standards for COPCs. Runoff from the Proposed Action is not expected to result in additional loading of COPCs to surface water in the drainage for Beaver Pond.

Baseflow to springs and wetlands near Beaver Pond is supplied by shallow groundwater from the Dinwoody Formation. The groundwater model indicates that the regional flow system would be the dominant path for the transportation of COPCs in groundwater. The transfer of water between the regional groundwater flow system and the shallow groundwater flow system is limited by the Meade Peak Member, which is a strong aquitard (Whetstone 2006a). The groundwater model indicates that impacts to surface water quality in Beaver Pond drainage are not expected from the Proposed Action (ARCADIS 2010).

Fish Pond Drainage

Direct impacts to water quality from increased sediment yield would occur during construction of the EOP, Mid Pit, and water control ponds in the unnamed tributary to Fish Pond. EP1 through EP4 and rock fill (as necessary) in the bottom of the drainage would be used to retain sediment on site and manage seepage from the EOP. The dams would detain surface water flow and allow sediment to settle from runoff before leaving the drainage. The function of the rock fill would be to prevent direct surface exposure of wildlife to runoff and seepage that may contain elevated COPC concentrations. Sediment would be managed during construction of the dams and rock fill using fences, straw bales, and geotextiles.

Fish Pond would be upgraded to more effectively hold stormwater as part of the water management system. Pond upgrade would involve raising and sealing the dam and adding clay

or other materials to the pond bottom to increase capacity. If water in Fish Pond does not meet applicable water quality standards, it would be pumped to WMP1 and WMP2 for evaporation.

Potential impacts to water quality in the drainage above Fish Pond were evaluated in the groundwater model using the location of Wetland G Spring as a surrogate for the numerous small wetland areas and springs below the toe of the proposed EOP. Precipitation that falls on the backfilled Mid Pit and EOP would either run off or infiltrate. The cover design under the Proposed Action would include at least 4 feet of chert or limestone (with low selenium content as specified by the Environmental Monitoring Plan - **Appendix A**) overlain by 18 inches of topsoil over the backfilled pit and majority of the EOP. The segregated Meade Peak overburden in the EOP would be capped with the Simple 1 cover. The covered overburden would be vegetated and graded to a stable slope to prevent erosion. The cover design would prevent contact of the runoff with backfill and overburden, and the water quality of runoff from the reclaimed facility is expected to meet applicable surface water quality standards. Runoff from the reclaimed surface of the EOP and backfilled Mid Pit is not expected to result in additional loading of COPCs to surface water in the drainage above Fish Pond.

Precipitation that infiltrates into the backfilled Mid Pit and EOP would move downward through the material and leach COPCs (Whetstone 2009b). The groundwater model indicates that seepage from the backfilled Mid Pit would report to the water table in the regional groundwater system in the Wells Formation and be transported generally northward, parallel to the strike of bedding. Seepage from the EOP would report to the shallow groundwater system in the Dinwoody Formation and alluvium and would move into the rock fill in the channel above Fish Pond. If water meets water quality standards, water in the channel would ultimately report to CP-1 where it would be discharged. If water does not meet standards, it would be pumped to WMP1 and WMP2 for evaporation. Modeled COPC concentrations for surface water in the drainage above Fish Pond are shown on **Figure 4.3-11** and summarized in **Table 4.3-9**.

Table 4.3-9 Modeled COPC Concentrations in Groundwater Flow to Surface Water in the Drainage above Fish Pond for the Proposed Action

Constituent	Peak Concentration (mg/L)	Long-Term Concentration (mg/L)	Surface Water Standard[1] (mg/L)	Groundwater Standard (mg/L)
Cadmium	0.0002	0.0001	0.0006	0.005
Iron	0.010	0.010	N/A	0.3
Manganese	0.035	0.007	N/A	0.05
Nickel	0.0059	0.0028	0.0520	N/A
Phosphorous	0.039	0.039	N/A	N/A
Selenium	0.0252	0.0023	0.005	0.05
Sulfate	38	10	N/A	250
TDS	100	43	N/A	500
Uranium	0.006	0.004	N/A	0.03
Zinc	0.002	0.001	0.120	5

Notes:
1 Cold water aquatic life CCC or chronic standards are based on 100 mg/L hardness and a water effect ratio (WER) of 1.
N/A - none applicable
The listed uranium standard is the federal drinking water MCL. Idaho does not have a groundwater standard for uranium.
Source: Whetstone 2009c; ARCADIS 2010

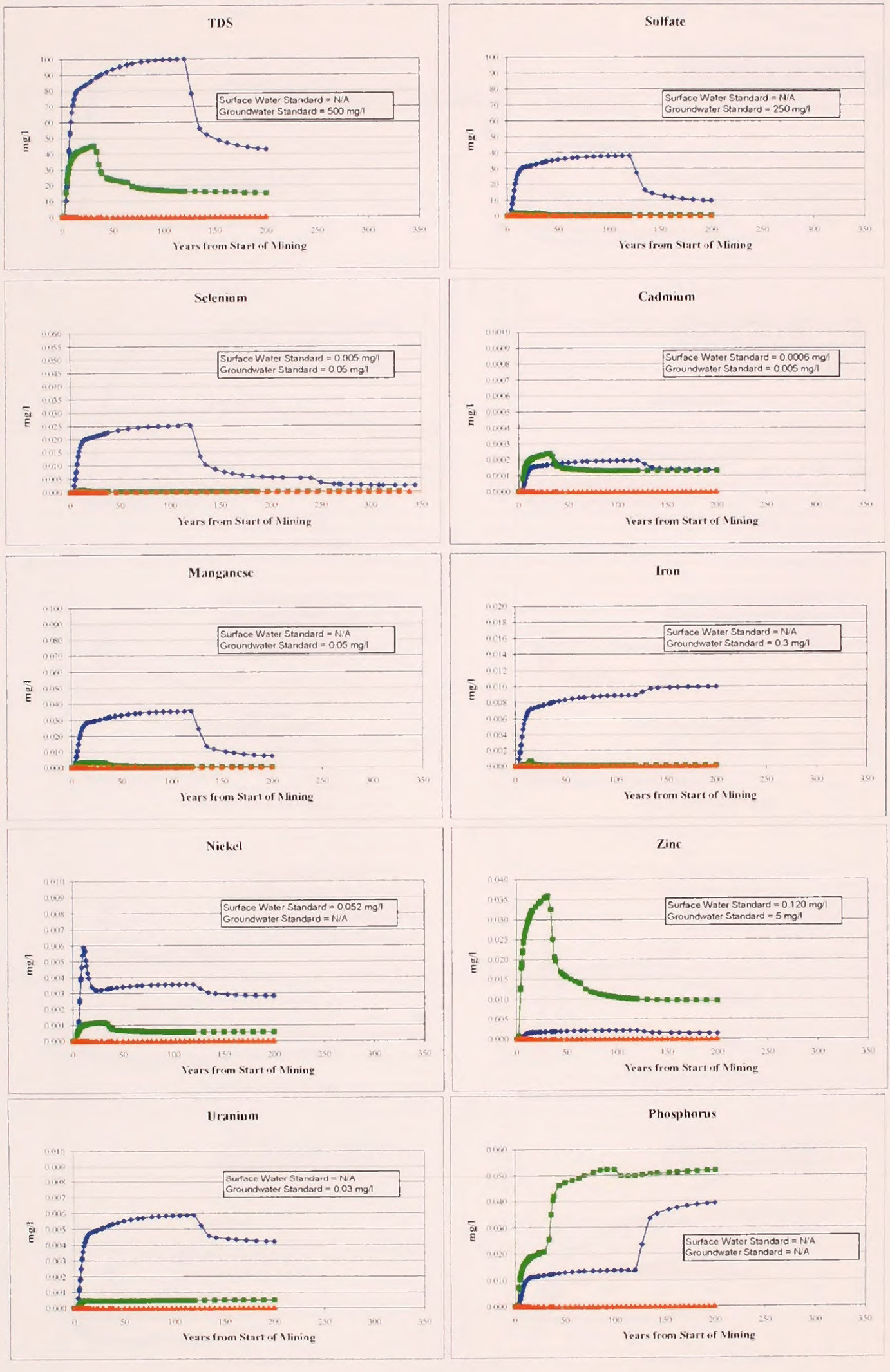
The groundwater model indicates that selenium concentrations in groundwater flow that would report to surface water in the drainage above Fish Pond would likely exceed the cold water aquatic life CCC chronic standard of 0.005 mg/L, starting in year 5, and attain a maximum predicted concentration of about 0.0252 mg/L about 120 years after the start of mining. The dominant source of selenium loading to the drainage would be from the segregated Meade Peak overburden in the EOP. Concentrations for all other COPCs are projected to meet applicable surface water quality standards during mining and after reclamation. Because the model predictions are sensitive to uncertainty associated with the input parameters, the results should not be interpreted as absolute numerical values, but should be evaluated in broad terms with selenium being likely to have impacts at levels of regulatory concern and other COPCs, being likely to have impacts at levels below regulatory thresholds.

Blackfoot River

All drainages from disturbed areas under the Proposed Action are tributary to the Blackfoot River. The Blackfoot River also gains flow from the regional groundwater system where it passes north of the project area. The Proposed Action has the potential to affect water quality in the Blackfoot River by contributing either poor quality surface water or groundwater flow to the river.

Runoff from the west side of the backfilled North Pit, including the NWOP, would flow west toward Wetland X and north toward the Blackfoot River. Precipitation falling within the excavation for the North Pit during mining would be contained by the pit and would not run off. NWP1 through NWP4 would be constructed to reduce sediment load in runoff from the NWOP. A berm would be constructed along the toe of the topsoil pile south of the NWOP to capture runoff from the pile. Sediment in the drainages below disturbed areas would be managed during mining using BMPs including sediment fences, straw bales, or geotextiles. After mining, overburden piles and backfilled pits would be capped and reclaimed using a combination of the base cover design and the Simple 1 cover. All reclaimed disturbance areas would be vegetated and graded to a stable slope to prevent erosion. Sediment in drainages below reclaimed areas would be managed using BMPs until the vegetative cover is sufficiently well established to prevent excess sediment and turbidity in the runoff water. Cover systems for the reclaimed mine facilities would prevent runoff from contacting potentially reactive overburden, and runoff that would report to the Blackfoot River is expected to meet applicable surface water quality standards. Runoff from the Proposed Action is expected to result in negligible water quality impacts to the Blackfoot River because the water management system is designed to capture runoff from disturbed areas and BMPs would be used to control sediment and turbidity.

Precipitation infiltrating through backfilled pits, overburden piles, and the ore stockpile would leach COPCs into groundwater. Seepage from the mine facilities would move downward to the water table in the Dinwoody and Wells Formations, where it would be transported north in groundwater to exit points along the Blackfoot River. The groundwater model indicates that selenium concentrations in groundwater flow to the river prior to mixing would likely exceed applicable surface water standards. Concentrations for the other COPCs in groundwater that would flow to the river are predicted to meet applicable surface water standards. Predicted concentrations for COPCs in groundwater immediately prior to mixing with river water for Reaches 1 and 2 are summarized in **Table 4.3-10** and on **Figures 4.3-12** and **4.3-13**.



BLACKFOOT BRIDGE PROJECT EIS

FIGURE 4.3-11
Modeled COPC Concentrations in Groundwater Discharging to Surface Water in the Drainage above Fish Pond

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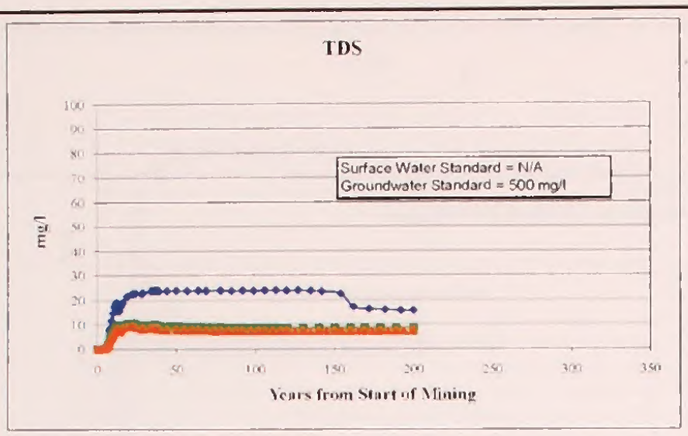
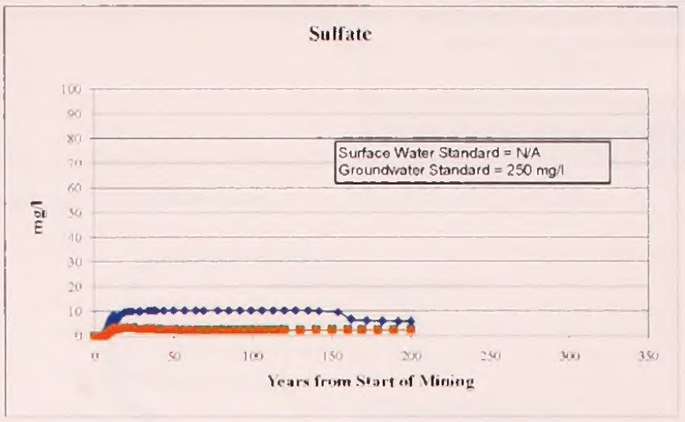
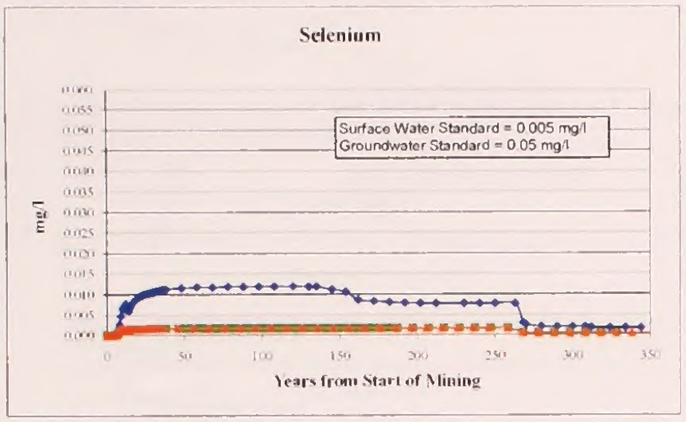
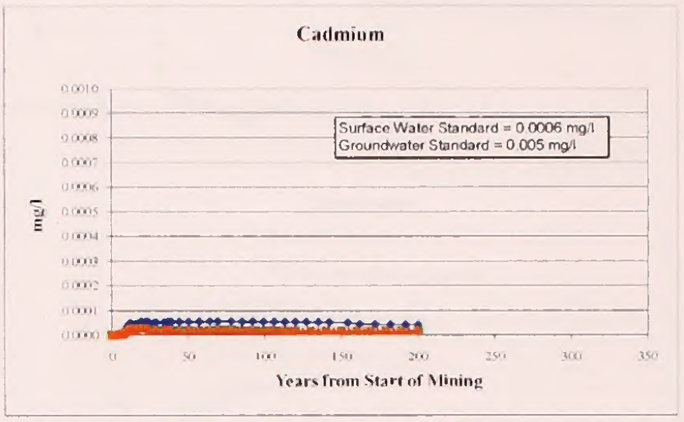
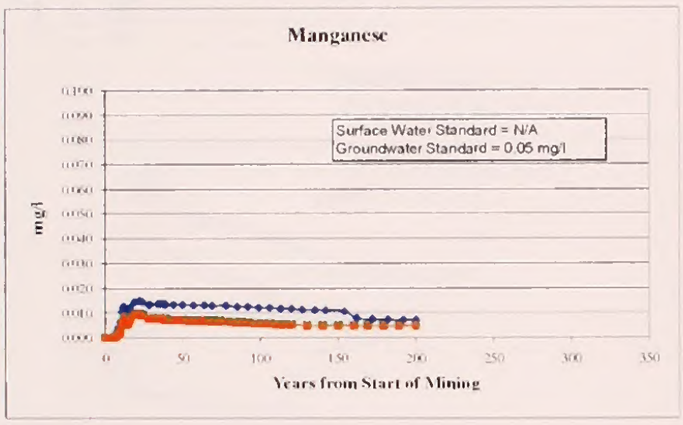
Date: 08/05/10	File: Graphs.dwg
Drawn By: JC	Layout: 001

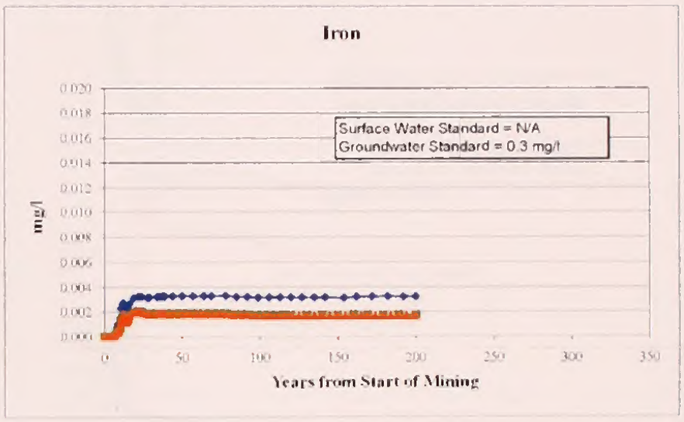


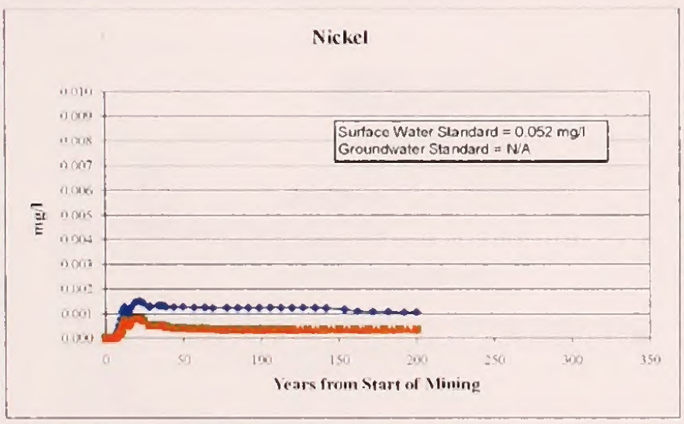


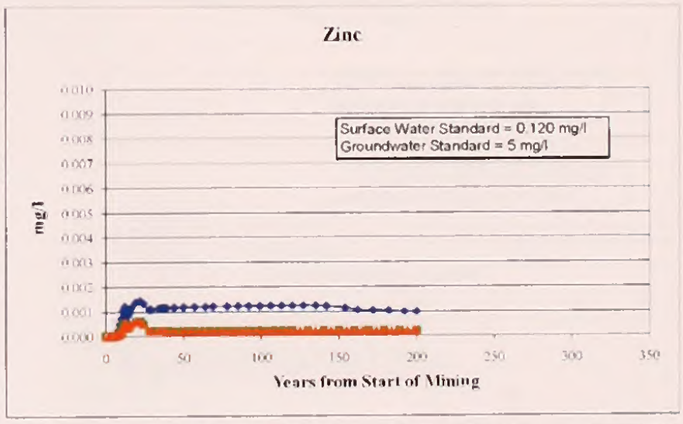


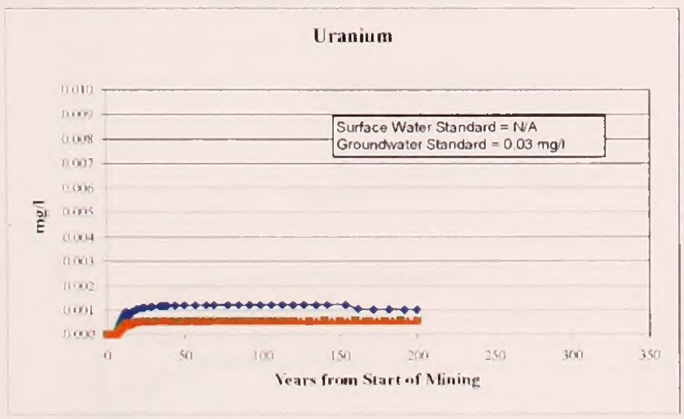


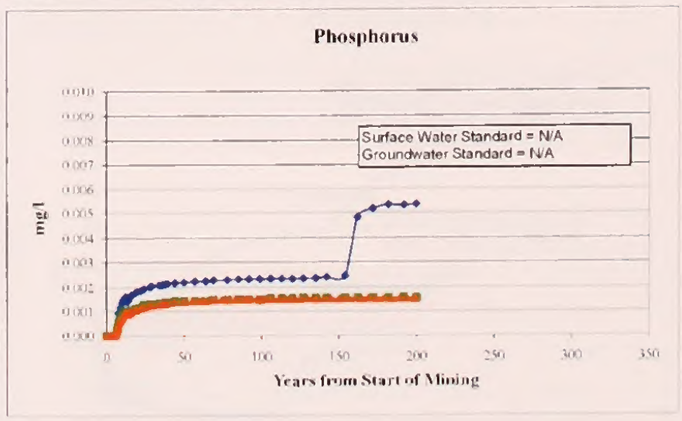










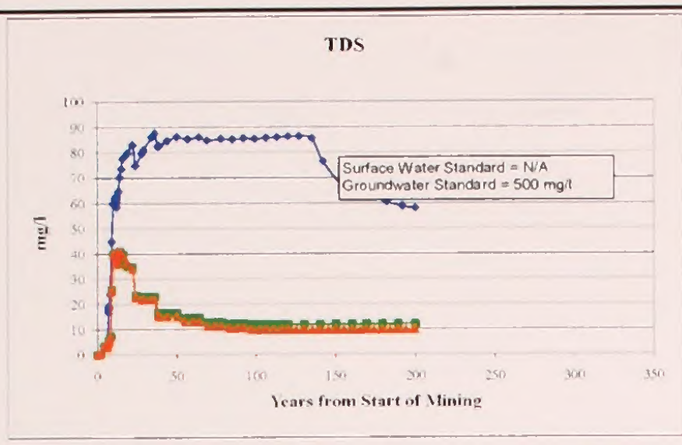


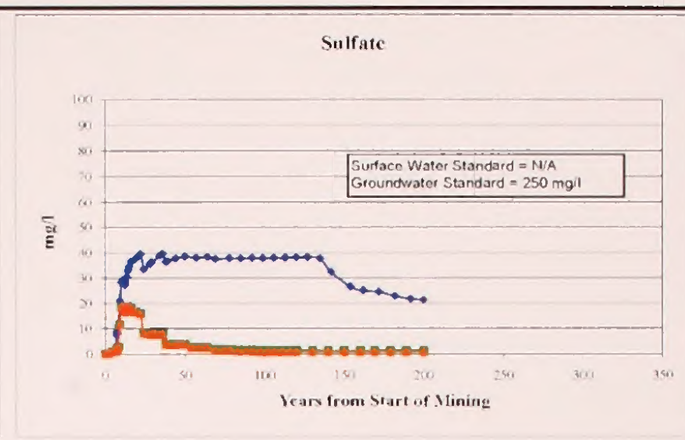
Proposed Action — Alternative 1A — Alternative 1B

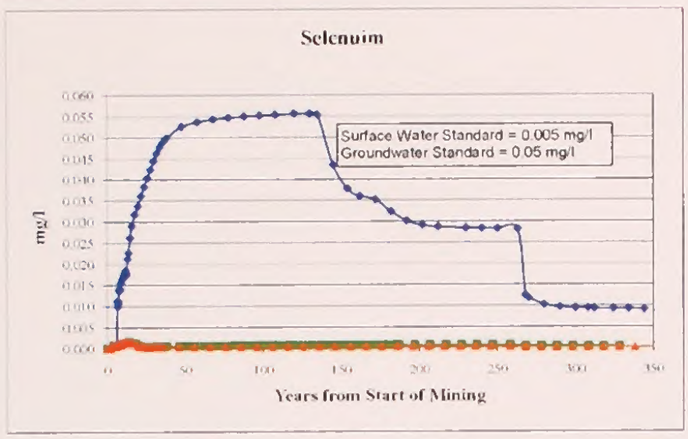
BLACKFOOT BRIDGE PROJECT EIS

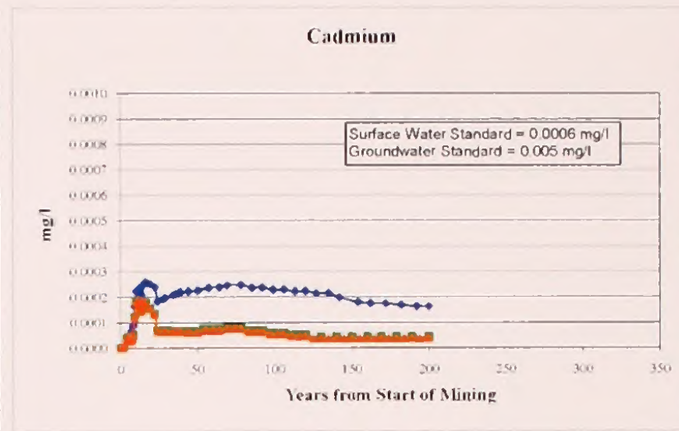
FIGURE 4.3-12
Modeled COPC Concentrations in Baseflow Reporting to Blackfoot River Reach 1

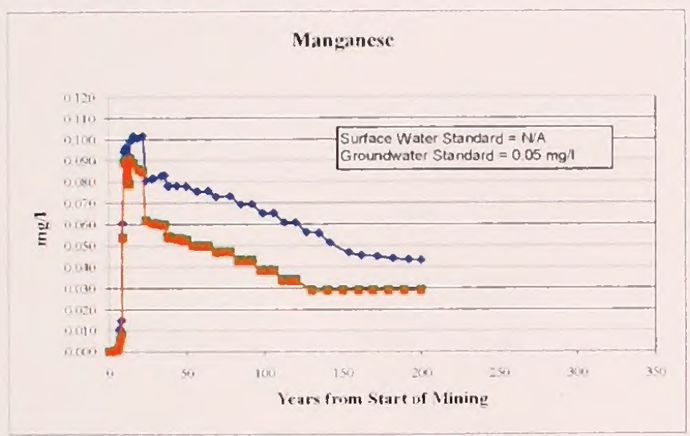
ANALYSIS AREA: Caribou County, Idaho	
Date: 12/22/10	File: Graphs.dwg
Drawn By: JC	Layout: 002

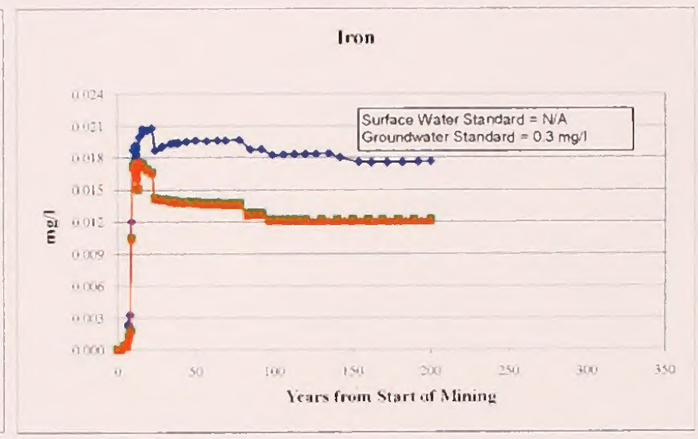


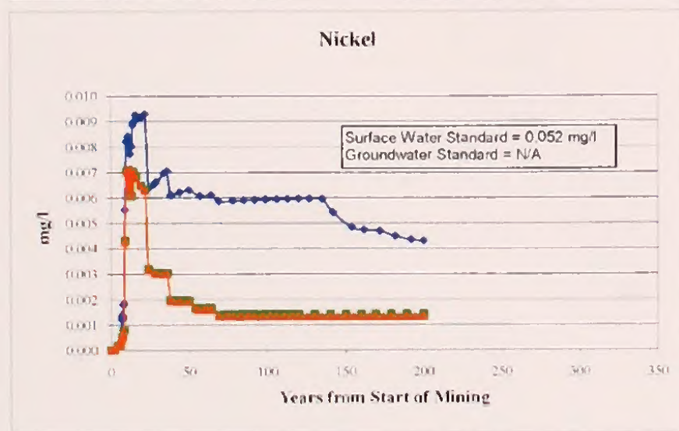


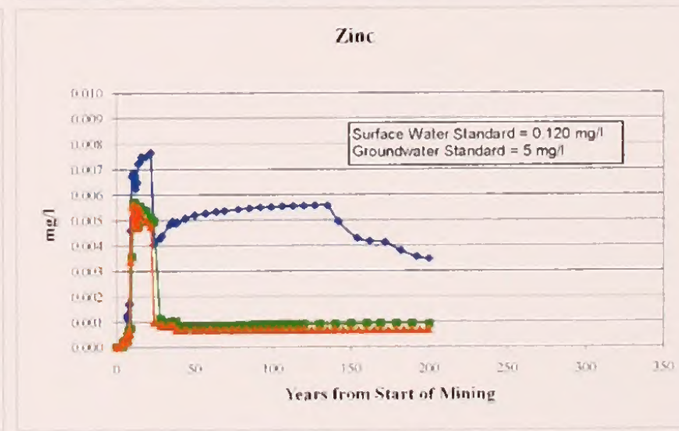


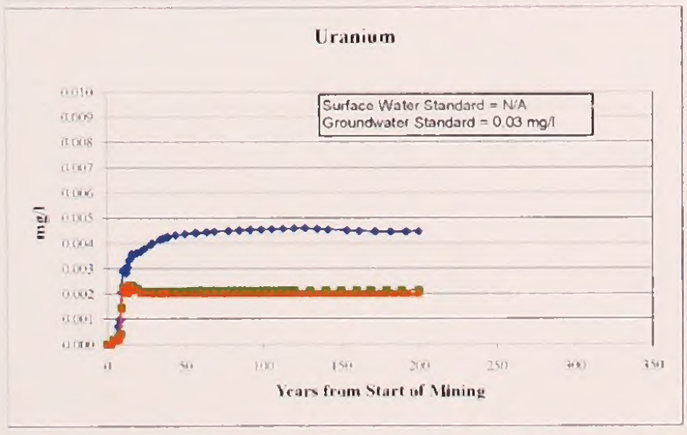


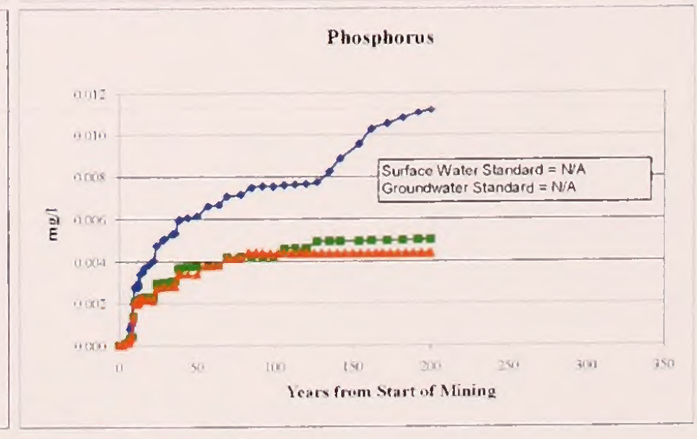












Proposed Action — Alternative 1A — Alternative 1B

BLACKFOOT BRIDGE PROJECT EIS

FIGURE 4.3-13
Modeled COPC Concentrations in
Baseflow Reporting to Blackfoot River Reach 2

ANALYSIS AREA: Caribou County, Idaho	
Date: 08/05/10	File: Graphs.dwg
Drawn By: JC	Layout: 003

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Table 4.3-10 Modeled COPC Concentrations in Groundwater Flow to Blackfoot River in Reaches 1 and 2 for the Proposed Action

Constituent	Peak Concentration (mg/L)	Long-Term Concentration (mg/L)	Surface Water Standard[1] (mg/L)	Groundwater Standard (mg/L)
Model Reach 1				
Cadmium	0.00006	0.00004	0.0006	0.005
Iron	0.003	0.003	N/A	0.3
Manganese	0.015	0.007	N/A	0.05
Nickel	0.0015	0.0011	0.0520	N/A
Phosphorous	0.005	0.005	N/A	N/A
Selenium	0.0118	0.0016	0.005	0.05
Sulfate	10	5	N/A	250
TDS	24	16	N/A	500
Uranium	0.001	0.001	N/A	0.03
Zinc	0.002	0.001	0.120	5
Model Reach 2				
Cadmium	0.0003	0.0002	0.0006	0.005
Iron	0.021	0.018	N/A	0.3
Manganese	0.102	0.043	N/A	0.05
Nickel	0.0093	0.0043	0.0520	N/A
Phosphorous	0.011	0.011	N/A	N/A
Selenium	0.0556	0.0090	0.005	0.05
Sulfate	40	21	N/A	250
TDS	88	58	N/A	500
Uranium	0.005	0.005	N/A	0.03
Zinc	0.008	0.004	0.120	5

Notes:
[1] Cold water aquatic life CCC, or chronic, standards are based on 100 mg/L hardness and a Water Effect Ratio (WER) of 1.
N/A = none applicable
The listed uranium standard is the federal drinking water MCL. Idaho does not have a groundwater standard for uranium.
Source: Whetstone 2009c; ARCADIS 2010

Predicted annual loading rates of COPCs to the Blackfoot River from the Proposed Action are summarized in **Table 4.3-11**. Model Reach 3 for Blackfoot River is omitted from these summaries because it is a losing segment along the majority of the reach. Model simulations indicate that Reach 3 would receive a small chemical load from groundwater near its boundary with Reach 2. This mass is included in the total annual loads in **Table 4.3-11** and is not broken out separately. Results from the groundwater model indicate that selenium concentrations in groundwater flow to the Blackfoot River would likely exceed the cold water aquatic life CCC standard of 0.005 mg/L, starting in year 10 at Reach 1 and year 7 at Reach 2. Peak selenium concentrations and loading to the river are projected to occur approximately 130 years after the start of mining (**Table 4.3-11**). Selenium concentrations in groundwater flow to the river are projected to decrease rapidly after the peak but remain elevated above 0.005 mg/L at Reach 2 for the modeled period of 350 years. Modeled selenium concentrations in groundwater flow to Reach 2 would be higher than in groundwater flow to Reach 1. Chemical loading to Reach 2 would originate mostly from the backfilled pits. Chemical loading to Reach 1 would be mostly from the NWOP. Modeling results indicate that concentrations for other COPCs in groundwater flow to the river are likely to meet applicable surface water quality standards during mining and after reclamation. Because the model predictions are sensitive to uncertainty associated with the

input parameters, the results should not be interpreted as absolute numerical values, but should be evaluated in broad terms with selenium being likely to have impacts at levels of regulatory concern and other COPCs, being likely to have impacts at levels below regulatory thresholds.

Table 4.3-11 Modeled Peak Annual Loading Rates for COPCs in Groundwater Flow to Blackfoot River for the Proposed Action

Constituent	Annual Loading From Reach 1 (lb/yr)	Annual Loading From Reach 2 (lb/yr)	Total Annual Load to Blackfoot River (lb/yr)
Cadmium	0.03	0.31	0.4
Iron	2.6	21.4	24.7
Manganese	13.3	101.4	117.5
Nickel	1.2	9.5	11.0
Phosphorus	2	14.1	16.5
Selenium	7.6	78.8	89.5
Sulfate	5,514	54,295	61,856
TDS	12,658	119,316	136,378
Uranium	0.7	5.6	6.5
Zinc	1	8	9.2

Note:
Total annual load includes loading from model river reaches 1, 2, and 3
Source: Whetstone 2009c

Data from the USGS monitoring station above the project area indicate that the Blackfoot River is seasonally impacted by elevated selenium concentrations (Whetstone 2009a). Selenium concentrations in the river typically exceed the surface water standard of 0.005 mg/L for about 1 to 3 weeks during peak flow from spring runoff. Selenium concentrations in the river water are typically below 0.005 mg/L during the remainder of the year. Mixing calculations for peak selenium concentrations in groundwater entering the Blackfoot River for model year 130 indicate that the Proposed Action would increase selenium concentrations in the river by 0.00009 mg/L during the high-flow period and 0.00087 mg/L during low-flow conditions (**Table 4.3-12**). Long-term loading (e.g., model year 350) from groundwater flow to the Blackfoot River under the Proposed Action would increase selenium concentrations in the river by 0.00001 mg/L during high-flow conditions and 0.000115 mg/L during low-flow conditions.

Table 4.3-12 Calculated Increases in In-Stream Selenium Concentrations for Blackfoot River under the Proposed Action

Period	Modeled Selenium Loading Rate (lbs/yr)	Long-Term Average Stream Flow[1] (cfs)	Calculated In-Stream Increase in Selenium Concentration (mg/L)
Peak Loading (model year 130)			
High Flow	89.5	520	0.00009
Low Flow	89.5	52	0.00087
Long-Term Loading (model year 350)			
High Flow	15.3	520	0.00001
Low Flow	15.3	52	0.00015

Note:
[1] Long-term average stream flows for May (high flow) and January (low flow) (Whetstone 2009a)
Source Whetstone 2009a; ARCADIS 2010

4.3.1.1.6 Impacts to Groundwater Resources

The Proposed Action would have direct impacts to groundwater resources in and near the project area. The impacts would include changes in water level and availability and increased chemical loading of COPCs to groundwater.

Impacts to Groundwater Levels

The Proposed Action would include mining below the regional groundwater table in the North and Mid Pits. Baseline monitoring data indicate that the elevation of the water table within the footprint of the North Pit ranges from about 6,150 to 6,185 feet (Whetstone 2009a), and the planned pit bottom is at 6,075 feet. The bottom of the Mid Pit would slope downward to the north, with the lowest elevation being approximately 6,160 feet (P4 2008a). The water table elevation at the north end of the Mid Pit is approximately 6,180 feet (**Figure 3.3-15**).

Intermittent mining below the water table and pumping for pit dewatering would occur between years 5 and 13. Dewatering for mining would be accomplished using a series of in-pit sumps. The sumps would be excavated one or two levels below the mining horizon, and groundwater entering the sumps would be pumped to WMP1 or WMP2 for disposal. The maximum flow and the duration of pumping that would be required to adequately dewater the pits for mining were evaluated using the groundwater model. The results of the pumping evaluation are summarized in **Table 4.3-13**.

Table 4.3-13 Modeled Pumping Requirements for Intermittent Mining below the Regional Water Table in the North Pit and Mid Pit

Year	Mining Location	Estimated Number of Days Mining below the Water Table	Estimated Number of Days Pumping for Pit Dewatering	Pumping Rate (cfs)	Total Annual Volume of Groundwater Discharged to Water Management Ponds (cubic ft)
5	Mid Pit	15	22	1.06	2,014,848
6	North Pit	55	69	2.62	15,619,392
7	North Pit	36	50	2.86	12,355,200
8	North Pit	35	49	0.52	2,201,472
9	North Pit	57	71	0.86	5,275,584
10	--	0	0	0	0
11	--	0	0	0	0
12	North Pit	40	54	0.04	186,624
13	North Pit	82	96	3.49	28,947,456

Source Whetstone 2009b; ARCADIS 2010

Groundwater from the North and Mid Pits would be pumped to WMP1 and WMP2 and evaporated. The ponds are sized with excess capacity to contain the expected runoff and dewatering flow from the pits. Should emergency upset conditions occur, the water would be pumped to the Mid Pit on a temporary basis and infiltrated through clean limestone or tuff overburden back into the Wells Formation.

Pumping for pit dewatering would temporarily lower groundwater levels in the rocks adjacent to the pits. At the cessation of pumping, groundwater levels in the aquifer would quickly rebound to near their pre-pumping elevation. The projected maximum drawdown in the aquifer due to mine

dewatering is modeled to occur in year 13. The predicted maximum extent of the water table drawdown is shown on **Figure 4.3-14**.

With the exception of the South Pit, construction and capping of the overburden piles and backfills would permanently reduce the amount of recharge reporting to the water table over the footprints of the facilities. Runoff from the exposed walls of the South Pit after reclamation would report to the bottom of the pit, where it would infiltrate and result in a net increase in recharge to the Wells Formation. Decreased recharge from the other facilities would have the largest effect on water levels in the Dinwoody Formation near the EOP.

The maximum long-term groundwater drawdown in the Dinwoody Formation below the EOP is projected to be about 25 feet. Long-term groundwater drawdown in areas outside of the footprint of the EOP is projected to be less than 5 feet. Increased recharge to the Wells Formation in the South Pit would result in locally increased groundwater levels in the regional aquifer. The potential rise in groundwater levels near the South Pit is projected to be less than 5 feet. Annual changes in recharge rates over the footprints of the proposed facilities for the Proposed Action are summarized in **Table 4.3-14**. The predicted maximum extent of permanent water table drawdown greater than 5 feet is shown on **Figure 4.3-15**.

Table 4.3-14 Predicted Annual Changes in Groundwater Recharge for Mine Facilities under the Proposed Action

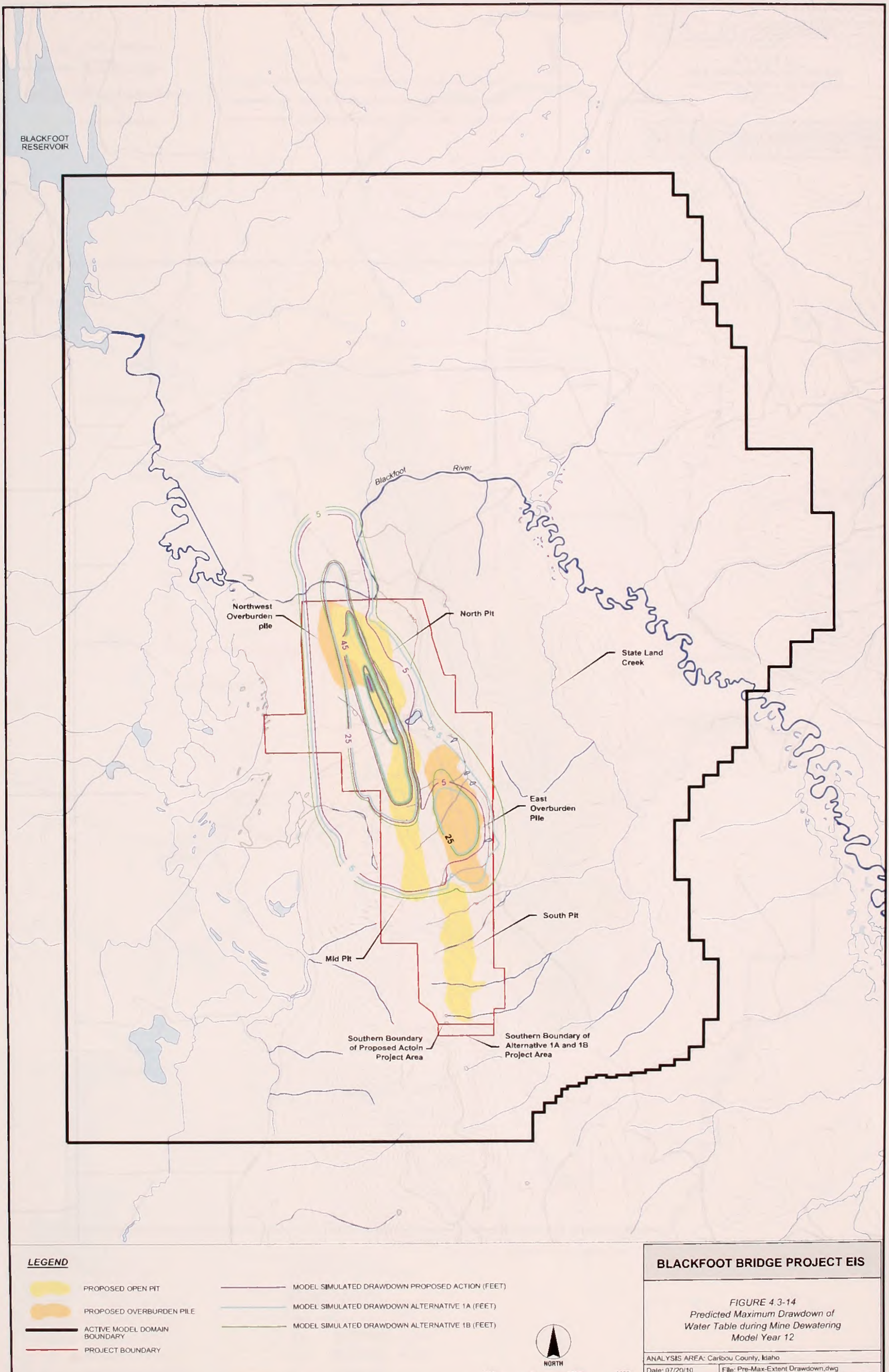
Facility	Undisturbed ft^3/yr	Proposed Action ft^3/yr	Change Under the Proposed Action ft^3/yr
North Pit	628,530	693,477	64,947
Mid Pit	763,580	780,748	17,168
South Pit	816,140	2,519,433	1,703,293
EOP	867,970	615,852	-252,118
NWOP	219,365	89,701	-129,664

Source: Whetstone 2009b

Impacts to Groundwater Quality

Under the Proposed Action, groundwater quality in the project area would be potentially impacted by seepage from the proposed overburden piles and backfilled pits. Seepage from the mine facilities would potentially result in increased loading of selenium, manganese, and other COPCs to groundwater. These constituents would be transported north, forming plumes with higher concentrations of COPCs than in unaffected groundwater. Increased loading of COPCs to groundwater is predicted to begin shortly after mining commences originating from disturbed areas and partially constructed overburden piles and backfills. Overburden and backfill would be capped and reclaimed concurrent to mining progress to limit exposure of reactive material to infiltrating precipitation.

Modeling results predict that, with the exceptions of selenium and manganese, groundwater plumes with COPC concentrations exceeding applicable standards would not be transported outside of the footprints of mine facilities. Limited areas of groundwater at the water table below the proposed pits and overburden piles would, however, carry concentrations of cadmium, manganese, iron, sulfate, and zinc that are near or above their respective standards. Selenium and



BLACKFOOT BRIDGE PROJECT EIS

FIGURE 4.3-14
Predicted Maximum Drawdown of Water Table during Mine Dewatering Model Year 12

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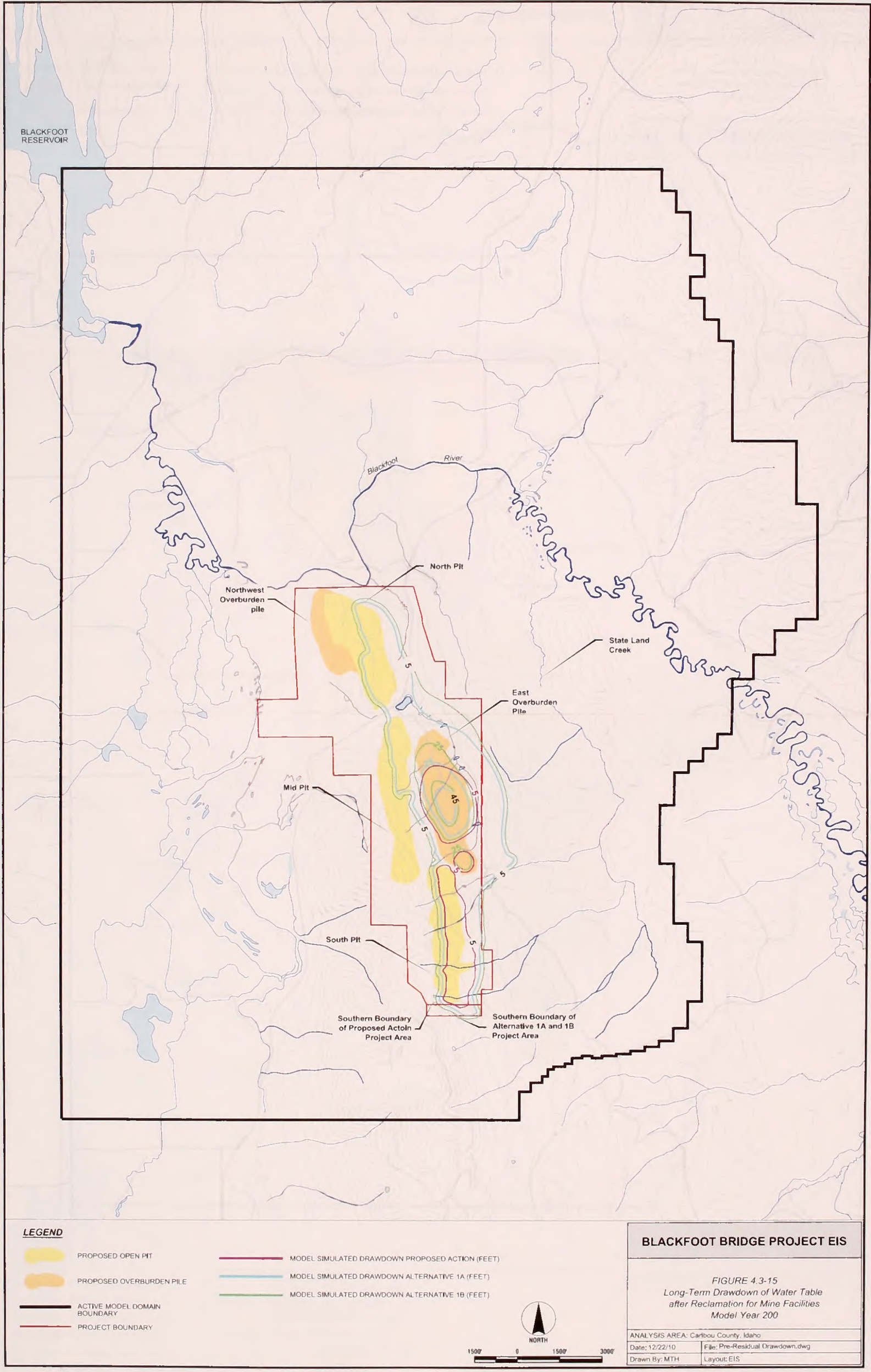
Date: 07/20/10	File: Pre-Max-Extent Drawdown.dwg
Drawn By: MTH	Layout: EIS



BLACKFOOT BRIDGE PROJECT EIS

FIGURE 4.3-15
Long-Term Drawdown of Water Table after Reclamation for Mine Facilities Model Year 200

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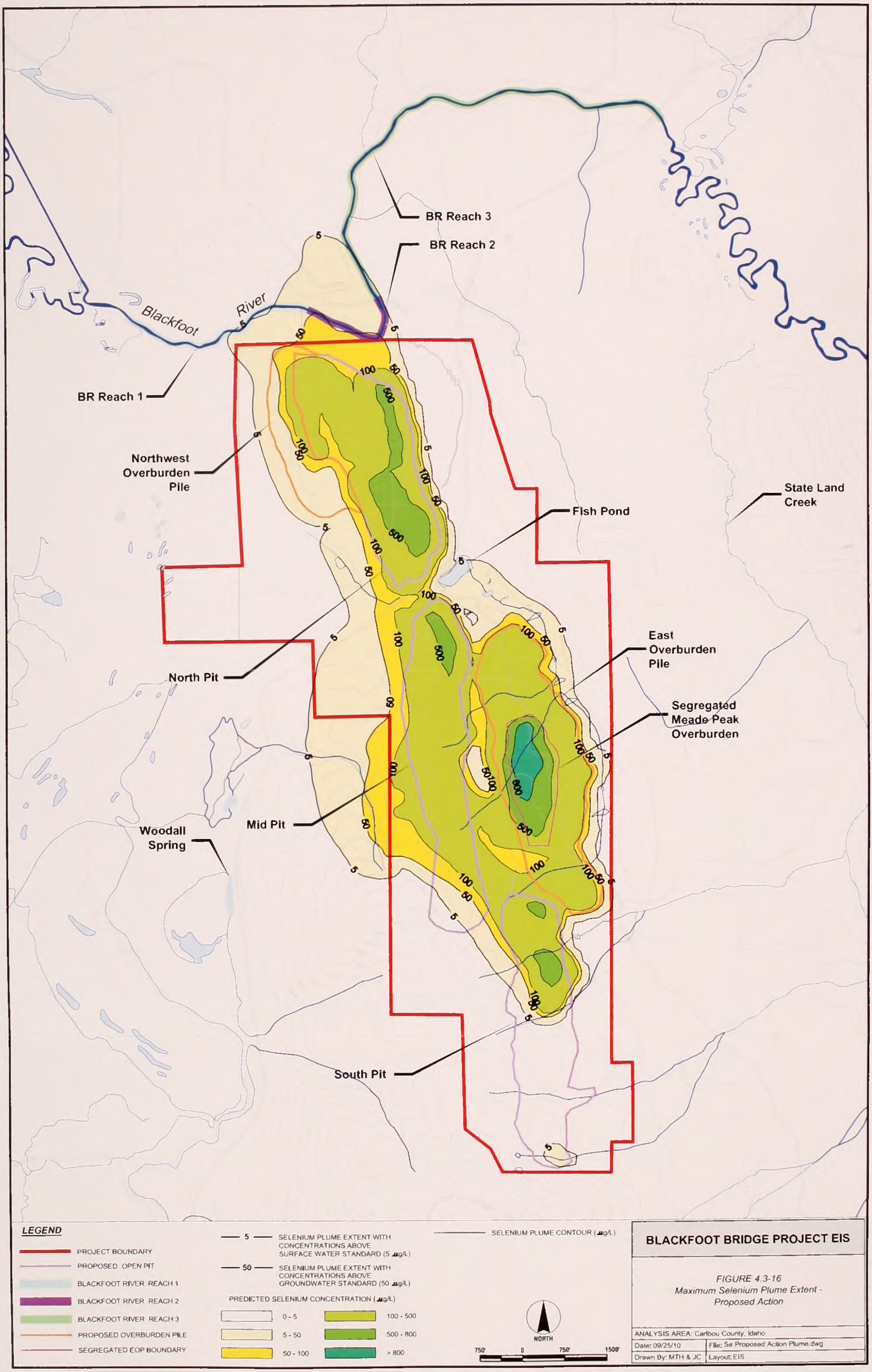
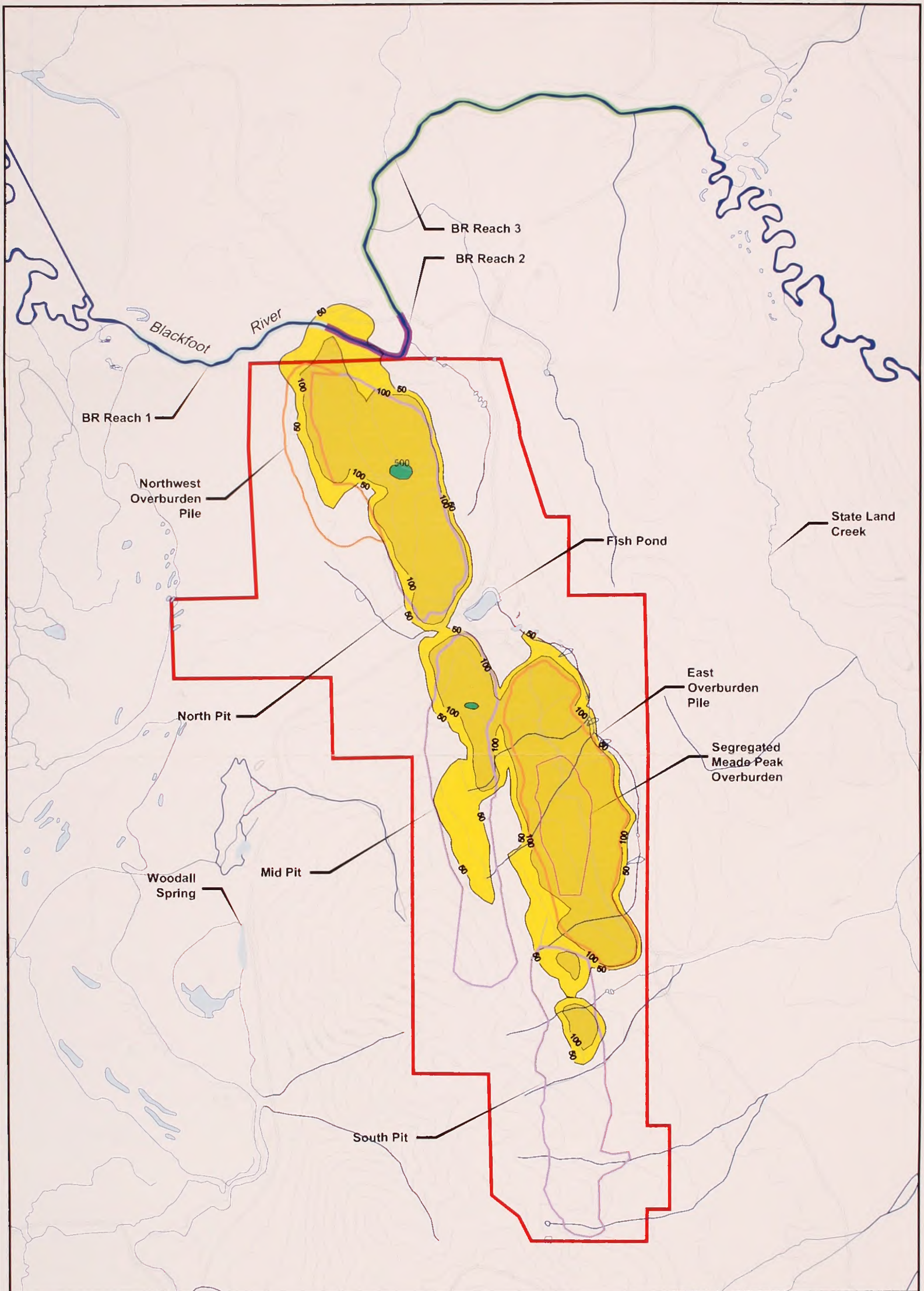
Drawn By: MTH	Layout: EIS


BR Reach 3
BR Reach 2
Blackfoot River
BR Reach 1
Northwest Overburden Pile
State Land Creek
Fish Pond
East Overburden Pile
North Pit
Segregated Meade Peak Overburden
Mid Pit
Woodall Spring
South Pit
LEGEND
PROJECT BOUNDARY
PROPOSED OPEN PIT
BLACKFOOT RIVER REACH 1
BLACKFOOT RIVER REACH 2
BLACKFOOT RIVER REACH 3
PROPOSED OVERBURDEN PILE
SEGREGATED EOP BOUNDARY
5 SELENIUM PLUME EXTENT WITH CONCENTRATIONS ABOVE SURFACE WATER STANDARD (5 µg/L)
50 SELENIUM PLUME EXTENT WITH CONCENTRATIONS ABOVE GROUNDWATER STANDARD (50 µg/L)
SELENIUM PLUME CONTOUR (µg/L)
PREDICTED SELENIUM CONCENTRATION (µg/L)
0 - 5
5 - 50
50 - 100
100 - 500
500 - 800
> 800
NORTH
750' 0 750' 1500'
BLACKFOOT BRIDGE PROJECT EIS
FIGURE 4.3-16
Maximum Selenium Plume Extent - Proposed Action
ANALYSIS AREA: Caribou County, Idaho
Date: 09/25/10
File: Se Proposed Action Plume.dwg
Drawn By: MTH & JC
Layout: EIS



LEGEND

- PROJECT BOUNDARY
- PROPOSED OPEN PIT
- BLACKFOOT RIVER REACH 1
- BLACKFOOT RIVER REACH 2
- BLACKFOOT RIVER REACH 3
- PROPOSED OVERBURDEN PILE
- SEGREGATED EOP BOUNDARY
- 50 — MANGANESE PLUME EXTENT WITH CONCENTRATIONS ABOVE GROUNDWATER STANDARD (50 µg/L)
- MANGANESE PLUME CONTOUR (µg/L)

PREDICTED MANGANESE CONCENTRATION (µg/L)

0 - 50	100 - 500
50 - 100	> 500

NORTH

750' 0 750' 1500'

BLACKFOOT BRIDGE PROJECT EIS

FIGURE 4.3-17
Maximum Manganese Plume Extent - Proposed Action

ANALYSIS AREA: Caribou County, Idaho	
Date: 12/22/10	File: Mn Proposed Action Plume.dwg
Drawn By: MTH & JC	Layout: EIS

manganese concentrations in groundwater are predicted to exceed the numerical groundwater standard of 0.05 mg/L in areas outside of the mine facilities and project area. The maximum extent of the modeled selenium plume for the Proposed Action is shown on **Figure 4.3-16**. The maximum extent of the manganese plume is shown on **Figure 4.3-17**.

Background concentrations of manganese in groundwater north of the North Pit exceed secondary groundwater standards. The secondary groundwater standard is based on aesthetic qualities (per IDAPA 58.01.11.200.01.a Table III), not toxic effects. Predicted concentrations for manganese are below the EPA health advisory value (P4 2010g). The Idaho Ground Water Quality Rule provides that, upon request of the mine operator, IDEQ shall set a point or points of compliance at which the mine operator must meet the groundwater quality standards. The points of compliance are required to be set such that outside the mining area boundary there is no injury to current or projected future beneficial uses and there is no violation of surface water quality standards applicable to interconnected surface waters. P4 has submitted a Point of Compliance application to the IDEQ (P4 2010g) that will provide for points of compliance consistent with the Idaho Ground Water Quality Rule. As part of that review, IDEQ would set appropriate points of compliance for groundwater; including any analyte-specific compliance points. Thus, P4 would demonstrate compliance with the amended Idaho Ground Water Quality Rule (IDAPA 58.01.11).

4.3.1.2 Alternative 1A – GCLL Cover System Over Core Materials in EOP and Overburden in Pits

4.3.1.2.1 Impacts to Surface Water Resources

This alternative would be similar to the Proposed Action but would include the installation of GCLL covers over the backfills in the North Pit, Mid Pit, and South Pit, and an 86 acre area of the EOP that includes segregated Meade Peak overburden. Simple 1 covers would be installed over the NWOP and part of the EOP. The material balance for the EOP would be modified under Alternative 1A to include a 21 acre area of selectively handled limestone and dolomite (limestone) that would be placed at the northern end of the overburden pile. The purpose of the selectively handled limestone would be to reduce potential water quality impacts in the unnamed drainage below the EOP. A Simple 1 cover would be used over the selectively handled limestone. The material balance for the partial backfill in the South Pit would also be modified under Alternative 1A. Non-Meade Peak overburden including Rex Chert, alluvium, tuff, and Wells Formation/Grandeur Member of the Park City Formation would be placed as partial backfill in the South Pit instead of selectively handled limestone and dolomite. The partial backfill would be covered with a GCLL cover. The effect of the re-designed covers and material balances under Alternative 1A would be to reduce the volume of precipitation that infiltrates through the reclaimed mine facilities and reduce project-related chemical loading to groundwater and surface water.

Modeled infiltration rates for Alternative 1A are summarized in **Table 4.3-15**. Discussion of how infiltration through the cover systems was modeled for various slope aspects is presented in the Revised Source Term Development Report (Whetstone 2010b) and the modified Groundwater Modeling Report (ARCADIS 2010).

Impacts to Runoff Areas

Alternative 1A would have direct impacts to runoff areas for State Land Creek and the Fish Pond Watershed that differ from the Proposed Action. Other impacts to runoff areas in the project area would be the same as for the Proposed Action.

Table 4.3-15 Area-Weighted Average Infiltration Rates for Mine Facilities under Alternative 1A

Mine Facility	Cover Type	Average Infiltration (in/yr)
NWOP	Simple 1	0.326
EOP Non-Meade Peak Overburden	Simple 1	0.583
EOP Non-Meade Peak Overburden	GCLL	0.001
EOP Segregated Meade Peak Overburden	GCLL	0.001
EOP Selectively Handled Limestone (north slope areas)	Simple 1	5.700
EOP Selectively Handled Limestone (east and west slope areas)	Simple 1	0.399
North Pit	GCLL	0.001
Mid Pit	GCLL	0.001
South Pit Complete Backfill	GCLL	0.001
South Pit Partial Backfill	GCLL	0.001

Source: ARCADIS 2010

Under Alternative 1A, a ditch would be constructed on the west side of the reclaimed South Pit to divert surface water runoff away from the partially backfilled section of the pit. The ditch would intercept runoff from an upland area of 13 acres in State Land Creek Tributary 1, 78 acres in State Land Creek Tributary 2, and 58 acres in State Land Creek Tributary 3 and route it to an exit point approximately 400 feet below Wetland A spring in State Land Creek Tributary 3. The ditch would also intercept runoff from the 40 acre area of the Fish Pond Watershed and divert it to State Land Creek Tributary 3. Under Alternative 1A the partially backfilled South Pit would permanently capture runoff from an area of 84 acres in the State Land Creek watershed. The net loss in drainage area to State Land Creek watershed from Alternative 1A including the intercepted area from Fish Pond Watershed would be 44 acres. Under Alternative 1A, the reduction in runoff area for the State Land Creek Watershed would be 79 acres less than for the Proposed Action. The runoff area removed from the Fish Pond Watershed under Alternative 1A would be 40 acres more than for the Proposed Action. Under the Proposed Action, no runoff area would be permanently removed from the Fishpond Watershed. The difference in runoff area for the Blackfoot River for Alternative 1A and the Proposed Action would be less than 0.1 percent and would be negligible.

Impacts to Peak Flows

Direct impacts to peak flows in streams and drainages in the project area for Alternative 1A would be the same as for the Proposed Action.

Impacts to Channels

Direct impacts to channels in the project area for Alternative 1A would be the same as for the Proposed Action.

Impacts to Stream and Spring Flows

Alternative 1A would have direct impacts to spring and stream flows in the State Land Creek and Fish Pond Watersheds that differ from the Proposed Action, as described below. Other impacts to spring and stream flows in the project area would be the same as for the Proposed Action.

Wetland A and the Unnamed Tributary to State Land Creek

The drainage that supplies groundwater and runoff to Wetland A spring has an area of approximately 82 acres. Under Alternative 1 A, the South Pit and diversion ditch would permanently intercept surface water runoff and shallow groundwater flow from 50 acres of the overlying drainage. Assuming that flow from the spring is proportional to surface area, Alternative 1A would result in a 62 percent reduction in surface water availability at Wetland A. This represents 34 percent less reduction in surface water availability to Wetland A from the spring compared to the Proposed Action. However, surface water runoff from the slope above the South Pit, a portion of the reclaimed backfill, and the ditch capture area from the Fish Pond Watershed (117 acres total) would be captured by a diversion ditch and be routed to the drainage 400 feet below Wetland A spring (P4 2010c). Consequently, this water would not be available for Wetland A spring at its current location.

Unnamed Tributary to Fish Pond

The South Pit diversion ditch would capture 40 acres of runoff area from the Fish Pond Watershed and reduce surface flow at Wetland H by 9 percent compared to the Proposed Action.

Installation of the GCLL cover over the backfill pits and Simple 1 covers over the non-Meade Peak overburden in the NWOP would reduce recharge to groundwater over the footprint of the facilities; however, this would result in a negligible change in the amount of groundwater available to streams and springs compared to the Proposed Action. Impacts to spring flows in the drainage above Fish Pond and in Wetland A would be the same as for the Proposed Action because both Alternative 1A and the Proposed Action would result in the elimination of perennial spring flows in the drainages. Changes to flow in Woodall Spring, North Woodall Spring, Beaver Pond drainage, and the Blackfoot River are modeled to be less than 1 percent change compared to the Proposed Action.

Impacts to Surface Water Quality

Alternative 1A would result in reduced loading to groundwater and surface water from the project compared to the Proposed Action. As a conservative measure, the OSMS was not considered in the modeling for Alternative 1A. Modeling results predict that concentrations for all COPCs in groundwater flowing to the Blackfoot River would meet numerical criteria for surface water. Likewise, COPCs in groundwater flow to surface water in the drainage above Fish Pond are predicted to meet all applicable water quality standards under Alternative 1A. Other surface water bodies in the project area would have negligible impacts from chemical loading by the proposed project. Modeled COPC concentrations in groundwater flow to the Blackfoot River and the unnamed drainage above Fish Pond are shown on **Figures 4.3-11, 4.3-12**, and **4.3-13,** and are summarized in **Table 4.3-16**. Modeled peak annual loading rates for COPCs in groundwater recharge to the Blackfoot River for Alternative 1A are presented in **Table 4.3-17**. Calculated increases for in-stream selenium concentrations for the Blackfoot River using the proposed GCLL cover are presented in **Table 4.3-18**.

Table 4.3-16 Modeled COPC Concentrations in Groundwater Flowing to Blackfoot River and Surface Water in the Drainage above Fish Pond for Alternative 1A

Constituent	Peak Concentration (mg/L)	Long Term Concentration (mg/L)	Surface Water Standard[1] (mg/L)	Groundwater Standard (mg/L)
Blackfoot River Model Reach 1				
Cadmium	0.00003	0.00002	0.0006	0.005
Iron	0.002	0.002	N/A	0.3
Manganese	0.010	0.005	N/A	0.05
Nickel	0.0008	0.0004	0.0520	N/A
Phosphorous	0.002	0.002	N/A	N/A
Selenium	0.0016	0.0003	0.005	0.05
Sulfate	4	2	N/A	250
TDS	10	9	N/A	500
Uranium	0.001	0.001	N/A	0.03
Zinc	0.0006	0.0002	0.120	5
Blackfoot River Model Reach 2				
Cadmium	0.00018	0.00004	0.0006	0.005
Iron	0.017	0.0122	N/A	0.3
Manganese	0.091	0.029	N/A	0.05
Nickel	0.0071	0.0014	0.0520	N/A
Phosphorous	0.005	0.005	N/A	N/A
Selenium	0.0017	0.0003	0.005	0.05
Sulfate	19	1	N/A	250
TDS	41	12	N/A	500
Uranium	0.002	0.002	N/A	0.03
Zinc	0.006	0.001	0.120	5
Surface Water in the Drainage Above Fish Pond				
Cadmium	0.00024	0.00013	0.0006	0.005
Iron	0.0007	0.0001	N/A	0.3
Manganese	0.003	0.001	N/A	0.05
Nickel	0.0012	0.0006	0.0520	N/A
Phosphorus	0.053	0.053	N/A	N/A
Selenium	0.0008	0.0001	0.005	0.05
Sulfate	2	0.414	N/A	250
TDS	45	15	N/A	500
Uranium	0.001	0.001	N/A	0.03
Zinc	0.036	0.0096	0.120	5

Note:
[1] Coldwater aquatic life CCC based on 100 mg/L hardness and a water effect ratio (WER) of 1.
N/A - not applicable
The listed uranium standard is the federal drinking water MCL. Idaho does not have a groundwater standard for uranium.
Source: ARCADIS 2010

Table 4.3-17 Modeled Peak Annual Loading Rates for COPCs in to Blackfoot River for Alternative 1A

Constituent	Annual Loading to Reach 1 (lb/yr)	Annual Loading to Reach 2 (lb/yr)	Total Annual Load to Blackfoot River (lb/yr)
Cadmium	0.02	0.16	0.2
Iron	2.1	15.2	17.7
Manganese	10.3	79.1	91.0
Nickel	0.8	6.2	7.2
Phosphorous	0.7	5.5	6.4

Table 4.3-17 Modeled Peak Annual Loading Rates for COPCs in to Blackfoot River for Alternative 1A

Constituent	Annual Loading to Reach 1 (lb/yr)	Annual Loading to Reach 2 (lb/yr)	Total Annual Load to Blackfoot River (lb/yr)
Selenium	0.3	1.3	1.6
Sulfate	2,341	16,155	18,852
TDS	5,168	35,119	41,058
Uranium	0.3	2.0	2.4
Zinc	0.7	5.0	5.7

Note:
Annual loading rates for model year 108.
Total annual load includes loading from model river reaches 1, 2, and 3.
Source: ARCADIS 2010

Table 4.3-18 Calculated Increases in In-Stream Selenium Concentrations for Blackfoot River for Alternative 1A

Period	Modeled Selenium Loading Rate (lbs/yr)	Long-Term Average Stream Flow[1] (cfs)	Calculated In-Stream Increase in Selenium Concentration (mg/L)
Peak Loading (Model Year 258)			
High-Flow	1.6	520	0.000002
Low-Flow	1.6	52	0.000016
Long-Term Loading (Model Year 350)			
High-Flow	0.6	520	0.000001
Low-Flow	0.6	52	0.000006

Note:
[1] Long-term average stream flows for May (high-flow) and January (low-flow)
Source: ARCADIS 2010

4.3.1.2.2 Impacts to Groundwater Resources

Impacts to Groundwater Levels

Installation of GCLL covers over backfilled pits and part of the EOP and Simple 1 covers over the NWOP and the remainder of the EOP for Alternative 1A would reduce recharge to groundwater under the mine facilities compared to the Proposed Action and increase groundwater drawdown in the project area after reclamation. The maximum extent of groundwater drawdown during active dewatering of the Mid Pit and North Pit would be similar to the Proposed Action. Changes in groundwater recharge under Alternative 1A are compared to the Proposed Action and shown in **Table 4.3-19**. Modeled drawdown impacts for Alternative 1A are presented on **Figures 4.3-14** and **4.3-15**.

Table 4.3-19 Predicted Annual Changes in Groundwater Recharge for Mine Facilities for Alternative 1A

Facility	Proposed Action (ft^3/yr)	Alternative 1A (ft^3/yr)	Change from the Proposed Action (ft^3/yr)
North Pit	693,477	514	-692,963
Mid Pit	780,748	452	-780,297
South Pit	2,519,433	2,348,642	-170,791
EOP	615,852	223,847	-392,005
NWOP	89,701	53,465	-36,236

Source: ARCADIS 2010

Impacts to Groundwater Quality

Installation of GCLL covers over backfill pits and part of the EOP and Simple 1 covers over the NWOP and the remainder of the EOP for Alternative 1A would result in reduced loading of COPCs to groundwater compared to the Proposed Action. Modeling results indicate that the extent of selenium and manganese plumes exceeding numerical standards for groundwater would be reduced compared to the Proposed Action. Plumes with selenium concentrations greater than 0.05 mg/L would be limited to small areas within the footprint of the North Pit, areas below the EOP and north end of the Mid Pit (**Figure 4.3-18**). Manganese concentrations exceeding the numerical secondary groundwater standard of 0.05 mg/L would occur below the footprints of the North Pit, the NWOP, the Mid Pit, the South Pit, and the EOP. A manganese plume exceeding numerical groundwater standards is also predicted to extend below Blackfoot River several hundred feet north of the project boundary (**Figure 4.3-19**). Background concentrations of manganese in groundwater north of the North Pit exceed secondary groundwater standards. The secondary groundwater standard is based on aesthetic qualities (per IDAPA 58.01.11.200.01.a Table III), not toxic effects. Predicted concentrations are below the EPA health advisory value (P4 2010g). The Idaho Ground Water Quality Rule provides that, upon request of the mine operator, IDEQ shall set a point or points of compliance at which the mine operator must meet the groundwater quality standards. The points of compliance are required to be set such that outside the mining area boundary there is no injury to current or projected future beneficial uses and there is no violation of surface water quality standards applicable to interconnected surface waters. P4 has submitted a Point of Compliance application to the IDEQ (P4 2010g) that will provide for points of compliance consistent with the Idaho Ground Water Quality Rule. As part of that review, IDEQ would set appropriate points of compliance for groundwater; including any analyte-specific compliance points. Thus, P4 would demonstrate compliance with the amended Idaho Ground Water Quality Rule (IDAPA 58.01.11). (See the Point of Compliance application for additional monitoring information). Modeling results indicate that all other COPCs in groundwater outside of the footprints of the mine facilities would meet applicable water quality standards. Because the model predictions are sensitive to uncertainty associated with the input parameters, the results in **Table 4.3-16** should not be interpreted as absolute numerical values, but should be evaluated in broad terms with manganese being likely to have impacts at levels of regulatory concern outside of the project boundary and other COPCs being likely to have impacts at levels below regulatory thresholds outside of facility footprints.

4.3.1.3 Alternative 1B – GCLL over the Entire EOP and Overburden in Pits

4.3.1.3.1 Impacts to Surface Water Resources

This alternative would be similar to Alternative 1A but would include the installation of GCLL covers over the backfills in the North Pit, Mid Pit, and South Pit, and the entire EOP. A Simple 1 cover would be installed over the NWOP. The material balance for the South Pit would be modified under Alternative 1B compared to the Proposed Action to place non-Meade Peak overburden including Rex Chert, alluvium, tuff, and Wells Formation/Grandeur Member of the Park City Formation as partial backfill in the South Pit instead of selectively handled limestone and dolomite. The partial backfill would be covered with a GCLL cover. The effect of the more extensive GCLL covers for Alternative 1B would be to reduce the volume of precipitation that infiltrates through the reclaimed mine facilities and, therefore, reduce project-related chemical

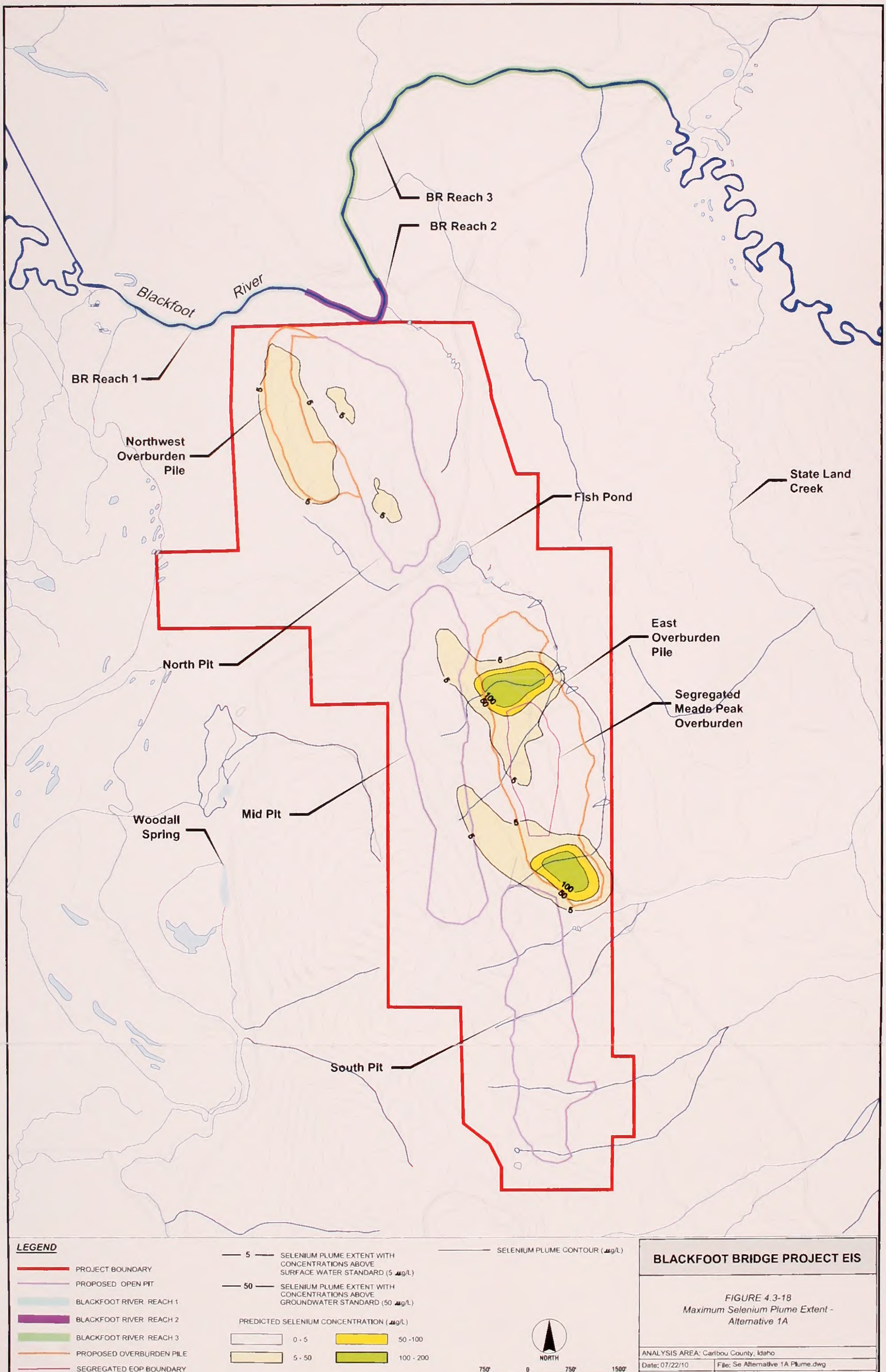


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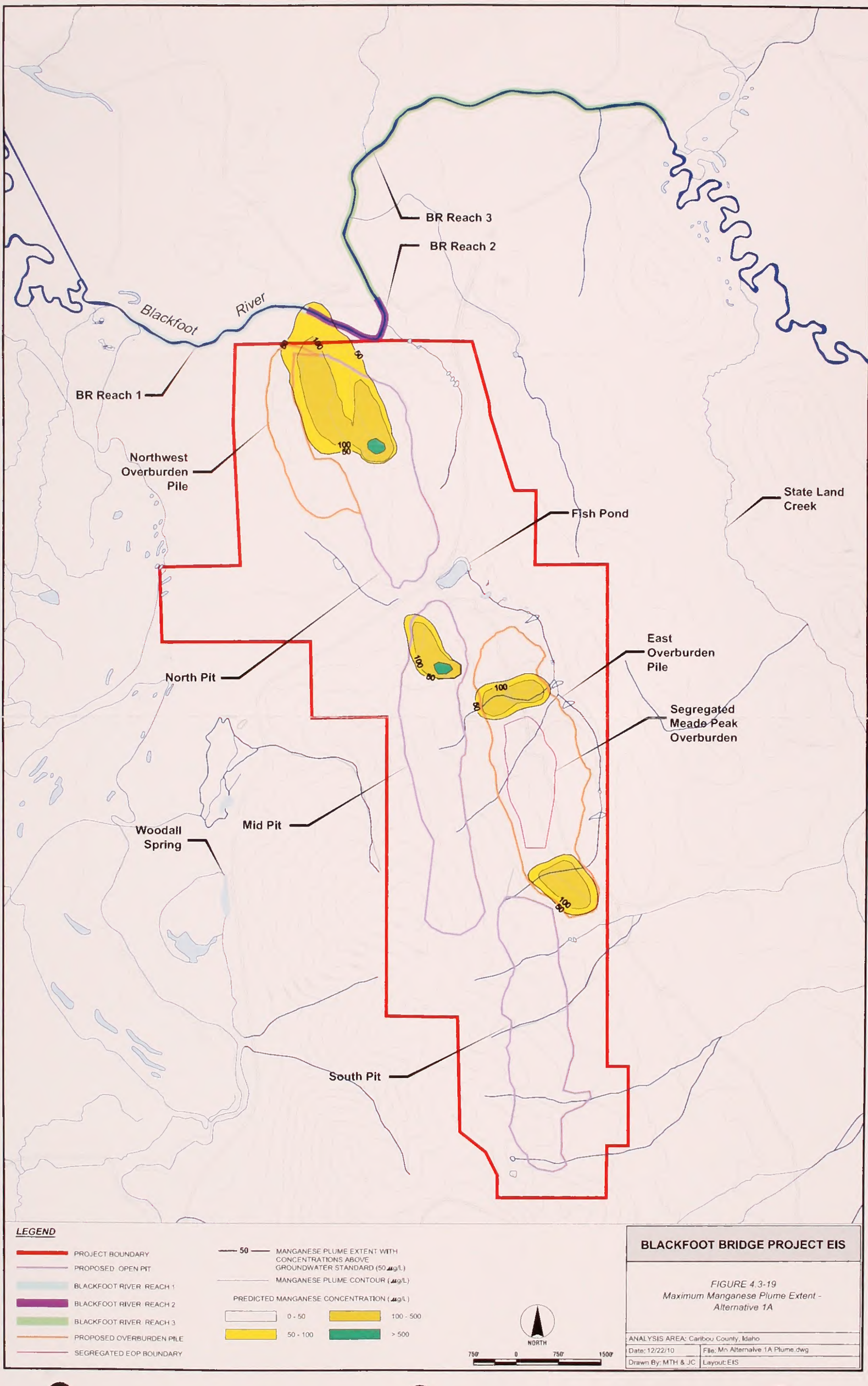
FIGURE 4.3-18
Maximum Selenium Plume Extent - Alternative 1A

ANALYSIS AREA: Caribou County, Idaho	
Date: 07/22/10	File: Se Alternative 1A Plume.dwg
Drawn By: MTH & JC	Layout: EIS


BR Reach 3
BR Reach 2
Blackfoot River
BR Reach 1
Northwest Overburden Pile
Fish Pond
State Land Creek
North Pit
East Overburden Pile
Segregated Meade Peak Overburden
Mid Pit
Woodall Spring
South Pit
50
100
LEGEND
PROJECT BOUNDARY
PROPOSED OPEN PIT
BLACKFOOT RIVER REACH 1
BLACKFOOT RIVER REACH 2
BLACKFOOT RIVER REACH 3
PROPOSED OVERBURDEN PILE
SEGREGATED EOP BOUNDARY
50 MANGANESE PLUME EXTENT WITH CONCENTRATIONS ABOVE GROUNDWATER STANDARD (50 µg/L)
MANGANESE PLUME CONTOUR (µg/L)
PREDICTED MANGANESE CONCENTRATION (µg/L)
0 - 50
50 - 100
100 - 500
> 500
NORTH
750' 0 750' 1500'
BLACKFOOT BRIDGE PROJECT EIS
FIGURE 4.3-19
Maximum Manganese Plume Extent - Alternative 1A
ANALYSIS AREA: Caribou County, Idaho
Date: 12/22/10
File: Mn Alternative 1A Plume.dwg
Drawn By: MTH & JC
Layout: EIS

loading to groundwater and surface water. As a conservative measure, the OSMS was not considered in the modeling for Alternative 1B. Modeled infiltration rates for Alternative 1B using the proposed GCLL cover are summarized in **Table 4.3-20**.

Table 4.3-20 Area-Weighted Average Infiltration Rates for Mine Facilities under Alternative 1B

Mine Facility	Cover Type	Average Infiltration (in/yr)
NWOP	Simple 1	0.362
EOP Non Meade Peak Overburden	GCLL	0.001
EOP Segregated Meade Peak Overburden	GCLL	0.001
North Pit	GCLL	0.001
Mid Pit	GCLL	0.001
South Pit Complete Backfill	GCLL	0.001
South Pit Partial Backfill	GCLL	0.001

Source: ARCADIS 2010

Impacts to Runoff Areas

Direct impacts to runoff areas in the project area for Alternative 1B would be the same as for Alternative 1A.

Impacts Peak Flows

Direct impacts to peak flows in streams and drainages in the project area for Alternative 1B would be the same as for the Proposed Action.

Impacts to Channels

Direct impacts to channels in the project area for Alternative 1B would be the same as for the Proposed Action.

Impacts to Stream and Spring Flows

Direct impacts to stream and spring flows in the project area for Alternative 1B would be the same as for Alternative 1A.

Impacts to Surface Water Quality

Alternative 1B would result in reduced chemical loading of COPCs to surface water from the project compared to either the Proposed Action or Alternative 1A. Concentrations for all COPCs in groundwater flow to the Blackfoot River are projected to meet numerical criteria for surface water. Likewise, COPCs in water reporting to Fish Pond are modeled to meet applicable water quality standards. Other surface water bodies in the project area would not be impacted by chemical loading from the project. Modeled COPC concentrations in groundwater flow reporting to the Blackfoot River and the drainage above Fish Pond are shown on **Figures 4.3-11, 4.3-12,** and **4.3-13,** and are summarized in **Table 4.3-21**. Modeled peak annual loading rates for COPCs in groundwater flow to the Blackfoot River for Alternative 1B are presented in **Table 4.3-22**. Predicted increases in in-stream selenium concentrations for the Blackfoot River for Alternative 1B are presented in **Table 4.3-23**.

Table 4.3-21 Modeled COPC Concentrations in Groundwater Flow to Blackfoot River and the Drainage above Fishpond for Alternative 1B

Constituent	Peak Concentration (mg/L)	Long Term Concentration (mg/L)	Surface Water Standard[1] (mg/L)	Groundwater Standard (mg/L)
Blackfoot River Model Reach 1				
Cadmium	0.00003	0.00002	0.0006	0.005
Iron	0.002	0.002	N/A	0.3
Manganese	0.010	0.005	N/A	0.05
Nickel	0.0008	0.0004	0.0520	N/A
Phosphorous	0.002	0.002	N/A	N/A
Selenium	0.0016	0.0003	0.005	0.05
Sulfate	4	2	N/A	250
TDS	9	7	N/A	500
Uranium	0.001	0.001	N/A	0.03
Zinc	0.0006	0.0002	0.120	5
Blackfoot River Model Reach 2				
Cadmium	0.00018	0.00004	0.0006	0.005
Iron	0.017	0.012	N/A	0.3
Manganese	0.091	0.029	N/A	0.05
Nickel	0.0071	0.0013	0.0520	N/A
Phosphorous	0.004	0.004	N/A	N/A
Selenium	0.0017	0.0002	0.005	0.05
Sulfate	19	1	N/A	250
TDS	41	5	N/A	500
Uranium	0.002	0.002	N/A	0.03
Zinc	0.0056	0.0007	0.120	5
Surface Water in the Drainage above Fish Pond				
Cadmium	4×10^{-8}	4×10^{-8}	0.0006	0.005
Iron	2×10^{-6}	1×10^{-6}	N/A	0.3
Manganese	9×10^{-6}	5×10^{-6}	N/A	0.05
Nickel	1×10^{-6}	1×10^{-6}	0.0520	N/A
Phosphorous	1×10^{-5}	1×10^{-5}	N/A	N/A
Selenium	6×10^{-6}	4×10^{-6}	0.005	0.05
Sulfate	0.01	0.006	N/A	250
TDS	0.03	0.02	N/A	500
Uranium	2×10^{-6}	1×10^{-6}	N/A	0.03
Zinc	1×10^{-6}	3×10^{-7}	0.120	5

Notes:
[1] Coldwater aquatic life CCC based on 100 mg/L hardness and a WER of 1.
N/A - not applicable
The listed uranium standard is the federal drinking water MCL. Idaho does not have a groundwater standard for uranium.
Source: ARCADIS 2010

Table 4.3-22 Modeled Peak Annual Loading Rates for COPCs in Groundwater Flow to Blackfoot River for Alternative 1B

Constituent	Annual Loading to Reach 1 (lb/yr)	Annual Loading to Reach 2 (lb/yr)	Total Annual Load to Blackfoot River (lb/yr)
Cadmium	0.02	0.16	0.2
Iron	2.0	15.3	17.7
Manganese	10.3	79.0	91.0
Nickel	0.8	6.2	7.2

Table 4.3-22 Modeled Peak Annual Loading Rates for COPCs in Groundwater Flow to Blackfoot River for Alternative 1B

Constituent	Annual Loading to Reach 1 (lb/yr)	Annual Loading to Reach 2 (lb/yr)	Total Annual Load to Blackfoot River (lb/yr)
Phosphorous	0.7	4.0	4.9
Selenium	0.3	1.2	1.6
Sulfate	2,328	16,181	18,859
TDS	5,183	35,008	40,960
Uranium	0.3	1.9	2.3
Zinc	0.7	4.9	5.6

Notes:
Annual loading rates for Model Year 108.
Total annual load includes loading from model river reaches 1, 2, and 3.
Source: ARCADIS 2010

Table 4.3-23 Calculated Increases in In-Stream Selenium Concentrations for Blackfoot River for Alternative 1B

Period	Modeled Selenium Loading Rate (lbs/yr)	Long-Term Average Stream Flow[1] (cfs)	Calculated In-Stream Increase in Selenium Concentration (mg/L)
Peak Loading (Model Year 248)			
High-Flow	1.6	520	0.000002
Low-Flow	1.6	52	0.00002
Long-Term Loading (Model Year 350)			
High-Flow	0.2	520	0.0000002
Low-Flow	0.2	52	0.000002

Notes:
[1] Long-term average stream flows for May (high-flow) and January (low-flow).
Source: ARCADIS 2010

4.3.1.3.2 Impacts to Groundwater Resources

Impacts to Groundwater Levels

Alternative 1B would reduce recharge to groundwater under the mine facilities compared to the Proposed Action and increase groundwater drawdown in the project area after reclamation. The maximum extent of groundwater drawdown during active dewatering of the Mid Pit and North Pit would be similar to the Proposed Action. Changes in groundwater recharge under Alternative 1B are compared to the Proposed Action and shown in **Table 4.3-24**. Modeled drawdown impacts for Alternative 1B are presented on **Figures 4.3-14** and **4.3-15**.

Table 4.3-24 Predicted Annual Changes in Groundwater Recharge for Mine Facilities for Alternative 1B

Facility	Proposed Action (ft^3/yr)	Alternative 1B (ft^3/yr)	Change from the Proposed Action (ft^3/yr)
North Pit	693,477	514	-692,963
Mid Pit	780,748	452	-780,297
South Pit	2,519,433	2,348,642	-170,791
EOP	615,852	534	-615,318
NWOP	89,701	52,435	-37,266

Source: Whetstone 2010a

Impacts to Groundwater Quality

Installation of GCLL covers over the backfill pits and the EOP and the Simple 1 cover over the NWOP for Alternative 1B would result in reduced loading of COPCs to groundwater compared to the Proposed Action. Modeling results indicate that, for Alternative 1B, the extent of selenium and manganese plumes exceeding numerical standards for groundwater would be reduced from either the Proposed Action or Alternative 1A. Plumes with selenium concentrations greater than 0.05 mg/L would be limited to small areas within the footprint of the North Pit and the EOP (**Figure 4.3-20**). Groundwater plumes with manganese concentrations exceeding the secondary groundwater standard of 0.05 mg/L would be limited to areas near the north ends of the Mid Pit and North Pit. The manganese plume from the backfilled North Pit would extend several hundred feet outside of the project boundary to the north (**Figure 4.3-21**). Background concentrations of manganese in groundwater north of the North Pit exceed secondary groundwater standards. The secondary groundwater standard is based on aesthetic qualities (per IDAPA 58.01.11.200.01.a Table III), not toxic effects. Predicted concentrations are below the EPA health advisory value (P4 2010g). The Idaho Ground Water Quality Rule provides that, upon request of the mine operator, IDEQ shall set a point or points of compliance at which the mine operator must meet the groundwater quality standards. The points of compliance are required to be set such that outside the mining area boundary there is no injury to current or projected future beneficial uses and there is no violation of surface water quality standards applicable to interconnected surface waters. P4 has submitted a Point of Compliance application to the IDEQ (P4 2010g) that will provide for points of compliance consistent with the Idaho Ground Water Quality Rule. As part of that review, IDEQ would set appropriate points of compliance for groundwater; including any analyte-specific compliance points. Thus, P4 would demonstrate compliance with the amended Idaho Ground Water Quality Rule (IDAPA 58.01.11). See Point of Compliance application for additional monitoring information.

The manganese plume from the Mid Pit would extend 50 to 100 feet outside of the pit footprint to the northwest. Modeling results indicate that all other COPCs in groundwater outside of the footprints of the mine facilities would meet applicable water quality standards. Because the model predictions are sensitive to uncertainty associated with the input parameters, the results for Alternative B1 should not be interpreted as absolute numerical values, but should be evaluated in broad terms with manganese being likely to have impacts at levels of regulatory concern outside of the project boundary and other COPCs being likely to have impacts at levels below regulatory thresholds outside of facility footprints.

4.3.1.4 No Action Alternative

Implementation of the No Action Alternative would avoid water resource impacts described for the Proposed Action. Specifically, predicted impacts to runoff areas, groundwater flow to streams and springs, groundwater recharge, and surface and groundwater quality would not occur. Under the No Action Alternative, the federal phosphate leases would not be developed. However, this does not preclude future development of the federal phosphate leases under a different mine plan.

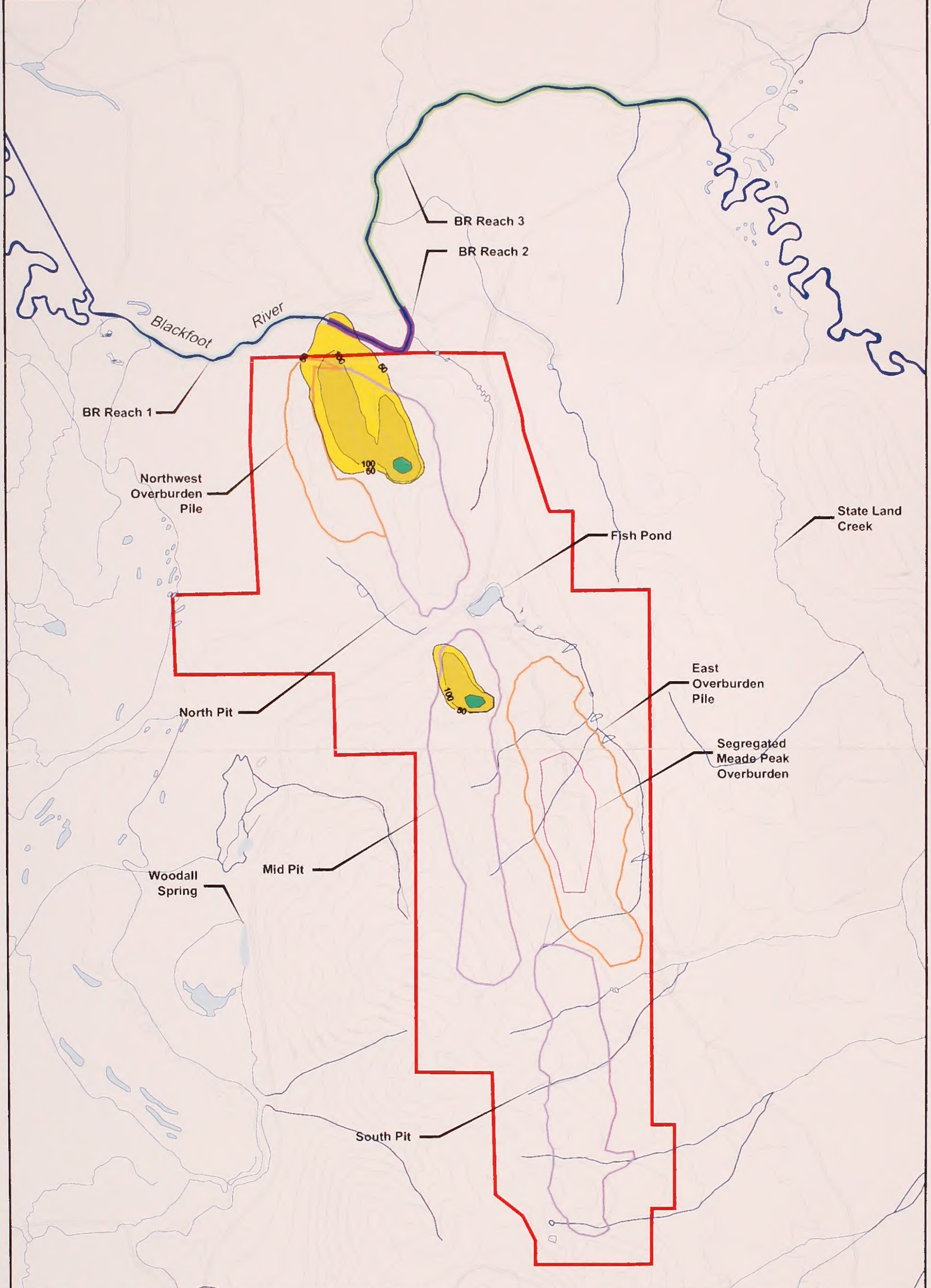


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FIGURE 4.3-21
Maximum Manganese Plume Extent - Alternative 1B

ANALYSIS AREA: Caribou County, Idaho	
Date: 12/22/10	File: Mn Alternative 1B Plume.dwg
Drawn By: MTH & JC	Layout: EIS

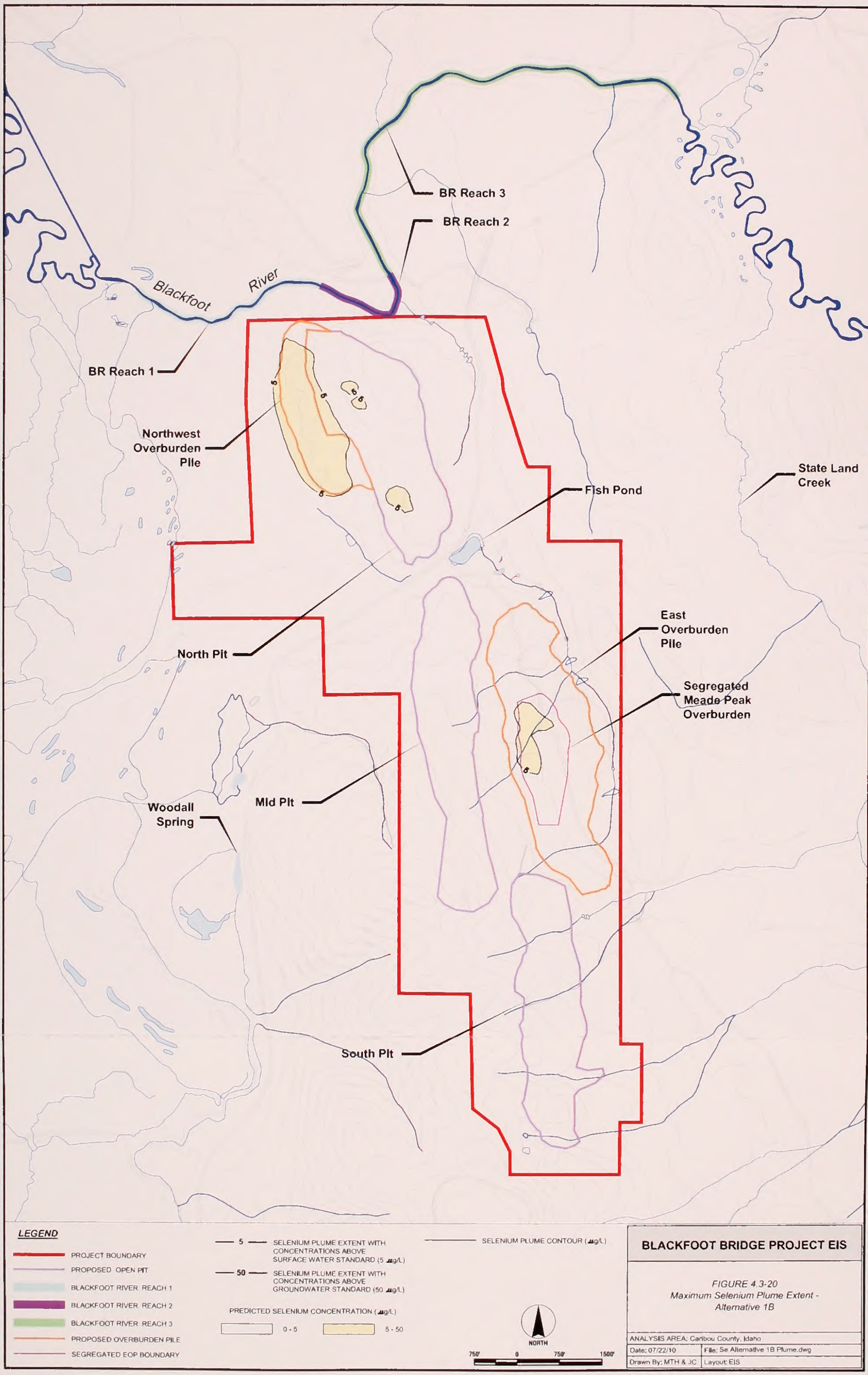

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FIGURE 4.3-20
Maximum Selenium Plume Extent - Alternative 1B

ANALYSIS AREA: Caribou County, Idaho	
Date: 07/22/10	File: Se Alternative 1B Plume.dwg
Drawn By: MTH & JC	Layout: EIS

4.3.2 Irreversible and Irretrievable Commitment of Resources

Irreversible impacts to water resources from the Proposed Action would include changes in runoff areas to local drainages, capture of surface water and shallow alluvial groundwater by the partially backfilled South Pit, elimination of spring and intermittent stream flow in the unnamed tributary to the Blackfoot River, and changes in groundwater levels in the project area.

The South Pit would be partially backfilled and would continue to capture runoff from an area of 123 acres in the State Land Creek drainage after reclamation. The total area of the State Land Creek drainage is 2,828 acres. The runoff area that would be permanently removed from State Land Creek by the partially backfilled South Pit would represent about 4.3 percent of the total drainage area.

The final reclaimed surface of the backfilled North Pit would alter the location of the drainage divide and would permanently add 13 acres to the runoff area for the drainage for Beaver Pond. The runoff area reporting to the Blackfoot River along the west side of the project area would be reduced by the same amount, but the total runoff area reporting to the Blackfoot River below the project area from the drainages on the east and west sides of the proposed North Pit would remain unchanged.

The Proposed Action would result in an estimated 0.01 percent reduction in total runoff area reporting to the Blackfoot River above Blackfoot Reservoir. The reduction in runoff area for Alternatives 1A and 1B would be identical to the Proposed Action.

The partially backfilled South Pit would intercept the shallow alluvial water that is the source of the spring for Wetland A. The alluvial water would be diverted to infiltrate into the Wells Formation, and flows from the spring would be reduced or possibly eliminated. This impact is common to the Proposed Action and Alternatives 1A and 1B.

Rock fill in the drainage above Fish Pond would cover wetlands, springs, and the channel in the drainage. The surface expression of spring flow and seasonal surface water flow would be eliminated. This impact is common to the Proposed Action and Alternatives 1A and 1B.

Recharge to groundwater below the EOP would be reduced by 252,118 cubic feet annually for the Proposed Action, and 644,252 and 867,436 cubic feet for Alternatives 1A and 1B, respectively. Groundwater levels in the Dinwoody Formation below the EOP are projected to decrease by more than 25 feet. The drawdowns caused by Alternatives 1A and 1B would be larger than for the Proposed Action (**Figure 4.3-15**).

4.3.3 Unavoidable Residual Adverse Impacts

Under the Proposed Action and Alternatives 1A and 1B, overburden placed as backfill and as external dumps would continue to leach selenium, manganese, and other COPCs into the environment. The leachate would affect groundwater quality in the project area and surface water quality in the drainage above Fish Pond and the Blackfoot River. Selenium concentrations in groundwater entering the Blackfoot River would exceed the surface water criteria for 300 or more years after the end of mining for the Proposed Action. Selenium concentrations in groundwater flow to the Blackfoot River are predicted to meet numerical standards for surface water for Alternatives 1A and 1B.

4.3.4 Mitigation Measures

Project design features, BMPs, the Revised Mine Water Management Plan (P4 2009a), and the proposed Mine Plan (P4 2008a) are the elements of the Proposed Action designed to reduce environmental impacts to water resources. For Alternatives 1A and 1B, additional mitigation measures to reduce environmental impacts to water resources include the Adaptive Management Plan and the modified Mine Water Management Plan (P4 2010c), which include the OSMS and the ditch system on the north part of the South Pit to partially mitigate impacts to Wetland A.

4.4 SOILS

Issues:

- The potential effects of the project on soil erosion and sedimentation of area streams.

4.4.1 Direct and Indirect Impacts

The primary impact indicators for soil resources are the total acreage of soils disturbed by mining activities and the amount of soil lost during soil salvage, stockpiling, and redistribution during reclamation.

4.4.1.1 Proposed Action

Direct disturbance of soils and vegetation through mining operations and haul road construction would increase erosion and soil movement from the project site. Straw wattles, dozer track dragging, hydro-seeding, and other erosion control BMPs would be implemented under the Proposed Action to capture and control soil movement. All slopes would be dragged, fertilized, and seeded on the contour as much as practical to reduce soil movement. Reclaimed areas are expected to achieve cover densities that meet federal and state requirements. Excess sediment transport by runoff would be contained by water control ponds until the establishment of vegetative controls is achieved.

The Proposed Action would include approximately 739 acres of surface disturbance, of which 674 acres would be reclaimed. The remaining 65 acres would consist of pit highwalls with steep slopes, where it would be impractical to reclaim. Approximately 1.6 million bcy of primary plant growth medium (PPGM) would be used to cover the proposed reclamation area of 674 acres with 18 inches of PPGM.

Within the project area, approximately 2.5 million bcy of soil could be salvaged for use as PPGM for reclamation. An estimated additional 1.2 million bcy of marginal soil would be salvageable for overburden cover material if determined necessary (Greystone 2006b).

Three locations in the project area have been identified for storage of up to 2.1 million bcy of salvaged soil. Topsoil would be stored separately from marginal soil or subsoil because mixing could diminish soil productivity. In addition, surface soil in the project area represents a source of seed and plant propagules and microorganism inoculums. Seeds and microbial inoculums are typically contained in the upper 8 inches of growth medium. Root propagules are typically found within the top 2 feet of the soil profile. Stockpiling of these materials reduces their viability over time due to reduced microbiological activity and nutrient cycling while soil is resident in

stockpiles. Direct placement (live-handling) of these soil components onto regraded surfaces as proposed by P4 would preserve these soil characteristics.

Approximately 1.6 million bcy of PPGM would be necessary to cover the proposed reclamation area of 674 acres and meet the 18-inch depth required for the base cover and Simple 1 cover systems. An additional 51,000 cubic yards of "weathered alluvium" (O'Kane 2009a) would be required for use of the Simple 1 cover system to isolate the 21-acre segregated Meade Peak overburden in the EOP.

4.4.1.2 Alternative 1A – GCLL Cover System Over Core Materials in EOP and Overburden in Pits

The total disturbance for Alternative 1A would be approximately 767 acres, of which 702 acres would be reclaimed and 65 acres consisting of pit highwalls would be unreclaimed. Expanded use of the GCLL and Simple 1 cover systems under Alternative 1A would require an increase of about 1 million bcy of cover material for construction compared to the Proposed Action. The source of this additional material would be within the disturbance footprint of the proposed pits and overburden piles. Stability concerns and design considerations under the Proposed Action would be similar to those under Alternative 1A. Similarly, impacts to topography would occur, but would be mitigated by the reclamation plan for disturbed areas. A modified water management system and other design modifications would also be incorporated, as well as a slightly increased disturbance area.

4.4.1.3 Alternative 1B – GCLL over the Entire EOP and Overburden in Pits

Disturbance of existing soils would be similar in type and extent to impacts under the Alternative 1A. The total area of disturbance for Alternative 1B would be the same as for Alternative 1A. The same amount of PPGM would be required throughout the project area during reclamation. Stability concerns and design considerations under Alternative 1B would be similar to those under Alternative 1A. Similarly, impacts to topography would occur, but would be mitigated by the reclamation plan for disturbed areas.

4.4.1.4 No Action Alternative

Under the No Action Alternative, soil resources would remain in their natural condition. Under the No Action Alternative, the federal phosphate leases would not be developed. However, this does not preclude future development of the federal phosphate leases under a different mine plan.

4.4.2 Irreversible and Irretrievable Commitments of Resources

Anticipated soil impacts for the Proposed Action and both alternatives would include long-term consequences and irreversible commitments of soil resources in areas of the project site where soil would not be replaced during reclamation (highwalls and steep slopes). Highwalls would eventually collapse to where stable slopes would form and support natural soil development. Soil removed during project activities and not used for reclamation would remain in stockpiles. This soil would become vegetated and would therefore maintain productivity.

4.4.3 Unavoidable Residual Adverse Impacts

Unavoidable residual adverse impacts for the Proposed Action and both alternatives would result in disturbed areas that have slope or surface geological characteristics altered in a manner that prevents formation of soils similar to existing soils in the project area.

4.4.4 Mitigation Measures

P4 would mitigate impacts to soil resources through the implementation of direct haul soil placement, erosion control, and sediment capture BMPs. Productive use of disturbed soil resources would be confirmed through the use of soil resources during reclamation and cover system construction. Soils would be stored, transported, and reused in a manner that maximizes soil productivity. This includes segregation of PPGM from marginal soils and live-handling of soil containing seeds, root propagules, and microbial inoculum when possible.

4.5 VEGETATION, RIPARIAN AREAS, AND WETLANDS

Issues:

- The potential effects on prime and unique agricultural lands.
- The potential effect on the spread or introduction of exotic plant species and noxious weeds.
- The potential direct disturbance effects on wetlands and riparian habitat.
- The potential indirect effects on wetlands resulting from potential loss of subsurface water.

This section presents potential impacts of the Proposed Action, Alternatives 1A and 1B, and the No Action Alternative on vegetation, riparian areas, and wetlands within the proposed project area. There are no prime or unique agricultural lands within or adjacent to the project area.

4.5.1 Direct and Indirect Impacts

4.5.1.1 Proposed Action

4.5.1.1.1 Vegetation

Over the life of the mine, the Proposed Action would remove 725 acres of upland vegetation. There are about 5 acres of barren disturbed areas and about 9 acres of wetlands and waters that account for the remainder of the 739 total disturbed acreage. The vegetation types and associated acreages affected by the Proposed Action are summarized in **Table 4.5-1**.

All vegetation would be removed within the vegetation types impacted by the Proposed Action. The direct impacts to these vegetation types would be long-term. During the reclamation period, these areas would be reseeded using the seed mix shown in **Table 4.5-2**. While these areas would result in growth of vegetation, the resulting species composition and community structure would be different than prior to disturbance.

Table 4.5-1 Vegetation Types and Estimated Affected Acreages under the Proposed Action and Alternatives

Vegetation Types	Proposed Action	Alternative 1A and 1B
Aspen	149	151
Mixed Needleleaf/Broadleaf Forest	118	131
Mountain Big Sagebrush (mesic)	120	121
Mountain Big Sagebrush (xeric)	338	352
Disturbed Areas	5	8
Wetlands/Waters	9	4
Total	**739**	**767**

Source: Greystone 2006a

Table 4.5-2 Proposed Reclamation Seed Mix Typical Seed Mix with Inoculum

Percent per Pound	Common Name	Scientific Name	Variety	Seeds per Pound	Seeds in Mix per Pound	Percent of Total Seeds per Pound
53.33	Mycorrihzal Inoculum					
4.67	Great Basin Wildrye	*Elymus cinereus*	Magnar	130,000	6,067	10.88
3.50	Bluebunch Wheatgrass	*Pseudoroegneria spicata ssp spicata*	Goldar	140,000	4,900	8.79
4.20	Western Wheatgrass	*Pascopyrum smithii*	Rosanna	110,000	4,620	8.28
4.67	Mountain Bromegrass	*Bromus marginatus*	Bromar	90,000	4,200	7.53
0.70	Rocky Mtn Penstemon	*Penstemon strictus*	Bandera	592,000	4,144	7.43
1.63	Alfalfa	*Medicago sativa*	Ladak	210,000	3,430	6.15
1.17	Lewis Blue Flax	*Linum lewisii*	Appar	293,000	3,419	6.13
0.47	Orchardgrass	*Dactylis glomerata*	Paiute	654,000	3,052	5.47
0.23	Timothy	*Phleum pretense*	Climax	1,300,000	3,034	5.44
2.80	Pubescent Wheatgrass	*Elytrigia intermedia ssp trichophorum*	Greenleaf	100,000	2,800	5.02
4.67	Small Burnet	*Sanguisorba minor*	Delar	55,000	2,567	4.60
0.12	Kentucky Bluegrass	*Poa pratensis*	Ginger	2,177,000	2,540	4.55
0.23	Mountain Phlox	*Leptosiphon grandiflorus*		907,000	2,116	3.79
0.23	Big Bluegrass	*Poa ampla*	Sherman	882,000	2,058	3.69
4.90	Sainfoin	*Onobrychis viciaefolia*	Eski	30,000	1,470	2.64
0.12	Showy Goldeneye	*Viguiera multiflora*		1,055,000	1,231	2.21
0.32	Wax Currant	*Ribes cereum*		350,000	1,111	1.99
5.13	Antelope Bitterbrush	*Purshia tridentata*		15,000	770	1.38
1.52	Woods Rose	*Rosa woodsii*		45,300	687	1.23
0.23	Strawberry Clover	*Trifolium fragirerum*	Palestine	300,000	700	1.26
4.70	Quickguard	*Sterile Triticale Cover Crop*	CMS 154E	13,000	611	1.10
0.47	Sticky Purple Geranium	*Geranium viscosissimum*		52,000	243	0.44
46.67					55,771	100.00

Notes:
Seed to be distributed at 35 pounds per acre and inoculum to be distributed at 40 pounds per acre.
If Brillion seeder is set to lay down 75 pounds per ac, the above amounts would meet the seed and inoculum quotas.
Source: P4 2008a

The remaining 65 acres would be reclaimed as pit highwall, which would not receive PPGM or seeding. These acres would represent a long-term loss until slope conditions of the highwall erode to a configuration that supports vegetation.

The management of PPGM would be critical to the success of revegetation. All soil deemed suitable for a PPGM would be salvaged and stockpiled or placed directly on areas ready for reclamation (**Section 2.3.7.6**). The PPGM would be spread over the final backfill slope to an average depth of 1.5 feet with minimum compaction. Brush and small trees that were not removed for a brush barrier would be included with the PPGM to be spread on the final reclaimed slopes. Seeding would be completed as soon as possible to reduce rilling and soil movement. The selection of plant species would concentrate on shallow-rooting species of mostly native plants with low rates of selenium uptake to minimize selenium contamination of reclamation vegetation.

Under the Proposed Action, all disturbed areas that are amenable would be reclaimed. Vegetation would be re-established in a timely manner to reduce the exposure time of bare, unvegetated surfaces to potential erosion and the effects of the surrounding environment. Of the 739 acres disturbed under the Proposed Action, 674 acres, or 91.2 percent of the total disturbed area, would be reclaimed. The remaining acreage (65 acres) generally consists of steep rock highwalls that are impractical to seed.

About 5.7 million cubic yards of segregated Meade Peak overburden is proposed for placement in the EOP. This material includes center shale, hanging wall mud, footwall mud, and various ore partings. Placement of center Meade Peak shale that carries elevated concentrations of selenium would be encapsulated within the central portion of the pile. The EOP has a total volume capacity of 20 million+ bcy, allowing for a 20 percent swell. Center Meade Peak shale represents approximately 25 percent of the total EOP volume; therefore, ample material is available to encapsulate this material. It is assumed that suitable clay or capping material would be available on site. If suitable on-site materials are not available, other equivalent sources for a capping medium would be developed.

Construction of an encapsulation cell of the segregated Meade Peak overburden encompasses compaction of chert and limestone using truck wheel traffic to compact all sides of the cell. Ultimately, the segregated Meade Peak overburden would be capped with a relatively impermeable moisture barrier of weathered alluvium. This method is designed to reduce surface water infiltration to the segregated Meade Peak overburden materials. The moisture barrier would consist of an 18-inch-thick layer of material sourced from weathered alluvium and alluvial clays having permeability characteristics of at least 0.000001 centimeter per second or less. Under the Proposed Action, a 12-inch layer of weathered alluvium would be placed between 18 inches of topsoil and a 2-foot layer of non-segregated overburden chert, serving as a barrier to groundwater percolation into segregated Meade Peak overburden materials.

The placement of PPGM on top of non-segregated overburden limestone and chert has been used as a cover design to reclaim several mine areas. Studies have been undertaken at P4's South Rasmussen Mine to document uptake of selenium by vegetation growing on reclaimed overburden piles. In 1999, 24 vegetation samples were collected from the slopes of the reclaimed P4's South Rasmussen overburden pile (TRC 1999). In a second study in 1999, five additional samples were collected from the same overburden pile. Selenium values in all of the vegetation samples taken from the South Rasmussen overburden pile, ranged from less than 0.5 to 2.9 milligrams selenium per dry weight kilogram of vegetation (mg/kg), with a mean value of 1.3 mg/kg and a median value of 1.1 mg/kg (background selenium concentrations in terrestrial plants

range from 0.01 to 0.6 mg/kg [Ohlendorf 2003]). Three of the vegetation samples taken from run-of-mine overburden at P4's South Rasmussen Mine carried selenium concentrations that exceeded 2.0 mg/kg, but concentrations of total selenium in all three of these samples were below agency-recommended levels of 5.0 mg/kg (BLM 2003).

Under the Proposed Action, a seed mixture has been developed to encourage uptake of water from the upper soil horizon and minimize rooting depths. The majority of the rooting mass for the selected species would occur within the top 3 feet of the cover above segregated Meade Peak overburden. Some species (e.g., alfalfa) in the seed mix have a deep taproot that could extend to depths where segregated Meade Peak overburden would be encountered. Alfalfa is included in the seed mix because it provides excellent forage for livestock. Alfalfa roots have been reported to reach depths of tens of meters (Witte and Will 1993). Plants with roots reaching depths of even 1 meter in reclaimed areas could absorb selenium, thereby introducing it into the food chain (Ohlendorf 2003). In addition, two of the plants in the seed mix, alfalfa and western wheatgrass, are passive selenium accumulators. Given the thickness of the cover that would be installed under the Proposed Action and the species of vegetation included in the seed mix, accumulation of selenium in plants grown on reclaimed areas would be limited. Alfalfa represents less than 2 percent of the proposed seed mix and, therefore, to the extent that this species would encounter selenium-bearing materials at depths where roots penetrate, some uptake of selenium could occur. Western wheatgrass would be less of a concern, because it does not have a deep taproot and accumulates selenium at a lesser rate (Mackowiak and Amacher 2008).

Some native tree and shrub species currently present in the study area could become established in reclaimed areas from propagules occurring in replaced topsoil and as a result of natural succession processes. The rooting depths for trees present in the study area include Douglas-fir with a maximum rooting depth of 32.8 feet and quaking aspen with a maximum rooting depth greater than 9.8 feet (BLM and USFS 2002). The rooting depths of these species are much greater than the species (primarily grasses) to be used in the reclamation seed mixture. Establishment of grass as the dominant community type on reclaimed areas would out-compete native species seeking to establish on the site for a period of time.

The rooting depths reported for Douglas-fir and quaking aspen exceed the depths at which potentially segregated Meade Peak overburden materials would be placed. If selenium accumulation occurs, the impact to vegetation would be localized to the reclaimed areas, but could have long-term effects within those areas, including the proliferation of selenium-tolerant plants.

There are no prime or unique agricultural lands identified within the project area that would be affected by the Proposed Action.

4.5.1.1.2 Wetlands

Executive Order 11990, Protection of Wetlands, requires that federal agencies "...avoid to the extent possible the long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative..." The project facilities have been designed and sited to limit direct impacts to wetlands and non-wetland waters of the U.S. A total of 9.43 acres of wetlands and non-wetland waters of the U.S. would be affected by the project.

Wetlands that would be directly affected by the Proposed Action lie along the unnamed tributary to Fish Pond on the eastern boundary of the EOP (Wetlands B, C, D, E, F, G, H, I J, K, and L) including the man-made Fish Pond and associated wetland (Wetland K). Additionally, two small wetlands (Wetlands AA and BB) would be filled by other mine-related facilities just north of the existing ore haul road (**Figure 4.5-1**). **Table 4.5-3** summarizes project components that would result in impacts to wetlands and non-wetland waters of the U.S.

Table 4.5-3 Direct Impacts to Wetlands and Other Waters of the United States

Project Component	Affected Unit	Wetlands (acres)	Non-wetland Waters of the U.S. (acres)	Total Acres Impacted
EOP	Wetland E	0.08	--	0.08
Mine Truck-Railroad Crossing and Water Control Pond Downstream of Fish Pond	Wetland L	0.67	--	0.67
Ore Truck Turnaround Loop	Wetland AA and Wetland BB	0.08	0.11	0.19
Water Management Structure - Fish Pond Area	Wetland K and Fish Pond	3.27	2.82	6.09
Water Management Structures - Upgradient to Fish Pond	Wetlands B, C, D, F, G, H, I, and J	2.01 --	0.38	2.40
Water Management Structures - Construction of NEP1	Upgradient to Wetland M	--	0.01	0.01
	Total	**6.11**	**3.32**	**9.43**

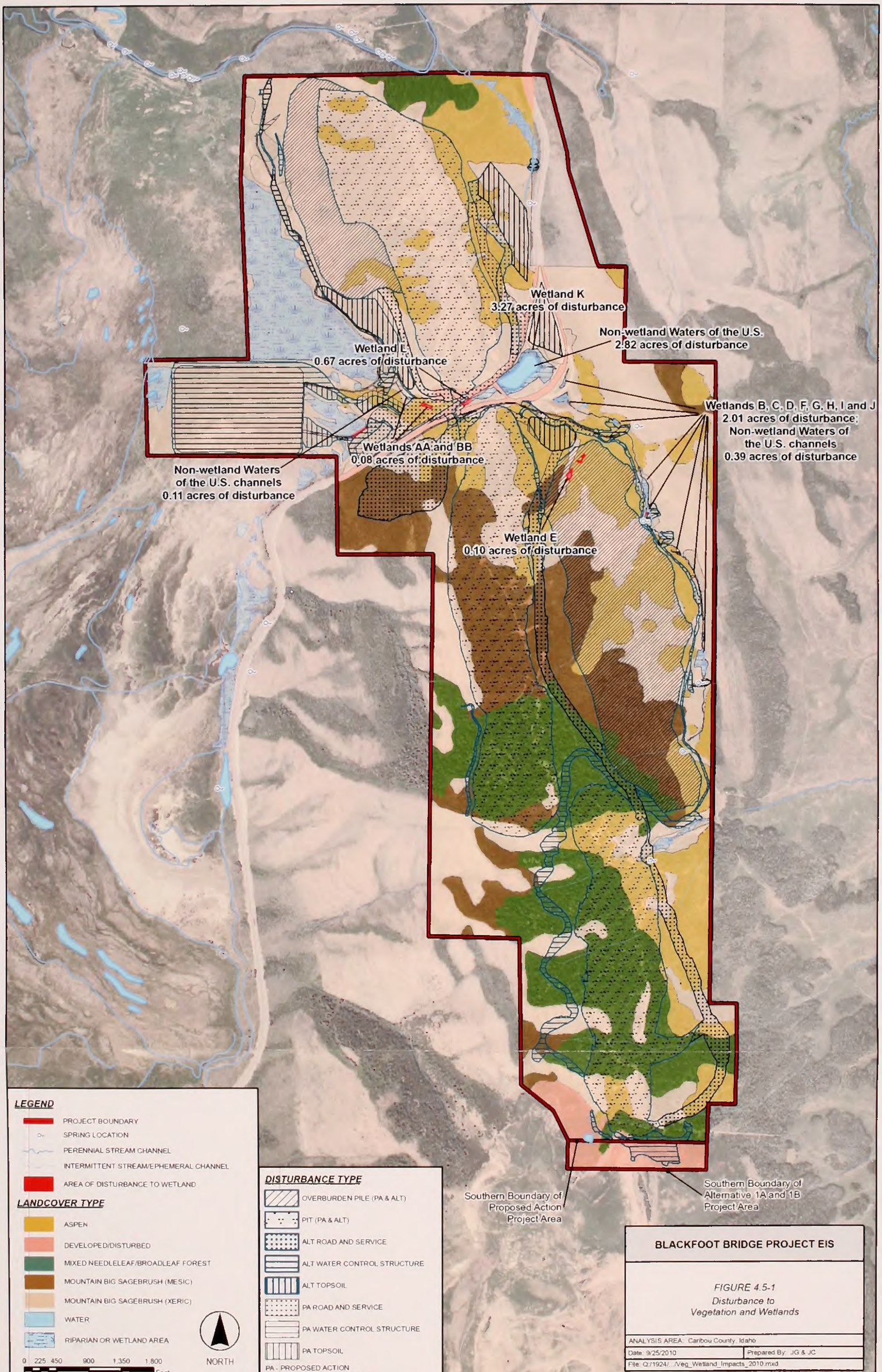
Source: JBR 2003 and 2006

As shown in **Table 4.5-3**, the construction of the NEP1 would impact 0.01 acres of non-wetland waters of the U.S., but would not cause any fill or dredging in Wetland M. Water forming behind NEP1 would back-up into Wetlands Y and Z causing a higher water level mostly during spring time periods. This is not expected to reduce the wetland functionality of Wetlands Y and Z.

The primary functions of the wetlands are groundwater flow and sediment stabilization. They also provide wildlife habitat, flood attenuation, and production export. The functions that these wetlands provide would either be completely lost (Wetlands B, C, D, E, F, G, H, I, and J) or reduced (Wetlands AA, BB, and L) during the mining operations.

Wetland K and Fish Pond provide groundwater flow, short- and long-term water storage, and sediment stabilization. Wetland K also provides moderate values for special-status species, wildlife habitat, flood attenuation, and production export. These functions would be reduced as a result of the Proposed Action.

As discussed in **Section 3.5.2**, the MDT Method was used to determine wetlands functions and values. The level at which affected wetlands provide ecological functions was estimated by deriving a functional index that reflects wetland functional parameters compared to an ideal condition. The functional index is a percentage of the level at which ecological functions are


Wetland K
3.27 acres of disturbance
Non-wetland Waters of the U.S.
2.82 acres of disturbance
Wetland L
0.67 acres of disturbance
Wetlands B, C, D, F, G, H, I and J
2.01 acres of disturbance;
Non-wetland Waters of
the U.S. channels
0.39 acres of disturbance
Wetlands AA and BB
0.08 acres of disturbance
Non-wetland Waters
of the U.S. channels
0.11 acres of disturbance
Wetland E
0.10 acres of disturbance
Southern Boundary of
Proposed Action
Project Area
Southern Boundary of
Alternative 1A and 1B
Project Area
LEGEND
PROJECT BOUNDARY
SPRING LOCATION
PERENNIAL STREAM CHANNEL
INTERMITTENT STREAM/EPHEMERAL CHANNEL
AREA OF DISTURBANCE TO WETLAND
LANDCOVER TYPE
ASPEN
DEVELOPED/DISTURBED
MIXED NEEDLELEAF/BROADLEAF FOREST
MOUNTAIN BIG SAGEBRUSH (MESIC)
MOUNTAIN BIG SAGEBRUSH (XERIC)
WATER
RIPARIAN OR WETLAND AREA
0 225 450 900 1,350 1,800
Feet
NORTH
DISTURBANCE TYPE
OVERBURDEN PILE (PA & ALT)
PIT (PA & ALT)
ALT ROAD AND SERVICE
ALT WATER CONTROL STRUCTURE
ALT TOPSOIL
PA ROAD AND SERVICE
PA WATER CONTROL STRUCTURE
PA TOPSOIL
PA - PROPOSED ACTION
ALT - ALTERNATIVE 1A AND 1B
BLACKFOOT BRIDGE PROJECT EIS
FIGURE 4.5-1
Disturbance to
Vegetation and Wetlands
ANALYSIS AREA: Caribou County, Idaho
Date: 9/25/2010
Prepared By: JG & JC
File: Q:/1924/ /Veg_Wetland_Impacts_2010.mxd

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being delivered by the affected wetland. This index is multiplied by the acres of wetlands to derive "functional units," which become the "currency" of impact determination and mitigation compensation. Functional units are calculated by multiplying the level at which ecological functions are provided (e.g., Function Index) by the acreages of wetlands affected. Functional indices are derived by quantifying the levels at which wetlands perform ecological functions. Twelve functional parameters are evaluated to derive functional indices.

The Proposed Action would result in the loss of 3.21 functional units, as summarized in **Table 4.5-4**. Mitigation measures for replacement of these functional units as well as mitigation for impacts to non-waters of the U.S. are described in **Section 2.3.9.5**.

Table 4.5-4 Reduction in Wetland Functional Units Due to Dredging and/or Filling

Wetland Designation	Functional Index (Percent)	Affected Acreage	Functional Unit Lost
B	0.45	0.07	0.03
C	0.45	0.86	0.39
D	0.45	0.02	0.01
E	0.45	0.08	0.04
F	0.45	0.04	0.02
G	0.45	0.43	0.19
H	0.45	0.08	0.04
I	0.45	0.36	0.16
J	0.45	0.15	0.07
K	0.45	3.27	1.93
L	0.45	0.67	0.30
AA	0.45	0.03	0.01
BB	0.45	0.05	0.02
	Total	**6.11**	**3.21**

Source: JBR 2003 and 2006

In addition to the wetlands that would be directly affected under the Proposed Action, Wetland A may be indirectly affected by mining operations, resulting in a functional unit loss of 0.50. Wetland A is not included in P4's Clean Water Act Section 404 Permit Application because it would not be dredged or filled as a consequence of the Proposed Action and therefore, is not subject to Clean Water Act Section 404 Permit requirements. Excavation of the South Pit across the drainage above Wetland A under the Proposed Action could interrupt approximately 94 percent of the shallow alluvial groundwater source for the wetland spring. Mining operations could cause Wetland A to partially or completely dry up; however, upon completion of mining and backfilling using appropriate practices and materials, some or all flow to Wetland A may be restored.

Backfilling the South Pit would restore surface water runoff in the drainage but may not restore shallow alluvial groundwater flow. Surface water runoff from the area above the South Pit would be diverted around the pit into the Wetland A drainage (P4 2010c). The flow would be episodic and would probably not sustain perennial flow in the wetland. Using appropriate backfilling practices, some alluvial water captured by the South Pit may continue to be released from Wetland A as surface flow tributary to State Land Creek. Because no other wetlands, including

those in the State Land Creek drainage, are expected to be substantially affected by mining operations, overall affects on wetlands are considered to be local, minor, and long-term.

Selenium could accumulate in still-water environments, such as wetlands and around beaver dams. Isolating and controlling the movement of water with culverts and retention ponds can reduce possible selenium uptake in vegetation and accumulation in wetland habitat. In order to minimize this potential effect of runoff water from the EOP and NWOP, a series of water control ponds would be constructed (**Figure 2.3-8**). A total of 11 water control ponds would be constructed in the drainages immediately adjacent to proposed disturbance areas. These ponds are described in **Section 2.3.5**. Four dams (EP1-EP4) would be constructed along the tributary channel to the east of the EOP. Four dams (NW1-NW4) would also be constructed along the west side of the NWOP. Two dams (CP1-CP2) would also be constructed in the vicinity of the proposed ore truck turnaround loop and equipment yard: one dam (CP-1) would be constructed in the tributary channel downstream from Fish Pond and would be the farthest downstream structure that would capture water and sediment from the EOP area. This dam would be designed to prevent release of water downstream to the Blackfoot River.

Mining could result in reduced water quality in the wetlands and non-wetland waters of the Fish Pond drainage. Surface water runoff from the EOP would flow north in the drainage to the diversion ditch located at EP1 above Fish Pond where it would be routed to settling pond CP2. Precipitation that infiltrates into the EOP would move downward through the pile and leach COPCs at levels of potential regulatory concern (Whetstone 2010a). This infiltrating water could either flow to springs and seeps at the toe of the pile or continue to move downward through unsaturated colluvium and bedrock (Dinwoody Formation) to the water table. Springs associated with the Fish Pond drainage are fed by groundwater that is recharged from overlying slopes. Therefore, transportation of solutes in shallow groundwater would likely flow to springs in the Fish Pond drainage. Metals concentrations in groundwater and spring flows may be attenuated by precipitation, adsorption, and anaerobic bacteria.

During construction, potential direct effects to water quality would not likely occur from sediment yield of the overburden piles and water control ponds in the tributary drainage to State Land Creek because of the use of water control ponds that would control sediment on site and seepage from the EOP area. The rock fill as needed would allow control and prevent direct exposure of any surface water runoff and seepage that may be potentially impacted by elevated selenium concentrations. Fish Pond would be used and expanded, if needed subject to the Adaptive Management Plan (Appendix B) to allow collection and monitoring of this water from the unnamed tributary to Fish Pond. If water collected in the pond does not have acceptable water quality, it would be pumped to WMP1-WMP2 for evaporation. If the water exhibits acceptable water quality, it would be discharged in accordance with the requirements of the NPDES permit or permits issued by EPA for the project.

4.5.1.1.3 Noxious Weeds

Executive Order 13112, Invasive Species, requires that a federal agency "...not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless, pursuant to guidelines it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and

prudent measures to minimize risk of harm would be taken in conjunction with actions." The primary purpose of this Executive Order is to reduce ecological and economic effects of invasive plant and animal species to agriculture, industry, recreation, and the environment.

As discussed in **Section 3.5.4**, four species on the Idaho Noxious Weed List are known to occur within the project area. These species are Dalmatian toadflax, whitetop (also known as hoary cress), Canada thistle, and Scotch thistle. The removal of native vegetation would increase the potential for expansion of non-native plants including noxious weeds. Non-native plants colonize disturbed areas and, once established, may reduce the diversity in native plant communities. Incorporation of BMPs into the project design and P4's commitment to control noxious weeds, the potential for the establishment of noxious weeds would be minimized and effects from noxious weeds would be short-term and minor. Project BMPs that would minimize noxious weed impacts include keeping mining disturbances to a minimum for as short a timeframe as possible, with overburden areas and pit backfill advancing in concert with the active pit, monitoring and controlling noxious weed infestations, use of certified weed-free seed, mulch, straw bales, and development of an annual noxious weed treatment plan. The BLM-recommended treatments for whitetop and Canada thistle are chemical and biological, and chemical and mechanical treatments are recommended for Scotch thistle.

4.5.1.1.4 Fire Management

Under the Proposed Action, 267 acres of forest would be removed and as part of reclamation, much of this would be replaced with a grass-dominated vegetation community. This would shift much of the project area from Aspen/Conifer and Dry Conifer fire regimes to a Perennial Grass fire regime.

According to the BLM, fuel loads in perennial grasslands range from 250 pounds per acre to greater than 2,000 pounds per acre. Perennial grasses reportedly exhibit good recovery after severe fire. Growth points in these grasses are compressed near the ground at the base of shoots (e.g., root crowns in bunchgrasses and lateral shoots in sod-formers). Most perennial grasses respond by resprouting from these basal growing points following fire. The primary determinant of fire response in perennial grasslands is fire residence time. Fast-moving fires have a short residence time and seldom cause substantial mortality. Slow moving fires, however, have longer residence times and greater severity. Mortality to perennial grasses is high under these conditions, as the fire spends more time in the vegetative base of the plant. With most natural ignitions, the predominant fire spread is a fast-moving fire. Because native grasslands are seral to sagebrush steppe, natural/historical fire rotations of 60 to 110 years, the same as for low-elevation shrub, would be expected (BLM 2008a).

4.5.1.2 Alternative 1A – GCLL Cover System Over Core Materials in EOP and Overburden in Pits

The total disturbance for Alternative 1A would be approximately 767 acres, of which 702 acres would be reclaimed and 65 acres consisting of pit highwalls would be unreclaimed. The vegetation types and associated acreages affected by the Alternative 1A are summarized in **Table 4.5-1**. Under the revised Alternative 1A, a low-permeability GCLL cover would be placed over the North, Mid and South Pits and over 86 acres covering the 35 acres of segregated Meade Peak overburden core associated with the EOP. A Simple 1 cover (proposed for use over the EOP segregated Meade Peak overburden in the Proposed Action) would be placed over the

remainder of the EOP and the entire NWOP. A modified water management system and other design modifications would also be incorporated, as well as a slightly increased disturbance area. All other aspects of Alternative 1A would be identical to the Proposed Action.

Effects to vegetation under Alternative 1A would be slightly higher than those under the Proposed Action, except that the potential for selenium accumulation by plants growing on the reclaimed areas would be lower due to use of a cover system. The types of plant species that would be selected for use in reclamation of backfilled pits and external overburden piles would include shallow-rooting species. Use of shallow-rooting species would reduce the potential for selenium uptake and root penetration of the GCLL cover system. The GCLL cover system includes an additional synthetic layer which strengthens the cover against penetration. The installation of a drain layer associated with Alternative 1A is specifically designed to transport water during high runoff periods. Animals are unlikely to burrow into seasonal water transport zones, which could affect the integrity of the burrow.

GCLLs are also considered to provide enhanced resistance to penetration by plant roots or burrowing animals by providing an extra layer of protection in addition to its self-sealing qualities (O'Kane 2009a; EPA 2001). Laminated geotextiles have increased strength and are more resistant to penetration damage including biointrusion. Additionally, the design of the cover above the GCLL (including the topsoil layer, the weathered alluvium and the drainage layer) provides for moisture retention in the upper layers of the cover design.

As discussed above, the seed mix for the reclamation plan would be adjusted to account for potential impacts from plant roots in areas where the GCLL would be used. Plant rooting depths would be controlled by selection of appropriate reclamation plant species. Species for Alternative 1A would be selected based on their appropriate shallow rooting depths in order to minimize biointrusion from roots. Establishment of a grass community on the reclaimed areas would also limit invasive deeper rooted native species. Finally, the unique nature of the GCLL is its ability to "self-repair" in the event of penetrating roots.

4.5.1.3 Alternative 1B – GCLL over the Entire EOP and Overburden in Pits

Under Alternative 1B, a low-permeability GCLL cover would be placed over the entire EOP and the North, Mid, and South Pits. The vegetation types and associated acreages affected by the Alternative 1B are summarized in **Table 4.5-1**. A Simple 1 cover (proposed for use over the EOP segregated Meade Peak overburden in the Proposed Action) would be placed over the NWOP. A modified water management system and other design modifications would also be incorporated, as well as a slightly increased disturbance area. All other aspects of Alternative 1B would be identical to the Proposed Action.

Effects to vegetation under Alternative 1B would be similar to those under Alternative 1A, except that the use of the GCLL liner over the entire EOP would decrease the potential for selenium to enter wetlands. As discussed under Alternative 1A, use of shallow-rooting plant species, placement of a drainage layer, and use of the GCLL cover with the additional synthetic layer are expected to result in limiting the penetration of plant roots and burrowing animals.

4.5.1.4 No Action Alternative

Under the No Action Alternative, the federal phosphate leases would not be developed. However, this does not preclude future development of the federal phosphate leases under a different mine plan. The 725 acres of direct impact to existing upland vegetation would not occur, and the area would not be more susceptible to an increase in spreading of noxious weeds as a result of the Proposed Action. Additionally, the potential of increased selenium accumulation in vegetation would not occur.

Under the No Action Alternative, direct disturbance to existing upland vegetation would not occur, and the area would not be more susceptible to an increase of noxious weeds. Additionally, the potential for increased selenium accumulation in vegetation and wetlands would remain at existing levels. Direct disturbance to 9.43 acres of wetlands and non-wetland waters of the U.S. would not occur.

4.5.2 Irreversible and Irretrievable Commitment of Resources

For the Proposed Action and both alternatives, approximately 65 acres of vegetation would be lost for a period of time. Long-term loss of vegetation would occur in areas of pit highwall disturbance that would not be resoiled and revegetated during reclamation. The majority of the long-term loss of vegetation would occur in existing xeric Mountain Big Sagebrush. Eventually, pit highwalls would succumb to erosional forces and fine materials, and soil would accumulate or develop on intervening benches of the highwall. Exposed rock in the vertical components of the highwall would weather and eventually fail to a reduced slope configuration conducive to supporting vegetative communities.

Forest species that would be replanted would eventually recover to their existing state and complexity in the long term (approximately 100 to 200 years) and thus, this impact would not be considered irreversible.

The wetlands that would be altered or lost would represent an irreversible commitment of wetland resources. The proposed Reclamation Plan is expected to restore partial or full hydrological function of the wetland areas. Mine development would have an irretrievable impact on Wetland A, which may not return to its pre-disturbance hydrology, although some hydrological function is expected to be restored to Wetland A.

No irreversible or irretrievable commitment of vegetation resources would occur. Vegetation would be reestablished either through direct seeding of reclaimed areas or by succession of native plants into reclaimed areas from adjacent seed sources. Some alteration of the vegetation community would result from the use of shallow-rooted species with grasses outcompeting native plants for a period of time.

4.5.3 Unavoidable Residual Adverse Impacts

For the Proposed Action and alternatives, an unavoidable residual adverse impact would occur if existing vegetation were not eventually replaced through reclamation and subsequent natural succession. P4 would be required to stabilize and revegetate disturbed areas in accordance with

their approved reclamation plan. Performance bonds would be held by regulatory agencies to ensure the site is reclaimed to acceptable standards.

4.5.4 Mitigation Measures

P4 would implement and follow applicable mining and reclamation practices, as described in Agrium et al. (2005), developed by the southeastern Idaho phosphate mining industry and state and federal agencies. High reclamation standards and practices would be essential to execution of the P4 operating plan. It is P4's philosophy to minimize the ultimate disturbance at any one time and keep the backfill as close as possible to the active pit area. The plan intends to keep mining disturbances to a minimum for as short a timeframe as possible with overburden areas and pit backfill advancing in sequence with the active pit. Additionally, the cover would be constructed incrementally as mining advances, which would also help minimize impacts. **Table 2.3-8** summarizes the project disturbed and reclaimed acres by year.

4.5.4.1 Vegetation

Impacts to vegetation resources would be mitigated through implementation of the Reclamation Plan. Under the Proposed Action, approximately 674 acres, or 91.2 percent of the total disturbed area, would be reclaimed. Under Alternatives 1A and 1B, approximately 702 acres, or 91.5 percent of the total area of disturbance, would be reclaimed. Topsoil would be salvaged from all future mining and road-building areas before development begins. Reclamation of the open pit would involve selective placement of segregated Meade Peak overburden materials into the EOP. Segregated Meade Peak overburden materials would then be covered with a final top layer of 1.5 to 2 feet of non-segregated overburden topsoil/PPGM.

After an area has been finished with the appropriate depth of topsoil/PPGM, the area would be dragged with a 10-foot or greater length of a dozer track that would remove large rocks and small irregularities. The process would result in large rocks rolling down slope, and thus, provide a more workable surface for fertilizing and seeding. The reclaimed area would be fertilized with approximately 300 pounds per acre of a urea blend fertilizer consisting of about 75 units of nitrogen, 45 units of phosphate, 20 units of potash, and 10 units of sulfur (75-45-20-10).

After fertilizer application, seeding would be performed using an approved seed mix at approximately 35 pounds per acre (**Table 4.5-2**). Final reclamation areas are expected to achieve cover densities meeting or exceeding both federal and state requirements.

Prior to applying for bond release and lease relinquishment, P4 would confirm that the site is safe and meets revegetation standards as set by the BLM, IDL, and the respective private landowners. Soils and vegetation on overburden piles and backfilled pits would be sampled to confirm that they meet applicable standards. The bottom of the final mining pit (South Pit) would be covered with rehandled overburden to cover the exposed Meade Peak overburden sections of the Phosphoria Formation. This fill would be sloped to minimize the potential for ponding, covered with topsoil, and revegetated.

Ultimately, site mechanical facilities, such as the tipple hoppers and conveyors, would be dismantled and removed from the site, with the cleared areas covered with soil or PPGM and planted. Cement feeder boxes, bulkheads, or retaining walls would be covered with soil, shaped,

and seeded so as to return the site to a natural pre-project-like landscape. All non-permanent roads would be ripped, scarified, and planted.

4.5.4.2 Wetlands

P4 submitted a Section 404 permit application to the USACE for disturbance of 9.43 acres of wetlands and other waters of the U.S. As part of the application, and in compliance with the Final Rule, Compensatory Mitigation for Losses of Aquatic Resources (33 CFR Parts 325 and 332, and 40 CFR Part 230), P4 submitted a Compensatory Mitigation Plan (P4 2010b) that identified potential compensatory mitigation for the USACE to consider in replacement of wetlands and lost functions and values. The primary goal of the proposed compensatory wetland mitigation for the Proposed Action is to replace or enhance wetland functions to maintain no net loss. The amount of wetland mitigation required was determined based on the functional assessment conducted for projected levels of ecological functions. Under the Proposed Action, 3.21 functional units would be lost.

All mitigation must comply with the Final Rule, Compensatory Mitigation for Losses of Aquatic Resources (33 CFR Parts 325 and 332, and 40 CFR Part 230). Specific wetland mitigation measures are discussed in **Section 2.3.9.5**.

4.5.4.3 Noxious Weeds

Expansion of the existing weed management program to monitor and treat areas disturbed by the Proposed Action or the alternatives would limit the potential expansion of noxious weeds within the area of the Blackfoot Bridge Mine. Implementation of BMPs would further reduce the potential for establishment of noxious weeds in newly disturbed areas. The BMPs would include using selective seed mixes, avoiding stands of noxious weeds during construction and mining operations, treating established stands, monitoring, and reclaiming disturbed areas.

4.6 TERRESTRIAL WILDLIFE

Issues:

- The potential effects of habitat loss on wildlife populations, both resident and migratory, including bald eagle, elk, deer, and grouse.
- The potential for fragmentation of habitat and loss of biodiversity.
- The potential for contamination of habitat by elevated concentrations of COPCs (cadmium, iron, manganese, nickel, selenium, sulfate, TDS, and zinc).

This section presents potential impacts of the Proposed Action, Alternatives 1A and 1B, and the No Action Alternative to terrestrial wildlife in the project area. The Proposed Action would disturb wildlife habitat during construction and mining operations. The potential effects to wildlife also include habitat loss and potential effects from exposure to selenium and other COPCs. After mining operations cease, the majority of habitat affected would be initially dominated by perennial grasses with limited trees and shrubs.

This section discusses potential impacts to BLM special status species; however, **Section 4.8** addresses these species in context of any threatened, endangered, or special status designation.

4.6.1 Direct and Indirect Impacts

4.6.1.1 Proposed Action

The Proposed Action would result in the long-term loss of wildlife habitat that supports some species as well as a shift in the composition of the plant community. The Proposed Action would result in the long-term loss of 65 acres of existing wildlife habitat associated with pit highwalls. Over time, erosion of the highwall would reduce the configuration to conditions that would support vegetative growth. Approximately 674 acres of wildlife habitat would be resoiled and vegetated. Reclamation would result in a shift to communities dominated by perennial grasses. Disturbance of existing habitats and reclamation of perennial grasses would contribute to habitat fragmentation.

Direct effects to wildlife could include mortality through crushing by heavy equipment within the mine footprint. This type of effect would be most likely to occur to small, fairly immobile species, and on a short-term basis and a localized scale. For most species, it would affect individuals but would not be expected to have an impact at the overall population level due to the small scale involved. Indirect effects to wildlife populations from habitat alteration would be localized, long-term, and minor due to the small size of the disturbed area relative to the availability of the surrounding habitat. Competition and a shortage of resources could arise from individuals displacing from the project area into surrounding habitat; therefore, the population of the displaced species would be expected to decrease proportionate to the amount of habitat lost.

Table 4.6-1 provides some population densities of representative species of wildlife in an attempt to quantify effects to different types of wildlife. Estimates are high because densities given are maximums expected to occur under ideal conditions. It is likely that conditions at the project site are already less than ideal for some species because of the current level of human disturbance (e.g., traffic on the existing haul road and railroad).

Table 4.6-1 Representative Wildlife Population Densities and Numbers Expected to be Impacted

Species	Estimated population density (from literature)[1]	Number of individuals/breeding pairs[2] likely to occur in the disturbed area
Mule deer	0.163/acre	119
Red fox	0.003/acre	3
Flammulated owl	0.021/acre	6
Brewer's sparrow	0.5/acre	229
Blue grouse	1.8/acre	481
Canada goose	62/acre	583

Notes:
1 Source for blue grouse information: Verner and Boss (1980); source for all other species: CWHR (2009)
2 Number of breeding pairs is given for flammulated owl, Brewer's sparrow, and Canada goose.

The potential severity of effects to wildlife species depends on the scale of analysis. For example, on the project-level scale, some impacts to water birds (Canada geese) would be expected based on the number potentially impacted by habitat loss. However, the impact is negligible on a larger scale, as Canada geese are one of the most common birds nationwide (NatureServe 2009). Long-term habitat loss is more likely to have greater effects on species that are already declining region-wide, such as Brewer's sparrow (NatureServe 2009).

No segregated Meade Peak overburden will be left exposed and the thickness of the GCLL cover and non-segregated overburden topsoil will be great enough that the roots of forage plants cannot reach the segregated Meade Peak overburden. Consequently, impacts to terrestrial wildlife by way of selenium uptake in plant forage are not likely to occur as a result of the Proposed Action. As discussed above in **Section 4.5**, it is likely that plants growing on the reclaimed site would accumulate selenium. Big game species (mule deer and elk) are known to forage on vegetation in the project area. Other species, including upland game birds, songbirds, small mammals, reptiles, and amphibians, can also be affected. These species might also be susceptible to acute or chronic selenium toxicity. Possible direct effects of selenium exposure at certain doses include mortality and reproductive failure. However, big game and intermediate-sized species, such as coyotes, badgers, and bobcats, tend to range over large areas, and their behavior would tend to reduce risk of exposure and subsequent adverse impacts.

The threshold at which the toxic symptoms of selenium poisoning first appear in grazing mammals is 5 mg/kg of food (NRC 1980). Many factors determine the level of selenium in feeds that are toxic to animals; however, 5 mg/kg or more may generally be considered toxic (Gough et al. 1979). In fact, grazing cattle on reclaimed areas on the Henry Mine, where selenium concentrations in vegetation samples have ranged from 0.81 mg/kg to 75 mg/kg, have not shown any reproductive or health problems (Knight 2004, Raisbeck et al. 2006).

The Proposed Action is not expected to result in accumulation of selenium in bird eggs that would affect reproductive success. Mammals and birds may access downgradient seeps and springs as sources of drinking water in the fall when some creeks are dry; however, P4 may place rock materials as needed to preclude access of certain wildlife species to seeps and springs in the unnamed tributary to Fish Pond. Selenium toxicity has been confirmed in salamanders at the Gay Mine at the Fort Hall Indian Reservation (Idaho) and the Smoky Canyon Mine. Concentrations in some individuals are 10 to 100 times the normal level in animal tissue (BLM 2003). Selenium in exposed segregated Meade Peak overburden can be leached through the soil to underlying alluvial water, the source of some seeps and springs. P4's mine plan limits the exposure time for segregated Meade Peak overburden material through concurrent backfill and installation of cover materials as areas are graded and prepared for capping.

Concentrations of 0.5 mg/L selenium of drinking water are considered toxic to large mammals such as cattle (Gough et al. 1979). An indirect effect (chronic selenium toxicity) may occur to carrion-feeders and predators (such as bobcat, mountain lion, coyote, and raptors) via bioaccumulation of selenium in animal tissues.

The potential exists for wildlife to have access to contaminated water; however P4 would implement management practices to discourage and prevent wildlife access to water containing COPCs. The facility would be fenced to prevent larger wildlife from accessing the area. WMP1 and WMP2 would be designed with steep slopes and certain grasses in an effort to create low quality habitat. Water birds may temporarily land on the ponds during migration, but the ponds would not have habitat features that would make it suitable for long-term foraging or nesting. Therefore, should water birds have contact with water containing COPCs, it is anticipated that the contact time would be minimal. Small mammals, reptiles, and amphibians may be able to pass through the fence and access the water management ponds; however the steep slopes and low quality habitat would provide minimal cover and therefore use of the area is expected to be

low. Wildlife use of WMP1 and WMP2 would be monitored and if needed additional measures to prevent and discourage wildlife use of the area would be implemented. Overall effects to wildlife from selenium exposure would be localized and long-term.

4.6.1.1.1 Big Game

Habitats adjacent to the project area could be used less by big game during mine operations. However, some individuals may become accustomed to mine activities and continue to use these areas. Construction and use of haul roads would result in increased traffic. Traffic would not likely result in any increase in wildlife mortalities and injuries, as wildlife usage of this area could already be reduced due to current mining activities. Although reclaimed areas would have a higher initial productivity, their long-term suitability for elk and mule deer forage would likely be reduced as forbs, shrubs, and trees became established.

Based on previous revegetation efforts, the forage production on reclaimed lands would increase from the current range of 400 pounds to 800 pounds of usable forage per acre dry weight to between 1,200 to 1,600 pounds dry weight per acre. A study of mule deer on a reclaimed mine in northeastern Wyoming that had been re-seeded with wheat-grasses, blue grama, green needlegrass, bearded wheat, alfalfa, yellow sweetclover, sainfoin, and sunflower found that deer preferentially used reclaimed land compared with un-mined land (Medcraft and Clark 1986). Although reclaimed areas would have a higher initial productivity, their long-term suitability as elk and mule deer forage would likely be reduced as forbs, shrubs, and trees become reestablished and displace grasses.

Mule deer populations have fluctuated over the past 50 years. In 1993, the mule deer population suffered a major decline in southern Idaho from a long-term drought and harsh winter. While some populations have rebounded, others have not (IDFG 2009a). The IDFG has implemented the Mule Deer Initiative to protect and improve habitat, increase mule deer numbers, manage predators, provide more hunter access, and keep the hunting public informed and involved.

The project area is located on the edge of 70,585 acres of elk and mule deer winter range. Approximately 332 acres of this winter range (0.2 percent) is within the project area. The Proposed Action would directly impact approximately 155 acres of the winter range (**Figure 3.6-1**), including 45 acres of aspen patches, 19 acres of mesic mountain big sagebrush, 38 acres of xeric mountain big sagebrush, and 52 acres of mixed needleleaf/broadleaf forest within the winter range for mule deer and elk.

For mule deer and elk, a winter range functions to provide refuge from disturbance, as well as to provide thermal cover and vegetation for browsing. Mule deer depend on aspen patches for successful fawning, summer range, and essential nutritional needs of winter survival. Aspen availability is in decline in southeastern Idaho (IDFG 2006b). Both resident and migratory elk herds use the winter range habitat, especially the heavily forested east face of the project area that contains prime elk habitat, both in terms of security and food source (GYC 2006).

Mining activity may also have indirect impacts to the winter range that is adjacent to the project area. Mule deer and elk may not utilize portions of this habitat during mining operations. Wildlife that encounters human-related disturbances responds similarly to wildlife encountering predators. This could divert from survival activities such as feeding, parental care, or mating

displays. However, if a resource in the disturbance area is high or there is no suitable alternative habitat, wildlife may not flee (Frid and Dill 2002).

Human-related disturbances can cause animals to burn necessary fat reserves that help them survive the winter. Spring is an especially crucial time of year when deer are most vulnerable. Deer have nearly depleted their fat reserves by springtime and are exerting their energies to find food as it becomes available. Any extra activity or unnecessary movements, such as running from the sound of a vehicle, can ultimately result in death (IDFG 2009a). A study of elk calf response to human activity and simulated mine noises in southeastern Idaho found that calves exposed to disturbance moved farther, used larger areas, and used less favorable habitat than calves not exposed to disturbance (Kuck et al. 1985). According to the authors, "the increased energy costs of movement, escape, and stress caused by frequent and unpredictable disturbance may have been detrimental to calf growth," but they did not find an effect on survival rate over the 2-year study (Kuck et al. 1985).

While the winter range habitat impacted by the Proposed Action would be reclaimed, the successional stages of grass habitat to shrub and eventually forest would take a number of years. Furthermore, the habitat is not likely to provide the same structure and complexity as it did prior to disturbance. While the Proposed Action would result in direct and indirect long-term impacts to the winter range of mule deer and elk, these impacts are not expected to be major when analyzed in context of the whole winter range.

4.6.1.1.2 Bats

As discussed in **Section 3.6.1.2**, bat species are known to occur in the project area; however, bats do not appear to be prevalent in the project area. Furthermore, the project area does not provide highly suitable bat roosting habitat. While the Proposed Action would probably result in some direct and indirect impacts to bats resulting from project activity noise and vibrations and loss of habitat, respectively, these impacts are expected to be minimal due to the marginal bat habitat in the project area.

4.6.1.1.3 Other Mammals

Some large mammals were either directly observed, or evidence of their presence (scat or tracks) was documented, as part of the baseline studies. These species included red fox, coyote, and possibly mountain lion. Impacts to species that have large ranges, such as mountain lion and coyote, would likely be negligible because local prey populations are not expected to decrease in size or density. Local red fox populations could be directly affected because of their smaller ranges and burrowing behavior. The Proposed Action may result in some mortalities or displacement of local badger populations. Habitats affected by increased activity associated with construction and mining would also likely experience a short-term reduction in use by predators.

4.6.1.1.4 Raptors

Raptor species observed or documented during baseline studies included the bald eagle, golden eagle, red-tailed hawk, flammulated owl, northern saw-whet owl, great-horned owl, and the short-eared owl. Raptors that occur in the project area would be directly and indirectly affected by the Proposed Action. Raptors could be directly disturbed by noise and activity associated with construction or mine operation. Indirect disturbances would include loss of foraging habitat, reduction in prey base, and loss of nesting habitat. The Proposed Action would reduce habitat for

a number of prey species including mice, voles, ground squirrels, and rabbits. However, abundant foraging habitat exists adjacent to the project area, which would limit the potential effects of the Proposed Action.

During the baseline study, the flammulated owl (a BLM special status species), northern saw-whet owl, and great-horned owl were detected in aspen and Douglas-fir habitats. The Proposed Action would directly impact 149 acres of aspen habitat and 118 acres of mixed needleleaf/broadleaf forest habitat. Thus, owls could be impacted directly (e.g., mortality through removal of an occupied nest tree) or indirectly (e.g., responses to habitat loss).

Bald Eagles

The bald eagle pair in the project area utilizes three nests, all of which are located within the project area (**Figure 3.6-2**). These nests have been observed in use during the nesting seasons of 2004 through 2009. The proximity of these nests to the existing paved haul road varies from 990 feet to 1,845 feet.

On August 9, 2007, the bald eagle was removed from the federal list of threatened and endangered species; however, it is still protected by the Bald and Golden Eagle Protection Act (Eagle Act) and the MBTA. In May 2007, the USFWS developed National Bald Eagle Management Guidelines to advise the public on how to protect eagles consistent with the requirements of these acts. The Eagle Act provides criminal and civil penalties for persons who "take, possess, sell, purchase…any bald eagle, alive or dead, or any part, nest, or egg thereof." The Eagle Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb." Federal regulations define "disturb" as to "agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior."

On September 11, 2009, the USFWS published the final rule in the Federal Register on permit regulations that would allow for the take of eagles and eagle nests under the Eagle Act. The rule authorizes limited non-purposeful take of bald and golden eagles in the course of conducting lawful activities under a permit from the USFWS. As a precautionary measure, P4 is coordinating with USFWS and submitted an application for an incidental take permit on March 2010 (P4 2010e).

During the breeding season, which generally occurs in Idaho from the beginning of January to the end of August, bald eagles can be sensitive to a variety of human activities. However, bald eagle reactions to human activities vary greatly. While some bald eagle pairs nest successfully just dozens of yards from human activity, others abandon nest sites in response to activities much farther away. This variability may be related to a number of factors including visibility, duration, noise levels, extent of the area affected by the activity, prior experiences with humans, and tolerance of the nesting pair (USFWS 2007).

Table 4.6-2 summarizes the relative sensitivity of bald eagles during the different phases of the breeding season.

If agitated by human activities, eagles may inadequately construct or repair their nest, may expend energy defending the nest rather than tending to their young, or may abandon the nest altogether. Disturbances that cause prolonged absences of adults from their nests can jeopardize eggs or young. Depending on weather conditions, eggs may overheat or cool too much and fail to hatch. Unattended eggs and nestlings are subject to predation. Young nestlings are particularly vulnerable because they rely on their parents to provide warmth or shade, without which they may die as a result of hypothermia or heat stress. If food delivery is interrupted, the young may not develop healthy plumage, which can affect their survival. In addition, adults startled while incubating or brooding young may damage eggs or injure their young as they abruptly leave the nest. Older nestlings no longer require constant attention from the adults, but they may be startled by loud or intrusive human activities and prematurely jump from the nest before they are able to fly or care for themselves. Once fledged, juveniles range up to 0.25 mile from the nest site, often to a site with minimal human activity. During this period, until about 6 weeks after departure from the nest, juveniles still depend on adults for food (USFWS 2007).

Table 4.6-2 Nesting Bald Eagle Sensitivity to Human Activities

Phase	Activity	Sensitivity to Human Activity	Comments
I	Courtship and Nest Building	Most sensitive period; likely to respond negatively.	Most critical time period. Disturbance is manifested in nest abandonment. Bald eagles in newly established territories are more prone to abandon nest sites.
II	Egg Laying	Very sensitive period.	Human activity of even limited duration may cause nest desertion and abandonment of territory for the breeding season.
III	Incubation and Early Nestling Period (up to 4 weeks)	Very sensitive period.	Adults are less likely to abandon the nest near and after hatching. However, flushed adults leave eggs and young unattended; eggs are susceptible to cooling, loss of moisture, overheating, and predation; young are vulnerable to elements.
IV	Nestling Period, 4 to 8 weeks	Moderately sensitive period.	Likelihood of nest abandonment and vulnerability of the nestlings to elements somewhat decreases. However, nestlings may miss feedings, affecting their survival.
V	Nestlings 8 Weeks through Fledging	Very sensitive period.	Gaining flight capability, nestlings 8 weeks and older may flush from the nest prematurely due to disruption and die.

Source: USFWS 2007

To avoid disturbing nesting bald eagles, the USFWS recommends: 1) keeping a distance between the activity and the nest (distance buffers), 2) maintaining preferably forested (or natural) areas between the activity and around nest trees (landscape buffers), and 3) avoiding certain activities during the breeding season. The buffer areas serve to minimize visual and auditory impacts associated with human activities near nest sites. Additionally, the USFWS recommends that the activity be at least 660 feet from the nesting tree and that blasting within 0.5 mile of active nests be avoided (USFWS 2007).

The Proposed Action would leave an approximate 375-foot unmodified buffer of existing mixed needleleaf/broadleaf forest between project activities and the closest nesting trees. This buffer

would minimize visual and auditory impacts to the bald eagles. BMPs would also be implemented that would minimize impacts to bald eagles as described below in **Section 4.6.4**. In addition to these BMPs, the bald eagles are to a certain degree habituated to human activity in the area. The closest nest is 990 feet from a visible haul road that receives traffic from large trucks. Furthermore, the Blackfoot River provides a rich resource to the bald eagles, and it is expected that this resource would keep the bald eagles from fleeing the area. The bald eagle feeding pattern would utilize areas farther away from the Proposed Action; therefore, the bald eagles would not need to fly over the project area to reach the Blackfoot River. P4 has prepared and, unless issued a take permit by the USFWS authorizing additional activities, intends to follow an Eagle Management Plan consistent with the requirements of the USFWS, as discussed in **Section 4.6.4**. With the implementation of this plan, impacts to bald eagles from the Proposed Action would be expected to be local, short-term, and minor. Authorization of any take permit would be subject to review and approval by the USFWS. P4 would also comply with requirements of a bald eagle take permit, if issued by USFWS.

4.6.1.1.5 Migratory Birds

The 63 species of birds protected under the MBTA documented in the project area use all habitat types within the project area. The Proposed Action would result in the temporary loss of 674 acres and long-term loss of approximately 65 acres of migratory bird habitat associated with pit highwalls. Bird species associated with xeric big sagebrush habitat would be most affected.

Potential direct effects associated with the Proposed Action would include direct mortality, forced movement, and stress related to increased noise and human activity. P4 would plan ground clearing activities during non-nesting season to minimize potential impact to nesting birds. Loss of habitat could indirectly result in changes in species composition, as forested areas are converted to grassland after reclamation. P4 would create islands of diversity (areas of varying vegetation) within the reclaimed areas that would potentially be attractive to migratory birds following reclamation. Indirect effects could also include increased competition between displaced individuals and resident birds.

The Proposed Action would also result in habitat fragmentation. Avian response to habitat fragmentation is species-specific. Some avian species (white-breasted nuthatch) avoid edge habitat created from fragmenting habitat for reasons such as microclimatology or increased predation. For these species, utilized habitat is likely less than the actual habitat type availability. On the other hand, some avian species, such as the white-crowned sparrow, prefer early successional habitats. Habitat availability may increase as a result of fragmentation for these species that prefer early successional habitats.

Avian species that avoid edge habitat would lose more habitat than the footprint associated with the Proposed Action. However, major losses of avian habitat are not anticipated as a result of the Proposed Action due to the abundance of similar undisturbed habitat in the vicinity of the project area.

There have been numerous studies on avian nesting success with regard to fragmentation of habitat and the resulting edge effect. The edge effect is generally thought to result in an ecological trap, meaning that birds are attracted to nest along forest edges due to the increased vegetation density (e.g., cover), but actually experience increased nest predation, and thus,

reduced nest success (Glennon and Kretser 2005). The idea that predators use edges as travel or forage lanes is one of the most commonly cited hypotheses in the literature on avian nest predation versus success; however, in reviewing a number of studies, Chalfoun et al. (2002) found that few tests have been performed for this hypothesis. Avian nest predation rates have been most prevalent in more fragmented landscapes (Chalfoun et al. 2002). Chalfoun et al. found that the response of nest predator species to habitat fragmentation appears to be taxon-specific and context-dependent.

Opportunistic wildlife in the project area that may utilize the created habitat edge as a forage lane to prey on nesting birds and eggs include the red fox and coyote. It is anticipated that some nest predation may occur within the edge habitat, but because the predator population appears to be relatively low in the project area, nest predation is expected to be minimal.

In 1999 and 2000, Ratti et al. (2006) tested selenium levels in 544 bird eggs from mine and reference sites in southeastern Idaho, and in 2001 the authors monitored the nest success of 623 American robin (*Turdus migratorius*) and red-winged blackbird (*Agelaius phoenicus*) nests at these sites. The authors concluded, "On a population level, American robin and red-winged blackbird reproductive success in southeastern Idaho was not impaired by existing levels of Se in avian eggs. Based on our multi-species data . . . and more-specific data on American robins and red-winged blackbirds, we conclude that there are no negative effects on reproductive success of the general avian community at this time." The authors go on to acknowledge that negative effects may be occurring in some bird species immediately adjacent to mine sites, where high selenium concentrations (>10 µg/g) were observed in eggs (Ratti et al. 2006).

Another study by Skorupa et al. (2002) revealed higher than normal selenium concentrations (> 3 µg/g) in bird eggs at all six southeastern Idaho mine sites where sampling took place. The authors assessed 39 bird embryos from the 74 eggs that were collected in the study and found two embryos with abnormalities that were possibly, though not definitively, linked to selenium poisoning. The authors also performed a risk assessment for the sampled eggs and calculated an 8 percent risk of deformities, which equates to a predicted 40 to 50 percent rate of total embryo loss for the sampling region (Skorupa et al. 2002). The overall risk at the population level depends not only on the level of selenium contamination, but also on the attractiveness of the site to breeding birds. Risk would be low if there is no favorable aquatic habitat where birds can nest and forage (Skorupa et al. 2002). Water birds may temporarily land on WMP1 and WMP2 at the proposed mine during migration, but the ponds would be steep-sided and surrounded with minimal vegetation. The WMPs would not have habitat features that would make them suitable for long-term foraging or nesting. Therefore, selenium exposure to water birds using these ponds would be minimal.

4.6.1.1.6 Upland Game Birds

Two upland game birds, the blue grouse and ruffed grouse, and one active nest were observed during baseline studies. Ruffed grouse habitat in the project area includes aspen and mixed needleleaf/broadleaf forests, and habitat for the blue grouse in the project area includes mixed needleleaf/broadleaf forest. Habitat for the blue grouse and ruffed grouse would be disturbed under the Proposed Action. Indirect impacts from loss of habitat for the blue and ruffed grouse would be long-term because final reclamation would emphasize establishment of communities dominated by perennial grasses.

Sage grouse were not observed in the project area during baseline studies and the shrub habitats in the project area are unlikely to support sage grouse. Therefore, the proposed project would not be likely to affect sage grouse or their habitat.

4.6.1.1.7 Water Birds

Potential impacts to surface water quality from chemical loading of COPCs have the potential to degrade habitat for water birds. As discussed in **Section 4.3**, surface water runoff and groundwater infiltration are not expected to result in additional loading of COPCs to water resources in the project area such as State Land Creek, Woodall Spring, North Woodall Spring, and Beaver Pond; therefore the habitat that these water resources provide is not expected to be degraded by COPCs as a result of the Proposed Action. Fish Pond would be upgraded to more effectively hold stormwater as part of the water management system. If water in Fish Pond does not meet applicable water quality standards, it would be pumped to WMP1 and WMP2 for evaporation. Therefore, there may be short-term degradation to water bird habitat provided by Fish Pond until the water that does not meet applicable water quality standards is pumped to WMP1 and WMP2. The drainage above Fish Pond is not expected to receive additional loading of COPCs to the surface water. However, groundwater modeling indicates that selenium concentrations in groundwater flow that would report to surface water in the drainage above Fish Pond would likely exceed the cold water aquatic life CCC standard of 0.005 mg/L, starting in year 5, and attain a steady-state concentration of about 0.0023 mg/L about 100 years after the start of mining. Therefore, degradation of habitat in the drainage above Fish Pond may occur from about 5 to 100 years after the start of mining.

The Proposed Action is designed to minimize runoff from disturbed areas and, therefore, any runoff that would flow to the Blackfoot River is not expected to result in additional loading of COPCs and is expected to meet applicable surface water quality standards. The groundwater modeling indicates that selenium concentrations in groundwater flowing to Blackfoot River prior to mixing would likely exceed applicable surface water standards. Long-term loading (e.g., model year 350) from groundwater flowing to the Blackfoot River under the Proposed Action would increase selenium concentrations in the river by 0.00001 mg/L during high-flow conditions and 0.00013 mg/L during low-flow conditions, potentially increasing the risk for water birds that inhabit Blackfoot River of the toxic effects of selenium. Concentrations for other COPCs in groundwater that would flow to Blackfoot River are predicted to meet applicable water quality standards.

Cinnamon teal, blue-winged teal, mallards, and Canada geese were observed in the project area during the baseline studies. Studies show that there may be a relationship between selenium sensitivity and salt tolerance among water bird species. For example, black-necked stilts are more sensitive to selenium than are American avocets, which are more salt tolerant, and sea ducks seem to tolerate much higher selenium exposures without apparent ill effect than do freshwater ducks, which are among the bird species most sensitive to selenium (Hamilton 2004). Therefore, if selenium were released into the environment as a result of the Proposed Action, the ducks observed in the project area would potentially be vulnerable to indirect mortality and reproductive impacts associated with selenium toxicity.

The cinnamon teals were observed at Fish Pond. Other avian observations near Fish Pond include western grebe, red-tailed hawk (active nest), willow flycatcher, and yellow-breasted chat.

Fish Pond and surrounding wetlands would be a component of the Mine Water Management Plan for the Proposed Action. Fish Pond would be upgraded to more effectively hold stormwater as part of the water management system. The Fish Pond upgrade would involve sealing the dam and adding clay or other materials to the pond bottom to increase capacity. If needed, as set forth in the Adaptive Management Plan (**Appendix B**), Fish Pond would be expanded to allow collection and monitoring of water from the unnamed tributary to Fish Pond. For the Proposed Action, Fish Pond drainage is expected to carry selenium levels exceeding 0.005 mg/L during and after mining operations. These elevated selenium levels could pose a threat to birds using Fish Pond. Water birds may temporarily land on the pond during migration, but the pond would not have habitat features that would make it suitable for long-term foraging or nesting. Therefore, selenium exposure to water birds using the pond would be minimal.

While BMPs would be used to minimize sedimentation, some runoff and sediments may enter this system. Currently, this habitat is surrounded by the existing haul roads; therefore, avian species utilizing this area may be habituated to human activities. The Proposed Action would include mining activities adjacent to this habitat and may directly cause avian species to flee this area for other suitable habitat nearby. Given the availability of alternate suitable habitat in the vicinity of the project area, long-term impacts to water birds as a result of the Proposed Action are expected to be minimal.

4.6.1.1.8 Amphibians and Reptiles

The baseline studies found northern leopard frogs and tiger salamanders within the Fish Pond area, and boreal chorus frogs were heard in Wetland X. Two reptiles, western skink, and the common garter snake were encountered during the baseline study. The Proposed Action would impact 3.27 acres of Wetland K, which is adjacent to Fish Pond. Direct mortalities to amphibians and reptiles may occur during development in this area. Increased sediment loads that could affect amphibians and reptiles are expected to be minimal due to BMPs that would be implemented. Indirect effects could also adversely affect amphibian populations including increased concentrations of selenium in surface water, water control ponds, seeps, and springs. Because the concentration of selenium in the Fish Pond drainage is expected to exceed the cold water aquatic life CCC standard, and because reptiles and amphibians are small and fairly immobile, the Proposed Action could have long-term, major impacts on local populations using waters and wetlands within that drainage. Increased selenium exposure could result in impacts such as reduced hatching success, developmental abnormalities, abnormal swimming, and craniofacial abnormalities.

Hopkins et al. (2006) examined maternal transfer of contaminants in the eastern narrow-mouth toads collected from a reference site and near a coal-burning power plant. Results showed adult toads inhabiting the industrial area transferred major quantities of selenium to their eggs (up to 100 µg/g dry mass). Compared to the reference site, hatching success was reduced by 11 percent in clutches from the contaminated site. In surviving larvae, the frequency of developmental abnormalities and abnormal swimming was 55 to 58 percent higher in the contaminated site relative to the reference site. Craniofacial abnormalities were nearly an order of magnitude more prevalent in hatchlings from the contaminated site, and these same hatchlings experienced 19 percent lower viability.

4.6.1.2 Alternative 1A – GCLL Cover System Over Core Materials in EOP and Overburden in Pits

Under the revised Alternative 1A, a low-permeability GCLL cover would be placed over the North, Mid and South Pits and over 86 acres covering the 35 acres of segregated Meade Peak overburden core associated with the EOP. A Simple 1 cover (proposed for use over the EOP segregated Meade Peak overburden in the Proposed Action) would be placed over the remainder of the EOP and the entire NWOP. A modified water management system and other design modifications would also be incorporated, as well as a slightly increased disturbance area. All other aspects of Alternative 1A would be identical to the Proposed Action.

Potential impacts to wildlife under Alternative 1A would be similar to those under the Proposed Action, except that the potential for release of selenium and other COPCs would be lower due to the use of a different cover system. Installation of a GCLL cover system under Alternative 1A would reduce infiltration of precipitation into the backfilled overburden and EOP. Therefore, the potential for selenium to enter streams and wetlands via groundwater would be reduced and selenium-related impacts to aquatic species and species that fed on them would be lower.

GCLLs are also considered to provide enhanced resistance to penetration by plant roots or burrowing animals by providing an extra layer of protection in addition to its self-sealing qualities (O'Kane 2009a; EPA 2001). Laminated geotextiles are generally stronger and more resistant to penetration damage including biointrusion. Additionally, the design of the cover above the GCLL (including the topsoil layer, the weathered alluvium and the drainage layer) provides for moisture retention in the upper layers of the cover design. The drainage layer is specifically designed to transport water during high runoff periods. Animals are unlikely to burrow into seasonal water transport zones which could affect the integrity of the burrow.

As discussed above, the seed mix for the reclamation plan would be adjusted to account for potential impacts from plant roots in areas where the GCLL would be used. Plant rooting depths would be controlled by selection of appropriate reclamation plant species. Species for Alternative 1A would be selected based on their appropriate shallow rooting depths in order to minimize biointrusion from roots. Establishment of a grass community on the reclaimed areas would also limit invasive deeper-rooted native species.

4.6.1.3 Alternative 1B – GCLL over the Entire EOP and Overburden in Pits

Under Alternative 1B, a low-permeability GCLL cover would be placed over the entire EOP and the North, Mid, and South Pits. A Simple 1 cover (proposed for use over the EOP segregated Meade Peak overburden in the Proposed Action) would be placed over the NWOP. All other aspects of Alternative 1B would be identical to Alternative 1A.

Impacts to wildlife under Alternative 1B would be similar to those under Alternative 1A, except that the use of the GCLL liner over the entire EOP would decrease the potential for selenium to enter streams and wetlands. As described under Alternative 1A, the GCLL cover system, drainage system, and modified seed mix are designed to reduce the potential for plant root and burrowing animal penetration of the cover system.

4.6.1.4 No Action Alternative

Under the No Action Alternative, the federal phosphate leases would not be developed. The No Action Alternative would result in no impacts to wildlife in the project area. The No Action

Alternative would maintain the current status of wildlife and wildlife populations in and around the project area. However, this does not preclude future development of the federal phosphate leases under a different mine plan.

4.6.2 Irreversible and Irretrievable Commitment of Resources

Under the Proposed Action and Alternatives 1A and 1B, the loss of aspen, mixed needleleaf/broadleaf forest, and mountain big sagebrush habitat is considered an irreversible commitment of resources and would have long-term impacts on many wildlife species. Although the Reclamation Plan would re-establish grassland vegetation in disturbed areas after mining operations end, it would take a long time for forest habitat to re-establish its current level of maturity and complexity. Reclamation would, however, provide habitat in the meantime for species common to early successional areas. Recovery of early succession prey species, such as deer mice and other rodents, would also help to re-establish a prey base for predators. Recovery of species that depend on the forest, such as hairy woodpeckers, forest raptors, and pine martens, would not occur for hundreds of years. Loss of biological diversity in and around the project area would also be considered an irreversible commitment of resources.

It is possible that some terrestrial wildlife may be adversely affected by selenium contamination during the life of the Proposed Action and Alternatives 1A and 1B. These impacts are anticipated to be limited in magnitude and areal extent and, therefore, represent a minor irretrievable commitment of resources.

4.6.3 Unavoidable Residual Adverse Impacts

No unavoidable residual adverse effects on terrestrial wildlife are expected.

4.6.4 Mitigation Measures

P4 has developed an Eagle Management Plan that is consistent with the intent of the *National Bald Eagle Management Guidelines* (USFWS 2007). Prior to the onset of construction during the nesting season, a biologist would observe the activity of the bald eagles in the area to determine if the pair was nesting within or adjacent to the project area. If the pair was nesting, a qualified monitor would remain on site to assess eagle responses during blasting activities. The monitor would observe and log the behavior of the nesting pair to determine if project activities were disturbing nesting activities. Furthermore, in order to minimize disturbance to the nest, no project activities would take place within 660 feet of the nest (or 0.5 mile of the nest in the case of blasting for the early mining phase) during the nesting season for eagles observed near project activities (February through fledging in early to mid-July). Implementing these limitations to mining activities and monitoring these activities during the mine development (two to four years) is expected to result in a time frame and activity level that would allow the eagles to habituate to the activity. By year 5 of the mine, mine development is anticipated to create a northern high wall in the North Pit of at least 50 below the natural top, thus providing an additional topographic barrier between the mine activity and the nest location. Blasting may then occur behind the wall, within the 0.5 mile zone of the nests to minimize any disturbance to the birds from blasting, in consultation with the USFWS.

As a precautionary measure, P4 has applied for an incidental take permit with the USFWS and, if granted, P4 would comply with all permit requirements, including additional NEPA reviews if required. Additional BMPs that would be used to lessen impacts to bald eagles include

minimizing noise caused by blasting, clearing the haul road of roadkill to avoid attracting eagles feeding on carrion, designing power lines to be "eagle safe" to ensure an eagle wingspan could never ground between lines, informing workers of the importance of not disturbing the eagles, and placing signs warning against entering the nest tree stand (P4 2009b).

P4 would implement measures designed to help ensure compliance with the MBTA and reduce the potential for adverse impacts on migratory birds. These include planning ground clearing activities during non-nesting season, so that suitable nesting habitat would be removed from the proposed mine footprint before there was a chance of potential impact to nesting birds. Also, P4 would create islands of diversity (areas of varying vegetation) within the reclaimed areas that would potentially be attractive to migratory birds following reclamation. No raptors have been observed nesting on the power lines in the project area, but if raptors began nesting on power lines following the commencement of mining, appropriate mitigation measures would be developed at that time. Finally, WMP1 and WMP2 would be designed with steep sides and vegetative growth would be kept to minimum at these ponds in order to make them less attractive to water birds. These ponds would be monitored for use by water birds, and if any problems arose, further mitigation measures would be developed to discourage use.

Reclamation of the open pit with non-segregated overburden material, along with 1.5 to 2 feet of PPGM, would be expected to limit the potential for selenium uptake through the food chain once mineral extraction was completed. Potential exposure of wildlife to selenium would be limited by selective placement practices.

P4 would mitigate impacts to wildlife values from the Project by entering into an agreement with the BLM for a conservation easement on 120 acres of its Soda Hills undeveloped natural property in the general area of the mine and Soda Springs. The Monsanto Soda Hills property lies contiguous to BLM managed lands and is considered to have a "conservation value" of benefit to the public. The property will contribute to mule deer winter range acreage which is a benefit to the people of the county, state, USA, and Shoshone-Bannock Tribes. The conservation easement would preclude use of the land for any purpose other than buffer zone and require it be maintained in its current natural state.

The purpose of the conservation easement is to assure that the property would be retained forever in its relatively natural and scenic condition, to preserve opportunities to continue traditional agriculture and to prevent any use of the property that would significantly impair or interfere with the maintenance and protection of the conservation values of the property. A specific purpose of this conservation easement is to conserve the important Soda Springs Hills big game winter range. Grantor (P4) and Grantee (BLM) intend that this conservation easement would limit the use of the property to activities that are consistent with the purposes of this conservation easement, which include but are not limited to livestock grazing, enjoyment of nature and wildlife, and public access and recreation. P4 would fund a management reserve with a third party, if necessary, to monitor compliance and take actions necessary to ensure compliance. The easement would conserve the conservation values of the property in perpetuity.

For a conservation easement to do this it must prohibit actions such as:

- subdividing the property;
- mining;

- topographical alteration;
- wholesale vegetation removal/alteration;
- on-site hydrologic alteration;
- residential development;
- commercial development except for limited livestock grazing (if desired);
- storage of hazardous materials and other trash;
- new roads;
- landing strips and helipads; and
- deliberate introduction of exotic plant and animal species.

A conservation easement can allow activities that are not detrimental to the conservation values of the property such as:

- biological and chemical weed treatment in accordance with state/county rules;
- limited predator control;
- limited low impact recreational activities;
- low impact agricultural use such as limited livestock grazing (if desired);
- habitat enhancement projects;;
- low impact educational activities;
- public access (if desired);
- some structures - usually strive to cluster structures and minimize their visibility and size and structure maintenance; and
- maintenance of existing roads and trails.

4.7 FISHERIES AND AQUATIC RESOURCES

Issues:

- The potential effect on fish populations and their habitat and the potential habitat degradation of the Blackfoot River.

4.7.1 Direct and Indirect Impacts

4.7.1.1 Proposed Action

The Proposed Action is anticipated to result in the direct loss of 9.43 acres of water-related habitat in the project area (6.11 acres of wetlands and 3.32 acres of non-wetland waters of the U.S.). Also, waterbodies within and adjacent to the project area may receive indirect effects from the Proposed Action. Clearing vegetation within the study area could contribute to increased amounts of siltation in local drainages. An increase in the amounts of suspended sediment in runoff could adversely affect fish and aquatic invertebrates if released to local streams.

Implementation of the proposed BMPs, including construction of water control ponds and use of erosion control measures, would help to prevent sediment and runoff water from flowing into streams. Because of the incorporation of BMPs into the design of the Proposed Action, indirect impacts to water bodies and aquatic life from sedimentation are expected to be minimal and short-term (P4 2008a).

As discussed in **Section 3.7.2**, several samples of fish tissue taken from the Blackfoot River between 2000 and 2007 found selenium concentrations exceeding the EPA draft freshwater chronic criterion of 7.91 µg/g dry weight. As reported in the Hamilton and Buhl (2003) study, selenium levels in aquatic plants were also elevated compared with background concentrations, and the high selenium concentrations in aquatic invertebrates (8.7 to 10.8 µg/g) "were of concern to the health of fishery resources and species that use these resources."

Adverse selenium-related impacts to the fisheries and aquatic resources of the Blackfoot River and other tributaries in the project area, as well as their related downstream waterbodies, may occur via several exposure scenarios (Tetra Tech 2002c). Surface water runoff may carry sediments that contain selenium to drainages via erosion gullies and road ditches. Selenium can reside in streambed sediments and the water column to be taken up directly by rooted aquatic plants, plankton, aquatic insects, and fish. Selenium may have long-term effects on local populations of aquatic species within the Fish Pond drainage; however, filling portions of this drainage and water management would reduce the surface exposure of water containing COPCs. Selenium in the overburden piles could also leach into groundwater and flow through springs into nearby waterbodies such as the Blackfoot River. The selenium could then be absorbed by aquatic plants, where it would become available to organisms at higher trophic levels (Tetra Tech 2002c).

There may be an adverse ecological impact if selenium exposed during mining operations bioaccumulated in the food chains of local aquatic communities. Depending on dosage and exposure, selenium is toxic to fish and highly bioaccumulative in aquatic food chains (Ohlendorf 2003). Yellowstone cutthroat trout, rainbow trout, cutbow trout (hybrid of cutthroat and rainbow trout), leatherside chub, sculpin, Utah and mountain sucker, dace, and shiners inhabit the Blackfoot River. Bioaccumulation is difficult to quantify because it is affected by many variables, and as a result, there is wide variation in the measured "bioaccumulation factor," or the ratio of the concentration of selenium inside an organism to the concentration in the surrounding environment (Nagpal and Howell 2001). As a very rough estimate, however, if the mean selenium concentration in the Blackfoot River is taken to be 0.005 mg/kg (from baseline water quality studies discussed in **Section 3.3**), and the mean fish tissue concentration is taken to be 16 mg/kg (from studies discussed in **Section 3.7.2**), the bioaccumulation factor can be estimated at 3,200. This number is on the same order of magnitude as those found in other studies investigating selenium bioaccumulation in fish (Nagpal and Howell 2001). The same calculation for aquatic invertebrates yields an estimated bioaccumulation factor of 1,950, also similar to those found in other studies (Nagpal and Howell 2001).

As discussed in **Section 4.3.1.1.5**, modeling predicts that the Proposed Action would increase peak selenium concentrations in the Blackfoot River, near the project area, by 0.00009 mg/L during high-flow conditions and 0.00087 mg/L during low-flow conditions. However, the modeling predicts that long-term loading from groundwater flow to the Blackfoot River, near the

project area, under the Proposed Action would increase selenium concentrations in the river by 0.00001 mg/L during high-flow conditions and 0.00015 mg/L during low-flow conditions. This translates into an average increase in selenium concentration of 0.00048 mg/L over the short term and 0.00008 mg/L over the long term. Using the bioaccumulation factor calculated above, average whole-body fish tissue concentration would be expected to increase by about 1.5 mg/kg over the short term and 0.3 mg/kg over the long term. Average aquatic invertebrate concentration would be expected to increase by about 0.9 mg/kg over the short term and 0.2 mg/kg over the long term.

Using a compilation of field and laboratory data, Lemly (1997) described the relationships between whole-body selenium concentrations in fish populations, percentage of deformities, and associated mortalities. According to Lemly's data, there is a saturation point above which the input of additional selenium to the system does not further increase the level of deformity-related mortalities (Lemly 1997). Applying these relationships to the data from the Blackfoot River and predicted effects of the Proposed Action, the mortality rate due to selenium-induced deformities would not be expected to increase for larvae and fry under the Proposed Action, since the fish population would have already reached the saturation point (assuming a fish tissue selenium concentration of 16 mg/kg) (Lemly 1997). However, the mortality rate due to selenium-induced deformities would be expected to increase between 2 and 5 percent for juvenile and adult fish (Lemly 1997).

A study of effects of accumulated selenium on the reproductive success and larval development of cutthroat trout collected from a site of active coal mining in British Columbia showed eggs with selenium concentrations greater than 86.3 µg/g dry weight were not successfully fertilized or were nonviable at fertilization, while eggs with concentrations greater than 46.8 and less than 76.4 µg/g dry weight were fertilized but did not produce viable fry. In this study, a positive relationship between egg selenium concentrations and fry mortality was observed (Rudolph et al. 2008). The authors also described the relationship between egg selenium concentration and fish muscle tissue concentration. Assuming that the egg concentration/tissue concentration relationship that Rudolph et al. (2008) described holds true for the Blackfoot River, egg selenium concentrations likely already exceed 20.6 µg/g, which Rudolph et al.(2008) propose as the "no-effect" deformity threshold. Applying the relationship between egg selenium concentration and fry mortality that Rudolph et al. (2008) observed to the Blackfoot River, the increase in selenium concentration predicted under the Proposed Action would result in a 4.5 percent increase in fry mortality. Neither the background conditions nor the Proposed Action would result in egg selenium concentrations exceeding the thresholds for complete reproductive failure (no viable fry) established in the study (Rudolph et al. 2008).

Hardy et al. (2009) completed a 2.5 year feeding trial where cutthroat trout were fed dietary selenium supplied as selenomethionine, a dominant form found in algae and in the aquatic food chain. The results of the study suggest that cutthroat trout are not as sensitive to intake of dietary selenium as fish in other studies, such as the Ruldolph et al. (2008) study. Hardy et al. (2009) found egg selenium concentrations were not consistently higher or lower than fish whole-body tissue concentrations, but were higher in some treatment groups and lower in others. Results also found no differences in growth, feed intake, survival, or egg hatchability between dietary groups when concentration of selenium in whole fish and eggs were increased in proportion to dietary

selenium intake. The results suggest that there may be differences in response to selenium exposure among fish species.

NewFields (2009b) investigated selenium toxicity in wild brown trout (*Salmo trutta*) collected from waters downstream of the Smoky Canyon phosphate mine. The results of this study confirm the results of the Rudolph et al. (2008) study. There were positive correlations observed between egg selenium concentration and mortality, and between egg selenium concentration and incidence of deformities. While the NewFields (2009b) study is not specific to the Blackfoot River, it provides further evidence that selenium-related mortalities and deformities may likely already be occurring in the Blackfoot River, and if so the Proposed Action would be expected to increase the incidence of mortalities and deformities, which could result in a decline to fish populations. Under the Proposed Action, post-hatch mortality would be expected to increase between 8 and 11 percent, assuming that the egg selenium concentration-mortality relationship that NewFields (2009b) described is applicable to the Blackfoot River.

Van Kirk and Hill (2007) modeled population-level responses of Yellowstone cutthroat trout to selenium toxicity. The authors' model predicted a rapid decline in the trout population at elevated selenium levels, with a 90 percent decrease from carrying capacity at a whole-body selenium concentration of about 17 µg/g. After the rapid initial decline, the model predicted that the population would stabilize at a much reduced number of individuals (Van Kirk and Hill 2007).

In a study of wild cutthroat trout in a coal mining region of British Columbia, Kennedy et al. (2000) did not observe any correlation between egg selenium concentration and percentage of mortalities or deformities. Data suggest that due to the geology of the region where the study took place, natural background levels of selenium were already relatively high prior to human influence. The authors reasoned that the trout population may have, over time, evolved tolerance to elevated levels of selenium (Kennedy et al. 2000).

Canton and Baker (2008) analyzed studies that evaluated the impacts of selenium on fish populations in streams to try to determine if fish selenium thresholds are predictive of population-level effects. Canton and Baker evaluated six streams that have documented selenium impacts on fish population from coal fly ash discharges. They concluded that the studies indicated that selenium may be a factor in structuring fish communities; however habitat quality is also a major factor to consider when trying discerning selenium impacts to fish in streams, especially warm water streams. Many factors (e.g. migration, immigration or emigration, competition) are important when determining if patterns observed in fish populations are selenium related. Canton and Baker suggest field studies to fully attempt to elucidate the true impact of selenium, if any, at a given site.

The data presented here are based on averages and representative of the overall "fish population" of the Blackfoot River. It is likely that selenium affects some species or individuals more than others. It is also possible that short-term high inputs of selenium could be more of a limiting factor to aquatic resources than long-term, averaged inputs. Because evidence suggests that aquatic populations have already accumulated selenium (**Section 3.7.2**) from inputs into the watershed, the impacts associated with the Proposed Action are not expected to trigger any new declines. However, the Proposed Action may accelerate declines already taking place or further

reduce the size of populations that are already under stress (e.g. cutthroat trout populations). Other factors such as migration, competition, and habitat quality are important when assessing impacts to fish populations, as Canton and Baker (2008) concluded.

The presence of other project-related trace metals is not expected to cause adverse impacts to fisheries and aquatic resources because they are not predicted to occur in concentrations that would be harmful. Montgomery Watson (2000) (as cited in BLM 2003) concluded that selenium was the major element of concern associated with phosphate mining in the Blackfoot River watershed compared with other elements (such as cadmium, manganese, nickel, vanadium, and zinc).

Sediment would be controlled using various water control ponds and ditch systems under the Proposed Action. Sediment from runoff of active mine areas and reclaimed areas would be captured and returned to stockpiles or reclamation areas. Sediment would not be discharged off site.

4.7.1.2 Alternative 1A – GCLL Cover System Over Core Materials in EOP and Overburden in Pits

Under the revised Alternative 1A, a low-permeability GCLL cover would be placed over the North, Mid and South Pits and over 86 acres covering the 35 acres of segregated Meade Peak overburden core associated with the EOP. A Simple 1 cover (proposed for use over the EOP segregated Meade Peak overburden in the Proposed Action) would be placed over the remainder of the EOP and the entire NWOP. A modified water management system and other design modifications would also be incorporated, as well as a slightly increased disturbance area. All other aspects of Alternative 1A would be identical to the Proposed Action.

Some potential impacts to fisheries and aquatic resources under Alternative 1A would be similar to those under the Proposed Action, such as direct loss of 9.43 acres of water related habitat and the potential for increased siltation from clearing vegetation. The potential for release of selenium and other COPCs would be lower due under Alternative 1A than the Proposed Action due to the use of a different cover system. Installation of a GCLL cover system under Alternative 1A would reduce infiltration of precipitation into the backfilled overburden and EOP. Therefore, the potential for selenium to enter streams and wetlands via the groundwater would be reduced, and selenium-related impacts to aquatic species would be less.

GCLLs are also considered to provide enhanced resistance to penetration by plant roots or burrowing animals by providing an extra layer of protection, in addition to its self-sealing qualities (O'Kane 2009a, EPA 2001). Laminated geotextiles are generally stronger and more resistant to penetration damage including biointrusion. Additionally, the design of the cover above the GCLL (including the topsoil layer, the weathered alluvium and the drainage layer) provides for moisture retention in the upper layers of the cover design. The drainage layer is specifically designed to transport water during high runoff periods. Animals are unlikely to burrow into seasonal water transport zones, which could affect the integrity of the burrow.

As discussed above, the seed mix for the reclamation plan would be adjusted to account for potential impacts from plant roots in areas where the GCLL would be used. Plant rooting depths would be controlled by selection of appropriate reclamation plant species. Species for

Alternative 1A would be selected based on their appropriate shallow rooting depths in order to minimize biointrusion from roots. Establishment of a grass community on the reclaimed areas would also limit invasive deeper-rooted native species. Finally, the unique nature of the GCLL is its ability to "self-repair" in the event of penetrating roots providing enhanced protection for fisheries as compared to the Proposed Action.

4.7.1.3 Alternative 1B – GCLL over the Entire EOP and Overburden in Pits

Under Alternative 1B, a low-permeability GCLL cover would be placed over the entire EOP and the North, Mid, and South Pits. A Simple 1 cover (proposed for use over the EOP segregated Meade Peak overburden in the Proposed Action) would be placed over the NWOP. A modified water management system and other design modifications would also be incorporated. All other aspects of Alternative 1B would be identical to the Proposed Action.

Impacts to fisheries and aquatic resources under Alternative 1B would be similar to those under Alternative 1A, except that more extensive use of the GCLL liner would decrease the potential for selenium to enter streams and wetlands, at least over the short term, and thus further reduce impacts to fish and aquatic species.

4.7.1.4 No Action Alternative

The No Action Alternative would result in no impacts related to mining at the Blackfoot Bridge site and would preclude mining and any associated disturbance at Blackfoot Bridge site. The current status of aquatic wildlife populations and fisheries in and around the project area would remain as is.

4.7.2 Irreversible and Irretrievable Commitment of Resources

Impacts to the natural, physical habitat under the Proposed Action and the alternatives would be irreversible and irretrievable. Reclamation activities would restore some of the disturbed areas to topographic contours that mimic pre-mining conditions and thus reduce permanent impacts to physical habitat. However, disturbed areas that are not backfilled would remain as long-term impacts to topography, and thus physical habitat. Disturbed areas that are not backfilled could have a higher potential to produce sediments during runoff, and these sediments could reach wetlands and surface waters.

It is possible that the Proposed Action may contribute to a continuing decline of water quality, associated fisheries, and aquatic resources within the Blackfoot River watershed for a period of time as a result of contamination by selenium, considering the impacts of other phosphate mines in the area. Degradation of water quality is considered an irretrievable commitment of resources.

4.7.3 Unavoidable Residual Adverse Impacts

No unavoidable residual adverse effects on fisheries and aquatic resources are expected.

4.7.4 Mitigation Measures

A number of BMPs are included in the Mine Water Management Plan that would mitigate the potential impacts to fisheries and aquatic habitats (P4 2010c). Where applicable, other BMPs would be implemented as part of the SWPPP including the use of erosion matting, silt fencing,

and straw bales/wattles. During active mining, runoff from the open pit and roads would be contained and would not be allowed to flow to waterbodies. Concurrent reclamation would also be used to restore areas that were no longer required for mining operations. Disturbed areas, such as roadsides and topsoil stockpiles, would also be revegetated during operations to further limit the potential for erosion and sedimentation. Implementation of BMPs is expected to limit the potential for impacts from sedimentation and erosion and consequent impacts to aquatic wildlife.

Reclamation would involve selective placement of segregated Meade Peak overburden materials into the middle and deep levels of the open pits. Capping with 1 foot of weathered alluvium (Proposed Action) or 2 feet of weathered alluvium and a low-permeability liner (Alternatives 1A and 1B), topped by 1.5 of PPGM would be expected to limit the potential for uptake of selenium through the aquatic food chain after mineral extraction was completed. Potential exposure of aquatic life to selenium would be limited by selective reclamation and sediment and erosion control practices.

4.8 THREATENED, ENDANGERED, AND SPECIAL STATUS SPECIES

Issues:

- The potential effects of habitat loss on wildlife populations, both resident and migratory, including threatened, endangered, and special status species.

4.8.1 Direct and Indirect Impacts

4.8.1.1 Proposed Action

4.8.1.1.1 Threatened and Endangered Species

As discussed in **Section 3.8.1**, the federal list of threatened and endangered species was reviewed and the USFWS was consulted. It was determined that the gray wolf is the only species that is federally protected under the ESA that may occur in the general project area. The gray wolf is listed as an experimental non-essential population. The North American wolverine is a federal candidate species with the potential to occur in the project area. There are no other threatened, endangered, or candidate species (or species proposed for listing) known to occur within the general project area, nor any designated or proposed critical habitat.

Increased human activity associated with the project may cause gray wolves to temporarily avoid habitats in the project area. Because there are no established packs that are known to use the project area, these potential impacts would be limited to small numbers of individual wolves that may disperse through the project area and would, therefore, be negligible. Habitat disturbances within the project area would not have substantial effects on the occurrence and numbers of suitable prey species, including deer and elk. Overall impacts to wolves would be negligible, due to the small number of individual wolves that potentially use the project area. Because wolves are unlikely to be found in the project area and not likely to be disturbed by project activities, the Proposed Action is "not likely to jeopardize the continued existence of the population."

Similar to its effect on gray wolves, the increased human activity associated with the project may cause wolverines to temporarily avoid habitats in the project area. Because suitable habitat for wolverines is limited in the project area, these potential impacts would be limited to small numbers of individual wolverines that may wander through the project area and would, therefore,

be negligible. Habitat disturbances within the project area would not have substantial effects on the occurrence and numbers of suitable prey species, including deer and elk. Overall impacts to wolverines would be negligible, due to the small number of individual wolverines that potentially use the project area and the wide-ranging nature of this species. The Proposed Action is not likely to significantly impact populations, individuals, or suitable habitat.

Twenty-three BLM special status species were either observed in the project vicinity during baseline studies or an occurrence of the species has been documented by the IDFG. **Table 4.8-1** summarizes the habitat preferences for these 23 species and acres of potential habitat that would be directly impacted by the Proposed Action.

Table 4.8-1 Direct Impacts to Potential Habitat for BLM Special Status Species

Species	Habitat Preferences	Potential Habitat Directly Impacted by Proposed Action (Acres)
Type 1 - Threatened, Endangered, Proposed, and Candidate Species		
Bald Eagle (*Haliaeetus leucocephalus*) *(Note: the BLM special status classification for the bald eagle has not been reclassified since the species was federally delisted.)*	Forested areas adjacent to fish-bearing water bodies.	0 acres
Type 2 - Rangewide/Globally Imperiled Species		
American White Pelican (*Pelecanus erythrorhynchos*)	Open water.	3 acres of open water (Fish Pond)
Greater Sage-grouse (*Centrocercus urophasianus*)	Sagebrush with perennial forb and grass understory.	0 acres (no suitable sage grouse habitat in project area)
Northern Leopard Frog (*Rana pipiens*)	Waters, wetlands.	6 acres of wetlands, 3 acres of other waters (Fish Pond; streams)
Yellowstone Cutthroat Trout (*Oncorhynchus clarki bouveri*)	Rivers, streams, and lakes.	0 acres (none in project area support cutthroat trout)
Type 3 - Regional/State Imperiled Species		
Trumpeter Swan (*Cygnus buccinator*)	Open water.	3 acres of open water (Fish Pond)
Prairie Falcon (*Falco mexicanus*)	Low- and mid-elevation and shrub mountain, cliffs.	458 acres of sagebrush
Ferruginous Hawk (*Buteo regalis*)	Low- and mid-elevation shrub, especially on cliffs.	458 acres of sagebrush
Black Tern (*Chlidonias niger*)	Marsh/wetlands.	6 acres of wetlands
Flammulated Owl (*Otus flammeolus*)	Dry conifer and aspen-conifer mix.	118 acres of mixed forest, 149 acres of aspen
Willow Flycatcher (*Empidonax trailii*)	Riparian.	less than 1 acres of riparian
Olive-sided Flycatcher (*Contopus borealis*)	Dry conifer and wet/cold conifer.	118 acres of mixed forest
Brewer's Sparrow (*Spizella breweri*)	Low- and mid-elevation shrub.	458 acres of sagebrush
Common Garter Snake (*Thamnophis sirtalis*)	Dry conifer, aspen/aspen conifer mix, mountain shrub, and riparian.	149 acres of aspen, 118 acres of mixed forest, 458 acres of sagebrush, less than 1 acre of riparian
Type 4 - Peripheral Species		
Uinta Chipmunk (*Tamias umbrinus*)	Found at about 6,560 to 11,155 feet in coniferous forests, often near logs and brush in open areas, and at edge of forests.	118 acres of mixed forest
Hoary Willow (*Salix candida*)	Wet, hummocky, quaking swamp/meadows or fens, with low shrubs (*Salix planifolia* and *Salix candida* dominate) occupying the hummocks, and sedges (*Carex aquatilis*, *C. rostrata,* and others) dominating in the	0 acres

Table 4.8-1 Direct Impacts to Potential Habitat for BLM Special Status Species

Species	Habitat Preferences	Potential Habitat Directly Impacted by Proposed Action (Acres)
	standing water between hummocks. Soil typically consists of a layer of peat 1 decimeter or more thick overlying wet silty muck more than 1 meter deep. Known sites are located in broad, open valley bottoms with mountain sagebrush and low sagebrush on the upland. Hoary willow has a close affinity with calcareous fens.	
Type 5 - Watch List		
Swainson's Hawk (*Buteo swainsoni*)	Forested or shrub areas adjacent to riparian zones.	725 acres of forested or shrub areas adjacent to riparian zones
Blue Grouse (*Dendragapus obsurus*)	Coniferous forests, mostly open, with a mix of deciduous trees and shrubs.	118 acres of mixed forest
Long-billed Curlew (*Numenius americanus*)	Open, recently grazed shrub steppe.	458 acres of sagebrush
Short-eared Owl (*Asio flammeus*)	Prairies, meadows, tundra, moorlands, marshes, savannas, dunes, fields, and open woodlands.	149 acres of aspen, 118 acres of mixed forest
Red-naped Sapsucker (*Sphyrapicus nuchalis*)	Coniferous/deciduous forests that include aspen and cottonwood.	118 acres of mixed forest
Green-tailed Towhee (*Pipilo chlorurus*)	Thickets, chaparral, shrublands, riparian scrub.	458 acres of sagebrush
Brewer's Blackbird (*Euphagus cyanocephalus*)	Shrub, riparian woodlands, aspen parklands, cultivated lands, marshes, human habitation areas.	458 acres of sagebrush, 149 acres of aspen

Source: IDFG 1997

Reclaimed areas would represent a long-term change in wildlife habitat from aspen, conifer, mixed aspen/conifer, and sagebrush communities to a habitat dominated by perennial grasses. Habitat conversion would represent a long-tem loss of foraging habitat for forest-dependent wildlife, such as flammulated owl, olive-sided flycatcher, and red-naped sapsucker, and sagebrush-dependent wildlife such as Brewer's sparrow.

Habitat that would receive direct impacts is not unique to the project area; therefore, individuals of these mobile species would be displaced to suitable habitat that is adjacent to the area of impact. This would increase competition in these adjacent areas. During baseline studies, two green-tailed towhee nests were located near mountain sagebrush habitat near the haul road. Refer to **Section 4.8.4** for measures that would be taken to minimize impacts to avian nests.

The Proposed Action complies with IDFG's Management Plan for the Conservation of Cutthroat Trout (IDFG 2007a). The proposed compensatory wetland mitigation, including improving riparian habitat along the Blackfoot River for the Proposed Action, would conform to the management priorities and actions for the Blackfoot River Geographic Management Unit. Refer to **Section 4.5.4.2** for a discussion on wetland mitigation. Potential selenium impacts to Yellowstone cutthroat trout and other aquatic species is discussed in **Section 4.7**.

During baseline surveys, 21 northern leopard frogs were documented at Fish Pond. The northern leopard frogs inhabiting Fish Pond may receive direct impacts, including mortality, from work associated at Fish Pond. Fish Pond is a component of the Mine Water Management Plan and

would collect runoff from the EOP. This water is expected to carry elevated selenium concentrations; therefore, individual northern leopard frogs may be susceptible to the indirect impacts of selenium uptake.

While the Proposed Action may result in direct and indirect impacts to individual BLM special status species, these impacts are not anticipated to have an impact at the regional population level due to the small area of proposed disturbance compared with the regional availability of suitable habitat. The Proposed Action is not expected to elevate the status of the species to a federal listing.

4.8.1.2 Alternative 1A – GCLL Cover System Over Core Materials in EOP and Overburden in Pits

Under the revised Alternative 1A, a low-permeability GCLL cover would be placed over the North, Mid and South Pits and over 86 acres covering the 35 acres of segregated Meade Peak overburden core associated with the EOP. A Simple 1 cover (proposed for use over the EOP segregated Meade Peak overburden in the Proposed Action) would be placed over the remainder of the EOP and the entire NWOP. A modified water management system and other design modifications would also be incorporated, as well as a slightly increased disturbance area. All other aspects of Alternative 1A would be identical to the Proposed Action.

Potential impacts to gray wolves under Alternative 1A would be similar to those under the Proposed Action. Because wolves are unlikely to be found in the project area and be disturbed by project activities, Alternative 1A is "not likely to jeopardize the continued existence of the population." Impacts to wolverines would be the same as those under the Proposed Action.

Despite the additional disturbance acres and a slightly increased project boundary associated with Alternative 1A, potential impacts to BLM special status species would be similar to those under the Proposed Action, except that the potential for release of selenium and other COPCs would be lower due to the use of a different cover system. Installation of a GCLL cover system under Alternative 1A would reduce infiltration of precipitation into the backfilled overburden and EOP. Therefore, the potential for selenium to enter streams and wetlands via groundwater would be reduced and selenium-related impacts to aquatic species and species that feed on them would be less.

GCLLs also resist penetration by plant roots or burrowing animals by providing an extra layer of protection in addition to its self-sealing qualities (O'Kane 2009a; EPA 2001). Laminated geotextiles are generally stronger and more resistant to penetration damage including biointrusion. Additionally, the design of the cover above the GCLL (including the topsoil layer, the weathered alluvium, and the drainage layer) provides for moisture retention in the upper layers of the cover design. The drainage layer is specifically designed to transport water during high runoff periods. Animals are unlikely to burrow into seasonal water transport zones, which could affect the integrity of the burrow.

As discussed above, the seed mix for the reclamation plan would be adjusted to account for potential impacts from plant roots in areas where the GCLL would be used. Plant rooting depths would be controlled by selection of appropriate reclamation plant species. Species for Alternative 1A would be selected based on their appropriate shallow rooting depths in order to

minimize biointrusion from roots. Establishment of a grass community on the reclaimed areas would also limit invasive deeper-rooted native species. Finally, the unique nature of the GCLL is its ability to "self-repair" in the event of penetrating roots.

4.8.1.3 Alternative 1B – GCLL over the Entire EOP and Overburden in Pits

Under Alternative 1B, a low-permeability GCLL cover would be placed over the entire EOP and the North, Mid, and South Pits. A Simple 1 cover (proposed for use over the EOP segregated Meade Peak overburden in the Proposed Action) would be placed over the NWOP. All other aspects of Alternative 1B would be identical to the Proposed Action.

Potential impacts to gray wolves under Alternative 1B would be similar to those under the Proposed Action. Because wolves are unlikely to be found in the project area and be disturbed by project activities, Alternative 1B is "not likely to jeopardize the continued existence of the population." Impacts to wolverines would be the same as those under the Proposed Action.

Effects to BLM Special Status Species under Alternative 1B would be similar to those under Alternative 1A, except that the use of the GCLL would further decrease the potential for selenium to enter streams and wetlands.

4.8.1.4 No Action Alternative

Under the No Action Alternative, the federal phosphate leases would not be developed. The No Action Alternative would result in no additional effects in the project area and would maintain the status of threatened, endangered, and sensitive plant and wildlife populations in and around the study area. Existing concentrations of selenium in surface water seasonally exceed state chronic water quality standards and water consumption toxicity thresholds for aquatic life and terrestrial wildlife. Bioaccumulation of selenium from aquatic life through terrestrial food chains would continue at the present rate. However, this does not preclude future development of the federal phosphate leases under a different mine plan.

4.8.2 Irreversible and Irretrievable Commitment of Resources

For the Proposed Action and Alternatives 1A and 1B, the loss of aspen and mixed needleleaf/broadleaf forest habitat represents an irreversible commitment of resources through the long-term loss of foraging habitat for some sensitive species. Although the Reclamation Plan would help to re-establish vegetation in disturbed areas after mining operations end, it would take many years for disturbed areas to re-establish the current level of maturity and complexity. Local recovery of species that depend on the forest, such as flammulated owls, would be limited until these forests became re-established.

4.8.3 Unavoidable Residual Adverse Impacts

The primary unavoidable residual adverse impacts to sensitive species would result from the loss of forest habitat. Development of a mature forest that may be used by flammulated owls and bald eagles would only occur after an extended period. Even with planting and natural succession, it is expected that these forests would require decades to recover to their current structure and level of complexity.

4.8.4 Mitigation Measures

Reclamation of the open pit would involve selective placement of segregated Meade Peak overburden materials into the middle and deep levels of the open pit. The use of a cover system would be expected to limit the potential for uptake of selenium through the food chain. Potential exposure of threatened, endangered, and sensitive species to selenium would be limited by selective placement practices.

Impacts to foraging habitat used by BLM or Idaho sensitive species would be avoided where feasible. Mitigation measures would be implemented to minimize potential impacts to foraging habitat and would include limiting disturbance footprints and concurrent reclamation.

Pre-construction surveys would be conducted within and adjacent to the project area for raptors before construction began. These surveys would document use of the habitats by the species and locations of raptor nest sites (occupied and unoccupied), winter roost sites, and associated habitat use areas. If nests of threatened, endangered, or sensitive raptors were identified within the project area, the BLM biologist would be contacted. The BLM biologist would implement the conservation strategies for the species identified. The baseline surveys would be utilized to identify nests and other sensitive features to be re-surveyed prior to construction.

4.9 VISUAL RESOURCES

Issues:

- The potential degradation of scenic quality as viewed from publicly accessible viewpoints.

4.9.1 Direct and Indirect Impacts

4.9.1.1 Proposed Action

Short-term, localized effects to the visual character of the landscape would result from removal of vegetation, including timber, and exposure of soils of contrasting color and texture during construction and mining associated with the Proposed Action. The project area would be mined in a phased approach, so effects to visual resources would occur at different locations within the mine site over the different ore recovery phases for each of the three mine pits, as described in **Table 2.3-2**. The effects would occur over a 3- to 5-year period for each phase of mining in the portion of the mine site that would be visible to the public.

Most of the mine site under the Proposed Action would be hidden by the surrounding landforms from any potential viewpoint and would generally be unseen by public viewers. However, there is no intervening terrain between some proposed mine facilities and viewing areas to the west, northwest, and north of the mine site. Activities associated with the North Pit, located northwest of the haul road, and the north portion of the Mid Pit would be visible to the viewing public in the foreground-middleground (less than 3 miles away) to background (more than 3 miles from viewing area) distance zone from several key viewing areas to the west, northwest, and north of the mine site. These key viewing areas include a limited portion of State Highway 34, Blackfoot River Road, Kermit Park, and China Hat geologic area. Two KOPs were selected from these key

viewing areas for the preparation of visual simulations that depict the appearance of proposed mining disturbance, which are discussed below. Disturbances associated with the Proposed Action would not be visible from other public roads, residences, or recreation areas in the area because the hill and ridge terrain that surrounds most of the mine site would block views of proposed facilities. The potential viewers of the study area would be local ranchers, mine personnel, motorists on State Highway 34, and recreation users.

The key viewing areas are generally located on the relatively flat terrain of the Blackfoot Lava Fields to the west and northwest of the mine site. Elevations of recreation sites, travel-ways, and residences are at approximately the same elevations as the lowest elevations of the proposed North Pit and Mid Pit, as well as the ancillary facilities. Therefore, the facilities on east-facing slopes and the interior portions of excavated pits would not be visible from any key viewing area.

4.9.1.1.1 Pits and Overburden Piles

The most visible elements, as seen from the key viewing areas, would be the upper west-facing walls of pit excavations at the North Pit and the Mid Pit, the NWOP, and the EOP. The South Pit would not be visible from any location outside of the mine site. The overburden piles are next to the west and east boundaries of the North and Mid Pits, respectively, as shown on **Figure 2.3-1**. In general, these facilities would borrow from the horizontal, vertical, and angular lines of the existing landscape, which has sufficient diversity to absorb the modifications. The most visually prominent feature of the pits and the overburden piles would result from the contrasts associated with the color of the existing vegetation and disturbed soils and overburden materials. The overall texture of the landscape would be influenced more by the light and color contrasts created by the landforms than by the material, which would appear coarse. Weathering of the pit benches and walls over time would generally result in a more natural slope appearance resembling talus slopes or escarpments.

Mine facilities would be lit at night for maintenance activities and an operations shift. Each mounted light would be directed downward to illuminate the facility while minimizing the amount of light projected outside the facility. This type of night-lighting would minimize the night shine from the facilities. However, night-lighting is generally visible for longer distances than facilities would be during daylight hours. Night-lighting would be visible in background distance zones of views from the Blackfoot Reservoir and county roads and rural residences to the west of State Highway 34, in addition to viewers at key viewing areas.

Mining disturbances would be minimized to the shortest timeframe practical by using overburden areas and coordinating pit backfill activities to advance in concert with the active pit. Reclamation would be initiated in year 2 of operations at overburden piles, and in year 5 of operations at the Mid Pit.

4.9.1.1.2 Ancillary Facilities

Other facilities located to the north of the haul road would also be within the unimpeded viewshed of key viewing areas. Facilities and infrastructure that would be constructed or modified to support proposed mining operations at the mine site include: 1) a portion of a main power line around project facilities; 2) a mine haul truck-railroad crossing; 3) an ore stockpile area, tipple, and associated conveying systems; 4) an ore truck turnaround loop and yard area;

and 5) water management facilities. P4 would continue to use portions of its existing facilities at its Enoch Valley and Ballard Mines including maintenance and office support facilities.

Development of this project would require modification of an existing 4,160-volt transmission line owned by Rocky Mountain Power. This line currently runs through the project area and provides power to neighboring mines and residential customers. Rocky Mountain Power would implement BMPs to protect raptors and migratory birds.

The overall effect to the landscape from the relocation and juxtaposition of power lines described above would be similar to the impact from the existing arrangement. The relocated poles and lines would be small in scale relative to the surrounding landscape, as viewed from any of the key viewing areas. The impacts from the poles can be noticeable when structures are sky-lined; however, the overburden piles and the existing hill and ridge terrain would screen the poles by allowing the vertical forms to blend to some degree into the surrounding variable textures and colors of the back-dropping slopes.

The topsoil piles and ore pad would be lower in elevation than nearby pits and overburden piles. As viewed from the sensitive viewing areas to the north and northwest, the tan colors of the soils and ore materials would blend into the disturbed areas at the pits and overburden piles. The effect would be an increased area of tan to grey to brown soils and ore materials. These disturbances would present a large, angular to blocky landform that would contrast with the surrounding vegetated terrain primarily through color contrasts.

The transport, water management, and yard area facilities would be located in relatively flat terrain to minimize off-site drainage and earth-moving activities. The sites would generally have a low profile and would not be easily visible in the foreground-middleground and background zones from viewpoints at similar or lower elevations. The visibility of the tipple and associated conveyance systems would depend primarily on the color of the facility. Designated locations for safety color use, such as yellow or orange, would be visible against the backdrop colors of brown and tan-exposed soils and ore material, and the green and gold colors of vegetated slopes.

4.9.1.1.3 Key Observation Points

KOP 1 is located at the junction of State Highway 34 and China Cap Road. The simulation on **Figure 3.9-2** depicts the appearance of the North Pit and NWOP. The north part of the Mid Pit and EOP would also be visible. Views of the South Pit would be blocked by intervening terrain. The pits are shown in the simulation as a dark brown color. The overburden piles are shown as a light brown color.

The viewshed, as seen from a moving vehicle, is generally limited to 60 to 90 degrees centered on the front of the vehicle, depending on the speed of the vehicle. Because the attention of most motorists on the highway would be limited to the viewshed of the moving vehicle, the site would attract attention for a brief period of time before motorists move beyond the viewshed. The facilities would be evident to viewers, but would not dominate the landscape as viewed from the road and would be considered a major impact until reclamation. After reclamation, there would be minor impact because the facilities would harmonize with the surrounding landscape.

KOP 2 is located east of Kermit Park on the Blackfoot River Road. The proposed project would be visible to motorists on Blackfoot River Road and the recreating public at Kermit Park. The KOP is about 2 miles northwest of the North Pit, and is closer to the mine site than other sensitive viewing areas described above and shown on **Figure 3.9-3**. The North Pit and NWOP would be obvious from the KOP, and would be major features in views facing southeast from Kermit Park. Most of the EOP would be on east-facing slopes and hidden from viewers at the KOP. Views of the South Pit are blocked by intervening terrain. The pits are shown as a dark brown color, and the overburden piles are shown as a light brown color.

The most substantial change to the characteristic landscape as seen from Kermit Park would be the removal of the top portions of hills from the mining of ores at the North Pit. As mining of the pit proceeds, the upper west-facing walls of the pit would be revealed. The highwalls would weather and appear more natural over time. There would be strong color and texture contrasts between exposed soils, ore material, and overburden with surrounding vegetation. At the 2-mile distance, ancillary facilities would be small in scale relative to the landscape and to the strong color contrast. The facilities would be evident to viewers, but would not dominate the landscape as viewed from the road and would be considered a major impact until reclamation. After reclamation, there would be minor impact because the facilities would harmonize with the surrounding landscape.

4.9.1.1.4 Reclamation

Once mining activities are completed for a specific phase, the area would be rough-shaped by mine equipment. Both outside overburden and in-pit backfill would be shaped to resemble the pre-mining slopes and contours. About 674 acres would be revegetated for a total reclaimed percentage of 91 percent. The only areas that would not be reclaimed are steep rock highwalls that are impractical to seed. The final reclamation and revegetation would establish a mosaic of vegetation that would also blend the overburden piles and pit backfills with the adjacent terrain. Successfully revegetated areas would reduce differences in color and texture among disturbed and undisturbed areas. Reseeded areas may appear as a somewhat different color and texture compared with the vegetation of the background landscape.

Some coarse and durable material that would be placed on angle of repose slopes that are not revegetated may be darker than naturally exposed rock surfaces in the area. Over time, as the rock is weathered, these changes may become less visible and more closely resemble naturally occurring rock surfaces in the surrounding area.

The project area contains public lands managed with the VRM Class IV objective. The existing characteristic landscape would not be retained; however, Class IV provides for management activities that require major modification of the existing character of the landscape. The reclaimed landscape would mimic surrounding topography and vegetative cover so that, over the long term, the existing character would be retained to the extent possible. Under the VRM Class IV objective, the level of change to the characteristic landscape can be high. The proposed project would meet Class IV objectives.

4.9.1.2 Alternatives 1A and 1B – Capping of Overburden and Backfilled Areas

The effects to the scenic quality and characteristics of the existing landscape from implementation of Alternative 1A and Alternative 1B would be essentially the same as for the

Proposed Action. Alternatives 1A and 1B are essentially the same as the Proposed Action, but analyze two different cover scenarios using a combination of natural clay and synthetic liners in different defined areas to cover over external overburden piles and over backfilled areas. Both also have a modified water management system and a slightly increased project boundary. There would be no discernible effect to visual resources from the use of either cover type relative to impact described for the Proposed Action or from the features associated with the water management system. Any contrasts of color and texture associated with these cover types would be temporary, and would endure only until alluvial material and topsoil have been placed on the liner materials. The alternatives would meet VRM Class IV objectives.

4.9.1.3 No Action Alternative

Under the No Action Alternative, there would be no mining or associated disturbance at the Blackfoot Bridge on the existing leases. However, this does not preclude future development of the federal phosphate leases under a different mine plan.

4.9.2 Irreversible and Irretrievable Commitment of Resources

The existing characteristic landscape would not be retained. The reclaimed landscape may mimic surrounding topography, and vegetative cover would be predominantly grasses. Irreversible commitment of resources could occur if re-establishment of plants through reclamation is unsuccessful.

4.9.3 Unavoidable Residual Adverse Impacts

For the Proposed Action and Alternatives 1A and 1B, after reclamation is complete, minimal unavoidable residual adverse impacts to the visual quality of the study area would be expected as a result of implementation of any of the alternatives. There would be minimal modification of the visual resources in background views along a limited number of public roadways from the contrasting color and texture of the disturbed areas compared with the undisturbed landscape. Under any of the alternatives, the areas to be disturbed are not generally visible from traveled roadways.

4.9.4 Mitigation Measures

Project design features, BMPs, and the proposed reclamation plan (**Section 2.3.9**) are the elements of the Proposed Action designed to reduce environmental impacts to visual quality. Additional mitigation measures are not deemed necessary.

4.10 LAND USE AND ACCESS

Issues:

- The potential effects to and from livestock grazing, including the potential degradation of riparian vegetation, selenium uptake into vegetation subject to grazing, water quality, and the possibility of eliminating grazing during the project life.
- The potential effects of mining on current land use plans.
- The potential effects on the use of private lands.

- The proposed schedule for the lease modification and the potential effects to the environment.

4.10.1 Direct and Indirect Impacts

4.10.1.1 Proposed Action

4.10.1.1.1 Grazing Management

Under the Proposed Action, short-term effects to land use in the Blackfoot Bridge Mine area would occur from displacement of the existing land uses by mining-related facilities and activities over the 17-year life of the project. Surface disturbances associated with the Proposed Action are summarized in **Table 2.3-1**. Short-term effects of mining and associated activities to land use under the Proposed Action would include disturbance of 372 acres of land that is currently suitable for grazing, consisting of 76 acres of the BLM-administered public land and 296 acres of private land. The Woodall Spring grazing allotment accounts for 61 acres, and the Woodall Mountain grazing allotment accounts for 15 acres of BLM-administered public land. Private, state, and public land outside the mining leases that would not be directly affected by active mine operations would continue to be used to graze livestock.

Approximately 717 acres of the Woodall Mountain and Woodall Spring grazing allotments are located within the project area, as shown on **Table 3.10-1**. The Woodall Spring grazing allotment accounts for a total of 226 acres and Woodall Mountain grazing allotment accounts for 491 acres. The grazing areas would be affected only during mining, associated activities, and reclamation. Virtually all of these grazing lots are located south of the railroad, and mining in the North Pit would not affect these grazing allotments. No short-term loss of suitable grazing land is anticipated outside the disturbed area footprints. The grazing allotments include the entire BLM surface within the project area. Rangeland within the project area would not be displaced all at once, but progressively as mining activities moved south, and portions of the rangeland may remain accessible during mining activities. To compensate for grazing areas that are temporarily unsuitable during mining and reclamation, the BLM may need to reduce stocking rates or arrange for alternate allotments during mining.

Under the Proposed Action, all disturbed areas amenable to reclamation would be reclaimed and revegetated as described in **Section 2.3.8**. About 674 total acres are planned to be revegetated for a total reclaimed percentage of 91 percent. The remaining areas (65 acres) generally consist of steep rock highwalls or steep cut slopes that are impractical to seed. Under the 2008 Revised Mine Plan (P4 2008a), disturbed areas would be reclaimed using non-segregated overburden material and a seed mixture primarily made up of grasses, as shown in **Table 2.3-7**. After reclamation is successful, the rangeland (in terms of forage production and carrying capacity) may be improved compared to existing conditions. In the early stages of succession after reclamation, grasses would dominate, and relatively more forage may be available for livestock grazing than before mining. Based on the seed mix and reclamation plan for disturbed areas, selenium uptake into vegetation that would be grazed is not expected to result in levels that would cause problems in livestock.

4.10.1.1.2 Lease Modification

Mining activities in the lease modification areas would not require a phosphate lease readjustment for Lease I-05613. When a lease is modified, it is subject to the same terms and

conditions as the original lease (43 CFR 3510.21). Mining activities in the Mid Pit and the South Pit, which are partially within modified lease areas, are anticipated to occur through 2026. The lease is subject to readjustment of terms and conditions on June 1, 2015. The total acres of disturbance within the lease modification area would be about 120 acres, or approximately 16 percent of the total disturbance area of 739 acres.

4.10.1.1.3 Recreation

Public lands in the BLM Pocatello Field Office provide a variety of year-round dispersed recreational opportunities, such as hunting, fishing, and other outdoor activities. Public access to public lands is limited within and adjacent to the project area. This public land is isolated with no public access without trespass across private land. Hunting is a major recreation use in the study area. The project area is within Hunt Unit 76. Hunters generally enter the area near the existing Conda Mine from Blackfoot River Road. Mining would disturb 76 acres of public land and would result in disruption of the presence and movement of game animals in these areas during mining and reclamation. In the early stages of reclamation, a predominance of grasses would provide good forage but little cover for large game animals. In the long term, reclamation may be beneficial to hunting.

There are no areas of public land within the study area with special designations. The Proposed Action would have no impact on areas of special designation.

4.10.1.1.4 Land Use

Existing land uses on public land within the study area include commercial mining, timber, livestock grazing, and dispersed recreation. Livestock grazing is currently the principal use of public lands in the project area. Impacts to livestock grazing and dispersed recreation were discussed above. The Proposed Action is commercial mining, and commercial mining would benefit from this action.

Land use controls for private lands in Caribou County include the Comprehensive Plan (Caribou County 2006) and the Zoning Ordinance (Caribou County 2008). These county goals and ordinances do not provide any specific guidance on the development of mineral resources on split estate lands. The project area is within the Agriculture Natural Resource zoning district of the county Zoning Ordinance, which is aimed at the maintenance of agricultural land and land with natural resources, such as range, farming, and forestry. Mineral extraction on split estate is regulated by the BLM, but the county zoning would certainly encourage the reclamation of range and forestry lands affected by mineral extraction. Impacts to grazing were discussed above under Grazing Management.

4.10.1.1.5 Access and Transportation

Under the Proposed Action, public access and the volume of traffic on existing transportation facilities would increase on the haul road during mining. Traffic levels on the local transportation network would remain similar to current conditions. Traffic would not increase on the gated private road that enters the project area from Blackfoot River Road. Additional opportunities for public access to the study area are unlikely to result from the Proposed Action.

Little or no increase in vehicular traffic is anticipated to occur under the Proposed Action. The existing workforce at the South Rasmussen Mine (approximately 100 employees) would transfer

and continue mining at the Blackfoot Bridge Mine, and would commute daily on the local roads over the life of the project. Employees would commute from Soda Springs, Montpelier, and other communities via U.S. Highway 30 and State Highway 34. In addition, a limited number of contract personnel may be employed temporarily for a short-term construction phase of the project. Under the Proposed Action, traffic on U.S. Highway 30 and State Highway 34 would remain essentially at their current levels.

4.10.1.1.6 Land Use Planning and Controls

The BLM is the lessor for the leases within the project area including modified leases. The Proposed Action would comply with the conditions of approval and mitigation measures as required by the following BLM objectives for leasable minerals (BLM 1987):

- Objective B-ME-2.2 - Manage approximately 582,400 acres of the federal mineral estate (leasable minerals) as open to solid minerals leasing (e.g. phosphate) subject to standard lease terms and conditions.
- Action B-ME 2.2.3 - Appropriate site-specific mitigation measures, developed during BLM preparation or review of an operations plan, would be implemented as conditions of approval.

There are no other surface land uses managed by the BLM that would be affected by the Proposed Action. Most of the land surface in the project area is private.

The Caribou County Zoning Ordinance does not include mineral extraction operations in the list of allowable uses of the Agriculture Natural Resource district, which includes the project area. The Ordinance indicates that the Planning and Zoning Commission would decide the status of any use that is not specifically mentioned (Caribou County 2008). However, mineral extraction on split-estate lands is regulated by the BLM.

4.10.1.2 Alternatives 1A and 1B – Capping of Overburden and Backfilled Areas

Under the Alternatives 1A and 1B, short-term surface disturbance would displace approximately 416 acres of existing rangeland. The total surface disturbance associated with Alternative 1A and Alternative 1B would be about 29 acres greater than the Proposed Action. Approximately 8.5 percent of the total disturbance associated with this alternative would not be reclaimed.

The effects of Alternatives 1A and 1B on land use and recreation would be the same as the effects of the Proposed Action. Under Alternatives 1A and 1B, the potential effects to public access and traffic volume on the existing transportation facilities would be the same as were determined for the Proposed Action.

4.10.1.3 No Action Alternative

Under the No Action Alternative, the federal phosphate leases would not be developed. There would be no adverse impact to grazing allotments, recreation, land use, or access and transportation. However, this does not preclude future development of the federal phosphate leases under a different mine plan.

4.10.2 Irreversible and Irretrievable Commitment of Resources

There would be irreversible or irretrievable impacts to grazing under the Proposed Action or Alternatives 1A and 1B because highwalls and steep areas would be removed from rangeland uses over the long term. Under both of these alternatives, 65 acres would likely be unavailable for livestock grazing for an extended period of time.

There would be no irreversible or irretrievable impacts to recreation, access, or transportation resources as a result of implementation of any of the alternatives.

4.10.3 Unavoidable Residual Adverse Impacts

Unavoidable residual adverse impacts to land use resources would result from the Proposed Action or Alternatives 1A and 1B because the highwall areas would be removed from rangeland and recreational uses for the long term. These residual adverse impacts would be minor when compared with the overall availability of rangeland and recreational resources in the region.

There would be no unavoidable residual adverse impacts to access or transportation resources as a result of implementation of any of the alternatives.

4.10.4 Mitigation Measures

Project design features, BMPs, and the proposed reclamation plan (**Section 2.3.9**) are the elements of the Proposed Action designed to reduce environmental impacts to access, transportation, and land use.

4.11 CULTURAL RESOURCES

Issues:

- The potential effects on important scientific, archeological, and other cultural resources including historic properties listed or eligible for the NRHP.

4.11.1 Direct and Indirect Impacts

The entire area of potential effects of the Proposed Action has been inventoried for the presence of cultural resources. One site, 10CU260, has been determined eligible for the NRHP and is therefore a historic property. Direct impact to this eligible cultural resource could result from ground disturbance within the defined site boundaries. This archaeological site is eligible under Criterion D for its potential to yield information important in prehistory. Any displacement of surface materials or sediments could result in permanent loss of information or integrity of association of the information from the site, potentially resulting in a major impact to the resource. This site is not important for aspects of its design or construction, or for aspects of the setting or feeling that represent its periods of significance. Consequently, indirect impacts would not include visual or auditory intrusion on the cultural setting, but may result from physical damage removed in space or time from the project activities, such as runoff or erosion from roads, overburden material or topsoil piles, or vehicular traffic or vandalism in the site area resulting from increased access made possible by the project. The results of cultural resources studies have been considered in the development of the Proposed Action and alternatives.

4.11.1.1 Proposed Action

Under the Proposed Action, no eligible cultural resource sites are within areas of proposed disturbance. Eligible site (10CU260) is approximately 30 meters from the proposed area of disturbance of a water control pond. Precautions would be taken to assure that this site is not affected by these nearby activities. If any future activities are planned near this site, the site must be protected or a mitigation plan developed in consultation with SHPO.

4.11.1.2 Alternatives 1A and 1B – Capping of Overburden and Backfilled Areas

Alternative 1A and Alternative 1B differ in the extent of the liners that would be used to cover the pits and overburden piles for reclamation. Primarily because of differences in the size or arrangement of elements of the water management system, there would be 29 more acres of disturbance resulting from Alternatives 1A or 1B than from the Proposed Action. However, none of these changes in size or location would affect cultural resources differently. These alternatives would have the same potential effects to cultural resources as the Proposed Action.

4.11.1.3 No Action Alternative

Under the No Action Alternative, the Blackfoot Bridge Mine would not be developed, and there would be no adverse impact to known eligible cultural resources.

4.11.2 Irreversible and Irretrievable Commitment of Resources

One eligible cultural resource (10CU260) has been identified within the Blackfoot Bridge Project area. Cultural resource sites are non-renewable resources. Any project plan or design that would result in adverse effects to eligible cultural resources would be an irreversible and irretrievable commitment of resources.

4.11.3 Unavoidable Residual Adverse Impacts

This project would not result in unavoidable residual adverse impacts to cultural resources.

4.11.4 Mitigation Measures

No historic properties would be affected by the Proposed Action. Eligible site (10CU260) is approximately 30 meters from the proposed area of disturbance of a water control pond. The location of this site would be marked as a sensitive area where no surface disturbing activities would be allowed. The preferred treatment of any eligible cultural resource that may be affected by the undertaking is avoidance and protection of the site by alteration of the project and other protective measures. If alterations to the project or other measures to avoid and protect these sites are not feasible, appropriate mitigation measures would be developed and implemented as required by applicable laws and regulations.

If any unidentified cultural resources are discovered during the mining process or associated activities, operations in the immediate area of the discovery would be halted. The discovery would be reported to the BLM, and the BLM or its authorized representatives would be allowed to document and evaluate the discovery, and if appropriate, would be allowed time for the determination and implementation of actions necessary to prevent or mitigate the loss of important cultural values in consultation with the Idaho SHPO.

4.12 TRIBAL TREATY RIGHTS AND INTERESTS

Issues:

- The potential effects on access relevant to Tribes exercising treaty rights and interests.
- The potential effects on sacred sites and Indian Trust resources.

4.12.1 Direct and Indirect Impacts

Resources or issues of interest to the Tribes that could involve their traditional use or treaty rights include Tribal historic and archaeological sites, sacred sites and TCPs, traditional use sites, fisheries, traditional use plant and animal species, vegetation (including noxious and invasive, non-native species), air and water quality, wildlife, access to lands and continued availability of traditional resources, land status, and the visual quality of the environment. Many of these resources or issues overlap with other resource concerns discussed in this assessment, but also must be dealt with in consultation with the Tribes. Tribal consultation has not identified culturally unique resources in this project area, including any sacred sites, to date.

4.12.1.1 Proposed Action

There would be no changes in land status or access associated with the Proposed Action, and those portions of the project area that are currently unoccupied public land would retain that status. However, there would be substantial areas of disturbance on those federal lands. Although, there would be an interruption during mining activities to the Shoshone and Bannock Tribes' access to the lands to exercise treaty rights and traditional uses, that access would be restored at the completion of mining.

The Proposed Action would result in adverse impacts to some of the natural resources that the Tribes may require in the exercise of their treaty rights. Short-term impacts would be associated with the disturbance or displacement of plant and wildlife species that are used for traditional purposes and subsistence.

Over the long term, however, the quantity and diversity of vegetative species used by the Tribes would be enhanced by reclamation of the mine pit and overburden areas. This beneficial long-term impact to vegetative species would, in turn, encourage increased use of the area by wildlife hunted by the Tribes.

4.12.1.2 Alternatives 1A and 1B – Capping of Overburden and Backfilled Areas

Under Alternatives 1A and 1B, the nature and locations of disturbance would be the same under either alternative. Short-term impacts would be associated with the disturbance or displacement of plant and wildlife species that are used for traditional purposes and subsistence. Over the long term, however, the quantity and diversity of vegetative species used by the Tribes would be enhanced by reclamation of the mine pit and overburden areas.

4.12.1.3 No Action Alternative

Under the No Action Alternative, the Blackfoot Bridge Mine would not be authorized under the current 2008 Revised Mine Plan, and there would be no adverse impact to known Tribal treaty rights and interests.

4.12.2 Irreversible and Irretrievable Commitment of Resources

Mining would result in partial or complete loss of access to traditional resources on public lands during the mining and initial reclamation of public lands. Therefore, project elements have the potential to be irreversible and irretrievable commitments of resources. In contrast, many natural resources, including vegetative resources and wildlife, could be reclaimed or replaced.

4.12.3 Unavoidable Residual Adverse Impacts

No potential for unavoidable residual adverse impact to Tribal treaty rights and interests has been identified.

4.12.4 Mitigation Measures

Additional government-to-government consultation is underway between the BLM and the Shoshone and Bannock Tribes to identify any additional Tribal treaty rights and interests in the project area. If resources and issues associated with treaty rights and interests are identified, measures could be developed to avoid, minimize, or mitigate adverse impacts to those resources and interests.

4.13 SOCIAL AND ECONOMIC CONDITIONS

Issues:

- The potential effects on the short- and long-term regional economy.
- The potential effects on local economy including recreation and social values associated with the ecosystem and biodiversity.
- The potential effects of the project on the rural/urban status of the local communities.

4.13.1 Direct and Indirect Impacts

4.13.1.1 Proposed Action

The analysis area for the socioeconomic environment is Caribou, Bear Lake, and Bannock Counties in Idaho, and Lincoln County (Star Valley area) in Wyoming. Caribou and Bear Lake Counties would provide the majority of the project workforce; however, some workers would reside in Bannock and Lincoln Counties. It is anticipated that the project would use the P4 workforce currently employed in its operations in Caribou County. Actions or decisions that influence the economic feasibility of the mining operations would also be reflected in the socioeconomic environment. Mine economics have an effect on employment; salaries; property tax payments; royalties going to schools, roads, and bridges; net proceeds of mining tax revenues; and local purchases by P4 and its employees.

Implementation of the Proposed Action would result in effects to the social and economic structure and community resources of Caribou County over the proposed project life of 17 years based on the 2008 Revised Mine Plan (P4 2008a). The Caribou County economy depends on phosphate mining. Implementation of the Blackfoot Bridge Mine project would maintain continued mining employment opportunities in the affected counties; enhance community stability; and provide for continued payment of local, state, and federal taxes by P4 and its

employees. Local government fiscal conditions in particular depend on sustained economic activity and continued revenues from sales and use taxes and property taxes. It is anticipated that the transition from operations at the South Rasmussen Mine to the proposed Blackfoot Bridge Mine operations would allow the uninterrupted continuation of these effects.

The Proposed Action would not cause adverse impacts to the socioeconomic resources of the analysis area. The Proposed Action requires no in-migrating workforce from outside of the analysis area and generates only moderate tax revenues. Consequently, no increases in housing or community service demands would occur, and existing and planned facilities would not be adversely affected. The operation of the project would add revenue to the Caribou County tax base. Economic benefits to the other counties in the study area would be limited to the circulation and recirculation of personal income earned as wages paid to employees. A portion of the current P4 workforce resides in Bear Lake and Bannock Counties in Idaho and Lincoln County in Wyoming. P4 employees that reside in other counties in Idaho, Utah, and Wyoming are very small in number, resulting in very small impacts to these counties.

4.13.1.1.1 Population

It is anticipated that the project workforce would consist of local contract workers who have been employed in ongoing mining operations at the South Rasmussen Mine, which would be depleted by the time phosphate production under the project would be initiated. No changes in population from additional workers migrating into the analysis area are anticipated as a direct result of the Proposed Action.

Indirect impacts to population levels in the analysis could potentially occur from growth-inducing effects of additional workers and their families hired from outside the analysis area; however, the labor pool in the analysis area would be able to meet the needs for additional workers in the event that additional contract employees would be required for any phase of the proposed project. There would be no population increases from the growth-inducing effects of the proposed project.

The Census Bureau identifies and tabulates data for urban and rural populations. The rural/urban status of a county can affect policies that impact rural areas and the allocation of revenues received by the county from federal or state taxes. The City of Soda Springs is classified by the U.S. Census as an Urban Cluster. The remainder of the county is classified as rural (U.S. Census 2008c). It is not anticipated that there would be any changes to population in the county from employment at P4 facilities under the Proposed Action; therefore, there would be no change to the urban and rural classifications.

4.13.1.1.2 Economy and Employment

Short-term impacts to socioeconomic resources would be relatively minor. The primary economic sectors are services and agriculture. The services sector consists largely of recreation- and tourism-related establishments. Proposed activities would not affect tourist visits to the region. The initial development phases of the project would require purchases of equipment and supplies; however, the economic benefits to the affected counties would be limited to the construction period of the project.

Indirect impacts to employment levels in the analysis area could potentially occur from growth-inducing effects of additional workers and their families hired from outside of the analysis area; however, the labor pool in Caribou and Bear Lake Counties would be able to meet the needs for additional workers in the event that additional contract employees would be required for any phase of the project. There would be no changes in the size of the labor pool or changes in unemployment rates from growth-inducing effects of the project. Other indirect impacts would occur from potential effects to other economic sectors from businesses that provide services to P4 operations. The project would continue ongoing benefits to existing service providers in the analysis area.

Long-term impacts would be beneficial for the life of the proposed mine. These effects would be a continuation of the effects from current P4 operations in Caribou County for an additional 17 years. Caribou County would receive revenues from property taxes, fees, and permits. Additional personal income would be generated for residents in Caribou County and other analysis area counties and the State of Idaho by circulation and recirculation of dollars paid out as salaries, business expenditures, and as state and local taxes. The current direct fiscal impacts made by P4 to state and local governments are presented in **Section 3.13.5**. There is potential that the dollar amounts of payments derived from production revenues could vary considerably over the mine life, as prices for phosphate ore have increased from an average price of $27.79 per ton in 2004 to a high of $113.00 (estimated) per ton in 2008. 2008 prices are estimated by the USGS and have not been verified. In addition, 2008 prices were volatile and increased dramatically for a portion of the year, in part because of an increased demand in growing grains for biofuels. There would be little perceptible change in economic activity in Caribou County from the Proposed Action, primarily because project effects would be a continuation of current P4 activities in Caribou County.

Royalties are paid on any production from a lease in accordance with the terms specified by the BLM, as included in the lease. Minimum royalty rates are not less than 5 percent of the gross value of production from leased deposits at the mine, or not less than 25 cents per ton, whichever is greater, for the right "to mine and dispose of all the phosphate rock and associated and related minerals hereafter referred to as leased deposits." Federal law requires royalties and other revenues collected from federal phosphate leases be split equally between the state where the activity occurs and the federal treasury. The state receives 50 percent of royalty revenues, placing the revenues in a general fund, and a special revenue fund for mineral impacts. Typically, Caribou County receives about 10 percent of the general fund revenues received by the state. The estimated total federal royalties could be $39 million over the 17-year life of the Blackfoot Bridge Mine. The state would receive an estimated average annual payment of $1.0 million, of which an average annual amount of $100,000 would be received by Caribou County.

A mine license tax, payable to the State of Idaho Tax Commission, would be assessed at a rate of 1 percent of the net value of ores mined or extracted (or the net value of royalties received). The sums are remitted to the state treasurer, who then places 66 percent to the credit of the general fund of the state and 34 percent to the credit of the abandoned mine reclamation fund created by the provisions of section 47-1703, Idaho Code.

Expenditures made for equipment, energy, fuel, operating supplies, and other products and services benefit businesses in the counties and the state. In addition, P4's annual payments to the contractor include purchases of diesel fuel, parts, and supplies.

4.13.1.1.3 Housing

No changes in employment or population are anticipated as a direct result of implementation of the Proposed Action; therefore, no impacts to communities in the analysis area from additional pressure on housing would be expected. In the event that additional contract workers are hired from outside of the affected counties, there could be some difficulty meeting housing needs with the existing supply in Soda Springs, depending on the vacancy rates during the period of operations. Despite high vacancy rates, the *Soda Springs Community Review* (IRP 2007) reports that the existing housing stock is degraded, and there is a lack of choices in contemporary middle-class housing. However, because it is not anticipated that additional workers would be hired from outside of the analysis area, no adverse impacts to housing availability and services are expected. In addition, housing is available in other communities within the analysis area.

4.13.1.1.4 Community Services

Construction, operation, and maintenance of the proposed project would not increase or decrease the need for police, fire, medical or other community resources in the analysis area. The project would not cause an increase in the local population in the analysis area counties; therefore, no necessary increases for county and community services are anticipated. The local population increases considerably on an annual basis during hunting season, and the counties are accustomed to meeting the needs of the seasonal increases in population.

No increases in population are anticipated from implementation of the Proposed Action. Therefore, increases in existing levels of domestic water usage in analysis area counties are not expected, and no effects on existing domestic water facilities would occur. In addition, existing organized public water systems would not be used for any portion of mining operations. Wastewater disposal requirements in Caribou County or other analysis area counties are not anticipated to increase with implementation of either action alternative.

Similarly, no county-wide effects on solid waste collection or disposal are anticipated as a result of increases in the population. Solid waste generated at the project area would continue to be hauled from the site and disposed at an approved landfill.

4.13.1.2 Alternatives 1A and 1B – Capping of Overburden and Backfilled Areas

Implementation of Alternative 1A or Alternative 1B would result in socioeconomic effects similar to those described under the Proposed Action. Impacts to the socioeconomic structure of Caribou County, as well as the analysis area counties, including population, housing, and employment, would be similar to the Proposed Action. The type and extent of the cover systems proposed under Alternatives 1A and 1B may require additional expenditures for supplies or equipment, but any additional revenues realized from these purchases by vendors within the counties or the state would not differ greatly from purchases made for the Proposed Action.

It is estimated that, for Alternative 1A, the GCLL and Simple 1 cover systems, additional water management components (*e.g.,* OSMS, increased sizing of the WMPs, enlarge ditch systems), and reclamation costs would increase the cost of the project by about $30 million over the

Proposed Action. The cost would be spread out over 13 years (years 5 through 17). The estimated available ore reserve would be the same under Alternative 1A as the Proposed Action; therefore, the mine life and the number of years of mining employment would be 17 years. Royalty payments to the federal government and tax revenues contributed to state and local economies would be similar to the economic contributions associated with the Proposed Action.

Alternative 1B would further increase the cost above the Alternative 1A scenario by an additional $3 million or a total of $33 million over the Proposed Action cost.

4.13.1.3 No Action Alternative

Selection of the No Action Alternative would result in a decline in mining employment opportunities as existing mines are completed, and the mining workforce is not shifted to operations at the Blackfoot Bridge Mine. In addition, the required ore for P4's processing plant would not be produced, which would likely reduce current employment levels at the plant, or potentially shorten the operating life of the plant, thereby eliminating jobs, tax revenues paid to the county, and revenues paid into the local economy through operating expenditures and payroll.

In the absence of another source of ore to supply P4's Soda Springs Elemental Phosphorous Plant, approximately 770 jobs could be eliminated once current mining operations at the South Rasmussen Mine are shut down including 375 full-time jobs at the mine and P4's Soda Springs processing plant, and an additional 395 full-time, part-time, and temporary contract jobs. The projected loss of employment would lead to negative effects on overall stability of the community. Although many current P4 and contract employees may be hired at other mining projects in the area, other mines or processing plants would likely already have full staffs. A substantial number of the unemployed would leave the area to seek other employment, resulting in a slight reduction in the overall county population. Large fluctuations in employment would not provide for a stable community environment.

The No Action Alternative would generally have no effect on existing public utilities and services. However, tax-based revenues and other sources of municipal funding related to mining operations would be negatively affected if the Blackfoot Bridge Mine is not producing once current mining activities, such as the South Rasmussen Mine, are depleted. Subsequently, Caribou County's ability to fund certain utilities and services could be jeopardized.

Selection of the No Action Alternative would result in a reduction in sales, use, and property tax revenues generated by phosphate mining operations once existing operations at the South Rasmussen Mine cease. There would be losses in revenues from taxes paid by P4 and its employees, and by secondary businesses and their employees, resulting in a decrease in Caribou County's overall revenues, as well as revenues in other analysis area counties from the circulation of payroll dollars.

An impact to the federal government would be the loss of royalty payments totaling an estimated $18.9 million that would have been paid over the life of the mine under the Proposed Action. The State of Idaho and Caribou County would not receive royalty proceeds dispersed to the state by the federal government.

Once current P4 ore reserves are depleted and mining operations are shut down, the estimated $600,000 in property taxes paid annually by P4 would no longer provide revenues to state and county agencies. The Soda Springs School District #150 is dependent on property tax revenues provided by the phosphate industry. The phosphate industry, including P4, generates 52 percent of the revenue in the tax base of the school district. The No Action Alternative would reduce tax base that supports the district, which may result in shortfalls in the district budget.

4.13.2 Irreversible and Irretrievable Commitment of Resources

There would be no irreversible or irretrievable commitment of social or economic resources associated with the Proposed Action or alternatives.

4.13.3 Unavoidable Residual Adverse Impacts

The Proposed Action and Alternatives 1A and 1B would not have unavoidable residual adverse effects on social or economic resources. The No Action Alternative could result in some social dislocations and economic changes in county and local revenues beginning when mining at the South Rasmussen Mine ceases.

4.13.4 Mitigation Measures

No specific mitigation measures for socioeconomic resources have been proposed for any alternative.

4.14 ENVIRONMENTAL JUSTICE

Issues:

- The potential for disproportionately high and adverse human health or environmental effects on people of race, color, religion, or income.

4.14.1 Direct and Indirect Impacts

4.14.1.1 Proposed Action

On February 11, 1994, Executive Order 12898, "Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations" was published in the Federal Register (59 FR 7629). The order requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations. The Proposed Action is a new facility that includes BLM lands, and would not directly or indirectly affect any area occupying low-income housing or affect low-income populations. The nearest residence is 1.5 miles from the project area. The nearest concentration of population is in Soda Springs, more than 10 miles south of the project area.

The U.S. Census identified 714 residents, or 9.6 percent of the total population, who live below the poverty level in the urban areas of Caribou County. Residents who live below poverty level were not identified for rural areas between Soda Springs and the proposed Blackfoot Bridge mine site. The proposed project is on federal leases, and is not located within the corporate limits

of any urban community or in any populated rural area. The Proposed Action would not affect any area that contains populations living under the poverty level.

The 2000 Census provides population characteristics for Census Tracts, which contain Block Groups that are further divided into blocks. The blocks are the smallest Census area that contains the race characteristics of the population in Caribou County. The mine site area contains all or a portion of three blocks (Blocks 3013, 3014, and 3017) within Block Group 3 of Census Tract 9602 in Caribou County; however, there are no poverty data for individual blocks within each Block Group. Block Groups are the smallest Census area that contains poverty-level information. Block Group 3 contains the mine site, as well as a portion of south-central Caribou County east of State Highway 34, south of the Blackfoot River, and west of Slug Creek, including part of the City of Soda Springs.

Caribou County was selected to be the geographic area to compare the demographic data for the population in the affected Block Group. This determination was based on the need for a larger geographic area encompassing the affected Block Group in which equivalent quantitative resource information is provided. The population characteristics of the Block Group are compared with county population characteristics to determine whether there are concentrations of minority or low-income populations in the Block Group relative to the county.

According to the 2000 Census, the population of the Blocks within Block Group 3 totaled 1,860 people (U.S. Census 2008c). There were no minority populations in the three blocks. Given that the population of the county decreased in the years between the 2000 census and 2007, it is not likely that the 2007 population within the blocks is substantially different from 2000 levels. There would be no disproportionate impact to minority population from the construction and implementation of the project or the action alternatives.

Block Group 3 has a smaller percentage (6.8 percent) of people living below the poverty level than Caribou County (9.6 percent) (U.S. Census 2008d). The majority of the population in Block Group 3 resides in Soda Springs. No direct or indirect adverse environmental impacts would occur to the population within the Block Group from project activities; therefore, there would be no disproportionate adverse impact to populations living below the poverty level in Block Group 3 of Census Tract 9602.

There would be no adverse health risks to any population, including minority and low-income residents, as the project area is not located in close proximity to any residential area, and there would be no public access to the mine site during construction activities. For the most part, health risks are associated with the construction aspects of the project, in that construction workers could be exposed to hazardous materials that may be associated with the project. No specific or disproportionate health risks or other impacts to minority and low-income groups would be associated with the project.

Because there are no human health and environmental impacts on natural resources that would affect the minority or low-income populations, as well as the general population from the Proposed Action, any issues related to environmental justice are focused on potential socioeconomic impacts. Socioeconomic impacts to the general population are assessed in **Section 4.13**. Socioeconomic impacts to minority and low-income populations would be no

greater than those experienced by all members of the general population who reside in the affected Block Group. In addition, all members of the general population would share all project-generated benefits on an equal basis.

4.14.1.2 Alternatives 1A and 1B – Capping of Overburden and Backfilled Areas

Environmental justice impacts for Alternatives 1A and 1B would be the same as those described for the Proposed Action. Alternatives 1A and 1B would not result in any disproportionately high or adverse impacts to minority or low-income populations. The proposed socioeconomic effects would be spread across all races, ages, and income levels that occur in the Block Group.

4.14.1.3 No Action Alternative

Selection of the No Action Alternative would result in a decline in mining and production plant employment opportunities as described in **Section 4.13**. The socioeconomic effects of the No Action Alternative would be spread across all races, ages, and income levels that occur in the affected Block Group, and would not result in any disproportionately high or adverse impacts to minority or low-income populations.

4.14.2 Irreversible and Irretrievable Commitment of Resources

There would be no irreversible or irretrievable commitment of natural, social, or economic resources that affect minority and low-income populations associated with the Proposed Action or alternatives.

4.14.3 Unavoidable Residual Adverse Impacts

The Proposed Action, including Alternatives 1A and 1B, would not have unavoidable residual adverse effects on natural, social, or economic resources. The No Action Alternative could result in some social dislocations and economic changes in county and local revenues beginning when mining at the South Rasmussen Mine ceases. These changes would be spread across all races, ages, and income levels that occur in the affected Block Group.

4.14.4 Mitigation Measures

No specific mitigation measures for resources that affect environmental justice have been proposed for any alternative.

4.15 HAZARDOUS MATERIALS AND WASTE

Issues:

- The potential for hazardous materials entering the environment.
- The fate and transport of materials resulting from the mining process.
- The potential effects of mining activities contributing to hazardous materials entering the environment.

4.15.1 Direct and Indirect Impacts

4.15.1.1 Proposed Action

An accidental spill of hazardous materials or wastes associated with the Proposed Action is unlikely to pose environmental or public health and safety risks. Most of the hazardous materials to be used for the Proposed Action would be stored in existing facilities at the Enoch Valley Mine site. The capacity of the existing secondary containment facilities is adequate to hold more than the entire contents of the largest tank within the storage areas including freeboard for precipitation. Fuel leaks from the truck filling area would be contained within the bermed areas. Less than 100 kilograms of hazardous waste (waste oils, solvents, and antifreeze) would be generated per month. Compliance with the procedures and training defined in the existing approved SWPPP would minimize the potential for spills or leaks of hazardous materials or wastes.

The Proposed Action is unlikely to pose safety hazards to the public related to the proposed route for transporting hazardous materials and wastes (**Section 2.3.9.7**). Blackfoot Bridge Mine and the haul route for hazardous materials and wastes would be the same route that is currently used at the South Rasmussen Mine. The primary transportation route from Soda Springs to the existing mine area and to Enoch Valley Mine would be via State Highway 34, Blackfoot River Road, and the existing haul road to the mine site.

4.15.1.2 Alternatives 1A and 1B – Capping of Overburden and Backfilled Areas

Potential risks associated the hazardous materials or wastes for Alternatives 1A and 1B would be the same as were analyzed for the Proposed Action. Under Alternatives 1A and 1B, the hazardous materials and wastes, quantities used and stored on site, and storage locations would be the same as were analyzed for the Proposed Action. Under Alternatives 1A and 1B, hazardous materials and wastes would continue to be transported along the same route that is currently used for the South Rasmussen and Enoch Valley Mines.

4.15.1.3 No Action Alternative

The hazardous materials or wastes for the No Action Alternative would not pose any risks to the environment or public health and safety. Under the No Action Alternative, there would be no mining or associated disturbance at the Blackfoot Bridge Mine under the current leases. This alternative would involve continued mining at the South Rasmussen Mine until all ore was recovered. For the No Action Alternative, the hazardous materials and wastes, quantities used and stored on site, and storage locations would continue to be the same as are currently used at the South Rasmussen Mine.

4.15.2 Irreversible and Irretrievable Commitment of Resources

No long-term effects to health and safety from hazardous materials would result from implementation of any of the alternatives.

4.15.3 Unavoidable Residual Adverse Impacts

No unavoidable residual adverse impacts to health and safety from hazardous materials would result of implementation of any of the alternatives.

4.15.4 Mitigation Measures

No specific mitigation measures are proposed to address hazardous materials and wastes, as the handling and storage of those materials are already controlled by a body of laws and regulations. The regulatory framework for hazardous materials and wastes was presented in **Section 2.3.9.6**.

CHAPTER 5

CUMULATIVE IMPACTS

CHAPTER 5
CUMULATIVE EFFECTS

Cumulative effects are those impacts on the environment that result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions within the Cumulative Effects Areas (CEAs). The CEAs are described in the subsections below and vary by resource.

Cumulative effects can result from individually minor, but collectively major, actions taken over a period of time. Major past and present land uses in the area, which are also projected to continue into the future, include roads or trails, timber harvesting, wildfires, livestock grazing, agriculture, and mining. Dispersed recreation (including hunting and fishing) and residential development also occur in parts of the CEAs.

The configuration of the Proposed Action and alternatives, as well as public scoping input gathered for this EIS, provided the foundation for identifying the CEAs. Cumulative effects are evaluated in terms of the specific resource, ecosystem, and human community being impacted and, therefore, the boundaries of the CEAs vary by resource. An attempt was made for each environmental resource to determine the extent to which the environmental effect could be reasonably detected, and then include the geographic areas of resources that would be impacted by the environmental effect. However, for simplicity, ease of cumulative impact analysis, and in an attempt to avoid having only slightly different CEAs for some resources, the CEA boundaries were left identical for the resources where it seemed reasonable and conservative to do so. The CEA boundaries are reasonably sized to prevent dilution of the cumulative effects over large areas. Guidance from the CEQ, *Considering Cumulative Effects – January 1997*, was used in identifying geographic boundaries and, ultimately, the CEA for each resource. The CEA for each environmental resource is described below in the specific resource subsections. Figures for the various CEAs are also included **Figures 5.1-1, 5.3-1, 5.6-1, 5.10-1,** and **5.12-1**).

5.1 GEOLOGY, MINERALS, AND PALEONTOLOGY

5.1.1 CEA Boundary

The CEA for geology, minerals, topography, and paleontology, shown on **Figure 5.1-1,** represents an area of 696 square miles (445,356 acres). This includes the majority of the Southeastern Idaho Phosphate District, including KPLAs, in Bear Lake and Caribou Counties, Idaho. Within this CEA, there are 43,644 acres of current federal phosphate leases, representing 9.8 percent of the total CEA area. The CEA does not encompass the inactive Gay Mine, which is located in portions of Bingham, Bannock, and Caribou Counties, because of its geographic and hydrologic isolation from the other mines within the CEA. The Gay Mine is located approximately 20 miles west of the nearest KPLA near the northwest corner of the Southeastern Idaho Phosphate District, and in the Snake River watershed. Although the Gay Mine is part of the same mining district as most other mines in the CEA, the others produce ore from a tight cluster of anticlines and synclines in the Blackfoot River or Bear Lake watersheds. An exception is made for the Smoky Canyon Mine to account for recent and reasonably foreseeable future phosphate mining activities there.

Within the CEA, implementation of the Proposed Action or alternatives and other reasonably foreseeable activities would have potential effects related to mineral resource depletion, topographic changes, exposure of seleniferous materials, and other COPCs to weather processes and subsequent mobilization through seepage; geotechnical instability; and discovery, damage, or removal of paleontological resources. Impacts to these resources from past, present, and reasonably foreseeable future phosphate mining operations are generally confined to specific phosphate mining properties (KPLAs and federal phosphate leases) within the CEA. Other phosphate mining has occurred in the western United States within the greater Western Phosphate Field, but has slowed considerably in recent years (USGS 2002). Therefore, only cumulative effects within the Southeastern Idaho Phosphate District are considered.

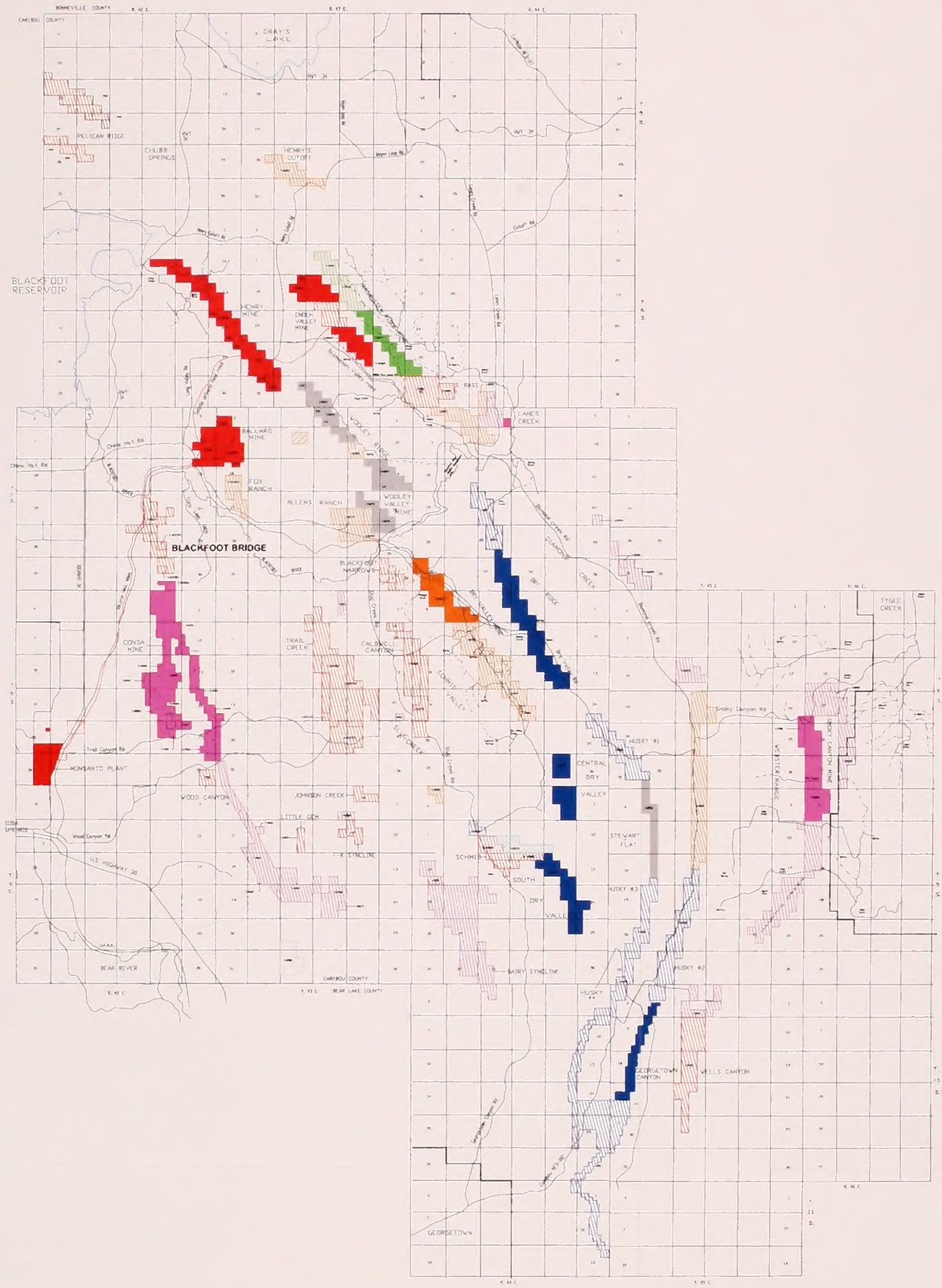
5.1.2 Introduction

Ground-disturbing activities are the primary cause of impacts to topographic and paleontological resources. Lesser impacts to currently undiscovered or unrecognized geologic and mineral resources can also result from these activities. Within the CEA, ground-disturbing activities consist of mining processes, and to a lesser extent, construction of transportation infrastructure. Impact types include direct destruction of resources and the loss of contextual geologic and paleontological data. Production of phosphate ore has historically been an important socioeconomic process within the CEA, and is expected to continue to be important in the future. Mining is expected to continue within the CEA until all economically recoverable phosphate has been produced from current and future federal phosphate leases.

Past, present, and reasonably foreseeable actions within the CEA have, or would, result in both beneficial (e.g., production and understanding of phosphate and other geologic and mineral resources) and adverse (e.g., alteration of natural terrain) impacts on this resource group. The total (historic and reasonably foreseeable) cumulative disturbance of geologic resources within the CEA as a result of phosphate mining would directly affect less than 10 percent of the CEA. Because phosphate mining affects higher volumes of rock across larger aerial extents than other activities, cumulative adverse impacts from activities other than phosphate mining within the CEA are expected to be minimal.

5.1.3 Past and Present Activities

A total of 31 phosphate mines have been developed in southeastern Idaho (27 in the CEA) since mining began in the early 20th century. Of these, 12 were small, underground mines that are mined out and closed. Surface disturbances from these underground mining operations are typically an acre or less. Three former underground mines: Waterloo, Conda, and Maybe Canyon, were converted to surface mining operations, and surface disturbances from these operations are noticeable at the present time (Lee 2000). The majority of mines in the region have been open pit operations. Total disturbances at active and inactive mines within the CEA are summarized in **Table 5.1-1**. Although volumes of mined ore and overburden material may be better indicators of disturbances to geologic, mineral, topographic, and paleontological resources, volumetric data may either be non-existent for older mines or proprietary in the case of current or recently operating mines.



LEGEND

- P4 PRODUCTION L.L.C.
- NU-WEST INDUSTRIES/AGRIUM
- NU-WEST MINING INC.
- RHODIA
- SIMPLOT
- CHAMP-WILLIAMS
- ASTARIS
- JOINT FMC - SIMPLOT

SOLID = MINED OUT
HATCHED = RESERVE LEASE

NORTH

3 0 3 6

Miles

BLACKFOOT BRIDGE PROJECT EIS

FIGURE 5.1-1
Southeast Idaho Phosphate District

ANALYSIS AREA: CARIBOU COUNTY, IDAHO	
Date: 2/18/2009	File: Regional Mines.dwg
Drawn By: EC	Layout: 1

Source: (Petrun 1999)

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Table 5.1-1 Total Disturbances for Active and Inactive Mines in the CEA

Mine	Years of Operation	Disturbed Area (Acres)
Waterloo	1907 to 1920, 1945 to 1960	196
Hot Springs	1907 to 1911, 1954 to 1956	0.5
Paris Canyon	1917 to 1926	<2 (estimate)
Rattlesnake Canyon	1920 to 1926	0.4
Bear Lake	1920 to 1921	0.1
Conda	1920 to 1984	1,608 (estimate)
Home Canyon	1916 to 1924	0.8
Consolidated	1920 to 1921, 1930 to 1938	<1 (estimate)
Bennington Canyon	1907 to 1912, 1939 to 1942	2 (estimate)
Wyodak	1942 to 1943	<1 (estimate)
Ballard	1952 to 1969	635
North and South Maybe Canyon	1951 to 1995	1,028
Georgetown Canyon	1958 to 1964	251
Wooley Valley	1955 to 1989	808
Diamond Gulch	1960	32
Fall Creek	1955 to 1964	<1 (estimate)
Mountain Fuel	1966 to 1967, 1985 to 1993	716
Henry	1969 to 1989	1074
Bloomington Canyon	1972 to 1975	<1
Pritchard Creek	1975 to 1976	2 (estimate)
Lanes Creek	1978 to 1989	29
Champ	1982 to 1985	392
Smoky Canyon	1982 to Present	2,472
Enoch Valley	1990 to 2003	673
Rasmussen Ridge	1991 to Present (Idle)	687
South Rasmussen	2003 to Present	285
Dry Valley	1992 to Present	1,045
Total Disturbed Acres		**11,935**

Source: BLM and USFS 2007

As of January 2010, there are four active phosphate mines in the Southeast Idaho Phosphate District: Dry Valley, Smoky Canyon, South Rasmussen, and North Rasmussen Ridge Mines. Each of the currently operating mines simultaneously performs mining and reclamation activities in different parts of the mines. The portion of the mined-out areas at previously permitted mines that has been reclaimed is unclear, as reclamation varies from mine to mine and information for older mines is sparse. Mines in operation prior to 1970 were often released from lease liabilities without stipulations requiring backfilling, regrading, or reseeding disturbed areas (Causey and Moyle 2001). Disturbed and reclaimed acreages at currently permitted mines are summarized in **Table 5.1-2.** Values for disturbed and reclaimed acreages were determined by combining values reported by the BLM and USFS (2007) (**Table 5.1-2**), and disturbed and reclaimed acreages reported by the three mines to the BLM. The total remaining unreclaimed topographic disturbance from the active mining operations (not including North Rasmussen Ridge Mine) at the end of 2007 was 2,238 acres, or approximately 59 percent of the initially disturbed area (0.45 percent of the total area within the CEA).

Additional ground-disturbing activities in Pole Canyon, within the Smoky Canyon Mine lease, have recently included construction of a 10,000-foot-long diversion pipeline, access roads, runon ditch,

and infiltration gallery (CTNF 2007). At North Maybe Mine, approximately 17,000 cy of selenium-containing overburden material was removed from sediment retention ponds in September 2008 and relocated to the West Mill Dump (CTNF 2008).

Table 5.1-2 Disturbed and Reclaimed Acreages at Currently Operating Mines as of January 2008

Mine	Total Disturbance (acres)	Area Reclaimed (acres)	Present Disturbance as Unreclaimed Area (acres)
Smoky Canyon – Year End 2007	**2,472**	**888**	**1,584**
Year-End 2004[a]	2,150	756	1,394
2005-2007[b]	322	132	--
South Rasmussen – Year End2007	**285**	**79**	**206**
Year-End 2004[a]	285	69	--
2005-2007[b]	0	10	216
Dry Valley – Year End 2007	**1,045**	**597**	**448**
Year-End 2004[a]	847	552	295
2005-2007[b]	198	45	--
All Permitted Mines			
Year-End 2004[a]	3,282	1,377	1,905
2005-2007[b]	520	177	--
TOTAL-Year End 2007	**3,802**	**1,564**	**2,238**

Notes:
North Rasmussen Ridge Mine operating as of August 2008, but disturbance estimates unavailable.
-- = Same as Year End 2007 value.
Sources:
[a] USFS and BLM 2007,
[b] Various 2005-2007 Operating Reports to the BLM

Within the CEA, additional major earth-moving activities include construction of roads, railways, dams, and aggregate pits. These features exist within the CEA, and primarily impact topographic resources, with lesser influences on geologic, mineral, and paleontological resources. The impact of aggregate pits on geologic resources is negligible in comparison to phosphate mining.

There is no known past oil and gas production in the CEA. Although exploration wells have been drilled in the recent past, no commercial production has been established. Hard-rock mineral and metals mines operate in Idaho but not within the CEA, although some gold prospecting does occur (Gillerman and Bennett 2007).

5.1.4 Foreseeable Future Activities

Increased consumption of phosphate fertilizers and phosphorous, coupled with limited supplies of available phosphate rock across the world, is expected to continue through 2011. After 2011, numerous new mines are expected to open in other countries, increasing worldwide production by 28 percent from 2007 to 2012 (USGS 2007a). Despite the increased demand and skyrocketing prices (an estimated 113 US dollars (USD) per ton in 2008 versus 27.79 USD per ton in 2004) phosphate rock production in the United States is expected to remain at approximately 31 million tons per year (USGS 2007a). Florida and North Carolina currently produce approximately 85 percent of all phosphate rock in the United States. Idaho and Utah produce the remainder (USGS 2009). If the price of phosphate rock remains consistently high after the dramatic increase of recent years, it is

possible that accelerated development of federal phosphate leases would occur. This may be limited, though, by ore processing capacity and a limited available local workforce.

Based on an average anticipated national production of 31 million tons per year and a contribution of approximately 12 percent from Idaho, average annual production in the CEA is expected to be approximately 3.7 million tons per year. Total production from the Proposed Action or alternatives is 15.26 million dry tons, which is over 17 operating years and averages to 0.90 million tons per year, or approximately 24 percent of annual production from within the CEA. However, if future production in Florida drops due to public and government opposition to new mining operations (USGS 2009), the rate of federal phosphate lease development in Idaho and other states would be expected to increase to meet market demand. In terms of cumulative impacts to mineral resources within the CEA, the impact of the Proposed Action or alternatives accounts for depletion of approximately 1.5 percent of the economically recoverable phosphate ore (1 billion tons gross) in southeastern Idaho (BLM and USFS 2007).

The reasonably foreseeable disturbance (including the Proposed Action or alternatives) expected from permitted phosphate mining in the CEA is the difference in total disturbance areas indicated in **Tables 5.1-2** and **5.1-3**, or approximately 4,852 acres. This acreage includes the recently permitted F and G panels at the Smoky Canyon Mine, as well as permitted disturbance at the Rasmussen Ridge and Rasmussen Valley Mines. Small areas of additional disturbance would be associated with exploration drilling for potential future phosphate mines. This includes an estimated 46 acres of disturbance for Agrium's proposed Husky1-North Dry Ridge exploration drilling plan east of the project. This drilling program, which has not yet been permitted, would be reclaimed as it is completed.

Table 5.1-3 Past, Present, and Reasonably Foreseeable Disturbance Expected from Phosphate Mining in the CEA

Mine	Permitted Disturbance	Permitted Area to be Reclaimed	Future Net Unreclaimed Area
Smoky Canyon (Including Panels F and G)	3,886	3,795	91
South Rasmussen	312	282	30
Rasmussen Ridge	651	579	72
Dry Valley	1,191	1,141	50
Blackfoot Bridge[1]	767	702	65
Dairy Syncline	1,389	1,356	33
Rasmussen Valley	458	431	27
Total All Mines	**8,654**	**8,286**	**368**

Note:
[1] Acreage from Alternatives 1A and 1B
Source: USFS and BLM 2007

Of the 8,654 acres of permitted future disturbances and current disturbances at mines within the CEA, 8,286 acres are scheduled to be reclaimed (**Table 5.1-3**). The remaining 368 acres represent 4.3 percent of the initial disturbance, or less than 1 percent of the KPLAs in the CEA.

5.1.5 Cumulative Activities

The total disturbance for the Proposed Action would be 739 acres, 674 acres (91.2 percent) of which would be reclaimed through reseeding and recontouring to near-original topography. The acreage listed in **Table 5.1-3** for the Blackfoot Bridge Mine is for Alternatives 1A or 1B, which is about 29 acres greater than the Proposed Action. The total disturbance for Alternative 1A or 1B would be 767 acres of which 702 acres (91.5 percent) would be reclaimed. The total area of long-term disturbance resulting from the Proposed Action or from Alternatives 1A or 1B would be about 65 acres, or 0.02 percent of the total area within the CEA. When combined with permitted unreclaimed disturbances and existing disturbances at previously permitted mines within the CEA, a total of 16,100 acres of natural topography would be disturbed, at least temporarily. This represents 37 percent of federal phosphate-leased areas and 3.6 percent of the total area in the CEA.

If all KPLAs within the CEA are developed to the extent that 90 percent of each federal phosphate lease is disturbed through excavation, construction, or other ancillary activities, approximately 39,300 acres (8.8 percent of the CEA) would be disturbed at some point. The volumetric equivalent of geological, mineral, and paleontological resources that would be disturbed is uncertain because each mine would design mine plans according to geologic and market constraints unique to each phosphate lease.

5.1.6 Cumulative Effects

The cumulative result of the Proposed Action, when combined with known past, present, and foreseeable (permitted) future disturbances in the CEA, would include the temporary to long-term disturbance of 16,100 acres of natural topography. Of this affected area, less than 1 percent of the CEA (368 acres) would undergo a long-term, residual alteration of topography. Cumulative effects to geologic, mineral, and paleontological resources are difficult to determine without estimates of mined volumes of rock within the CEA. However, it is likely that the phosphate resources of the CEA would eventually be depleted.

Because of increasing world-wide demand for phosphate resources, it is likely that there would be no reduction in current phosphate production levels. As prices increase and readily available resources decrease, deeper and lower-grade phosphate ores may be targeted for development. However, these less economic resources that remain in backfilled pits or beneath overburden piles would be less likely to be developed than if they were undisturbed.

Geological, mineral, and paleontological resources within the CEA are affected primarily by mining and other construction activities. Negative effects of mining operations can include the destruction and loss of paleontological resources. Positive effects can include discovery of paleontological and mineral resources. Likewise, mining excavations can also provide access to geologic data, such as local stratigraphy, that would otherwise be inaccessible from the surface.

Stability of geologic formations, landforms, and topography is affected by man-made and natural phenomena within the CEA. Areas of highwalls and overburden piles associated with mining operations or road/highway and railway construction can all contribute to instability. Geotechnical stability is typically constrained to the local area of disturbance for most construction activities. Unstable overburden piles at the edge of federal phosphate leases may affect other resources.

Because the disturbances within the CEA are small in comparison to the size of the CEA, and because no instances of overburden instability affecting off-site resources are known to have occurred, cumulative effects related to geotechnical stability are unlikely.

Selenium mobilization within the CEA is most affected by disturbance of selenium-containing bedrock or soil. Phosphate mining activities impact these resources and can result in release of selenium and trace metals to the environment. Most other ground-disturbing activities within the CEA including road/highway construction and maintenance, building construction, ditch construction, and agricultural practices, typically do not disturb bedrock. The effects of selenium mobilization on water resources are discussed in **Section 3.1.5.4**.

Cumulative effects resulting from rock excavation and placement on topographic, and paleontological resources within the CEA are anticipated to be similar for the Proposed Action, Alternatives 1A and 1B and would not be additive to other disturbances within the CEA.

5.2 AIR RESOURCES, CLIMATE, AND NOISE

5.2.1 Air Resources

5.2.1.1 CEA Boundary

The CEA is the southeast Idaho phosphate resource area, which includes the eastern half of Caribou County and a portion of Bear Lake County (**Figure 5.1-1**). This includes the majority of the Southeastern Idaho Phosphate District and KPLAs. The CEA also includes the area along State Highway 34 and Blackfoot River Road affected by traffic air emissions. This CEA includes the area of the Proposed Action or alternatives and other past, present, and reasonably foreseeable future activities have the potential to affect air quality. Air pollutants are expected to comply with all federal and state air quality standards within the CEA, so cumulative effects are not anticipated outside of this area.

5.2.1.2 Introduction

The CEA is within a region of generally north- to northwest-trending mountain ranges and valleys. Twenty-seven previously permitted and active phosphate mine sites are within the CEA. As of January 2009, there were four active phosphate mines in the Southeast Idaho Phosphate District: Dry Valley, Smoky Canyon, South Rasmussen, and North Rasmussen Ridge Mines. The CEA also encompasses chemical processing activities at the Soda Springs Plant. Class I Areas are not included in the CEA because the closest Class I Area is more than 100 kilometers away and there is no requirement for a regional haze and visibility analysis associated with the proposed project.

5.2.1.3 Past and Present Activities

Air quality in the vicinity of the project area can be adversely affected by pollutants from sources outside the project area. The effects typically occur during winter inversions or when stable air masses occur under static, high-pressure weather systems (BLM and USFS 2007).

Air quality conditions in the CEA are generally good to excellent (BLM and USFS 2007). The project area is located within an area designated as an attainment area or unclassified for all NAAQS. PM_{10} is the most common air pollutant emission associated with phosphate mining, and

mining is the major activity that produces fugitive dust in the area. Agriculture activities contribute to PM_{10} and gaseous emissions seasonally. Gaseous emissions are also associated with mining activity.

Including existing phosphate mining, other sources that can contribute particulate and gaseous emissions are wildfires and controlled burns, timber harvesting, agriculture, travel on paved and unpaved roads, and grazing. Wildfires are short-term sources of air pollutants and can generate fine particulate matter. Smoke and gases from wildfire or controlled burns are a complex mixture of carbon, tars, liquids, and different gases, but the major air pollutants are PM_{10} and $PM_{2.5}$. Equipment used for fire suppression can also generate air pollutants. Wildfires would generate temporary and intermittent effects on air quality in the immediate vicinity of the ignitions and could also potentially impact visibility at Class I Areas. Because conditions from wildfires are not controlled, they have the potential for greater impacts than controlled burns. Controlled burns are implemented at specific times when atmospheric conditions would allow rapid dispersal of air pollutants. The effects of controlled burns would be mitigated through the implementation of a burn plan, but would still have the potential to generate temporary impacts. Vehicle travel on paved and unpaved roads can also contribute to an adverse impact to air quality. However, this source has not adversely affected air quality measurably in the past and is not considered a concern (BLM and USFS 2007). Agriculture activity contributes to uncontrolled emission of particulate and gaseous emission on a seasonal basis. Grazing and timber harvesting can produce fugitive dust, but the quantities are minimal and are expected to remain approximately equal to present conditions. Results of timber cruises conducted on public land and administered by BLM are estimated to be approximately 8,000 board feet per acre of timber that would be removed from the proposed disturbance area.

Other past and present sources of impacts include residential and small industrial heating sources such as natural gas, oil, and wood. These sources are primarily located in Soda Springs and the impacts are minimal and are expected to remain approximately equal to present conditions.

5.2.1.4 Foreseeable Future Activities

Foreseeable future disturbances include ongoing and new phosphate mining, wildfires and controlled burns, timber harvesting, travel on paved and unpaved roads, and residential and small industrial heating sources. Mining, wildfire, and controlled burns have the greatest potential to affect air quality in the CEA.

The trend in phosphate production in southeast Idaho is an increase of one to two percent annually (BLM and USFS 2002). Because fugitive dust emissions are directly related to the mining process rate, it can reasonably be expected that fugitive emissions in southeast Idaho may increase annually.

It is anticipated that the population of Soda Springs and Caribou County will continue to increase slightly over time and impacts from residential and small industrial heating sources may increase by a small amount. However, given that Caribou County had one of the lowest growth rates in Idaho between 2000 and 2007 (**Section 3.13.1**), the impacts would not likely be noticeable.

5.2.1.5 Cumulative Activities

Past, present, and reasonably foreseeable disturbance impacts to the CEA have been and would be predominately associated with mining and wildfire. Impacts from mining operations include gaseous

air pollutants from drilling and blasting, generators, boilers, and tailpipe emissions. Impacts also include fugitive dust from drilling and blasting; ore crushing and screening; and vehicle travel on haul roads. Impacts from wildfires and controlled burns would include gaseous and PM_{10} emissions from the burning of vegetation and from the use of equipment for fire suppression.

5.2.1.6 Cumulative Effects

The effect of adding wildfires to the past, present, and foreseeable future disturbances to air resources could produce cumulative effects that result in non-attainment of the NAAQS. According to the BLM (2008a), many of the cover types near the project area have been subjected to wildland fire that is not within the historical range of variability. Fires are occurring more frequently and are burning more severely in some cover types. Since approximately 1996, wildland fires have occurred in the region at an overall accelerated rate, mostly due to vegetation changes and changed conditions like cheatgrass invasion into sagebrush steppe cover types. To a lesser extent, the area has experienced decreases in fire frequency and attendant increases in fire severity in its aspen, dry conifer, and mountain shrub cover types.

Fire frequencies in the aspen/conifer mix range between 25 years and 100 years (63 years mid-range) with mixed severity (Loope and Gruell 1973). Fuel loads range upwards from 6 tons per acre. Pre-settlement stand-replacing fire frequencies for low-elevation shrub are estimated to vary from 60 to 110 years (85 years mid-range) for basin big sagebrush and Wyoming sagebrush types (Whisenant 1990, Peters and Bunting 1994, Miller 2001).

Substantial effects from phosphate mining are not expected because all existing mines and all foreseeable mines are required by stipulations in their permits to implement BMPs for air quality that includes watering roads and active work areas or applying another dust suppressant. Adherence to these and other permit conditions confirms that the mines would be in compliance for fugitive dust. Additionally, there are typically from 2 to 5 miles between mines in southeast Idaho (**Figure 5.1-1**), and the distance between mines contributes to the improvement of effects from any single mine rather than contributing to cumulative effects among several mines. Air emissions from the new proposed mine would also be offset by the closing of the South Rasmussen Mine.

The effects of adding the proposed project to the past, present, and foreseeable future disturbances to air resources would not result in adverse cumulative impacts.

5.2.2 Climate Change

5.2.2.1 Local Climate Change

5.2.2.1.1 CEA Boundary

As a contributor to local GHG emissions and potentially climate change, the proposed Blackfoot Bridge Mine and other phosphate mining activities can be viewed within the same CEA as Air Resources. As described in **Section 4.2.1.1**, the CEA is the southeast Idaho phosphate resource area, which includes the eastern half of Caribou County and a portion of Bear Lake County (**Figure 5.1-1**).

5.2.2.1.2 Introduction

The CEA is within a region of generally north- to northwest-trending mountain ranges and valleys. Twenty-seven previously permitted and active phosphate mine sites are within the CEA. As of January 2010, there are four active phosphate mines in the Southeast Idaho Phosphate District: Dry Valley, Smoky Canyon, South Rasmussen, and North Rasmussen Ridge Mines. It is anticipated that the phasing out of the South Rasmussen Mine and the start-up of the Blackfoot Bridge Mine would overlap and production rates would remain at roughly their current levels. The CEA also encompasses chemical processing activities at P4's Soda Springs Plant and Agrium's Conda Plant southwest of the Blackfoot Bridge Mine.

5.2.2.1.3 Past and Present Activities

In addition to phosphate mining and processing, contributions to GHG emissions include local rural and community traffic, traffic through the area and to recreational locations on the highways, operation of agricultural equipment, residential and small industrial heating sources, and other commercial and industrial activities. Quantitative data on these varied sources is not readily available, but their contribution is small compared to phosphate mining and processing and they are expected to remain approximately equal to present conditions.

5.2.2.1.4 Foreseeable Future Activities

Foreseeable future conditions for GHG emissions include ongoing and new phosphate mining and processing and general travel, agricultural, and community sources including local rural and community traffic, traffic through the area and to recreational locations on the highways, operation of agricultural equipment, residential and small industrial heating sources, and other commercial and industrial activities. Quantitative data on these varied sources that are not directly associated with phosphate mining and processing is not readily available, but their contribution is small compared to phosphate mining and processing and they are expected to remain approximately equal to present conditions. Worldwide phosphate mining has increased by about 28 percent over the past four years. However, mining and processing activities in Idaho have remained relatively constant. The trend in phosphate production in southeast Idaho is an increase of 1 to 2 percent annually (BLM and USFS 2002).

5.2.2.1.5 Cumulative Effects

Past, present and reasonably foreseeable contributions to GHG emissions in the CEA have been and would continue to be predominantly associated with phosphate mining and processing. GHG emissions from the mining operations are associated with direct fuel consumption for operating equipment and machinery including haul trucks or trains to transport or to the processing plant, and generation of electricity consumed at the facilities. GHG emissions are also generated at the processing plant. Over the next five years these emissions are not expected to change greatly. Mining at the South Rasmussen Mine would be phased out and replaced by the development of the Blackfoot Bridge Mine and the other three mines currently in operation would continue. The level of processing of the ore would also continue approximately at current levels.

Viewed individually, the projected GHG emissions of the Blackfoot Bridge Mine are substantially below the reference level of 25,000 metric tons per year of CO_2-equivalent emissions recommended by CEQ (2010). Based on comparable ongoing activities at the South Rasmussen Mine, the Blackfoot Bridge Mine is expected to emit 13,000 tons per year from direct fuel consumption of

equipment and machinery, 1,400 from transporting ore to the processing facility, and 3,300 from generating electricity for the mine facilities. This total of 17,700 tons of CO_2-equivalent emissions annually is equivalent to approximately 16,050 metric tons. According to the CEQ guidance, this level of emissions may not be meaningful for analysis.

The potential cumulative effects at the level of the CEA are somewhat different. Four phosphate mines are currently active in the CEA: the Dry Valley, Smoky Canyon, South Rasmussen, and North Rasmussen Ridge Mines. Over the next 5 years, it is expected that the Blackfoot Bridge Mine will replace the South Rasmussen Mine and that overall production will remain roughly the same as it is currently. If it is assumed that the GHG emissions of the other three mines are roughly the same as South Rasmussen/Blackfoot Bridge, the combined emissions would be approximately 64,000 metric tons annually. The phosphate ore is also processed in the CEA. P4's ore is processed at the Soda Springs Plant. Annual CO_2-equivalent emissions from the Soda Springs Plant are estimated to be 655,000 tons (594,100 metric tons). Agrium also operates a processing plant nearby at Conda. Estimating from figures provided by EPA (2009), the 2006 CO_2-equivalent emissions from the Conda plant were approximately 130,000 metric tons. Realizing that these are approximate figures from diverse sources, it nevertheless indicates that CO_2-equivalent GHG emissions from phosphate mining and processing in the CEA are on the order of 800,000 to 850,000 metric tons per year. A large part of this (approximately 92 percent) is from the P4 and Agrium processing plants in Soda Springs.

Cumulatively within the CEA, phosphate mining and processing is a significant contributor to GHG emissions. The mines contribute a relatively small proportion (less that 10 percent) of those emissions, but the overall level of emissions is very likely a factor in local and regional climate. Phosphate mining and processing has been ongoing in the region since the early 1900s and increased in the latter half of that century. Comparative data on climate has not been linked to that mining activity, but it can be assumed that the GHG emissions from mining and processing of phosphate have contributed to climatic trends. The major contributors in this scenario are the processing plants. Although the BLM has no control or authority over the operation of the processing plants, these emissions must be recognized as part of the cumulative effects associated with phosphate mining.

5.2.2.2 Global Climate Change

5.2.2.2.1 CEA Boundary

The CEA for issues related to climate change is based on the global atmospheric system.

5.2.2.2.2 Introduction

There are two viewpoints within the scientific community regarding the potential for climate change: 1) global warming as a result of man's activities; and 2) climate change due to natural climatic cycles.

Global Warming

Ongoing scientific research has identified the potential impacts of anthropogenic (man-made) and natural GHG emissions and changes in biological carbon sequestration due to land management activities on global climate. Although GHG levels have varied for millennia, recent industrialization and burning of fossil carbon sources have caused CO_2 concentrations to increase. As with any field of scientific study, there are uncertainties associated with the science of climate change. This does

not imply that scientists do not have confidence in many aspects of climate change science. Some aspects of the science are known with virtual certainty because they are based on well-known physical laws and documents trends (EPA 2008).

Historic trend data (1850 to present) show an increase of 1°C in global mean temperature. There have been extended periods (decades) where mean global temperature has dropped or stayed constant. The overall historic warming over that same period has been identified the cause for rising sea levels, and has been implicated in changes in climate patterns on land. However, the changes have not been consistent over the planet. Equatorial temperatures have cooled by about 5°C, while closer to the poles, temperatures have risen by similar amounts (Hansen and Lebedeff 1987). In northern latitudes, temperature increases have been documented since 1900. Changes in weather patterns (rainfall and wind) resulting from temperature changes may affect vegetation and habitat.

Natural Climatic Cycles

Some scientists believe that the earth's natural climate is associated with natural cycles, including the sun's activity and other natural atmospheric conditions, and is less dependent on man's contribution. NASA scientists have monitored solar activity for decades, and recent monitoring has indicated changes taking place on the sun's surface. This evidence indicates a climate change may be coming that would bring an extended period of deep cold to the planet (Casey 2008). This is not, however, a unique event for the planet, but understood to be the normal sequence of alternating climate changes that has been going on for thousands of years. Further, according to this research, solar cycles are predictable and can be used to forecast the next series of climate changes many decades in advance. The accuracy of these cycles' behavior over the last 1,000 years relative to temperatures on Earth had been verified to more than 90 percent.

The sun's surface flows have slowed dramatically as NASA has indicated. This process of surface movement, what NASA calls the "conveyor belt" essentially sweeps up old sunspots and deposits new ones. NASA studies have found that, when the surface movement on the sun slows down, sunspot counts drop significantly. All records of sunspot counts and other proxies of solar activity going back 6,000 years validate the findings that when sunspot counts are lower than 50, an intense cold climate globally follows.

5.2.2.2.3 Past and Present Activities

According to the Energy Information Administration (EIA 2008), estimated anthropogenic (man-caused) CO_2 emissions in the U.S. totaled 6 million metric tons in 2006. Total world anthropogenic emissions of CO_2 are estimated at 32 billion metric tons (EIA 2008). The primary anthropogenic source of CO_2 is fossil fuel burning, which accounts for 82 percent of the total anthropogenic CO_2 emissions.

5.2.2.2.4 Foreseeable Future Activities

Global Warming

World CO_2 emissions are expected to increase by 1.8 percent annually between 2004 and 2030 (EIA 2008). Much of the increase in emissions is expected to occur in the developing world, where emerging economies, such as China and India, fuel economic development with fossil energy. Emissions from the countries outside the Organization for Economic Cooperation and Development are expected to grow above the world average at 2.6 percent annually between 2004 and 2030.

Natural Climatic Cycles

Records of past climate changes suggest global cooling for the first several decades of the 21st century to about 2030, followed by global warming from about 2030 to about 2060, and renewed global cooling from 2060 to 2090 (Easterbrook 2008). Climatic fluctuations over the past several hundred years suggest about 30-year climatic cycles of global warming and cooling, on a general rising trend from the Little Ice Age.

5.2.2.2.5 Cumulative Effects

Direct CO_2 emissions resulting from mining associated with the Proposed Action or alternatives, are estimated at 16,300 tons/year. Estimated annual indirect emissions of CO_2 related to hauling ore from the mine to the processing plant are 1,400 tons. Indirect emissions from the processing plant in 2009 were 652,000 tons, plus 1,400 tons for electrical usage at the plant. Total direct and indirect emissions (671,000 tons/year or approximately 610,000 metric tons/year) of CO_2 resulting from the project would combine with the existing CO_2 levels in the atmosphere. Total annual contribution of carbon dioxide from the Proposed Action or alternatives would represent approximately 0.00002 percent of total world CO_2 levels. This is a conservative estimate given the continued CO_2 uptake by plants.

Addition of CO_2 to regional or global atmospheric conditions is not expected to affect development of the Proposed Action or implementation of alternatives. Warming conditions would likely result in shorter winter periods, thereby decreasing the costs associated with mining operations. Cooling trends would increase the winter period, thereby increasing the need for snow management and generally raising equipment maintenance and operational costs.

Global Warming

Assuming global warming trends continue into the future, Chambers (2006) indicates that the following changes may be expected to occur in the West.

- Precipitation as rain may increase over most areas (IPCC 2007) with increases in summer precipitation predicted at 10 percent, fall by 30 percent, and winter by 40 percent. Snowfall would be reduced, and snowmelt would occur earlier in the spring.
- Flow in streams and rivers would change in response to less snowpack and increased precipitation in the form of rain. Spring runoff flow would occur earlier in the spring and may be lower in magnitude as a result of snowpack changes. Summer and fall low flow periods may be variable due to late season storm events.
- Some species of vegetation would expand including invasive (noxious weeds) species. Elevated levels of CO_2 in the atmosphere would provide favorable growing conditions for most plant species.
- Wildfire episodes may increase in response to increase in small fuels load in grasslands and forests. Increase in average temperatures may result in extending the fire seasons.

Natural Climatic Cycles

A period of extreme cold can result in massive crop losses, food shortages, famine, and disease. The projected cooling climate change is predicted to last up to 30 years with increased length of winter periods and more precipitation occurring as snow. With extended winter periods, at least in the

northern latitudes, crop production in southern latitudes would see increased pressure to support the food supply (Casey 2008). Some animal species would migrate to southern latitudes to maintain populations; some individuals may die in response to extended winter periods.

5.2.3 Noise

5.2.3.1 CEA Boundary

The CEA for noise was delineated to include the past, present, and reasonably foreseeable Blackfoot Bridge Mine operations. The CEA includes the Blackfoot Bridge Mine and sensitive noise receptors within 1.5 miles, including the area along State Highway 34 and Blackfoot River Road, where the closest residents live. Noise from mining is attenuated by vegetation and topography to levels that are not discernable for long distances to humans. Noise related to access traffic and haul roads is of importance to persons along nearby public roads and in nearby residences.

5.2.3.2 Introduction

Mines from the Southeastern Idaho Phosphate District do not overlap within the CEA. Noise impacts from Blackfoot Bridge Mine operations or other existing mines do not impact sensitive receptors in the CEA. The effects of adding the proposed project to the past, present, and foreseeable future disturbances to noise resources would not result in adverse cumulative impacts.

5.2.3.3 Past and Present Activities

Past and present disturbances contributing to noise include vehicular traffic on State Highway 34, Blackfoot River Road, the haul road, and from the Union Pacific Dry Valley Ranch Railroad. Noise from vehicular traffic and the railroad are short-term and intermittent. Mines that operated in the past would no longer contribute to noise impacts. Existing operating phosphate mines are located outside the CEA and would not impact the CEA.

5.2.3.4 Foreseeable Future Activities

Foreseeable future disturbances contributing to noise would include construction and operation of the mine and its related facilities, vehicular traffic, and the Union Pacific Dry Valley Ranch Railroad. Noise from vehicular traffic and the railroad would be short-term and intermittent. Noise from Blackfoot Bridge Mine would not impact sensitive noise receptors within the CEA. Existing operating phosphate mines are located outside the CEA and would not impact the CEA. If a future mine were to begin operating in the CEA or within 2 miles of the CEA, there is potential for cumulative impacts to noise.

5.2.3.5 Cumulative Activities

Past, present, and reasonably foreseeable disturbance impacts to the CEA have been and would be predominately associated with noise localized to the mining areas.

5.2.3.6 Cumulative Effects

Noise impacts from Blackfoot Bridge mining operations would not impact sensitive receptors within the CEA. The noise from Blackfoot Bridge and other mining operations would likely not overlap. Instead, noise would be localized to each phosphate mine.

The effects of adding the proposed project to the past, present, and foreseeable future disturbances on sensitive noise receptors would not result in adverse cumulative impacts.

5.3 WATER RESOURCES

5.3.1 CEA Boundary

The CEA for water resources contains the Upper Blackfoot Watershed, which comprises the eastern third of USGS 4th order Hydrologic Unit Code (HUC-4) sub-basin (17040207). This CEA encompasses approximately 223,389 acres and incorporates areas that include all past, present, and reasonably foreseeable phosphate mining-related disturbances upstream of the Blackfoot Reservoir. Approximately 55 percent of the CEA is located within CTNF. The rest includes private, BLM, and State of Idaho land ownerships. CEA boundaries as well as locations of past and present mining activities are depicted on **Figure 5.3-1**. Water resources are addressed within this area due to the indirect effect that vegetation and soil disturbance has on surface- and groundwater quality as a result of erosion and sediment transport.

5.3.2 Introduction

Activities or phenomena affecting water resources within the CEA include mining; farming; ranching; livestock grazing; wildfires; fire suppression activities; road building; and development of domestic, commercial, and industrial land parcels. Two prominent water quality issues in the CEA include drainage from phosphate mine overburden and sediment from a variety of other sources. Major sediment sources include native surfaced roads and motorized trails near streams, eroding streambanks, gullies, and riparian areas lacking sufficient or proper ground cover. Mining activities increase the potential mobilization of COPCs (selenium is of primary concern) and sediment through ground-disturbing activities. Agricultural practices impact water quality through the introduction of fertilizers and animal and vegetation waste. Agriculture-derived sediment can also be introduced through normal runoff from tilled fields and from trampled or disturbed areas adjacent to water bodies. Various land use practices, such as mining, farming, grazing, and construction activities, can impact surface water by affecting volume and timing of surface runoff and through alteration of natural channel morphology.

Cumulative effects to surface water resources may include increases of COPC concentrations and sediment load in streams, ponds, and springs, and impacts to water quantity related to changes in volume and timing of surface runoff.

Cumulative effects to groundwater resources may include increases of chemical loading in local and regional aquifers and changes in depth to groundwater due to pumping or decreased infiltration rates.

5.3.3 Past and Present Activities

A variety of human actions have affected streams, riparian areas, and watersheds in the CEA. Reduction of beaver population due to trapping in 1800s reduced channel/pond water and sediment storage capacity, which in turn caused increased peak storm flows, flow energies, and sediment downstream (USDA 2009). Beginning in about 1870, intensive logging activities converted forest to range land, which resulted in reduced infiltration and increased storm runoff peaks and volumes.

Intensive livestock grazing on open lands (increased by logging) over many years depleted soils of upper organic layers which absorb and hold rain and snowmelt. Organic layers increase the volume of moisture that is available later in the year and decrease runoff volumes and peak flows (USDA 2009).

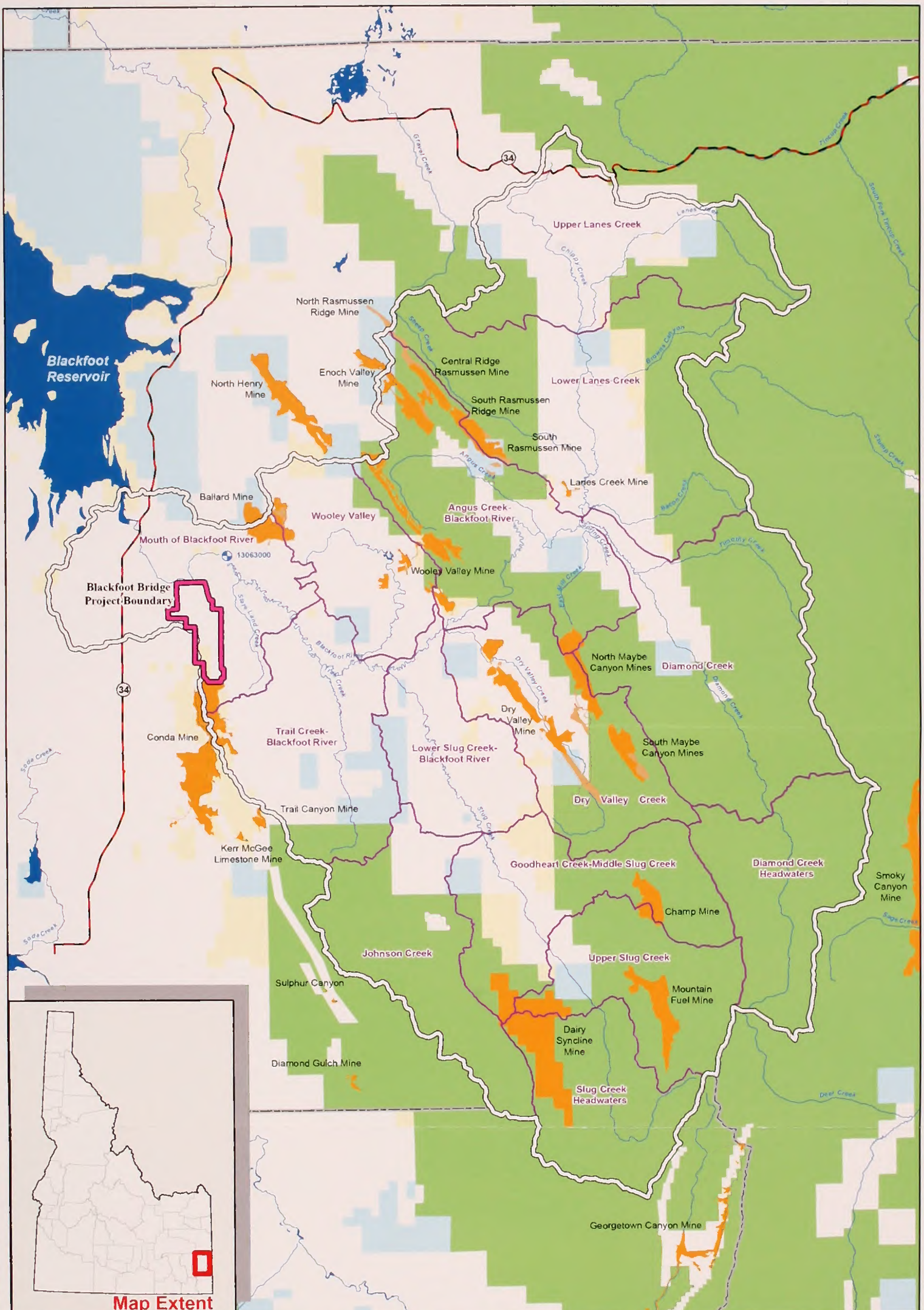
Exclusion of fire in the 1900s has changed vegetation communities, which directly and indirectly affect hydrologic conditions. Exclusion of fire promotes replacement of aspen by conifer or brush. Aspen produce a much thicker, more effective soil sponge than do conifer or brush, and transpire less water on an annual basis. Fire exclusion, therefore, can change the annual watershed water balance, which translates to less groundwater recharge and lower summertime streamflows (USDA 2009).

Starting in the 1950s, willows were eliminated near stream beds in many areas to increase forage for livestock. Reduction of willows contributed to bank stability problems, causing increased sediment loading in streams from bank erosion and overly widened channels. It also resulted in higher water temperatures due to loss of shading vegetation along stream banks. Increased bankwidths caused by willow reduction also increased the amount of solar energy transferred to the water, resulting in higher in-stream temperatures (USDA 2009).

Construction of roads and the use of off-road motorized vehicles such as all-terrain vehicles (ATVs) have increased the soils erosion in the watershed. Channel modifications have been done on a section of the Blackfoot River near the Blackfoot River Road. Small sections of channel have been modified elsewhere for road crossings and sometimes portions of channels have been moved or crowded for road placement. In general, channelization straightens and enlarges the channel cross-section. While this temporarily improves drainage efficiency in the area treated, over the medium- to long-term, it alters the sediment balance and almost always causes unintended side effects. Straightened channels have steeper gradients and more erosional power than meandering channels. Straightening triggers erosion and sedimentation in the channelized reach and erosion and downcutting in the reach above as the channel begins to re-adjust to a new equilibrium with the locally increased gradient and erosional power (USDA 2009).

Previous phosphate mining operations have left open pits and overburden piles scattered throughout the watershed. Older mining practices left shale materials with elevated levels of selenium and other elements either exposed at the surface or with shallow or no cover. Older overburden dumps generally do not have capillary barrier covers to restrict infiltration, and the surfaces may have shallow slopes or rough surfaces that do not minimize infiltration of precipitation. Seepage from many of the overburden disposal sites contain COPCs at elevated concentrations that may be transported into streams (USDA 2009). Selenium is the COPC of greatest regulatory focus in the CEA.

Twelve phosphate mines have operated within the CEA boundary between 1906 and 2009 (**Figure 5.3-1**). Investigations under CERCLA have been initiated for five of the mines to assess the contamination and potential risks associated with the sites. Previously permitted mining sites that are being investigated under CERCLA include the Henry Mine, Enoch Valley Mine, Ballard Mine, Conda Mine, North Maybe Mine, and South Maybe Mine. Additionally, there are three active phosphate mining operations within the Upper Blackfoot River Watershed. Active phosphate mining operations include Dry Valley Mine, North Rasmussen Ridge Mine, and South Rasmussen Mine.


Blackfoot Reservoir
North Rasmussen Ridge Mine
Enoch Valley Mine
North Henry Mine
Central Ridge Rasmussen Mine
South Rasmussen Ridge Mine
South Rasmussen Mine
Lanes Creek Mine
Upper Lanes Creek
Lower Lanes Creek
Ballard Mine
Wooley Valley
Angus Creek-Blackfoot River
Mouth of Blackfoot River
13063000
Wooley Valley Mine
Blackfoot Bridge Project Boundary
North Maybe Canyon Mines
Diamond Creek
Dry Valley Mine
South Maybe Canyon Mines
Conda Mine
Trail Creek-Blackfoot River
Lower Slug Creek-Blackfoot River
Dry Valley Creek
Trail Canyon Mine
Kerr McGee Limestone Mine
Goodheart Creek-Middle Slug Creek
Diamond Creek Headwaters
Smoky Canyon Mine
Champ Mine
Johnson Creek
Upper Slug Creek
Sulphur Canyon
Mountain Fuel Mine
Dairy Syncline Mine
Diamond Gulch Mine
Slug Creek Headwaters
Georgetown Canyon Mine
Map Extent
LEGEND
USGS Gauging Station
Project Boundary
Cumulative Effects Area Boundary
State Route
Collateral Disturbance
Mining Disturbance
Stream / River
6th Code Hydrologic Unit
County Boundary
Land Owner
Bureau of Land Management
Forest Service
Private
State of Idaho
Open Water
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0 1.5 3 6
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BLACKFOOT BRIDGE PROJECT EIS
FIGURE 5.3-1
Upper Blackfoot Watershed CEA
ANALYSIS AREA: Caribou County, Idaho
Date: 8/5/2010
File: 1924\CEA.mxd
Prepared By: JG & JC
Layout: CEA.pdf

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The other four mines (Champ Mine, Mountain Fuel Mine, Wooley Valley Mine, and Lanes Creek Mine) are previously permitted mines, and the reserves have been mined out. The operating Smoky Canyon Mine is located outside of the CEA.

One of the CERCLA sites, the Conda Mine, shares a common boundary with the Blackfoot Bridge Project and is located south of the project area (**Figure 5.3-1**). Recent environmental investigations for the CERCLA study at the Conda Mine indicate that groundwater in the local- to intermediate-scale groundwater system contains selenium at concentrations that exceed groundwater standards. Total selenium concentrations for wells completed in alluvium and shallow bedrock ranged from < 0.0002 mg/L to 0.215 mg/L during fall 2008, exceeding the groundwater standard of 0.05 mg/L in samples from four of the 11 wells. Selenium concentrations from wells completed in the regional Wells Formation were detected below the groundwater standard during this monitoring period (NewFields 2009a).

Previously permitted mining activities in the CEA have resulted in increased selenium concentrations in the Blackfoot River and some of its tributaries. IDEQ has annually sampled up to 21 surface water sites in the Upper Blackfoot Watershed since 2004 to assess water quality impacts from phosphate mining operations (USDA 2009). The monitoring program included analyses for metals including cadmium, chromium, copper, lead, nickel, selenium, silver, vanadium, zinc, as well as measurement of streamflow and physical parameters. Selenium levels greater than or equal to the chronic aquatic live (CCC) standard of 0.005 mg/L have been measured in the Blackfoot River, Goodheart Creek, Spring Creek, State Land Creek, and East Mill Creek. Selenium levels greater than the acute aquatic life (CMC) standard of 0.02 mg/L were measured in East Mill Creek and nearby Spring Creek (**Figure 5.3-1**) (USDA 2009).

As discussed in **Section 3.3**, the USGS has also monitored water quality for Blackfoot River at station 13063000 upstream of the project area (**Figure 5.3-1**). Water quality data from the USGS station indicate that selenium concentrations in the river vary considerably (from 0.005 mg/L to 0.0094 mg/L) and generally exceed the CCC aquatic life standard for a few days each spring before decreasing to below the standard during the remainder of the year. This seasonal cycling correlates to peak flows in the Blackfoot River and is likely related to increased runoff from phosphate mine overburden materials in the sub-basin during spring snowmelt (Whetstone 2009a).

Additionally, baseline monitoring in **Section 3.3** indicates that metal concentrations in the mainstem of State Land Creek are below applicable water quality standards with the exception of selenium, which was detected at concentrations that exceeded the CCC aquatic life standard. Concentrations of selenium in State Land Creek Tributary 2 were also elevated exceeding the CCC and CMC aquatic life standards. Samples from State Land Creek Tributaries 1 and 3 below the proposed Blackfoot Bridge Project have consistently met all applicable water quality standards.

These impacts have been recognized by IDEQ by listing portions of Blackfoot River and several of its tributaries, including State Land Creek, as impaired waterbodies under Section 303(d) of the Clean Water Act (IDEQ 2005a and 2009a). Section 303(d) requires states to identify streams and lakes that do not meet water quality standards and to establish a TMDL value for the listed pollutants. The most frequently identified causes of impairment in the CEA are sediment, habitat alteration, and chemical constituents (USDA 2009). Cultivated agriculture and livestock range land uses continue to occur on private land across the CEA. Forest management activities on the CTNF

include timber sales, livestock grazing, and public recreation. Many of the past and current human activities within CEA, including mining, livestock grazing, and road construction, continue to increase sediment loads to streams that often result in channel instability. These types of impacts have also been documented within the CEA. The Blackfoot River, as well as several tributaries within the Upper Blackfoot Watershed, have been identified as impaired by sediment loads under Section 303(d) of the Clean Water Act (IDEQ 2005a and 2009a).

5.3.4 Foreseeable Future Activities

Foreseeable future activities that have potential to affect water resources in the CEA include agricultural and livestock range land uses, public recreation, remediation of inactive mines, and construction activities resulting in ground disturbance. Mining activities at the currently operating Dry Valley, North Rasmussen Ridge, and South Rasmussen Mines, and proposed phosphate mining projects also have the potential to affect water resources.

Changes to private agricultural lands are likely, as portions of these lands are converted into low-density residential areas. Near-term development of private agricultural lands within the CEA is expected to be limited because Caribou County has identified infilling of existing city limits and impact areas, rather than expansion into rural areas as a growth goal (Caribou County 2006). No known changes to transportation or recreational uses of the CEA beyond those identified in the Proposed Action and alternatives have been identified. The proposed project has the potential to affect the surface water and groundwater quantity and quality. These impacts have been evaluated and are described in detail in **Section 4.3** The primary impact of the Proposed Action would be from percolation of annual recharge water through the seleniferous stockpiles and overburden materials introducing COPCs into the Wells Formation aquifer, and consequently into the Blackfoot River. Alternatives 1A and 1B would minimize these impacts as discussed in **Section 4.3**.

As described in **Section 4.3**, the proposed project would also add sediment and reduce runoff to drainages for State Land Creek, Fish Pond, Beaver Pond, and the Blackfoot River during mining operations. However, backfilling of the pits would be concurrent with mining, and the area of the open pits that would capture runoff during any given year would be limited. The impacts to the local aquifers of the Rex Chert and Dinwoody Formation are expected to be of limited extent in the immediate vicinity of the proposed mine facilities. Pit dewatering during mining operations would result in a lowered water table and a depletion of about 2 percent of the stream flow in Blackfoot River under low-flow conditions. These impacts would be temporary and of limited duration. Another mining project currently proposed within the CEA in addition to the proposed Blackfoot Bridge Project, the Dairy Syncline Mine and Reclamation Plan for Federal Leases I-28115 and I-2058, was submitted to the BLM in October 2008. The leases total about 2,302 acres, all of which are on USFS System lands. Simplot, the proponent, is seeking to acquire six fringe leases or lease modifications that would total an additional 1,101 acres, mostly on USFS System lands (USDA 2009). The Final EIS for the North Rasmussen Mine for Federal Leases I-04375 and I-07619, and on State Lease I-9313 was submitted to the BLM/USFS in August 2003. The leases total 1,357 acres which are on USFS, BLM, and private land. Agrium has recently begun the application and impact assessment process for the proposed Rasmussen Valley Mine for Federal Phosphate Lease I-05975 totaling approximately 560 acres on BLM, USFS, State and private lands.

Development of the Fox Ranch and Trail Creek federal phosphate leases near the Blackfoot River could also impact water resources. However, because the mining and water management programs have not been developed, potential impacts to water resources cannot be quantified.

CERCLA studies and remedial actions would occur at phosphate mining sites within the CEA. Remedial activities could include regrading, capping and revegetation of existing overburden piles or backfills, backfilling of pits, and removal of overburden that was placed as cross-valley fills. Remedial activities would be designed to arrest existing sources of COPCs associated with these sites and minimize contaminated seepage from existing overburden disposal facilities and sediment loading to surface water from past mining disturbances.

Although it is not a requirement to meet Idaho Water Quality Standards in the Blackfoot River, P4 has evaluated projects to reduce selenium discharges to the river from other sources in the Upper Blackfoot River Drainage. While the modeling results provided in this EIS predict that mine discharges would cause a negligible increase in concentrations of selenium in the Blackfoot River, with peak selenium loads of 89.5 pounds per year (lbs/yr) under the Proposed Action and 1.6 lbs/yr for both Alternatives 1A and 1B (ARCADIS 2010), P4 has identified the following projects that would provide a reduction in impacts well beyond the estimated contribution of selenium from the Blackfoot Bridge Mine.

Blackfoot River Restoration - Restoration and construction of new wetlands would provide the required compensatory mitigation for losses of jurisdictional wetlands for the Blackfoot Bridge project. The proposed Compensatory Mitigation Plan (P4 2010b) includes restoring approximately 5,500 feet of degraded Blackfoot River bank and associated wetland and riparian vegetation within P4's Fox Hills Ranch property (**Figure 2.3-9**). In addition to improving wetlands and increasing biodiversity within the river bed, this project would improve the fish habitat in those areas while reducing sediment (and possibly selenium load) being released when river flow exceeds normal conditions (e.g., spring snowmelt, large rainfall episodes).

South Rasmussen Mine - As part of the overburden area design at the South Rasmussen Mine, a "toe trench" system was constructed at the toe of the overburden area to eliminate any buildup of water within the overburden pile that might cause a stability problem on the hillside. The toe trench also intercepts groundwater that may seep from below the pile. In 2008, P4 instituted a program to collect water from the toe trench and pump it back into the mining area water system where it is used or evaporated. In late 2009, the toe trench system was extended to intercept all potentially impacted water that may express from the overburden pile and pump the intercepted water to one of two water management ponds for use or evaporation. Preliminary data suggests that the toe trench extension has further reduced selenium loading to the Blackfoot River Basin. Estimates based on water quality samples from five sumps in the interception trenches at the South Rasmussen Mine from March 3, 2010 through mid-June, 2010 (P4 2010i) are that the toe trench interception system has captured approximately 15 pounds of selenium.

Mining is an important economic resource for the State of Idaho, so it is anticipated that the trend for phosphate mining resource development within the watershed will continue into the future at a similar or accelerated pace due to improvements in mining equipment and ore recovery optimization.

5.3.5 Cumulative Effects

From all identified past, present, and foreseeable future developments within the CEA, mining has the greatest potential to cumulatively impact water resources. However, other activities such as farming, grazing, road construction, and recreational uses also have the potential to cumulatively affect water resources by increasing temperature, nutrients, and sediment loads in surface water features. These effects are expected to be minor and would be most pronounced during rainstorms and spring runoff.

Cumulative impacts to groundwater quality would primarily occur from mobilization of metals during mining at proposed and operating mines, and by leaching of COPCs from overburden at active, historical, and proposed phosphate mine sites. Contamination of shallow and intermediate scale aquifers at Blackfoot Bridge would be localized and of limited extent, and would not cumulatively affect the groundwater quality in the CEA outside of the project boundary. Groundwater quality of the regional Wells Formation may be cumulatively affected by past, present, and future mining activities. The proposed project is located downgradient from the Conda Mine and along the groundwater flowpath toward the Blackfoot River. Contamination from the Conda Mine, when combined with the predicted chemical loading of groundwater from the proposed project, would have the potential to result in cumulative impacts to the Wells Formation. The potential cumulative impacts to groundwater quality in the regional aquifer within the Blackfoot Bridge Project boundary are expected to be moderate and long-term.

Impacts from groundwater withdrawals during mining would be temporary and would only occur during active dewatering for mining below the water table. Pumping for mine dewatering would be limited to less than about 3 months during any given year. Impacts related to groundwater withdrawals in the CEA outside of the project area would be negligible to minor, localized, and short-term.

In the long-term, reduced infiltration may occur as a result of capping overburden piles and backfills. Cumulative impacts to groundwater quantity may also occur from pumping related to irrigation, municipal and domestic water supply, and other industrial activities. Project-related impacts to groundwater quantity in the CEA are expected to be negligible. Cumulative impacts to surface water quality would occur primarily due to contaminated runoff from overburden at the previously permitted mines to nearby surface water features. At these former mines, direct recharge through mine features, such as overburden disposal areas and/or leaching from contaminated shallow/intermediate groundwater flow systems, may infiltrate into the regional Wells Formation flow system. Both local and regional groundwater systems could eventually transport and discharge these contaminants into the Blackfoot River. Contribution from the current and proposed mining activities would be limited to groundwater discharges to the Blackfoot River. BMPs and mitigation measures would limit contaminated runoff discharges into surface water bodies.

As discussed in **Section 5.3.3**, Blackfoot River has been impacted by increased selenium concentration from phosphate mining activities in the watershed. The predicted project-related selenium load to the Blackfoot River would be relatively small compared to the current load in the river during peak flow; therefore, the proposed project would result in a minor impact to the river. However, effects to water quality from the proposed project, when combined with past, present, and other foreseeable developments, are expected to be moderate to major and long-term until

remediation actions at inactive mines reduce selenium load to streams. Increases in sediment loads to streams within CEA due to past, present, and foreseeable developments are expected to be minor, local, and short-term.

Impacts from reduced groundwater flow to the Blackfoot River during mining would be temporary and would occur as a result of dewatering during mining below the regional water table. Long-term increased runoff due to capping of reclaimed areas may result from all mines within the CEA. These impacts would be localized and negligible with respect to the CEA.

5.4 SOILS

5.4.1 CEA Boundary

The CEA for soil resources is the same as for water resources (**Section 5.3**) and encompasses the Upper Blackfoot Watershed Analysis Area (**Figure 5.3-1**). Soil and watershed resources are addressed under the same CEA due to the indirect effect that soil disturbance has on surface and groundwater quality as a result of erosion and sediment transport.

5.4.2 Introduction

Direct impacts to soil resources typically occur as a result of ground-disturbing activity. Activities affecting soils within the CEA could include mining, farming, ranching, livestock grazing, wildfires, fire suppression activities, timber harvest and management, road building, recreation, and development of domestic, commercial, and industrial land parcels. Potential impacts to soil resources include damage or removal of vegetation, topsoil and subsoil, changes in slope and aspect, decreased slope stability, and exposure of soil materials to weathering processes and subsequent erosion. Although soils are capable of regeneration over extended periods of time, cumulative impacts to soils can include the loss of productivity and increased exposure of people and facilities to unstable slopes.

The most extensive impacts to soils in the CEA would likely result from mining, agricultural, and timber harvesting activities. Because the success of mine reclamation largely depends on reuse of stockpiled or live-handled topsoil, and because all mines are required to implement a SWPPP, impacts to soils beyond initial disturbance and relocation (i.e., soil loss through erosion) are minimized. The success of the agricultural industry is also inherently dependant on soil quality, and range management practices are widely implemented during these activities. Forest management activities on the CTNF include timber sales, livestock grazing, and public recreation. Extensive portions of the soil resource CEA are located on lands administered by the CTNF. Activities in these areas are subject to management goals and standards provided in the CTNF Forest Plan (USFS 2003b). Forest management activities (including timber sales, livestock grazing, and public recreation) are not expected to contribute to cumulative effects on soil resources within the CEA.

5.4.3 Past and Present Activities

Past and present disturbances within and near the CEA are similar to those discussed in **Section 5.3.3**. Many former and current human activities within the CEA can increase sediment loads to streams. Livestock grazing has the potential to affect soil resources by decreasing the vegetative

cover, destroying the microbiotic crust, increasing compaction, and increasing the erodibility of soils. Localized damage in areas adjacent to waterways can destroy stream banks and allow sediment to directly enter the water system.

Typical recreation activities in the CEA include hunting, fishing, and other outdoor activities. Generally, these activities have a lesser impact on soils resources than other uses due to their intermittent and seasonal nature. Effects on soils resources due to past and present recreation are limited to compaction from off-road vehicle travel, runoff from dirt roads, and hiking or pack trails.

Mining activities have major impacts on soil resources within in the CEA. Soils are directly impacted by removal and storage during open pit excavations and subsequent replacement during reclamation. Successful reuse of soils is a primary goal of mine reclamation and is a critical component of maintaining soil productivity.

Current soil erosion hazards across the project area are generally low (soil erodibility [K] factor less than 0.25), as are hot-water soluble selenium concentrations (less than 0.01 mg/kg) (Greystone 2006a). Despite generally low local soil erodibility, the Draft 2008 Integrated 303(d)/305(b) Report (IDEQ 2009a) listed approximately 18 miles of water within the CEA (stretches of Coyote Creek, Bear Creek, State Land Creek, upper Mill Canyon, lower Chippy Creek, and Clarks Cut above Sheep Creek) as impaired due to sedimentation/siltation. Excessive sediment levels in the CEA have not been attributed to a specific source and have likely resulted from a combination of activities within the CEA.

5.4.4 Foreseeable Future Activities

Mining could occur on lease areas that have not been developed, which would result in disturbance to soil resources. Soil would be salvaged, stockpiled, and replaced to achieve reclamation of mine areas. Water control systems would be used to control soil loss from disturbance areas.

Future quantities, extents, and types of grazing activities within the CEA are not expected to vary from current activities. Present rates of soil loss in agricultural areas are expected to be maintained in the foreseeable future. Changes to private agricultural lands and disruption of soils are likely, as portions of these lands are converted into low-density residential areas. Near-term development of private agricultural lands within the CEA is expected to be limited because Caribou County has identified infilling of existing city limits and impact areas rather than expansion into rural areas as a growth goal (Caribou County 2006). Timber sales are anticipated to continue similar to current levels, with similar constraints on soil disruption as in recent years (USFS 2003b). No known changes to transportation or recreational uses beyond those identified in the Proposed Action and alternatives have been proposed that would affect soil resources within the CEA.

Although current soil conditions within the project area are resistant to erosion, disruption of vegetative cover and soil aggregates would result in increased soil erosion and transport of sediment by water and wind. Due to low native concentrations of selenium and other COPCs within project area soils (Greystone 2006a), the amount of soil-derived COPCs is not expected to increase significantly. Increases to sediment load in the Blackfoot River and tributaries from future phosphate mining within the CEA, including the Proposed Action and alternatives, would be minimized by implementation of SWPPPs and the Water Management Plan, which is designed to contain all transported sediment within the project area. These plans would be designed to contain sediment

derived from future mining disturbances and minimize sediment loading in area waters. Because soil movement would be controlled by installation of water control ponds, runoff control ditches, and implementation of BMPs, changes to soil erosion and sediment transport as a result of the Proposed Action and alternatives have not been quantified.

5.4.5 Cumulative Activities

Cumulative disturbances of soil resources within the CEA as a result of past, present, and reasonably foreseeable developments, including the Proposed Action and Alternatives 1A and 1B, would primarily be the result of agricultural practices and phosphate mining activities. Additional disturbances of soils as a result of timber sales and residential development would also occur but would be of smaller scale.

5.4.6 Cumulative Effects

Cumulative impacts to soil resources within the CEA as a result of past, present, and reasonably foreseeable developments, including the Proposed Action and Alternatives 1A and 1B, are expected to be minor. Because soils disturbed during the Proposed Action or alternatives and other mining ventures would be collected, protected, and reused during reclamation, long-term cumulative effects to soil resources would be less than cumulative disturbances. Other activities that contribute sediment to watersheds would continue.

Effects resulting from the Proposed Action and the alternatives would be limited to the project area and would generally be short-term. One exception is unreclaimed areas, such as highwalls, which have had soil removed and would continue to be unproductive until soils redevelop through pedogenic processes. Because impacts to water as a result of sediment loading in the CEA have been identified and are anticipated to decrease in the future, and because mining, agriculture, and forest management activities are all vested in maintaining soil productivity, no long-term effects on soil resources are expected in the CEA. Long-term, local effects on soils as a result of residential development within the CEA would be minor.

5.5 VEGETATION, RIPARIAN AREAS, AND WETLANDS

5.5.1 CEA Boundary

The CEA for vegetation, riparian areas, and wetlands is the same as that described for surface water and soils (**Figure 5.3-1**). It is composed of the Upper Blackfoot River Watershed. Much of the land within the CEA is under private ownership, where data on past, present, and particularly future disturbances are not readily available. Other land managers include the State of Idaho, BLM, and USFS, which includes the majority of the land in the CEA.

Vegetation, wetlands, and riparian areas are supported and influenced by surface water and near-surface groundwater. Disturbance to vegetation would also be roughly equivalent to the disturbance of soil in the same area. Vegetation effects from the Proposed Action and alternatives would not be noticeable beyond the natural watershed boundaries that define the CEA.

5.5.2 Introduction

Disturbance of vegetation in the CEA occurs through activities related to mining, agriculture, grazing, vegetation management, wildfires, controlled burns, and off-road vehicle use. The reasonably foreseeable developments in the CEA include the continuation of past and present disturbances. **Table 5.5-1** provides the major vegetation types and the amount of acreage each vegetation type occupies within the CEA. The six major vegetation types (deciduous forest, evergreen forest, mixed forest, scrub/shrub, grassland/herbaceous, and wetland) cover approximately 97 percent of the CEA (USGS 2007b). According to available data, approximately 14,303 acres of past and present land uses and direct disturbances to vegetation have occurred within the CEA (**Table 5.5-2**), which represents approximately 6 percent of the total CEA.

According to National Wetland Inventory (NWI) data, approximately 13,251 acres of emergent and forest/shrub wetlands were present within the CEA as of the early 1980s, when the data were collected (USFWS 2009). Direct impacts to wetlands and riparian areas within the CEA have occurred mainly through agricultural activities. Many activities that have affected vegetation in the past are expected to continue in the reasonably foreseeable future (e.g., agriculture, grazing, recreation, and mining).

Table 5.5-1 Existing Land Cover in Vegetation CEA

Cover Type	Acres
Open Water	18
Developed, Open Space	1,107
Developed, Low Intensity	27
Developed, Medium Intensity	<1
Barren Land	31
Deciduous Forest	13,630
Evergreen Forest	84,375
Mixed Forest	227
Scrub/Shrub	82,445
Grassland/Herbaceous	29,467
Pasture/Hay	386
Cultivated Crops	4,565
Woody Wetlands	2,124
Emergent Herbaceous Wetland	4,985
Total	**223,386**

Source: USGS 2007b.

Table 5.5-2 Acres of Disturbance from Past and Present Activities in Vegetation CEA

Disturbance Type	Acres
Agriculture (Cultivated Crops and Pasture)	4,951
Development (e.g., Roads, Buildings, Railroads)	1,334
Wildfires	730
Phosphate Mining	5,057
Timber Harvest/Prescribed Burns	2,231 *
Total	**14,303**

Note:
* Since 2005
Source: USGS 2007b; Moyle and Kayser 2006; BLM 2008c; USFS 2003b.

5.5.3 Past and Present Activities

5.5.3.1 Vegetation

Table 5.5-2 indicates the acreage of disturbance from various past and present sources in the CEA. The principal past and present anthropogenic disturbances to vegetation within the CEA include phosphate mining, accounting for 42 percent of disturbance; agriculture (cultivated crops and pasture), accounting for 41 percent of disturbance; vegetation management activities, accounting for 16 percent of disturbance; and development (e.g., roads, buildings), accounting for 9 percent of disturbance. Wildfires have been a relatively minor cause of disturbance within the CEA. The Trail Fire burned 730 acres about 4.6 miles to the southeast of the project area in 2003. Dozens more fires have burned hundreds of acres just west of the CEA over the past century (BLM 2008c). Most disturbances have predominately affected evergreen forest and scrub/shrub communities, which are the primary vegetation types in the CEA.

Grazing activities occur throughout much of the CEA, which includes 33,618 acres of BLM grazing allotments (BLM 2008d). Livestock grazing has and would continue to alter vegetation community composition. In addition, grazing activities can result in specific, localized damage in riparian areas from vegetation removal by cattle, as well as increasing the introduction and spread of noxious and non-native vegetation species.

Vegetation growing on reclaimed mine sites in the CEA has been found to contain elevated levels of selenium. The IDEQ sampled terrestrial vegetation at the Conda and Ballard Mines as part of an area-wide risk assessment study. This study found selenium concentrations ranging from 8.9 to 39 mg/kg at the Ballard Mine and from 1.5 to 20 mg/kg at the Conda Mine (IDEQ 2003). In comparison, background selenium concentrations in terrestrial plants have been reported to range from 0.01 to 0.6 mg/kg (Ohlendorf 2003).

5.5.3.2 Wetlands

Past and present ground disturbances in the CEA that could have impacted wetlands are shown in **Table 5.5-3**. The principal past and present impacts to wetlands within the CEA occurred as a result of agricultural land uses. Overall, agriculture has accounted for 75 percent of disturbance to wetlands within the CEA since the early 1980s, when wetlands data were collected. Phosphate mining has accounted for 21 percent of direct wetland disturbance, and roads, buildings, and other facilities have accounted for 4 percent of disturbance to wetlands. The documented past and present direct impacts to wetlands (329 acres) from all of these activities amount to approximately 2 percent of the total wetlands area in the CEA, as determined by NWI data (USFWS 2009). However, programs administered by various regulatory agencies have greatly reduced or eliminated a potential net loss of wetlands through some type of mitigation whether it is fee in-lieu, wetland restoration, or wetland creation.

Table 5.5-3 Existing/Past Disturbance to Mapped NWI Wetlands in Vegetation CEA

Disturbance Type	Acres
Agriculture (Cultivated Crops and Pasture)	247
Development (e.g., Roads, Buildings, Railroads)	12
Phosphate Mining	70
Total	**329**

Sources: USFWS 2009, USGS 2007b, Moyle and Kayser 2006

Indirect impacts to wetlands, such as those resulting from sedimentation and selenium contamination, have likely occurred as well but are more difficult to quantify. Agricultural disturbances may include draining, flooding, leveling, and grazing in wetlands. These impacts are relatively transient and reversible. In contrast, roads, buildings, and mines may have long-term or permanent impacts on wetlands due to long-term changes in topography and hydrology.

5.5.3.3 Noxious Weeds

No quantitative data are available on the acres currently affected by noxious weeds within the CEA or the number of acres that have been treated to combat noxious weeds. Land disturbances totaling approximately 14,303 acres of past and present surface disturbances (e.g., wildfires, roads, mining and exploration activities, and private land development) have potentially introduced and increased the susceptibility for the establishment of noxious weeds in about 6 percent of the CEA. Wildfires in sagebrush often result in the establishment of cheatgrass, which establishes quickly after fire and excludes native perennials (Zouhar 2003).

5.5.3.4 Fire Management

The majority of the vegetation CEA was historically classified as Fire Regime IV, which is characterized by 35 to 100+ year fire frequency and high (stand replacement) severity (greater than 75 percent of the dominant overstory vegetation replaced). Low elevation shrub and perennial grass are cover types commonly associated with Fire Regime IV.

According to the BLM (2008a), many of the cover types near the project area have been subjected to wildland fire that is not within the historical range of variability. Large and/or uncharacteristic fires in these cover types can threaten people and property, as well as the resiliency, integrity, and long-term sustainability of ecosystem components and processes. Fires are occurring more frequently and are burning more severely in some cover types. For example, the invasion of the sagebrush steppe by invasive annual species, such as cheatgrass and medusahead wildrye, has substantially increased fine fuel continuity in this cover type, making it more susceptible to large, frequent, and uncharacteristic fires. In other vegetation cover types, fires are occurring less frequently than they have historically, which causes undesirable changes in vegetation species composition and structure and an accumulation of hazardous fuels. For example, because of long-term fire suppression, juniper species are expanding their range at the expense of sagebrush steppe, and dry conifer cover types are slowly replacing aspen and some mountain shrub cover types (BLM 2008a). Within these vegetation types, prescribed burns have been used as a management tool for fuel management, which reduces the potential for wildfires.

Since approximately 1996, wildland fires have occurred in the region at an overall accelerated rate, mostly due to vegetation changes and changed conditions like cheatgrass invasion into sagebrush steppe cover types. To a lesser extent, the area has experienced decreases in fire frequency and attendant increases in fire severity in its aspen, dry conifer, and mountain shrub cover types. These vegetation cover types require more frequent disturbance to decrease fuel loads, facilitate aspen and forb regeneration, and decrease fire intensity. Altered fire regimes (changes in fire frequency, severity, and size) not only threaten resources, such as wildlife habitat, cultural resources, air/visual quality, and grazing, but also affect public and firefighter safety within and around areas of human development (BLM 2008a).

5.5.4 Foreseeable Future Activities

5.5.4.1 Vegetation

No foreseeable future timber sales or prescribed burns are currently proposed or planned within the vegetation CEA by the State of Idaho, BLM Pocatello Field Office, or CTNF. Wildfire effects in the CEA cannot be reliably evaluated; therefore, results of wildfires are not considered for this analysis. Forest product extraction (including fuel, posts, poles, plant gathering, and Christmas trees) would continue to impact forest resources in the CEA.

Changes to private agricultural lands within the CEA are likely, as some of these lands are converted from traditional agricultural (farming and ranching) to residential and recreational use. Impacts to vegetation resources would include changes in vegetative composition and possibly loss of vegetation in some areas; however, specific plans for such conversions are unknown and cannot be reliably evaluated.

The Caribou-Lower Valley Transmission Line is a proposed 20-mile long segment of high voltage power line that would cross the CEA and affect vegetation within a 100-foot wide right-of-way. Overall, this project would result in disturbance to vegetation on about 150 acres in the CEA.

The reasonably foreseeable developments within the CEA that would affect vegetation include potential phosphate mining in several not-yet-mined federal phosphate leased areas, such as the Fox Ranch, Trail Creek, Schmid Valley, Rasmussen Valley, and Dairy Syncline leases. Exploration on the Dairy Syncline leases totaling 22 acres is planned beginning in 2009, but no specific plans are known for mining in the other available leases within the CEA in the immediate future. Federal phosphate lease boundaries may be used to estimate the maximum amount of potential disturbance from future mining, an area equal to approximately 11,446 acres. As with past and present disturbance, the majority of future disturbance would likely take place within the evergreen forest and scrub/shrub cover types, which comprises the majority of the leased areas.

Selenium-related impacts to vegetation in the CEA would be expected to continue on sites that were mined in the past. New phosphate mines are likely to incorporate BMPs and cover designs that limit potential for selenium uptake by vegetation, unlike past mines that were constructed without regard for potential selenium release (IDEQ 2006b).

5.5.4.2 Wetlands

Some additional wetland impacts, although not specifically described, are likely to occur from road maintenance, livestock grazing, and other activities, such as those conducted on private lands within the CEA. These impacts cannot be quantified due to lack of data. According to the NWI (USFWS 2009), not-yet-mined federal phosphate leases within the CEA overlap about 363 acres of mapped wetlands. Therefore, there is the possibility that future mining in these leases would directly impact wetlands, though mitigation measures would likely be implemented to compensate for these impacts. Future indirect impacts to wetlands from sedimentation and selenium contamination are also possible, though BMPs would likely minimize these impacts as well.

5.5.4.3 Noxious Weeds

The BLM Upper Snake and Pocatello Field Offices have recently completed the planning process for implementing an integrated weed control program (BLM 2009a). This would give the BLM more tools to control noxious weed infestations on BLM-administered public land in the vicinity of the project area and within the vegetation and wetlands CEA. Under the weed control program, the BLM would treat approximately 2,000 acres per year for weeds across the lands administered by the Upper Snake Field Office and Pocatello Field Office. Of these acres, approximately 500 acres per year would be treated using manual or mechanical methods, approximately 1,600 acres per year would be treated using herbicides, and approximately 400 acres per year would be treated using biocontrol methods (BLM 2009a). Specific locations for these treatments have yet to be identified.

5.5.4.4 Fire Management

Alteration of vegetation through fire suppression and spread of invasive species would continue to alter fire regimes in the CEA in the foreseeable future. The BLM Idaho Falls and Twin Falls Districts have released a fire and fuels plan (BLM 2008a). This plan incorporates the National Fire Plan direction into existing Land Use Plans by emphasizing the increased use of fire including prescribed burns and wildfires. This would approximate the historical role of fire and prepare sites for restoration treatments.

5.5.5 Cumulative Activities

5.5.5.1 Vegetation

The potential new disturbance to vegetation from the Proposed Action (739 acres) or Alternatives 1A and 1B (774 acres), added to known past, present, and reasonably foreseeable future disturbances, results in approximately 7 percent of the CEA being disturbed (15,214 or 15, 249 acres out of 233,386 respectively). The majority of this is disturbance due to phosphate mining (5,818 or 5,853 acres including the Proposed Action and alternatives respectively). Natural revegetation and reclamation reestablish vegetation relatively quickly to most of these disturbed areas, although the vegetation composition and community type is changed and modified from its pre-disturbance state. Long-term disturbance resulting from the Proposed Action or alternatives would total 99 acres, or 0.04 percent of the CEA.

Plant growth could extend to depths where seleniferous materials would be placed as pit backfill and external overburden piles; however, roots would need to extend to at least 4 feet to contact core seleniferous materials. With the exception of alfalfa, which represents about 2 percent of the Proposed Action seed mix, the species included in the seed mix are shallow rooting and would not extend to these depths. As native plants (shrubs and trees) invaded reclaimed areas, it is expected that more root systems could potentially extend into seleniferous materials, and to the extent that selenium is available to these roots, uptake of selenium could occur.

According to Gough et al. (1979), "Excess soil selenium may prevent plants not in [selenium-tolerant] groups from growing on seleniferous soils by causing toxicity symptoms to develop." These toxicity symptoms include stunting of growth and chlorosis (reduction in chlorophyll production), though it is unknown at what selenium threshold these symptoms are likely to occur (Gough et al. 1979). At a minimum, selenium content of growth medium and selenium

concentrations in vegetation on new reclaimed areas in the CEA may increase under the Proposed Action or alternatives, and cumulative effects may occur to vegetation in the CEA from this potential impact.

This impact would be minimized under Alternatives 1A and 1B because the seed mix to be used in reclamation would be adjusted to account for any potential impacts from plant rooting in areas where the GCLL would be used. Plant rooting depths would be controlled by selection of the types of species proposed to be used for reclamation seed mix. Species in the seed mix would be selected based on their shallow rooting depths in order to minimize potential penetration of the liner by roots. Finally, the unique nature of the GCLL is the ability to "self-repair" holes of up to 3 inches in diameter in the event of root penetration (O'Kane 2009a).

5.5.5.2 Wetlands

In addition to past and present impacts, implementation of the Proposed Action or the alternatives would result in a maximum direct disturbance of approximately 6.11 acres of wetlands (in addition to 3.23 acres of non-wetland waters of the U.S.), which would be mitigated by creating or enhancing wetlands elsewhere. This proposed wetland disturbance would be approximately 0.05 percent of the total wetlands in the CEA. In total, past, present, and reasonably foreseeable future disturbance would have a cumulative impact to approximately 335 acres of wetlands in the CEA (not including phosphate leases for which there are no current plans for mining). This represents approximately 3 percent of the estimated wetlands in the CEA. The Proposed Action or alternatives would also result in indirect impacts to wetlands including reduction in groundwater discharge to Wetland A and potential release of selenium to the Fish Pond drainage and Wetland X. These indirect effects would cumulatively contribute to wetland degradation in the CEA.

5.5.5.3 Noxious Weeds

Adding the proposed disturbance to vegetation within the CEA from implementing the Proposed Action (739 acres) Alternatives 1A and 1B (767 acres) would increase the cumulative effect of disturbed acres susceptible to noxious weed invasion by about 5 percent; however, improved weed prevention measures, control/treatment requirements, and the implementation of the BLM Upper Snake-Pocatello Integrated Weed Control Program (BLM 2009a) would limit the contribution of noxious weeds by the Proposed Action and alternatives to the overall cumulative effect within the CEA.

5.5.5.4 Fire Management

The Proposed Action would result in the conversion of 267 acres of forested land (historical Fire Regime III) to grassland (historical Fire Regime IV), representing a change in fire regime in 0.1 percent of the CEA. Alternatives 1A or 1B would convert 282 acres of forested land to grassland, roughly the same proportion of the CEA. The disturbed land could also cumulatively add to the amount of land deviating from natural fire regimes if natural characteristics were altered by noxious weed invasions, fire suppression, or grazing management practices.

5.5.6 Cumulative Effects

5.5.6.1 Vegetation

Adding the Proposed Action or alternatives disturbances to past, present, and foreseeable future vegetation disturbances, cumulative effects to vegetation in the CEA from direct disturbance would be short-term due to the temporary nature of many of the disturbances. Generally, mining would replace existing vegetation with grassland, which would then be subject to the process of succession.

Cumulative effects of selenium accumulation in the vegetation growing on the reclaimed site would be long-term until selenium mobility and availability within the reclaimed landscape stabilized. Mining activities constitute a relatively small area within the CEA, and future mines would likely incorporate BMPs and closure practices that minimize this potential effect.

5.5.6.2 Wetlands

Although approximately 3 percent of wetlands in the CEA either have been or could be directly disturbed, compensatory mitigation by the USACE is required for most projects that impact wetlands under their jurisdiction. The single largest past impact to wetlands in the CEA is from agriculture, which normally is not subject to USACE regulation. However, programs administered by USDA NRCS to address agricultural impacts to wetlands in agreement with state and USACE regulations could greatly reduce or eliminate a potential net loss of wetlands in general.

5.5.6.3 Noxious Weeds

Disturbed lands would be more susceptible to weed infestations; however, control measures would be implemented either by private landowners or county, state, and federal weed control efforts.

5.5.6.4 Fire Management

Because of the small area involved, the long-term cumulative effects of the altered fire regimes under the Proposed Action or alternatives would be negligible.

5.6 TERRESTRIAL WILDLIFE

5.6.1 CEA Boundary

The CEA for wildlife species (**Figure 5.6-1**) generally includes suitable habitat for a given species within a 15-mile radius surrounding the project area. The wildlife CEA encompasses approximately 523,000 acres and approximately 53 percent (277,593 acres) is private land. Public lands in the CEA include those administered by the USFS (115,425 acres), State of Idaho (70,140 acres), and the BLM (51,773 acres). There is no Wild and Scenic Rivers, wilderness, or other ecologically critical areas within the CEA.

Most impacts to wildlife would occur within or immediately adjacent to the project area and would affect individuals with home ranges overlapping or immediately adjacent to the project area. An area with a 15-mile radius is large enough to encompass the home ranges of the most mobile wildlife individuals in the project area, such as large predatory mammals. It is unknown to what extent wildlife individuals would be displaced and what the impacts of displacement on resident populations would be; however, given the scale of the Proposed Action or alternatives, it is unlikely

that any short- or long-term adverse impacts to wildlife species would occur beyond the identified CEA.

5.6.2 Introduction

According to the USGS (USGS 2007b), scrub/shrub (e.g., sagebrush), evergreen forest, and grassland/herbaceous are the dominant vegetation types within the CEA (**Table 5.6-1**). Riparian areas and other vegetation communities also occur throughout the CEA in lesser amounts. This diversity in habitat types allows many wildlife species to utilize the area.

Past, present, and reasonably foreseeable actions in the wildlife CEA have likely resulted in both beneficial and negative impacts at various levels on wildlife. The foremost impact to wildlife within the CEA has been habitat changes associated with past and present agriculture, wildfires, construction of roads and buildings, mining activities, and vegetation management activities. These changes measure approximately 98,162 acres or 19 percent of the CEA. In addition, range allotments, which affect vegetation through grazing, occur on 152,648 acres (29 percent) of the CEA. Other impacts that are not quantified include effect of noise on wildlife, displacement from mining, roads, and recreational activities. Negative impacts include loss of habitat; displacement; and fragmentation as a result of fires, mining, timber harvesting, roads, private land development, agriculture, and recreation. Specific to small and less mobile wildlife species (e.g., small mammals, amphibians, reptiles), past impacts from direct mortality (trampling) by livestock, large wild ungulates, and vehicles has likely also occurred within the CEA but is not quantifiable. In addition, grazing can contribute to impacts by increasing competition for forage and changes in the structure or composition of native plant communities.

Table 5.6-1 Existing Land Cover in Wildlife CEA

Cover Type	Acres
Open Water	12,229
Developed, Open Space	6,691
Developed, Low Intensity	1,515
Developed, Medium Intensity	653
Developed, High Intensity	81
Barren Land	483
Deciduous Forest	23,365
Evergreen Forest	100,861
Mixed Forest	1,135
Scrub/Shrub	204,223
Grassland/Herbaceous	79,246
Pasture/Hay	2,087
Cultivated Crops	68,195
Woody Wetlands	2,588
Emergent Herbaceous Wetland	19,691
Total	**523,043**

Source: USGS 2007b.

5.6.3 Past and Present Activities

Within the CEA, major past and present anthropogenic disturbances (**Table 5.6-2**) have resulted from grazing (152,648 acres, not shown in table), agriculture (70,282 acres), mining (7,697 acres),

roads and buildings (8,940 acres), vegetation management (2,231 acres since 2005), and recreation. Wildfires have also been an important cause of disturbance, having burned 9,012 acres in the CEA between 1937 and 2007.

Past and present timber harvests in the CEA have resulted in habitat changes that affect wildlife. The majority of habitat conversion is in the form of forest removal followed by reforestation with a short period of early seral (non-climax grass or shrub) conditions. This habitat conversion would cause forest-dependent wildlife using the affected areas to disperse in search of new areas. In contrast, most wildfires have affected the scrub/shrub (largely sagebrush) vegetation type. Wildfires in sagebrush may result in the establishment of cheatgrass, which establishes quickly after fire and excludes native perennials, reducing habitat for sagebrush-dependent species (Zouhar 2003).

Table 5.6-2 Past and Present Disturbances in the Wildlife CEA

Disturbance Type	Acres
Agriculture (Cultivated Crops and Pasture)	70,282
Wildfires	9,012
Development (e.g., Roads, Buildings, Railroads)	8,940
Phosphate Mining	7,697
Timber Harvest/Prescribed Burns	2,231*
Total	**98,162**

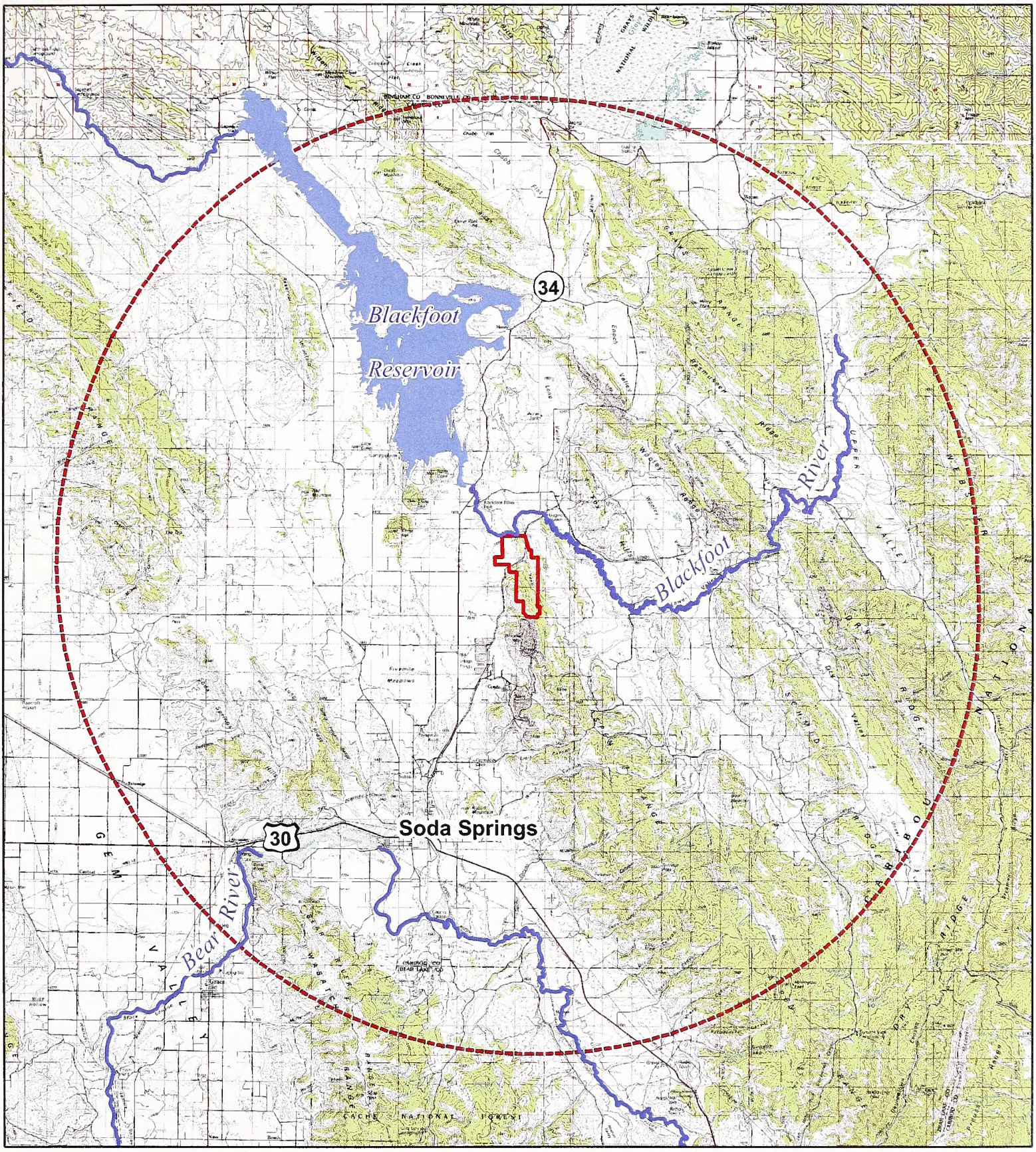
Note:
* Since 2005
Source: USGS 2007b; Moyle and Kayser 2006; BLM 2008c; USFS 2003b.

In general, wildlife are affected by livestock grazing due to competition for forage, direct mortality by trampling (e.g., amphibians and ground-nesting birds), and habitat removal and conversion. Both domestic livestock and wild ungulate grazing may change the structure or composition of native plant communities. Proper rotation and stocking rates can minimize these negative effects.

Human presence tends to disturb many species of wildlife. Past and present recreational uses in the area include hunting, fishing, ATV and snowmobile use, camping, and picnicking. Human disturbance during periods of the year when wildlife are otherwise stressed, due to a lack of forage and/or harsh weather (as occurs during the winter season), can further stress wildlife and may increase mortality.

Past and present disturbances from roads and mining activities have resulted in fragmentation of certain wildlife populations and their habitats. Fragmentation effects within the CEA have not been quantified by the land management agencies.

Other nearby phosphate mines have increased concentrations of selenium and other metals in water, aquatic plants, aquatic invertebrates, and fish near the project area (Hamilton and Buhl 2003). Increasing concentrations of selenium in surface water and groundwater seeps and springs may lead to reduced reproductive success in certain terrestrial wildlife of the region. The toxicity effects could, in turn, cause changes in food web structure and ecosystem functioning and decreased monetary revenues from big game and waterfowl hunting.



Source: Soda Springs & Palisades 1:100k USGS Quadrangles.

LEGEND

Project Boundary

Cumulative Effects Area Boundary
(Radius = 15 miles)

NORTH

1 0 1 2 3

Miles

BLACKFOOT BRIDGE PROJECT EIS

FIGURE 5.6-1
Wildlife and Special Status Species
Cumulative Effects Area

ANALYSIS AREA: Caribou County, Idaho	
Date: 6/4/2009	File: 1924\Cumulative_Impacts_Wildlife_CEA.mxd
Prepared By: JG	

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5.6.3.1 Big Game

Big game have potentially been affected by all of the past and present disturbances described above including habitat changes caused by agriculture, mining, development, vegetation management, and wildfires. According to the IDFG, there are about 29,151 acres of big game winter range within the wildlife CEA. Winter range represents areas that contribute to the long-term viability of elk and deer populations. Human disturbance during periods of the year when big game are otherwise stressed by a lack of forage or harsh weather has potentially led to increased stress and mortality on winter range in the CEA. On the range allotments within the CEA, big game has had to compete with livestock for forage. They have also been subject to direct disturbance from anthropogenic noise and activity and direct mortality from hunting and vehicle collisions.

Big game foraging on reclaimed mine overburden piles in the wildlife CEA have been exposed to elevated levels of selenium. One past study found selenium levels as high as 13.06 mg/kg in elk liver and 0.92 mg/kg in elk muscle tissue. The level found in elk liver was high enough for the Idaho Bureau of Community and Environmental Health to advise people to avoid eating elk liver in large quantities (BCEH 2006b). The controlling issue for Idaho Bureau of Community and Environmental Health advisory was copper content and not selenium. Although some samples yielded elevated selenium, it was secondary to copper. Relative to selenium, the advisory was only informational. Typically, these sorts of hunting advisories are issued annually. The selenium information advisory has not been issued for the past two hunting seasons. In grazing animals, chronic selenium poisoning is characterized by skin lesions involving alopecia (hair loss), hoof necrosis, and emaciation. An effort in 2000 to look for hoof deformities in a sample of 50 elk in southeastern Idaho turned up a single elk with abnormal hooves, but it is not known whether this elk's deformities were caused by selenium toxicity (Wright et al. 2002).

5.6.3.2 Bats

Potentially habitat for six species of bats could be affected as the result of the Proposed Action or alternatives in the wildlife CEA (these species are listed in **Section 3.6.1.2**). Bats have potentially been affected by all of the past and present disturbances described above, including habitat changes caused by agriculture, mining, development, vegetation management, and wildfires. Many bats forage on adult stages of aquatic insects, which have been found to contain elevated levels of selenium at some locations within the wildlife CEA (Hamilton and Buhl 2003). Selenium exposure has not been specifically evaluated for bats in the CEA.

5.6.3.3 Other Mammals

Other mammals in the wildlife CEA include small herbivores, such as rabbits; omnivores, such as rodents; and medium- to large-sized carnivores. All species have been subject to the disturbances described above. Smaller species, such as rodents, have likely been more susceptible to direct mortality due to crushing (e.g., by construction equipment during road building or by livestock grazing), whereas large carnivores have been more likely to be disturbed by noise and human presence.

5.6.3.4 Raptors

Suitable habitat for nesting and foraging raptors occurs throughout the wildlife CEA. In general, raptors are sensitive to human disturbance during the nesting season. Noise and activity from

vehicles, recreation, construction, mining, and vegetation management has likely resulted in disturbance to breeding raptors in the past, but this is not quantifiable. Timber removal has likely resulted in the loss of habitat for some species but increased foraging habitat for others that hunt prey in early successional habitats.

5.6.3.5 Bald Eagles

According to the Idaho Cooperative Fish and Wildlife Research Unit Gap Analysis Project, there are about 36,935 acres of potential bald eagle habitat in the wildlife CEA (Landscape Dynamics Lab 2001). Monitoring indicates that bald eagles have exceeded USFWS recovery goals in Idaho and are continuing to increase, though the nest failure rate has also increased in recent years (IDFG 2006a). The cause of the increased nest failure rate is unknown, though human disturbance, environmental contamination from heavy metals, and intraspecific competition for food or nesting habitat are listed as possibilities (IDFG 2006a). Past and present mining and other activities may have resulted in temporary displacement of bald eagles within the CEA at various times as a result of noise and disturbances. Timber removal may have resulted in the loss of large nesting trees. Degradation of rivers and streams through sedimentation (e.g., through road-building) and contamination (e.g., from mining and agricultural practices) may have affected eagle populations by affecting prey populations.

5.6.3.6 Migratory Birds

Habitat for migratory birds occurs throughout the wildlife CEA and includes every listed cover type, except perhaps the most heavily developed areas. Migratory birds have potentially been affected by all of the past and present disturbances described above including habitat changes caused by agriculture, mining, development, vegetation management, and wildfires.

Two studies completed outside the CEA in other areas of the southeastern Idaho phosphate region suggest that increased selenium from mining has not affected bird populations or reproductive success at the population level (Ratti et al .2006, Skorupa et al. 2002). In 1999 and 2000, Ratti et al. (2006) tested selenium levels in 544 bird eggs from mine and reference sites in southeastern Idaho, and in 2001 the authors monitored the nest success of 623 American robin (*Turdus migratorius*) and red-winged blackbird (*Agelaius phoenicus*) nests at these sites. The authors concluded, "on a population level, American robin and red-winged blackbird reproductive success in southeastern Idaho was not impaired by existing levels of Se in avian eggs. Based on our multi-species data . . . and more-specific data on American robins and red-winged blackbirds, we conclude that there are no negative effects on reproductive success of the general avian community at this time." The authors also acknowledge that negative effects may be occurring in some bird species immediately adjacent to mine sites, where high selenium concentrations (>10 µg/g) were observed in eggs (Ratti et al. 2006).

Another study by Skorupa et al. (2002) revealed higher than normal selenium concentrations (> 3 µg/g) in bird eggs at all six southeastern Idaho mine sites where sampling took place. The authors assessed 39 bird embryos from the 74 eggs that were collected in the study and found two embryos with abnormalities that were possibly, though not definitively, linked to selenium poisoning. The authors also performed a risk assessment for the sampled eggs and calculated an 8 percent risk of deformities, which equates to a predicted 40 to 50 percent rate of total embryo loss for the sampling region (Skorupa et al. 2002). The overall risk at the population level depends not only on the level of

selenium contamination, but also on the attractiveness of the site to breeding birds. Therefore, the authors concluded that "high potential for risk did not seem to be realized on a large scale due to the relative scarcity of breeding water birds at most sites surveyed" (Skorupa et al. 2002). However, the authors caution that there could be many sites in the phosphoria region that have not been assessed for breeding bird use, and that further sampling may reveal higher levels of risk (Skorupa et al. 2002).

5.6.3.7 Upland Game Birds

There are several species of upland game birds potentially found in the wildlife CEA including blue grouse, ruffed grouse, greater sage grouse, and sharp-tailed grouse. The blue grouse is a Type 5 BLM special status species, the sharp-tailed grouse is a Type 3 BLM special status species, and the greater sage grouse is a Type 2 BLM special status species. Known sage grouse and sharp-tailed grouse leks near the project area are presented in **Table 3.6-2**. About 56,282 acres within the wildlife CEA are considered key sage grouse habitat, defined as "Areas of generally intact sagebrush steppe habitat that provide sage grouse habitat during some portion of the year (summer-use, late brood-rearing, fall, transition sites from winter to spring, spring to summer, and summer/fall to winter)" (BLM 2008e).

All species have been subject to the past and present disturbances described above including mining, recreation, road and building construction, vegetation management, and wildfires. Forest-dwelling species (e.g., ruffed grouse, blue grouse) have been affected by timber removal. Sage grouse and sharp-tailed grouse have been impacted by loss of sagebrush habitat and grazing management practices. All species have potentially been affected by selenium exposure on reclaimed mine sites, but this impact has not been quantified for upland game birds in the CEA.

5.6.3.8 Water Birds

According to the USGS (USGS 2007b), there are about 12,229 acres of open water habitats in the CEA. These open water habitats may be used by a wide variety of water birds for foraging, brood-rearing, and resting.

Past and present disturbances to water birds in the CEA include impacts from noise related to construction, mining, and recreation; hunting; and degradation of water quality from sedimentation and contamination. Aquatic insects, plants, and fish, on which water birds feed, have been shown to carry elevated selenium levels at multiple sites within the CEA (Hamilton and Buhl 2003). Ratti et al. (2006) analyzed eggs collected from various mine and reference sites in the Southeast Idaho Phosphate District and for six water bird species (eared grebe, western grebe, cinnamon teal, Canada goose, mallard, and American coot) found higher selenium concentrations in eggs from mine sites. For some species (eared grebe, cinnamon teal, and American coot), egg concentrations exceeded 10 mg/kg dry weight. Ratti et al. (2006) did not find any indications of abnormal development such as embryo deformities.

The Skorupa et al. (2002) study, described above, found selenium levels as high as 80 µg/g in American coot eggs. However, the authors felt that, provisionally, the high levels of selenium observed did not translate into a high population-level risk to the region's water birds due to the scarcity of suitable breeding habitat in the region (Skorupa et al. 2002).

5.6.3.9 Amphibians and Reptiles

Many species of amphibians and reptiles are potentially found within the wildlife CEA. As a whole, they use every habitat type, from wetland to dry sagebrush to forest. Amphibians and reptiles are small and fairly immobile, so they likely have been more affected by habitat fragmentation and direct mortality than have other species in the wildlife CEA. Habitat fragmentation and mortality have occurred as a result of road-building and other construction projects, grazing, mining, vegetation management, conversion of land to agriculture, and wildfire.

Amphibians and reptiles residing in wet areas (such as garter snakes) are vulnerable to degradation of water quality and aquatic prey; these species have likely been affected by activities in the CEA causing sedimentation or contamination of streams and wetlands. Effects to amphibians and reptiles from elevated selenium concentrations have not been evaluated within the CEA, but studies have found elevated selenium levels in water, sediment, aquatic plants, and aquatic insects downstream of reclaimed phosphate mines (Hamilton and Buhl 2003). Also, selenium poisoning has been confirmed in many salamanders at the Gay Mine and the Smoky Canyon Mine, both of which are just outside the CEA boundary. Concentrations in some individuals were 10 to 100 times the normal level in animal tissue (BLM 2003). It seems likely, therefore, that amphibians and semi-aquatic reptiles have been affected by elevated selenium levels within the CEA.

5.6.4 Foreseeable Future Activities

In addition to the reasonably foreseeable actions described in **Section 5.5** within the applicable CEA, **Table 5.6-3** lists proposed activities that could impact wildlife habitat throughout the wildlife CEA. Fifty-three percent (277,593 acres) of the wildlife CEA occurs on private lands. Past and present actions on private land within the CEA have mainly included agriculture and grazing activities. Housing development has also occurred on the large ranches within the CEA. Specific land impacts on private lands in the CEA are difficult to quantify due to lack of specific data. Disturbance of wildlife habitat caused by these private land impacts is also not quantified with existing data, but would be an area smaller than the private land ownership area.

In addition to the projects listed in **Table 5.6-3**, there are approximately 13,089 acres of not-yet-mined federal phosphate leases in the wildlife CEA. Agrium is currently applying for development and reclamation of about 458 acres on the Rasmussen Valley Mine. This does not yet appear on the CTNF Schedule of Proposed Action (USFS 2010). While no other specific plans are known for mining in these leases in the immediate future, the lease boundaries may be used as an estimate of the maximum amount of potential disturbance from future mining.

Table 5.6-3 Proposed Activities in the Wildlife CEA

Project Name	Project Type	Expected Implementation	Acres
Caribou - Lower Valley Transmission Line	Transmission Line Construction	2013	242
Dairy Syncline Phosphate Mine	Phosphate Mine Development	2014	1,389
Husky 1 and North Dry Ridge Phosphate Exploration Project	Phosphate Exploration Drilling	In Progress	46
		Total	**1,677**

Source: USFS 2010

For most groups of species, disturbances described above under "Past and Present Disturbances" are expected to continue in the reasonably foreseeable future. Habitat fragmentation and alteration resulting from construction projects, grazing, mining, vegetation management, conversion of land to agriculture, wildfires, controlled burns, and noxious weed invasions would continue. Individuals of small, less mobile species would continue to be vulnerable to direct mortality from crushing by vehicles, construction equipment, and livestock. Wintering big game may be subject to increased harassment by recreationists, particularly if available hiding and escape cover is reduced by other activities. Recreation use in the area can be expected to reflect local changes in population and interest in outdoor activities.

All species are potentially vulnerable to the toxic effects of selenium accumulation. Selenium contamination is expected to continue below operating and reclaimed phosphate mines in the foreseeable future. New phosphate mines are likely to incorporate BMPs that limit the potential for selenium contamination of the environment, unlike past mines that were constructed without regard for selenium contamination (IDEQ 2006b).

5.6.5 Cumulative Activities

The reasonably foreseeable disturbances listed in **Table 5.6-3** (579 acres), when added to the past and present disturbance, would increase the disturbance of lands in the CEA to about 18.9 percent. The potential new disturbance of the Proposed Action (739 acres) or Alternatives 1A and 1B (774 acres) is added to that total, the overall percent of disturbance increases to 19.0 percent of lands in the CEA.

In general, wildlife dispersal from habitat disturbance decreases survival rates of affected individuals to some degree and increases competition. The effects to specific species from disturbance related to the Proposed Action and alternatives are described in detail in **Section 4.6**. P4 would mitigate impacts to wildlife values from the project by placing a legal restriction such as a restrictive covenant or conservation easement on 120 acres of its undeveloped private property in the vicinity of Soda Hills near Soda Springs or other similar undeveloped, natural property in the general area of the mine and Soda Springs. P4's Soda Hills property is located in what BLM and IDFG have identified as mule deer winter range. The covenant would limit the use of the land and require that it be maintained in its current natural state. P4 would fund a management reserve with a third party, if necessary, to monitor compliance and take actions necessary to ensure that compliance.

Mine construction and operation could temporarily limit the attractiveness of the CEA to wildlife, such as big game, carnivores, and raptors, which generally prefer areas free from anthropogenic noise and activity. Bald eagles usually modify their activities and movements to avoid human disturbance, but implementation of the Eagle Management Plan (P4 2009b) would minimize disturbance to the eagles nesting in the project area. In addition, P4 has submitted an incidental take permit application to the USFWS and would comply with any conditions or mitigation measures required by that permit. Some species, such as elk, could take advantage of new foraging areas after reclamation was completed.

Implementing the Proposed Action or alternatives would result in the displacement of wildlife and some forms of recreation (e.g., hiking, hunting, ATV use) from the project area and the surrounding habitat into adjacent undisturbed areas. Displacement of some forms of recreation has the potential

to result in a minor cumulative impact to wildlife for the duration of the Proposed Action or alternatives as a result of adding the impacts from the Proposed Action or alternatives to the past and present impacts from recreation on wildlife in the CEA.

Implementing the Proposed Action or alternatives would result in additional fragmentation to wildlife habitat and could isolate populations of small, immobile wildlife such as amphibians and reptiles. Thus, a minor cumulative effect to wildlife from fragmentation impacts would potentially occur for the duration of the Proposed Action or alternatives.

In terms of mining activities exposing wildlife species in the area to potentially toxic levels of selenium, the Proposed Action or alternatives would not incorporate harmful amounts of selenium or trace metals in the growth medium/soil of reclaimed areas due to the incorporation of BMPs into the mine and reclamation plan. As discussed in **Section 4.6**, however, plant roots and burrowing animals may still be able to reach seleniferous materials and introduce elevated levels of selenium into the food chain. The Proposed Action is likely to result in selenium concentrations in Fish Pond exceeding the cold water aquatic life CCC standard of 0.005 mg/L, which could pose a risk to wildlife residing in or drinking the water. Therefore, although BMPs would limit the potential for selenium exposure relative to some past mining operations, minor, long-term cumulative impacts to wildlife may still occur as a result of the Proposed Action. Alternatives 1A and 1B reduce the potential impacts to Fish Pond, and selenium and other COPC concentrations in Fish Pond are expected to stay below surface water standards. Therefore, long-term cumulative impacts to wildlife are minimized as a result of the Alternatives 1A or 1B.

5.6.6 Cumulative Effects

Adding the Proposed Action or alternatives disturbances to past, present, and foreseeable future disturbances would result in temporary and long-term, minor cumulative effects to wildlife. The disturbances would affect small areas compared with species' ranges and the overall extent of habitat available in the CEA.

5.7 FISHERIES AND AQUATIC RESOURCES

5.7.1 CEA Boundary

The CEA for fisheries and aquatic resources includes the Upper Blackfoot River Watershed above the Blackfoot Reservoir. It is the same CEA that is described for surface water, soils, and vegetation (**Figure 5.3-1**).

The most mobile aquatic species in the CEA are large fish, such as cutthroat trout. The reservoir population of cutthroat trout uses the upper Blackfoot River system for spawning. Activities throughout the upper Blackfoot River drainage would therefore potentially impact aquatic species downstream of the project area. Aquatic resources should not be affected by the Proposed Action or alternatives beyond this area, even over the long term.

5.7.2 Introduction

Fisheries and aquatic resources are affected by surface water quality which is discussed above in **Section 5.3**. Activities or phenomena affecting water resources within the CEA, and consequently

fisheries and aquatic habitat include mining; farming; ranching; livestock grazing; wildfires; fire suppression activities; road building; and development of domestic, commercial, and industrial land parcels. These activities, particularly mining, can increase the mobilization of selenium, other COPCs and sediments. Many of these activities also affect the volume and timing of surface runoff, directly altering aquatic habitat. Cumulative effects to fisheries and aquatic resources may include changes in concentrations of selenium and other COPCs, and changes in sediment load in waterways.

5.7.3 Past and Present Activities

Past activities within the CEA that have impacted fisheries and aquatic resources include livestock grazing, agriculture, vegetation management, road construction, and phosphate mining. Acres of disturbance in the CEA associated with most of these activities are shown in **Table 5.5-2**. In addition, predation by growing numbers of American white pelicans has also impacted fish populations within the CEA in recent years (Sallabanks 2008).

The IDEQ assessed approximately 85 miles of the Blackfoot River and its tributaries between 1997 and 2000. The agency determined that, along portions of the river, the Blackfoot River's beneficial uses (coldwater aquatic life, salmonid spawning, recreation, domestic water supply, agricultural water supply, industrial water supply, wildlife habitat, and aesthetics) are impaired by sediment, nutrients, organics, and unknown pollutants (IDEQ 2006b).

Sedimentation can reduce the foraging and reproductive success of aquatic organisms, disrupt fish migration, and impair the respiratory systems and gills of invertebrates and fish. Species composition and numbers of invertebrates can be altered by increased sedimentation and resultant habitat changes (Waters 1995). In the CEA, possible causes of sedimentation have included agriculture, grazing, and road construction.

Approximately 93 percent of the BLM Pocatello Field Office planning area is open to grazing by either cattle or sheep (BLM 2006a). Grazing allotments occur on approximately 33,618 acres in the CEA (BLM 2008d). Livestock grazing in riparian areas can increase sediment load to watersheds through increased instream trampling, increased disturbance and erosion from overgrazed streambanks, reduced sediment trapping by riparian and instream vegetation, decreased bank stability, and increased peak flows from compaction (Waters 1995).

Road construction has also impacted streams and wetlands in the CEA. Roads can disrupt the natural hydrology of watersheds by concentrating runoff, which is then directed to streams at higher flow rates, leading to widening or deepening of channels. Such changes in flow rate and stream morphology can negatively impact some species and benefit others, leading to shifts in community composition. Second, roads can lead to sedimentation of water bodies by contributing to erosion. Third, unless culverts are properly placed and maintained, roads can create barriers to stream flow and alter stream hydrology, isolating populations of aquatic organisms (Gucinski et al. 2001).

Agricultural practices, such as over-application of fertilizer and manure, can also affect streams and wetlands through phosphorous pollution. Runoff containing high concentrations of phosphorous can enter streams, leading to the increased growth of algae and aquatic weeds and subsequent oxygen shortages. Die-offs of fish and aquatic invertebrates may occur as a result (Sharpley et al. 2003).

Other nearby phosphate mines have caused increases in selenium and other metal concentrations in groundwater and surface water in the area watersheds including the Blackfoot River. In general, reproductive effects may be observed in fish if selenium concentrations in fish eggs exceed the recommended toxicity threshold of 10 mg selenium/kg egg tissue (Lemly 1997). The Lemly (1997) threshold was developed using data for bass, sunfish, and minnows, though it can be applied to all species.

Hamilton and Buhl (2003) extrapolated fish egg selenium concentrations from fish whole-body selenium concentrations and found values exceeding 10 mg/kg at several sites in and around the CEA. In State Land Creek, fish egg concentrations were determined to be as high as 50.2 mg/kg, extrapolated from a mean whole-body concentration of 15.2 mg/kg dry weight. However, no studies have reported reproductive impacts to fish from selenium exposure in the Blackfoot River.

Rudolph et al. (2008) studied cutthroat trout and determined the no-effect threshold selenium concentration in eggs to be >20.6 mg/kg dry weight. This threshold has likely been exceeded in the CEA, based on the relationship that they observed between fish muscle tissue concentration and fish egg concentration. If the Rudolph et al. (2008) relationship between percent fry mortality and egg selenium concentration holds true for the Blackfoot River, then fry mortality in the river is approximately 19.6 percent (based on an average fish tissue selenium concentration of 16 mg/kg).

NewFields (2009b) investigated selenium toxicity in wild brown trout (*Salmo trutta*) collected from waters downstream of the Smoky Canyon phosphate mine. The results of this study confirm the results of the Rudolph et al. (2008) study. There were positive correlations observed between egg selenium concentration and mortality, and between egg selenium concentration and incidence of deformities. The NewFields (2009b) study also provides further evidence that selenium-related mortalities and deformities are likely already occurring in the CEA.

Van Kirk and Hill (2007) modeled population-level responses of Yellowstone cutthroat trout to selenium toxicity. The authors' model predicted a rapid decline in the trout population at elevated selenium levels, with a 90 percent decrease from carrying capacity at a whole-body selenium concentration of about 17 µg/g. After the rapid initial decline, the model predicted that the population would stabilize at a much reduced number of individuals (Van Kirk and Hill 2007). The results of this study suggest that past and present activities in the CEA may have reduced fish populations below carrying capacity. Hardy (2009) observes that no effects of dietary selenium were observed in terms of toxicity to growing fish and reproductive impairment at the levels of dietary selenium used in the study. Natural history factors, such as migration, immigration or emigration of fish, competition between fish species, and food sources, are also important when determining whether patterns observed in fish populations are selenium related (Canton and Baker 2008).

5.7.4 Foreseeable Future Activities

The practices that have affected aquatic resources in the CEA in the past would be expected to continue into the foreseeable future. Reasonably foreseeable actions, including maximum acres of potential future phosphate mines in the CEA, are described in **Section 5.5**. Enforcement of water quality standards and the incorporation of BMPs into future projects would be expected to lessen impacts on aquatic resources in comparison to past projects that were implemented with less regard for impacts to aquatic resources (IDEQ 2006b). Remediation of inactive or abandoned mine

properties would reduce existing and future selenium and COPC release to groundwater and surface water resources in the Blackfoot River basin, thereby reducing the load to the river.

5.7.5 Cumulative Activities

The Proposed Action or alternatives would add the direct loss of 9.43 acres of aquatic habitat (6.11 acres of wetlands and 3.32 acres of non-wetland waters) to the amount of overall disturbance to aquatic habitats in the CEA. However, mitigation measures include the creation of new wetland habitats that would offset this loss. Implementation of BMPs and more advanced cover designs and a Water Management Plan would control discharges of sediment to surrounding waters; therefore, the Proposed Action or alternatives would not be expected to substantially add to the effects of sedimentation in the CEA.

The toxicity effects of selenium could reduce fisheries populations via direct effects on fish or indirectly through effects on prey populations and cause changes in the structure of the food web and ecosystem functioning that result in decreased monetary revenues from fishing licenses and associated spending (equipment, lodging, and meals). Localized impacts may occur to aquatic life inhabiting Fish Pond drainage and the extent of the impact on the water quality of the Blackfoot River would depend on the alternative selected with no detectable increases of selenium expected with the implementation of Alternatives 1A or 1B. As described in **Section 4.1.1.1**, the Proposed Action may accelerate aquatic population declines already taking place downstream of the project area, or further reduce the size of populations that are already under stress. Populations would be expected to stabilize over the long term, albeit reduced in size. Alternatives 1A or 1B would not be expected to contribute significantly to the cumulative effects of the mining operations.

5.7.6 Cumulative Effects

Direct loss of aquatic habitat, sedimentation, and releases of selenium would be controlled and mitigated as described in **Section 4.7**. Cumulative effects to aquatic resources resulting from the Proposed Action or alternatives are expected to be long-term and minor.

5.8 THREATENED, ENDANGERED, AND SPECIAL STATUS SPECIES

5.8.1 CEA Boundary

The CEA for threatened, endangered, and special status species (**Figure 5.6-1**) is the same as that for wildlife, described in **Section 5.6**. It generally includes suitable habitat for a given species within a 15-mile radius surrounding the project area.

Most impacts to threatened, endangered, and special status species would occur within or immediately adjacent to the project area and would affect individuals with home ranges overlapping or immediately adjacent to the project area. An area with a 15-mile radius is large enough to encompass the home ranges of the most mobile wildlife individuals in the project area. It is unknown to what extent wildlife individuals would be displaced and what the impacts of displacement on resident populations would be; however, given the scale of the Proposed Action or alternatives, it is unlikely that any short- or long-term adverse impacts to BLM special status species would occur beyond the identified CEA.

5.8.2 Introduction

As identified in **Sections 3.8.1** and **4.8.1.1.1**, the gray wolf is the only federally listed species that may occur in the project area, and it is listed as an experimental, non-essential population. Potential impacts to gray wolves would be negligible, due to the lack of wolf occurrences in the project area. As only small numbers of dispersing individual wolves could potentially be affected by the proposed project, no cumulative effects would result from implementing the project in combination with other past, present, and future actions.

The wolverine is the only federal candidate species with the potential to occur in or near the project area. Due to the large home range sizes and low population densities of wolverines, and lack of large tracts of suitable forested high-elevation habitat near the project area, very few individual wolverines are likely to be affected by the proposed project. Therefore, no population-level cumulative effects would result from implementing the project in combination with other past, present, and future actions. The project will not impact any other federally listed or candidate species.

The most common type of impacts to BLM special status species within the CEA is loss and fragmentation of habitat associated with agriculture, construction of roads and buildings, phosphate mining, timber harvest, and livestock grazing. These activities are expected to continue and increase in the future for the CEA and the southeastern Idaho region. The impact of these activities and the future trend would be the increasing displacement and disappearance of species from the region that require large tracts of relatively undisturbed forest. Other impacts to BLM special status species that might cause mortalities or large-scale avoidance of the region's high-activity areas include increased noise and dust, increased human activity, and degradation of water quality.

Table 5.8-1 summarizes the amount of existing habitat for each BLM special status species within the CEA.

Table 5.8-1 Predicted Existing Habitat[1] for BLM Special Status Species in the CEA

Species	Habitat Preferences	Predicted Existing Habitat in CEA
Type 1 - Threatened, Endangered, Proposed, and Candidate Species		
Bald Eagle (*Haliaeetus leucocephalus*) *(Note: the BLM special status classification for the bald eagle has not been reclassified since the species was federally delisted.)*	Forested areas adjacent to fish-bearing waterbodies.	36,935 acres
Type 2 - Rangewide/Globally Imperiled Species		
American White Pelican (*Pelecanus erythrorhynchos*)	Open water.	21,945 acres
Greater Sage-grouse (*Centrocercus urophasianus*)	Low- and mid-elevation shrub, and dry conifer.	329,729 acres
Northern Leopard Frog (*Rana pipiens*)	Riparian, wetlands.	99,326 acres
Yellowstone Cutthroat Trout (*Oncorhynchus clarki bouveri*)	Stream.	47 miles of stream[2]
Type 3 - Regional/State Imperiled Species		
Trumpeter Swan (*Cygnus buccinator*)	Open water.	21,794 acres
Prairie Falcon (*Falco mexicanus*)	Low- and mid-elevation and shrub mountain, cliffs.	338,394 acres
Ferruginous Hawk (*Buteo regalis*)	Low- and mid-elevation shrub, especially	175,839 acres

Table 5.8-1 Predicted Existing Habitat[1] for BLM Special Status Species in the CEA

Species	Habitat Preferences	Predicted Existing Habitat in CEA
	on cliffs.	
Black Tern (*Chlidonias niger*)	Marsh/wetlands.	21,945 acres
Flammulated Owl (*Otus flammeolus*)	Dry conifer and aspen-conifer mix.	93,251 acres
Willow Flycatcher (*Empidonax trailii*)	Riparian.	86,147 acres
Olive-sided Flycatcher (*Contopus borealis*)	Dry conifer and wet/cold conifer.	46,122 acres
Brewer's Sparrow (*Spizella breweri*)	Low- and mid-elevation shrub.	143,563 acres
Common Garter Snake (*Thamnophis sirtalis*)	Dry conifer, aspen/aspen conifer mix, mountain shrub, and riparian.	71,872 acres
Northern Leatherside Chub (*Gila copei*)	Stream.	47 miles of stream[2]
Type 4 - Peripheral Species		
Uinta Chipmunk (*Tamias umbrinus*)	Found, at about 6,560 to 11,155 feet in coniferous forests, often near logs and brush in open areas, and at edge of forests.	39,803 acres
Hoary Willow (*Salix candida*)	Wet, hummocky, quaking swamp/meadows or fens, with low shrubs (*Salix planifolia* and *Salix candida* dominate) occupying the hummocks, and sedges (*Carex aquatilis*, *C. rostrata,* and others) dominating in the standing water between hummocks. Soil typically consists of a layer of peat 1-decimeter or thicker, overlying wet silty muck more than 1 meter deep. Known sites are located in broad, open valley bottoms with mountain sagebrush and low sagebrush on the upland. Hoary willow has a close affinity with calcareous fens.	Not available
Type 5 - Watch List		
Swainson's Hawk (*Buteo swainsoni*)	Forested or shrub areas adjacent to riparian zones.	362,782 acres
Blue Grouse (*Dendragapus obsurus*)	Coniferous forests, mostly open with a mix of deciduous trees and shrubs.	277,398 acres
Long-billed Curlew (*Numenius americanus*)	Open, recently grazed shrub steppe.	336,462 acres
Short-eared Owl (*Asio flammeus*)	Prairies, meadows, tundra, moorlands, marshes, savannas, dunes, fields, and open woodlands.	362,511 acres
Red-naped Sapsucker (*Sphyrapicus nuchalis*)	Coniferous/deciduous forests that include aspen and cottonwood.	128,836 acres
Green-tailed Towhee (*Pipilo chlorurus*)	Thickets, chaparral, shrublands, riparian scrub.	175,172 acres
Brewer's Blackbird (*Euphagus cyanocephalus*)	Shrub, riparian woodlands, aspen parklands, cultivated lands, marshes, human habitation areas.	446,277 acres

Notes:

[1] Except where noted, values presented here are from the Idaho Gap Analysis Project, which predicts species' occurrence based on wildlife habitat relationship models that take into account known habitat associations, land cover, elevation, climate zones, distance to hydrologic features, and known species' range (Landscape Dynamics Lab 2001).

[2] This value is from IDFG 2003.

Source: IDFG 1997

5.8.3 Past and Present Activities

Within the CEA, major past and present anthropogenic disturbances (**Table 5.6-2**) have resulted from grazing (152,648 acres, not shown in table), agriculture (70,282 acres), mining (7,697 acres), roads and buildings (8,940 acres), vegetation management (2,231 acres since 2005), and recreation. Wildfires have also been an important cause of disturbance, having burned 9,012 acres in the CEA between 1937 and 2007.

Past and present timber harvests in the CEA have resulted in habitat changes that affect BLM special status species. The majority of habitat conversion is in the form of forest removal followed by reforestation with a short period of early seral conditions. This habitat conversion would cause forest-dependent wildlife using the affected areas to disperse in search of new areas. In contrast, most wildfires have affected the scrub/shrub (largely sagebrush) vegetation type. Wildfires in sagebrush may result in the establishment of cheatgrass, which establishes quickly after fire and excludes native perennials, reducing habitat for sagebrush-dependent species (Zouhar 2003).

In general, BLM special status species are affected by livestock grazing due to competition for forage, direct mortality by trampling (e.g., hoary willow, northern leopard frog, common garter snake) or overgrazing (hoary willow), and habitat removal or conversion. Grazing can also impact aquatic species, such as Yellowstone cutthroat trout, as described in **Section 5.7.3**. Both domestic livestock and wild ungulate grazing may change the structure or composition of native plant communities. Proper rotation and stocking rates can minimize these negative effects.

Human presence tends to disturb many species of wildlife. Past and present recreational uses in the area include hunting, fishing, ATV and snowmobile use, camping, and picnicking. BLM Special Status raptors residing in the CEA are particularly sensitive to human disturbance during the nesting season.

Past and present disturbances from roads and mining activities have resulted in fragmentation of certain wildlife populations and their habitats. Fragmentation effects within the CEA have not been quantified by the land management agencies.

Other nearby phosphate mines have increased concentrations of selenium and other metals in water, aquatic plants, aquatic invertebrates, and fish near the project area (Hamilton and Buhl 2003). Increasing concentrations of selenium in surface water and groundwater seeps and springs may lead to reduced reproductive success in the terrestrial and aquatic wildlife of the region including BLM special status species.

5.8.4 Foreseeable Future Activities

Table 5.6-3 lists some proposed activities that could impact BLM special status species habitat throughout the CEA. Fifty-three percent (277,593 acres) of the CEA is located on private land. Past and present actions on private land within the CEA have mainly included agriculture and grazing activities. Housing developments have also occurred on some large ranches within the CEA. Specific land impacts on private lands in the CEA are difficult to quantify due to lack of specific data. Disturbance of habitat caused by these private land impacts is also not quantified with existing data.

In addition to the projects listed in **Table 5.6-3**, there are approximately 14,478 acres of not-yet-mined federal phosphate leases located in the BLM special status species CEA. While no specific plans are known for mining in these leases in the immediate future, the lease boundaries may be used as an estimate of the maximum amount of potential disturbance from future mining.

Disturbances described above under "Past and Present Disturbances" are expected to continue in the reasonably foreseeable future. Habitat fragmentation and alteration resulting from construction projects, grazing, mining, vegetation management, conversion of land to agriculture, wildfires, and noxious weed invasions would continue. Individuals of small, less mobile species would continue to be vulnerable to direct mortality from crushing by vehicles, construction equipment, and livestock. Nesting raptors may be subject to increased harassment by recreationists, particularly if available nest trees are reduced by other activities. Recreation use in the area can be expected to reflect local changes in population and interest in outdoor activities.

All species are potentially vulnerable to the toxic effects of selenium accumulation. Selenium contamination is expected to continue to occur below operating and reclaimed phosphate mines in the foreseeable future. New phosphate mines are likely to incorporate BMPs that limit the potential for selenium contamination of the environment, unlike past mines that were constructed without regard for selenium contamination (IDEQ 2006b).

5.8.5 Cumulative Activities

Implementation of the Proposed Action and alternatives could potentially disturb suitable habitat for BLM special status species as described in **Table 4.8-1** in **Section 4.8**. The highest percentage of BLM special status species habitat that would be directly affected in the CEA by the Proposed Action or alternatives would be 1 percent of the predicted habitat in the CEA for the common garter snake. This is a conservative estimate because the overall amount of habitat in the CEA is predicted by the Idaho Gap Analysis, which considers many variables when determining potential habitat, whereas the amount of habitat affected in the project area is based solely on broad categorizations of cover types (e.g., aspen, sagebrush). In the CEA, 98,741 acres of this species' habitat have already been, are being, or would likely be impacted by agriculture, development, mining, wildfires, and vegetation management. Therefore, the Proposed Action or alternatives would account for approximately 0.7 percent of the disturbance to this species' habitat within the CEA.

In general, wildlife dispersal from habitat disturbance decreases survival rates of affected individuals to some degree and increases competition. The effects to specific species from disturbance related to the Proposed Action or alternatives were described in detail in **Section 4.8**. Mine construction and operation could temporarily limit the attractiveness of the CEA to BLM special status species such as raptors, which generally prefer areas free from anthropogenic noise and activity. Bald eagles usually modify their activities and movements to avoid human disturbance, but implementation of the Eagle Management Plan (P4 2009b) would minimize disturbance to the eagles nesting in the project area.

Implementing the Proposed Action or alternatives would result in additional fragmentation to wildlife habitat and could isolate populations of small, immobile wildlife, such as amphibians and reptiles. Therefore, a minor cumulative effect to wildlife from fragmentation impacts would potentially occur for the duration of the Proposed Action or alternatives.

In terms of mining activities exposing BLM special status species in the area to potentially harmful levels of selenium, the Proposed Action or alternatives would not result in placement of growth medium or soil with elevated amounts of selenium or trace metals in reclaimed areas. As discussed in **Section 4.6**, however, plant roots and burrowing animals may still be able to reach seleniferous materials and introduce elevated levels of selenium into the food chain.

The Proposed Action is likely to result in selenium concentrations in Fish Pond exceeding the cold water aquatic life CCC standard of 0.005 mg/L, which could pose a risk to wildlife residing in or drinking the water. Alternatives 1A and 1B, incorporating a GCLL, are expected to further reduce concentrations to be below this standard. Therefore, although BMPs would limit the potential for selenium exposure relative to some past mining operations, minor, long-term cumulative impacts to BLM special status species may still occur as a result of the Proposed Action. Long-term cumulative impacts would be minimized by the implementation of Alternative 1A or 1B.

Implementation of BMPs and a Water Management Plan would control discharges of sediment to surrounding waters; therefore, the Proposed Action or alternatives would not be expected to substantially add to the effects of sedimentation in the CEA.

5.8.6 Cumulative Effects

Adding the Proposed Action or alternatives disturbances to past, present, and foreseeable future disturbances would result in long-term, minor cumulative effects to the BLM special status species. Effects would be temporary, and disturbances are small in area compared with species' ranges and overall amount of habitat available in the CEA.

Direct loss of aquatic habitat, sedimentation, and releases of selenium would be controlled and mitigated as described in **Section 4.7**. Cumulative effects to aquatic BLM special status species resulting from the Proposed Action or alternatives are expected to be long-term and minor.

5.9 VISUAL RESOURCES

5.9.1 CEA Boundary

The CEA is the Southeastern Idaho Phosphate District, including KPLAs, in Bear Lake and Caribou Counties, Idaho, as shown on **Figure 5.1-1**. The CEA boundary was selected because there are vantage points from which the Proposed Action and alternatives, and other past, present, and reasonably foreseeable disturbances can be observed. Visual resources should not be affected beyond this area because of the topographic features that delineate the boundary and restrict line of sight.

5.9.2 Introduction

Cumulative effects to visual resources from phosphate mining would result from historical, existing, and future mining in the CEA. Often, phosphate mining impacts are not considered substantial if the disturbance areas are not readily visible to the general public. Most of this activity has occurred in relatively remote areas, and are not readily visible from sensitive viewing areas, such as travelways, residences, or recreation sites. There would also be cumulative effects to visual resources from other

types of planned or foreseeable activities, including various management activities on BLM and National Forest System (NFS) land, as well as development on private lands. The CEA is within a region of generally north- to northwest-trending mountain ranges and valleys. The most common landforms are foothills, which are cut at intervals by small creeks and drainages. Although scenic variety exists in the densities, arrangements, and colors of vegetation, no visually distinct landscapes are found in the CEA.

5.9.3 Past and Present Activities

Past and present developments in the CEA are primarily from rural land uses and management activities on NFS and BLM lands. The CEA is generally undeveloped other than for mining; visual modifications to the federal lands in the area have been in the form of timber cuts, roads, mining operations, range improvements, power lines, recreation sites (campgrounds), and pipelines. Other visible land uses that have occurred on private lands include road construction, vegetation management and fuels treatments, power line and utility corridors (water and gas lines), communication sites, campgrounds, day use facilities, trailheads, hiking trails, fuel wood gathering, agricultural use, and private residences. Current management activities, which are taking place at the present time, are a continuation of existing uses.

Most of the land surface in the CEA, including the majority of the previously permitted and existing mine areas, is federal land within the CTNF in the Montpelier and Soda Springs Ranger Districts. BLM land surface constitutes a small area of land within the area. Most of the NFS land is managed with NFS Visual Quality Objectives (VQOs) of Modification and Partial Retention. BLM land in the CEA is managed with VRM Class III and Class IV objectives. VQO Modification and VRM Class IV allow for considerable modification of the characteristic landscapes and typically are compatible with phosphate mining activities. Mining activities can generally meet VQO Partial Retention and VRM Class III objectives with mitigation.

5.9.4 Foreseeable Future Activities

As described in **Section 5.1.6** cumulative effects analysis, there are permitted leases with potential future disturbances from phosphate mining in the CEA. Development of permitted areas would result in effects to visual resources similar to past and present disturbances, but would include a larger area of affected landscape. Foreseeable future effects to the visual resources of the CEA would occur from likely activities on public land administered by USFS and BLM that include timber cuts, roads, mining operations, range improvements, power lines, recreation sites (campgrounds), and pipelines. These types of activities would likely occur as a consequence of population and economic growth in the CEA, which would increase public use and consumption of public land resources.

5.9.5 Cumulative Activities

Twenty-seven previously permitted and active phosphate mine sites are within the CEA. A total of 11,935 acres of phosphate mining-related surface disturbance are documented by the BLM and USFS (2007) for the southeast Idaho phosphate resource area. **Table 5.1-1** lists four active or idle phosphate mines (Dry Valley, South Rasmussen, Rasmussen Ridge, and Smoky Canyon) and 23 previously permitted phosphate mines.

The potential new disturbance from the Proposed Action (739 acres) or Alternatives 1A and 1B (774 acres) would increase the total phosphate mining-related surface disturbance within the CEA by 6 percent to 12,674 or 12,709 acres respectively. While the mining activities in the CEA are generally compatible with the VQOs of NFS and BLM land, the 6 percent increase in surface disturbance also increases the level of the visibility of phosphate mining facilities to the public.

5.9.6 Cumulative Effects

Under the Proposed Action and the action alternatives, phosphate mining activities would contribute to the cumulative effects that include previously permitted and existing phosphate mines in the CEA. The effects to the scenic quality and characteristics of the existing landscape would occur over a larger area with the implementation of the proposed project. The proposed project would extend the duration of visible mining-related disturbance in the CEA for an additional 17 years from the initiation of activities at Blackfoot Bridge Mine. It is likely that reclamation activities would occur at active mines throughout the CEA during the active mine life of Blackfoot Bridge Mine, so that there would be no substantial increase in visible mining facilities and activities despite an increase in surface disturbance. The cumulative effects of specific current and foreseeable projects that may affect scenic resources would not vary based on the inclusion of the effects of the proposed Blackfoot Bridge Project.

Economic and population growth would increase recreational uses of public lands in the CEA and would also increase the number of residents and recreationists who have a concern for scenic resources. An increase in viewers and increased phosphate mining disturbance in the CEA would increase opportunities for the public to view phosphate mining facilities from sensitive viewing areas including proposed Blackfoot Bridge facilities and activities.

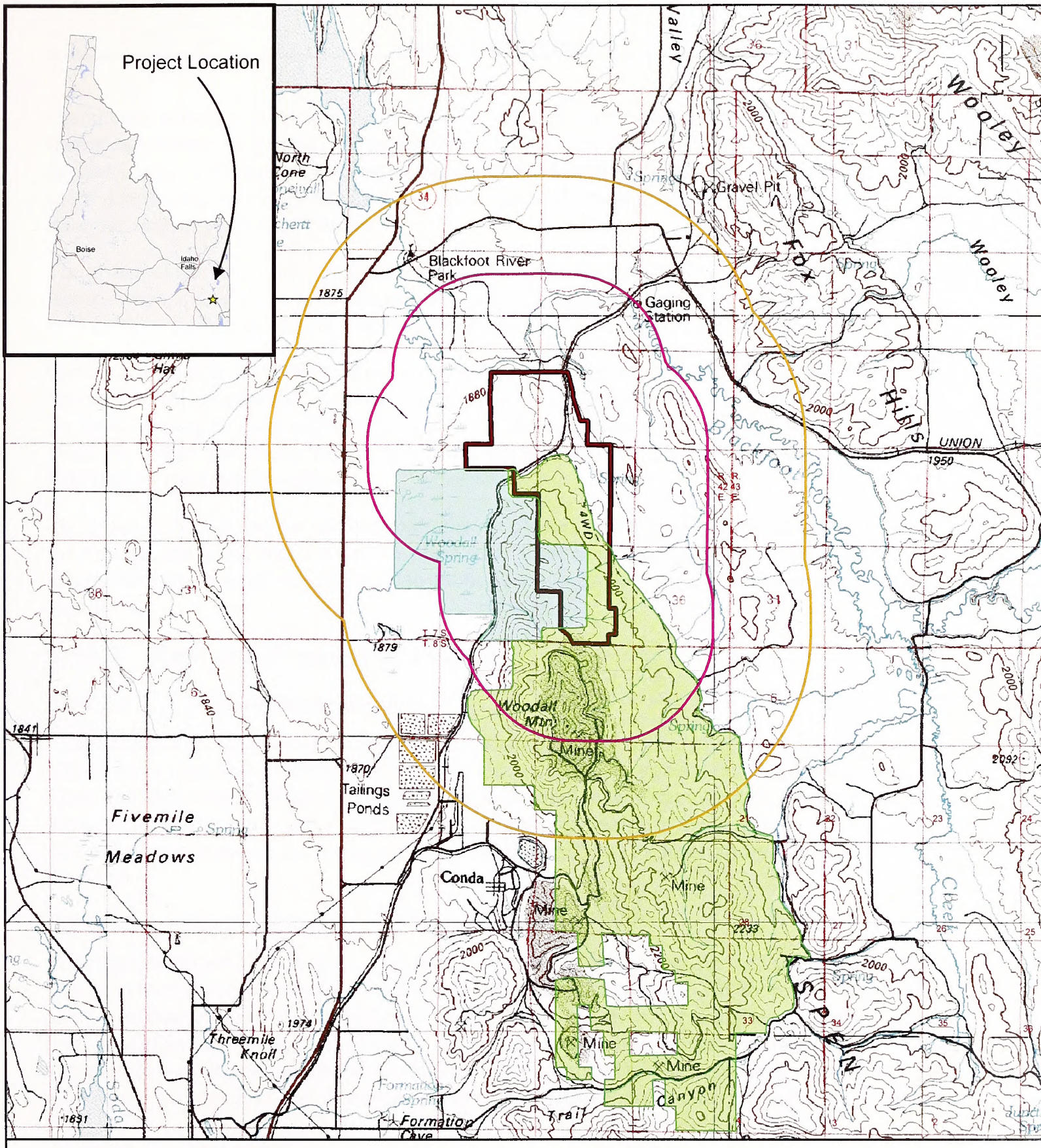
5.10 LAND USE AND ACCESS

5.10.1 CEA Boundary

The CEAs for land use and access vary among the topics addressed, but predominantly relate to the roads accessing the project area. The CEA for impacts to grazing management is the full extent of the two grazing allotments that overlap with the project area: Woodall Mountain and Woodall Spring (**Figure 5.10-1**). The CEA for recreation and land use (**Figure 5.10-1**) was determined by recreation opportunities that are accessed by the same roads that provide access the project area. The CEA for access and transportation is the project area and the roads that provide access to the mine site from State Highway 34 (**Figure 5.10-1**).

5.10.2 Introduction

Impacts to land use and access in the CEA consist of loss of resources or loss of access to resources. Loss of a resource can be total because of destruction of the resource by mining, or partial because of alteration of the resource or its distribution because of changes in vegetation, drainage, or the locations of roads. Mining in the CEA is expected to be a finite activity that would be followed by reclamation. Timber harvesting would continue intermittently as long as there is marketable timber and landowners allow access.



Source: USGS 1:100,000 Soda Springs Quadrangle

LEGEND

- Project Boundary
- Cultural Resources CEA Boundary
- Land Use and Access CEA Boundary

Grazing Allotments

- Woodall Mountain
- Woodall Spring

BLACKFOOT BRIDGE PROJECT EIS

FIGURE 5.10-1
CEAs for Land Use and Access and Cultural Resources

ANALYSIS AREA: Caribou County, Idaho	
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Prepared By: JG	

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Cumulative effects to grazing in the CEA occur primarily from mining and, to a lesser extent, from timber harvesting. In general, grazing is not allowed on active mine areas, livestock trailing is limited, and no watering is allowed in water control ponds or water flowing from mine overburden seeps. Depending on the reclamation methods, renewed grazing may not be allowed on a closed mine for several years after closure.

The principal recreation activity in the project area is hunting, primarily big game hunting, and to a lesser extent, upland game birds. Cumulative effects to hunting occur from alteration of the habitat by mining or timber harvesting and from interruption of migration routes by new roads.

Other land uses in the general area of the project area are mining and timber harvesting. The operation of this mine would dominate the land use during its operation and displace the opportunity for future mining because of the redistribution of mined minerals and overburden. The cumulative effect to timber harvesting would depend on the extent to which re-establishment of forest is inhibited by reclamation methods.

Cumulative effects to access and transportation would be affected by the roads built and maintained for mining and those that are left in place after closure and reclamation. During mining and reclamation, these roads may be closed to public access, but some may be opened by surface owners over time.

5.10.3 Past and Present Activities

5.10.3.1 Grazing Management

Cumulative effects to grazing in the study area occur primarily from mining and timber harvesting. Effects from road improvements and recreation can also affect grazing, but to a negligible extent. There has been limited timber harvesting in the area. Timber harvesting impairs grazing in the short term, but typically opens more extensive areas suitable for grazing in the long term. There are many past and present mines in the region including the Ballard Mine to the north and the Conda Mine to the south.

5.10.3.2 Recreation

The principal dispersed recreation in the study area is big game hunting. As with grazing, cumulative effects to hunting occur primarily from mining and timber harvesting. Timber harvesting causes a short-term disruption in the distribution of big game populations, but also creates attractive clearings with new growths of forage. Exploration for mining has resulted in past disturbance in the area. During mining and reclamation, access for hunting is restricted and areas of forage are destroyed by the mining. Reclamation, like timber harvesting, results in new growth that is attractive to big game.

5.10.3.3 Land Use

Existing land uses in the study area include commercial mining, timber harvesting, livestock grazing, and dispersed recreation. The principal use of public land in the project area is livestock grazing and recreation. The proposed project is consistent with past land uses in the study area.

Previous disturbances in the project area include extensive exploration activities from as early as 1956. Exploration activities included drilling and trenching. The recent exploration was in forested areas in and around the project area. At the inactive Conda Mine south of the project area, there is

extensive disturbance that includes the mine pit, overburden piles, roads, and other facilities and surface disturbance. The Conda Phosphate Plant is located along the haul road southwest of the project area and receives ore by rail along the railroad line that passes through the project area. Intermittent timber harvesting has also occurred in the study area, as reflected in clearcut patches in the south and west of the project area.

5.10.3.4 Access and Transportation

The primary route to access the study area is State Highway 34, which connects to U.S. Highway 30 at Soda Springs approximately 11 miles southwest of the project area. Access to the project area is by way of Blackfoot River Road and a gated private haul road. The project area can also be accessed by way of the private haul road to the Conda Mine and Phosphate Plant, which connect to State Highway 34 near Soda Springs. State Highway 34 also provides access to the Blackfoot Reservoir and Gray's Lake National Wildlife Refuge. Past mining at Conda Mine and other mines in the general area has contributed to increased traffic on State Highway 34 and on Blackfoot River Road. Traffic along the gated private access road and the haul road has principally been associated with the mines and phosphate plant. Public land in the immediate project area is accessible to the public only by permission through private land.

5.10.4 Foreseeable Future Activities

5.10.4.1 Grazing Management

No foreseeable future disturbances were identified within the grazing CEA except for the Proposed Action and alternatives.

5.10.4.2 Recreation

Implementation of the Proposed Action or Alternatives 1A and 1B would restrict access to areas of public land in this area for hunting and other dispersed recreation. However, public land in the project area is comparatively small, currently has limited access, and does not offer unique recreational opportunities that are not also found elsewhere in the general area.

5.10.4.3 Land Use

No foreseeable future disturbances are expected, other than the proposed mine and ongoing activities in the study area. During the life of the mine, land use in the study area would be dominated by the mine, but there would be little disruption to other ongoing land uses.

5.10.4.4 Access and Transportation

No foreseeable future disturbances, other than the proposed mine and ongoing activities in the study area, would alter access and transportation in the study area.

5.10.5 Cumulative Activities

5.10.5.1 Grazing Management

Mining disturbance affects grazing allotments by direct disturbance of the ground surface and short-term removal of forage vegetation. Grazing in the reclaimed areas is restricted until the vegetation

has been adequately re-established to withstand grazing pressure. When the allotments are reopened, the replacement of woodland and brush by grasses can increase suitable forage. BMPs would be implemented to minimize selenium bioaccumulation and the introduction of noxious weeds.

5.10.5.2 Recreation

Cumulative disturbance to recreational opportunities would be mainly from active and unreclaimed disturbance from mining activities. The disturbance would not occur all at once. Unreclaimed disturbance from mining, consisting mostly of remnant pit highwalls and steep cut slopes, would be limited to about 99 acres.

5.10.5.3 Land Use

The primary short-term cumulative disturbance to land use would be the project area.

5.10.5.4 Access and Transportation

The mine would constitute a short-term disturbance to access and transportation in the study area, but in the long term, would not contribute to cumulative disturbance.

5.10.6 Cumulative Effects

5.10.6.1 Grazing Management

The availability of forage suitable for grazing in the grazing allotments would be reduced during mining operations in the Mid Pit and South Pit. During mining and the early stages of reclamation, grazing, trailing, and watering would not be allowed due to safety risks associated with mining and implementation of measures during mining and reclamation to contain potential selenium contamination from selenium-bearing overburden. BMPs would be applied to prevent the introduction of noxious weeds and the accumulation of selenium in soil, groundwater, or vegetation. Over time, reclamation of the disturbed areas would replace lost grazing resources. As reclamation progresses, the re-established vegetation is dominated by grass species that are highly suitable for grazing. Impacts to grazing would be minimal in the short term and positive in the long term because reclaimed vegetation would be dominated by grasses and forbs favorable for grazing for years after mining.

5.10.6.2 Recreation

During mining, big game would likely move to other areas with less disturbance. This would result in a short-term redistribution of hunter use in the general area. Reclaimed and re-established vegetation after mining and timber harvesting would be dominated by grass and forb species that are attractive to big game animals. In the early stages of succession, there is also relatively little cover. The effects for hunting in the short term may be more game and favorable conditions for hunting. Ideally, in the long term, the habitat would return to its pre-disturbance condition. Long-term impacts to recreation would be minor relative to the overall availability of recreational opportunities in the general area.

5.10.6.3 Land Use

The principal effect of past, present, and foreseeable actions, including the proposed project, on land use would be the removal of portions of the project area from other land uses during the operation of

the mine. Minable minerals would be removed. Over the long term, reclamation would return the land to a condition suitable for other land uses.

The BLM Pocatello Resource Area Office administers the public land and mineral leases in the study area. The BLM would apply conditions for approval, stipulations, and mitigation measures to the mineral leases in the mine area. These would not include any BLM Special Designation or Management Areas. The mine would not require other federal land use authorizations. However, Caribou County zoning may have stipulations that would affect reclamation. Long-term impacts to land use would be minimal.

5.10.6.4 Access and Transportation

In the short term, the principal impacts of past, present, and foreseeable actions would be an increase in traffic along portions of State Highway 34 during the operation of the mine. This increase in traffic would diminish during reclamation. Long-term impacts to access and transportation would be minimal.

5.11 CULTURAL RESOURCES

5.11.1 CEA Boundary

The CEA for cultural resources is defined as the project area and a 1-mile radius around it. This CEA is shown on **Figure 5.10-1**. The Proposed Action or alternatives, or reasonably foreseeable actions outside the project boundary, would not affect cultural resources outside the CEA. Records searches and literature reviews for the CEA have not identified any cultural resource investigations, except those performed within the project boundary, or any previously documented cultural resources, except those documented for this analysis.

5.11.2 Introduction

Studies for the Blackfoot Bridge Mine have recorded six cultural resources. These resources include two rock features (one prehistoric and one historic) on a ridgetop, one large prehistoric camp, one large prehistoric lithic scatter, one isolated prehistoric artifact, and one historic farming and ranching site on lower ground near the edges of the permit areas. One of these sites has been determined to be eligible for the NRHP and the others are not eligible. Other studies in this high elevation region have also reported a low density of sites. Many of the historic sites are extraction or processing facilities, isolated cabins, or arborglyphs. Areas to the south and west are along the natural transportation corridor through Soda Springs that was used by early emigrant trails, and was also an important transportation corridor during the regional precious metal mining booms. Associated historic developments in those areas included railroad construction, small timber industries, and ranching.

5.11.3 Past and Present Activities

There are no other known past and present ground disturbances in the study area that have potentially affected cultural resources. Within the general area, there are other past and present phosphate mines, such as the Ballard Mine to the north, that may have affected cultural resources, but these effects are not documented. The areas that have been extensively disturbed have been unattractive for sustained historic or prehistoric occupation, are marginal for ranching, and do not

hold precious metal deposits that could have attracted early mining. Historic and prehistoric sites in the region, including emigrant trails, occur along the river valleys and in lower, more open terrain with access to reliable sources of water. Historic disturbances have been more extensive to the south along natural travel corridors through Soda Springs and to the north in the Caribou Mountains area associated with periodic mining booms from the 1860s to 1920.

5.11.4 Foreseeable Future Activities

Reasonably foreseeable disturbances in the study area are the proposed project and associated activities. There is no anticipated change in recreational activities in the area or any expectation of residential developments that would affect cultural resources.

5.11.5 Cumulative Activities

Past, present, and reasonably foreseeable disturbance to cultural resources in the study area have been and would be associated with mining. There has been no known disturbance to eligible cultural resource sites. The Proposed Action or alternatives, if developed to the maximum extent of disturbance, would include disturbance near the eligible site. The site would be avoided and protected. If the eligible site cannot be avoided and protected, a treatment plan would be developed, in consultation with the BLM and the Idaho SHPO.

5.11.6 Cumulative Effects

Because the eligible site would be avoided, there would be no adverse impacts to cultural resources as a result of the Proposed Action or alternatives. Section 106 of the NHPA requires consideration of effects to eligible cultural resources for federal actions. There would be no adverse cumulative impacts from the Proposed Action or alternatives in combination with past, present, and reasonably foreseeable future activities in the CEA.

5.12 TRIBAL TREATY RIGHTS AND INTERESTS

5.12.1 CEA Boundary

The CEA for Tribal treaty rights and interests is southeastern Idaho, including portions of the Snake River Plain (**Figure 5.12-1**). This area encompasses the Fort Hall Indian Reservation and much of the area currently used by Tribal members. The Shoshone and Bannock Tribes retain treaty rights to practice their traditional culture on unoccupied public lands in the region.

5.12.2 Introduction

Federal land managers have a responsibility to protect resources essential for the Tribes to exercise their treaty rights on public lands and a responsibility to maintain the habitat of traditional natural resources in a viable and sustainable condition. Over the years, the ability of the Tribes to practice their traditional culture on these lands has been reduced by loss of unoccupied lands through land exchanges and mineral leasing and degradation of the resources valued by the Tribes. The project area includes a relatively small area of unoccupied public land in comparison to the extent of BLM land and National Forests in the region. Nevertheless, the incremental loss of lands constitutes a cumulative impact.

5.12.3 Past and Present Activities

Past and present impacts to traditional resources include dams along the Snake River that have affected salmon runs and limited the availability of salmon for consumption. Access restrictions and land disposals or exchanges have also reduced the availability of unoccupied lands for exercising Tribal treaty rights. Fire suppression, mining, grazing, and timber harvest have changed the vegetation, and in some areas, have affected water quality. In addition, the Idaho National Engineering and Environmental Laboratory has restricted access to large areas of federal lands.

5.12.4 Foreseeable Future Activities

Reasonably foreseeable future disturbance in the study area are the proposed project and associated activities. During mining, many traditional natural resources would be destroyed and access to others would be impeded by the mine. Mining would continue until the permitted ore reserves are depleted, and reclamation of the mined areas would take many years. However, the mined areas would be reclaimed and there would not be a permanent loss of access to resources and the ability to exercise treaty rights.

5.12.5 Cumulative Activities

In recent years, the cumulative impacts to natural resources on unoccupied lands have been slowed, and more coordinated efforts have been directed to reclamation and restoration of the resources. Federal and state agencies are enhancing native fish and wildlife habitat, and these collective efforts to improve the condition of natural resources contribute to the protection and restoration of Tribal treaty rights.

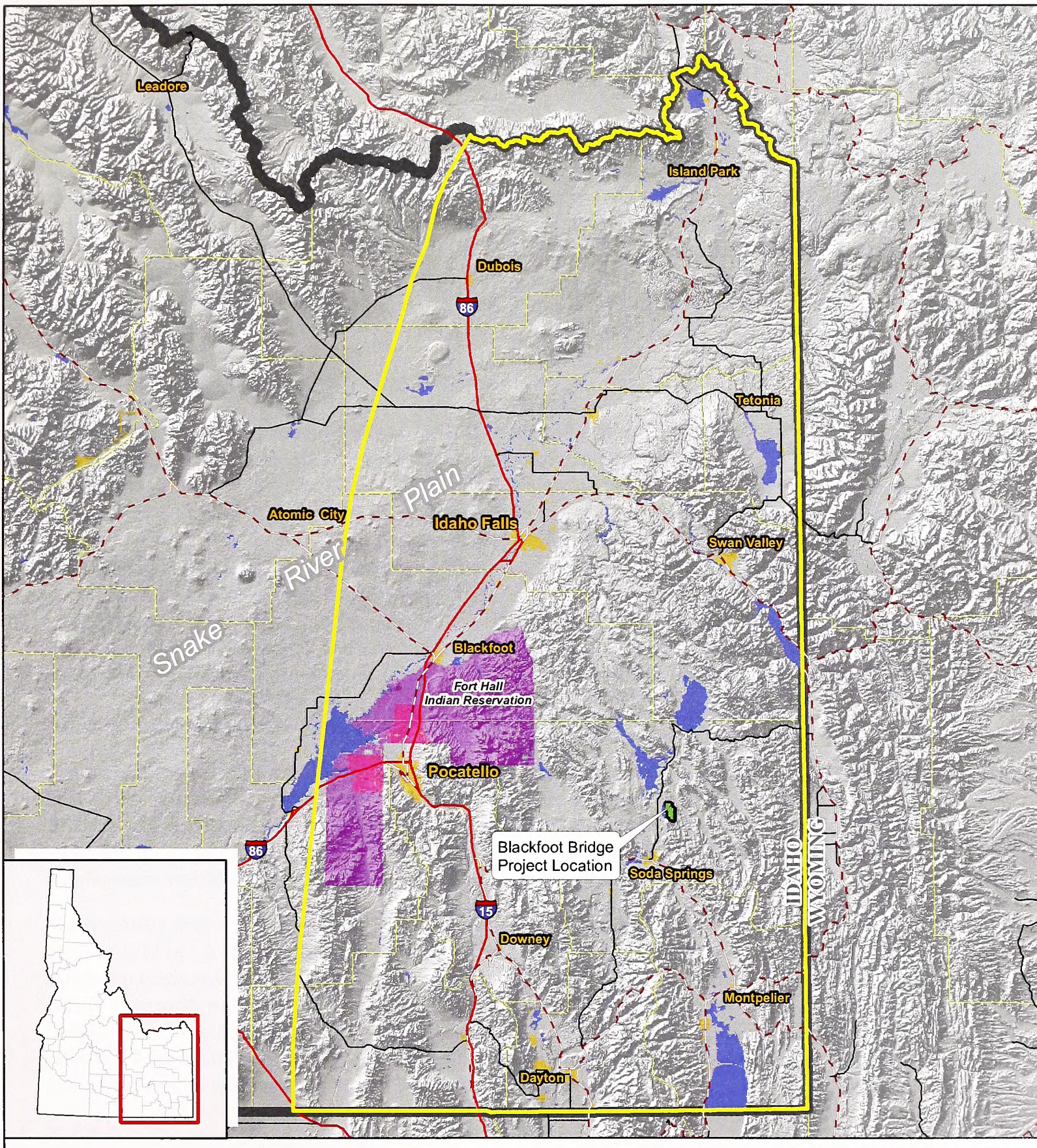
5.12.6 Cumulative Effects

There are currently no generally accepted measures to address the temporary or more prolonged loss of the exercise of treaty rights. The inability to exercise treaty rights is minimal to the Shoshone and Bannock Tribes and potentially affects all Tribal members.

5.13 SOCIAL AND ECONOMIC CONDITIONS

5.13.1 CEA Boundary

The CEA for cumulative effects to social and economic conditions is Caribou, Bear Lake, and Bannock Counties in Idaho, and Lincoln County (Star Valley area) in Wyoming. Most of the phosphate mines and processing facilities in the Southeastern Idaho Phosphate District, including KPLAs, are in Caribou County, Idaho with one mine in Bear Lake County however; employees are located within the four-county area. Most of the employees at the existing P4 South Rasmussen Mine and P4 Soda Springs elemental phosphorus plant live in Caribou and Bear Lake Counties. It is expected that the workforce would transfer from the South Rasmussen Mine to the Blackfoot Bridge Mine. Similar residential patterns are typical of the phosphate mine workforce for all mines in the Southeastern Idaho Phosphate District.



LEGEND

- Tribal CEA Boundary
- Interstate
- Federal Highway
- State Highway
- Fort Hall Indian Reservation
- Lake / Reservoir
- Municipal Boundary
- County Boundary

NORTH

10 5 0 10 20

Miles

BLACKFOOT BRIDGE PROJECT EIS

FIGURE 5.12-1
CEA for Tribal Treaty Rights and Interests

ANALYSIS AREA: Caribou County, Idaho	
Date: 6/4/2009	File: \1924\CEA_Tribal.mxd
Prepared By: JG	

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5.13.2 Introduction

The types of cumulative effects that could occur to social and economic conditions in the CEA would primarily be from population growth and economic development stimulated by the exploration and development of phosphate. The local economy (Caribou and Bear Lake Counties) has increased and diversified in recent years. It is likely that diversification would continue into the future so that the overall cumulative effects of the Blackfoot Bridge Mine, as well as other phosphate development, would be a smaller component of the complex social and economic characteristics of the CEA.

5.13.3 Past and Present Activities

The contribution of past and present phosphate mining to local economies within the CEA has been major in terms of employment and revenues earned from tax collections. The four active phosphate mines, as well as previously permitted mines, are part of the economic base of the CEA that stimulates the growth of other economic sectors through a multiplier effect. In comparison, past and present projects on federal lands, such as vegetation management or recreation activities, individually or collectively, produce few noticeable or measurable effects on the economic or social structure of the CEA. Contributions to local economies from increased employment and addition of workforce payroll to local economies have benefitted Bannock and Lincoln Counties; however, no phosphate mines are located in these counties, so that revenues earned from tax collections and equipment purchases have occurred primarily in Caribou and Bear Lake Counties.

5.13.4 Foreseeable Future Activities

Reasonably foreseeable phosphate mining within the CEA would occur on currently permitted phosphate leases that have not been developed. Future development of these leases would extend the anticipated life span of existing operations, and prolong revenue collections within the CEA. Payment of taxes on purchases of goods and services also would be prolonged. Continued employment would benefit the population of all CEA counties.

Many private properties are located adjacent to or near federal lands, and future activities on federal lands would be likely to affect the local social structure even if they are too small to noticeably affect the economy. Conversely, increased population and economic growth within the CEA are likely to result in increased activities on federal lands including mineral exploration and development, vegetation treatments, recreation and non-recreation special uses, utility corridors and infrastructure, road improvements, travel management plans, rangeland management and grazing, and additional recreation and tourism facilities.

5.13.5 Cumulative Effects

The cumulative effects on the social and economic structure from past, present, and reasonably foreseeable development activities have occurred within the CEA. These effects have occurred primarily in Caribou and Bear Lake Counties in terms of tax revenues and purchases of equipment and other services; however, all CEA counties benefit from employment of local populations. These phosphate mining effects (both negative and positive) have been substantial and have the potential to continue. Phosphate mining has provided benefits to county employment and county finances in the

form of distributions to local school districts from the payment of property taxes. The proposed project, in addition to other existing and reasonably foreseeable phosphate mining projects, would prolong the economic benefits of continued employment and contributions to county finances.

It is not anticipated that there would be any increases in the populations of the CEA counties as a result of the Proposed Action or alternatives; therefore, there would be no additive, cumulative effect to housing, community services, and infrastructure from the proposed Blackfoot Bridge Project. Other reasonably foreseeable phosphate mining activities may require the in-migration of workers that would pressure the existing capacities of housing and community services in addition to ongoing residential and commercial development in the region.

5.14 ENVIRONMENTAL JUSTICE

5.14.1 CEA Boundary

The CEA for cumulative effects on environmental justice is the Southeastern Idaho Phosphate District, including KPLAs, in Bear Lake and Caribou Counties, Idaho (**Figure 5.1-1**). Caribou and Bear Lake Counties contain most of the southeastern Idaho phosphate mines and processing facilities. The proposed Blackfoot Bridge Mine and existing P4's Soda Springs elemental phosphorus plant employees would live in the surrounding counties.

5.14.2 Introduction

The types of effects that could occur to minority and low-income populations in the CEA would primarily be from potential adverse environmental impacts of phosphate and other mineral resource exploration and development.

5.14.3 Past and Present Activities

The only minority population in the CEA is the Native American population of the Fort Hall Reservation, located partially within Caribou County. No past or present phosphate and other mineral exploration and production activities have been located near enough to the reservation to result in adverse environmental impacts. There would be no disproportionate adverse effects to minority or low-income groups from the development of past and present phosphate mining activities.

5.14.4 Foreseeable Future Activities

There are no concentrations of minority or low-income populations within any portion of the southeast Idaho Phosphate area. This includes residents of the Fort Hall Indian Reservation and other populations that are located within this area. There would be no foreseeable future effect to these populations.

5.14.5 Cumulative Effects

The cumulative effects of past, present, and reasonably foreseeable development activities that could occur to minority and low-income populations in the CEA would primarily be from potential adverse

environmental impacts of phosphate and other mineral resource development. Typically, phosphate mines in the CEA are located on public and private lands that are not located in the vicinity of communities or other population clusters. There are no identified effects to minority and low-income populations in the CEA.

5.15 HAZARDOUS AND SOLID WASTE

5.15.1 CEA Boundary

The CEA for cumulative effects associated with hazardous and solid waste is the Southeastern Idaho Phosphate District, including KPLAs, in Bear Lake and Caribou Counties, Idaho (**Figure 5.1-1**). Caribou and Bear Lake Counties contain most of the southeastern Idaho phosphate mines and processing facilities.

5.15.2 Introduction

The term "hazardous wastes" designates materials defined in 40 CFR Part 261.3 and would be regulated under RCRA. The regulatory environment and hazardous waste production and management are described in **Section 2.3.9.7**. No resources in the CEA have been identified that have been affected by the treatment and disposal of hazardous and solid wastes from mining operations in the CEA.

5.15.3 Past and Present Activities

Past and present phosphate mining in the CEA has produced hazardous and solid waste. These materials have been managed and controlled under current regulations and BMPs. Cumulative impacts would be kept within state and federal guidelines and would be minor. Development of residential subdivisions would also generate hazardous and solid wastes. It is expected that the private landowners would contract with private waste management specialists, and the cumulative effects would be minor.

Trash and non-mineral waste are hauled from mine sites by licensed waste disposal services for disposal off site. Mine facilities generally include a septic tank and drainfields to treat sewage and other waste water from potable systems, so that municipal treatment facilities are not affected by mining operations.

5.15.4 Foreseeable Future Activities

In addition to wastes directly related to the production of phosphate rock, such as overburden, mining activities in the CEA generate other maintenance wastes that may include used petroleum products, other hazardous wastes from equipment maintenance, trash, and debris. These wastes are recycled or hauled to appropriate landfills and other disposal sites. Hazardous and solid wastes, such as petroleum products, would be hauled from the mine site and recycled. There would be no cumulative effect to the capacity of disposal facilities from the recycling of hazardous wastes from the proposed project. Trash and debris would be hauled at the mine site and disposed of at an appropriate landfill. The Caribou County Landfill is located in Soda Springs; however, within an eight-county district in southeastern Idaho, there are 22 landfills consisting of seven municipal

landfills and 15 non-municipal landfills (Southeastern District Health Department 2009), so that the disposal of solid waste from phosphorus mines in southeast Idaho would not stress the capacity of any single landfill.

Hazardous and solid wastes are managed and controlled under current regulations and BMPs. Cumulative impacts would be kept within state and federal guidelines and would be minor.

CHAPTER 6

CONSULTATION AND COORDINATION

CHAPTER 6
CONSULTATION AND COORDINATION

6.1 PUBLIC PARTICIPATION SUMMARY

6.1.1 Public Scoping Period and Meetings

6.1.1.1 Initial Scoping

The public was provided a 30-day scoping period at the beginning of the EIS process to identify potential issues and concerns associated with the Proposed Action. The NOI for the Blackfoot Bridge Mine EIS was published in the Federal Register on February 3, 2006. The notice announced the agencies' intent to conduct an environmental analysis of phosphate ore mining at the Blackfoot Bridge property. It also announced the dates of February 28 and March 1, 2006 for two public meetings to solicit and receive comments on the proposed project. A copy of this NOI is included in the Scoping Summary (Greystone 2006e). A legal notice was also published in local newspapers and broadcast on public radio. A notice was published on February 9, 2006 in the Caribou County Sun newspaper and on February 12, 2006 in the Idaho State Journal newspaper. In addition, a news release was published in the Idaho State Journal on February 4, 2006. KBYI Radio aired a news release multiple times prior to the public meetings.

The public mailing list was compiled, and 274 letters sent to interested individuals, agencies, and groups. The EIS scoping mailing list is included in the Scoping Summary (Greystone 2006e).

Public meetings were held in Soda Springs (February 28, 2006) and Pocatello, Idaho, (March 1, 2006) to discuss the proposal and receive comments from the public. Both meetings were conducted in an open-house format, with representatives of the BLM, IDEQ, IDL, and the third-party EIS contractor (Greystone) in attendance and provided information, project handouts, answered questions, and solicited comments from participants. Lists of individuals who signed attendance sheets at the public meetings are included in the Scoping Summary (Greystone 2006e).

Comments were requested to be received on or before March 31, 2006. By the close of the scoping period on March 31, 2006, six comment letters, six comment sheets, and two e-mails had been received for the Blackfoot Bridge Mine project. In addition, one comment e-mail was received after the end of the scoping period for a total of 15 comments. Copies of all written comment letters, forms, and e-mails are included in the Scoping Summary (Greystone 2006e).

Concerns expressed in these comments included:

- Proximity of the project to the Blackfoot River and the impacts on water quality and fisheries;
- Potential for selenium contamination of the environment;
- Permanent changes to the landscape resulting from mining;

- Impacts to threatened, endangered, and sensitive species and habitats including big game and grouse;
- Effects of increased traffic on roads near the mine;
- Loss of access to public lands; and
- Cumulative impacts of the project.

Comments received in response to solicitations are part of the public record for this Proposed Action and available for public inspection. The mailing list for the project was revised to include persons that provided comments in response to scoping, requested to be on the mailing list, or signed a scoping meeting list.

6.1.2 EIS Mailing List

An EIS mailing list of interested persons was initially assembled from mailing lists maintained at the BLM Pocatello Resource Area Office. This list was supplemented by addresses of scoping participants. Additional parties that have contacted the agencies have also been added to the mailing list as individuals or groups. The mailing list for the FEIS has been adjusted accordingly based on comments received on the DEIS. The addresses of substantive commenters have been added to the FEIS mailing list.

6.1.3 Distribution of the Draft EIS

A 45-day review period was initiated by publication of the Notice of Availability (NOA) for the DEIS in the Federal Register on August 14, 2009 by the BLM and August 17, 2009 by the EPA NOA. The comment period was extended 30 days as published by the EPA on August 28, 2009. The comment period ended November 2, 2009.

The DEIS was distributed as follows:

- An NOA was published in the Federal Register specifying dates for the comment period and dates, times, and locations of the public meetings;
- A news release announcing availability of the DEIS was provided by BLM at the beginning of the 45-day comment period to the same news organizations as for the initial public scoping announcement; and
- The DEIS was distributed to interested parties identified in the EIS mailing list, as described above, and made available via the internet.

Public meetings were held on September 15, 16, and 17, 2009 to obtain comments on the DEIS and to answer questions that the public had regarding the project or the EIS process. The locations of these meetings were Pocatello, Fort Hall Indian Reservation, and Soda Springs, Idaho, respectively.

At the end of the comment period, a total of 6,760 letters, e-mail and comment forms had been received. Of these, 960 letters provided original comments. The remaining were form response letters or other organized response campaigns. See **Appendix C** for public comments and responses.

6.1.4 Walla Walla District, Corps of Engineers Permit Evaluation

Concurrent with the NOA for the DEIS, the USACE prepared and transmitted to the general public a public notice describing the applicant's proposal to conduct work in waters of the U.S. for which a Section 404 Clean Water Act permit had been requested (USACE 2009). The USACE Public Notice also serves as public notice that IDEQ is evaluating whether to certify that the discharges of dredged and fill material proposed for this project would not violate existing water quality standards. A Section 404 Clean Water Act permit would not be issued until water quality certification has been issued or waived by the IDEQ, as required by Section 401 of the Clean Water Act. Additionally, within (30) days of the public notice, any person could provide written comments to IDEQ or request in writing that IDEQ provide them notice of their preliminary 401 certification decision.

The USACE participated in and co-sponsored public meetings held for the DEIS and incorporated comments received into the USACE permit evaluation process and public record. USACE will prepare and issue to the general public a supplemental Public Notice concurrent with the NOA for the FEIS. The purpose of the supplemental Public Notice is to provide notice of updates in the project included in response to comments on the DEIS and to formally request IDEQ's 401 certification for this project based on the updated information provided in supplemental Public Notice.

6.1.5 Final EIS Distribution

The Final EIS distribution was completed after consideration was given to comments received on the DEIS. A 30-day FEIS review period follows publication of the NOA for the FEIS in the Federal Register and in local newspapers. The FEIS is being released as follows:

- The NOA has been published in the Federal Register;
- Copies of the FEIS have been sent to addresses on the updated mailing list and made available via the internet; and
- A news release notifying the public of availability of the FEIS was issued to the same newspapers used for previous project announcements.

6.1.6 Record of Decision

Subsequent to the 30-day review period for the FEIS, the BLM will prepare a ROD for distribution to people and organizations identified on the updated project mailing list. A news release notifying the public of the ROD will be provided to the same newspapers used for previous project announcements.

6.1.7 Walla Walla District, Corps of Engineers Permit Decision

A Joint Application for permit has been submitted to the USACE for review and approval under Section 404 of the Clean Water Act and to the State of Idaho under Section 401 of the Clean Water Act. The USACE is a cooperating agency and intends to adopt the FEIS in exercising its regulatory authority to make a permit decision. This permit decision will include a Section 404(b)(1) evaluation under 40 CFR Part 230.

6.2 PUBLIC INPUT

Comments received by the BLM on the DEIS were reviewed and evaluated by the agencies to determine if information provided in the comments requires formal response or contains new data that identify deficiencies in the EIS. See **Appendix C** for comment analysis and responses. Any such deficiencies were corrected and that information has been incorporated into this FEIS.

6.2.1 Consultation with Others

The following state and federal agencies were consulted during preparation of this EIS:

Idaho Conservation Data Center
Idaho Department of Environmental Quality
Idaho Department of Fish and Game
Idaho Department of Lands
Idaho Department of Water Resources
Idaho State Historic Preservation Office
U.S. Army Corps of Engineers
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
U.S. Geological Survey

The following Tribal organizations were consulted:

Shoshone-Bannock Tribes, Fort Hall Business Council

6.2.2 Consultation with Idaho Department of Environmental Quality and Idaho Department of Lands

The BLM requested that the IDEQ and IDL be cooperating agencies for this project. The IDEQ and IDL accepted this status, and BLM coordinated with these agencies during the preparation of the DEIS and the FEIS, and when reviewing information in the EIS. The IDEQ and IDL participated in conference calls and meetings as needed.

6.2.3 Consultation with the Walla Walla District, Corps of Engineers

The BLM requested that the USACE be a cooperating agency in preparation of the EIS. USACE accepted this status, and the BLM coordinated with the USACE during the preparation of the DEIS and the FEIS, and when reviewing the information in the document. The USACE participated in conference calls and meetings as needed.

6.3 GOVERNMENT TO GOVERNMENT CONSULTATION

The Shoshone-Bannock Tribes have reserved treaty rights on the public domain lands, in this case, administered by the BLM. The relationship of the United States government with American Indian tribes is based on legal agreements between sovereign nations. The Fort Bridger Treaty of July 3, 1868 reserved hunting and fishing rights for Tribal members on "...all unoccupied lands

of the United States." Consultation with the Fort Hall Business Council of the Shoshone-Bannock Tribes is required on land management activities that could affect public land uses and access to the land by tribal members. A comment letter from the Fort Hall Business Council regarding the Public Scoping Notice for the proposed Blackfoot Bridge Mine was received by the BLM in March 2006. A formal government-to-government consultation meeting was held on May 27, 2009 between the agencies and the Tribes prior to the issuance of DEIS. The Fort Hall Business Council also submitted comments to the DEIS on October 30, 2009, which are included in **Appendix C**. Another formal government-to-government consultation meeting was held on April 1, 2010 between the agencies and the Tribes to review their DEIS comments and agencies responses.

6.4 LISTS OF PREPARERS AND REVIEWERS

Lead Agency: BLM, Pocatello Field Office

Cooperating Agencies: IDEQ, IDL, USACE

Interdisciplinary Team and Technical Specialists:

Table 6.4-1 BLM, Pocatello Field Office

Name	Project Responsibility	Education/Experience
Kyle Free	EIS Project Lead, Mining Engineer:	B.S. Mining Engineering M.S. Mining Engineering 11 years experience
Jeff Cundick	Minerals Branch Chief, Mining Engineer	B.S. Mining Engineering M.B.A. Business / Economics 23 years experience
Joanna Wilson	Public Affairs Specialist	B.S. Communications 9 years experience
Candi Aguirre	Realty Specialist	BLM/FS Lands & Realty Academy 16 years experience
Chuck Patterson	Recreation/Visuals Specialist	B.S. Parks and Recreation Management M.A. Community and Environmental Planning 14 years experience
Channing Swan	Forestry Specialist	B.S. Forest Management 9 years experience
James Kumm	Wildlife Biologist	B.S. Wildlife Biology M.S. Wildlife Sciences 24 years experience
Bill Stout	Geologist	B.S. Earth Science Education M.S. Natural Science 17 years experience
Amy Lapp	Archaeologist/Cultural Resources Specialist	B.A. Anthropology M.S. Anthropology 4 years experience
Mike Jorgensen	Rangeland Management Specialist	B.S. Range Management B.S. Wildlife Management 25 years experience
Jayne Chipman	Threatened and Endangered Plants	B. S. Botany M. S. Biology (Botany) 2 years experience

Table 6.4-1 BLM, Pocatello Field Office

Name	Project Responsibility	Education/Experience
Dan Kotansky	Hydrologist	B.S. Forest Resources M.S. Watershed Science 24 years experience
Arn Berglund	Fisheries Biologist	B.S. Wildlife/Fisheries Resources 17 years experience
Eric Limbaugh	Range Management Specialist	B.S. Biology M.S. Botany M.S. Range Management Ph.D. Range Science 25 years experience

Table 6.4-2 Idaho Department of Environmental Quality

Name	Project Responsibility	Education/Experience
Margaretha English	Environmental Analyst/Project Manager	B.A. Geology/Environmental Studies M.S. Geology 23 years of experience
Gerry Winter	Environmental Hydrogeologist	A.S. Civil Engineering Technology B.A. Geology M.S. Hydrology 36 years experience

Table 6.4-3 Idaho Department of Lands

Name	Project Responsibility	Education/Experience
Al Ruberry	Civil Engineering	BS Geology 20 years experience

Table 6.4-4 United States Army Corps of Engineers

Name	Project Responsibility	Education/Experience
James Joyner	Water and Aquatic Resources (Wetlands)	B.S. and M.S. Biology 15 years of experience

Table 6.4-5 United States Fish and Wildlife Service

Name	Project Responsibility	Education/Experience
Sandi Fisher	Fish and Wildlife Service biologist Ensure conservation of Fish and Wildlife Service trust resources	B.S. Wildlife/Zoology M.S. Toxicology/Immunology 7 years of experience

THIRD PARTY CONTRACTORS

Table 6.4-6 ARCADIS U.S. Inc.

Name	Project Responsibility	Education/Experience
Jerry Koblitz	Project Manager	B.S. Natural Resource Management 35 years of experience
Eric Cowan	Assistant Project Manager	GIS Certificate/Business Studies 16 Years Experience
Carl Späth	Cultural Resources, Land Use, Grazing	Ph.D. Anthropology M.A. Anthropology B.A. Anthropology 36 years of experience
Gaston Leone	Water Resources, Geochemistry, and Modeling	B.S. and M.S. Civil Engineering 16 Years of experience
Magnus Skold	Geochemistry	B.S. Environmental Engineering; M.S. Environmental Science and Engineering; PhD - Hydrological Engineering 6 Years of experience
Jackie Headrick	Water Resources	B.S. Geochemistry M.A. Geology 14 years of experience
Lisa Welch	Visual Resources, Recreation, Socioeconomics, Environmental Justice, Transportation	B.S. Earth Resources 17 Years of experience
Allison Haraminac	Wildlife, Fisheries, TES, Vegetation	M.S. Ecology and Evolutionary Biology; B.S. Biology 3 Years of experience
Rachel Cruz	Wildlife, Fisheries, TES, Vegetation	B.S. Environmental Science 7 Years of experience
Carolyn Meyer	Vegetation	B.S. Natural Resources Planning, M.S. Zoology (wildlife biology), PhD Botany (ecology) 23 years of experience
Susan Riggs	Air Quality, Noise	M.S. Environmental Science; B.S. Biology 16 Years of experience
Jason Adams	Geology, Soils, Paleontology	M.S. Geological Sciences 3 Years of experience
Jason Gregory	GIS	B.S. Natural Resource Assessment 16 years of experience
Jie Chen	GIS/CAD Specialist	M.A. Geography 6 Years of experience
Deb Ballheim	Editor	B.A. English Composition and Linguistics 14 Years of experience
Carrie Womack Dixon	Document Control, Database Management, Word Processing	B.S. Animal Science 23 years of experience

Table 6.4-7 Whetstone & Associates

Name	Project Responsibility	Education/Experience
Scott Effner	Water Resources/Geochemistry, and Modeling	M.S. Geology 20 Years of experience
Susan Wyman	Water Resources Modeling	M.S. Hydrology 18 Years of experience
Christa Whitmore	Water Resources Modeling	B.S. Geology 2 years of experience

Table 6.4-8 Chemac

Name	Project Responsibility	Education/Experience
Dave McWharter	Custom geochemical testing, consulting	BS, Environmental Science 25 years experience

6.5 MAILING LISTS

6.5.1 Mailing List

FEDERAL

ADVISORY COUNCIL OF HISTORIC PRESERVATION
OFFICE OF ARCH ENV PRESERVATION
1100 PENNSYLVANIA AVENUE NW #809
WASHINGTON DC 20004

KITTY KUNTZ
REP MICHAEL K SIMPSON'S OFFICE
275 SOUTH 5TH AVENUE #275
POCATELLO ID 83201

SENATOR JAMES E. RISCH
275 SOUTH 5TH AVENUE, #290
POCATELLO IDAHO 83201

FARHANA HIBBERT
SENATOR MICHAEL D CRAPO'S OFFICE
275 SOUTH 5TH AVENUE #225
POCATELLO ID 83201

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BONNEVILLE POWER ADMIN
2410 EAST HAWTHORNE ROAD
MEAD WA 88021

BONNEVILLE POWER ADMIN
1350 LINDSAY DRIVE
IDAHO FALLS ID 83402

NATIONAL OCEAN SURVEY
LYNN PRESTON
315 E WEST HIGHWAY
SILVER SPRING MD 20910

ATTN: BRANCH CHIEF
NOAA FISHERIES SERVICES
10215 WEST EMERALD STREET #180
BOISE ID 83704

NMFS FISHERIES ENFORCEMENT
JOSEPH GIORDANO
10215 WEST EMERALD STREET #180
BOISE ID 83704

ATTN: DIST CONSERVATIONIST
NRCS
1120 LINCOLN ROAD
IDAHO FALLS ID 83401

NRCS
9173 WEST BARNES DRIVE
BOISE ID 83709

US ARMY CORPS OF ENGINEERS
WALLA WALLA DISTRICT
201 NORTH 3RD AVENUE
WALLA WALLA WA 99360

US ARMY CORPS OF ENGINEERS
GREG MARTINEZ
304 NORTH 8TH STREET
BOISE ID 83702

ROBERT BROCHU
US ARMY CORPS OF ENGINEERS
900 NORTH SKYLINE DRIVE #A
IDAHO FALLS ID 83402

JAMES JOYNER
US ARMY CORP OF ENGINEERS
900 NORTH SKYLINE DRIVE #A
IDAHO FALLS ID 83402

US ARMY CORP OF ENGINEERS
COEUR D'ALENE REGULATORY OFFICE
3815 NORTH SCHREIBER WAY
COEUR D'ALENE ID 83815

US ARMY CORP OF ENGINEERS
BOISE REGULATORY OFFICE
10095 EMERALD AVENUE
BOISE ID 83704

US ATTORNEY'S OFFICE
800 PARK BOULEVARD #600
BOISE ID 83712

ATTN: SUPERINTENDENT
US BIA FORT HALL INDIAN AGENCY
PO BOX 220
FORT HALL ID 83203

JACK D DEPPERSCHMIDT
US DOE
1955 FREMONT AVENUE MS 1216
IDAHO FALLS ID 83415

JOE WEBBER
FEMA
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BOTHELL WA 98021
BRENT INGHRAM
FEDERAL HIGHWAY ADMINISTRATION
3050 N LAKE HARBOR LANE #126
BOISE ID 83703

EDWIN JOHNSON
FEDERAL HIGHWAY ADMINISTRATION
3050 N LAKE HARBOR LANE #126
BOISE ID 83703

BRENT LARSON
USFS CARIBOU/TARGHEE
1405 HOLLIPARK DRIVE
IDAHO FALLS ID 83401

JAY PENCE
USFS CARIBOU/TARGHEE
TETON BASIN RANGER DISTRICT
515 S MAIN
DRIGGS ID 83422

MARY KAUFFMAN
CARIBOU-TARGHEE NATIONAL FOREST
1405 HOLLIPARK DRIVE
IDAHO FALLS ID 83401

ROBB MICKELSON
CARIBOU-TARGHEE NATIONAL FOREST
1405 HOLLIPARK DRIVE
IDAHO FALLS ID 83401

RICHARD NEWTON
USFS CARIBOU/TARGHEE
DUBOIS RANGER DISTRICT
127 WEST MAIN ST
IDAHO FALLS ID 83401

JACK ISAACS
USFS CARIBOU/TARGHEE
SODA SPRINGS RANGER DISTRICT
410 EAST HOPPER AVENUE
SODA SPRINGS ID 83276

DENNIS DUEHREN
USFS CARIBOU/TARGHEE
MONTPELIER RANGER DISTRICT
322 NORTH 4TH
MONTPELIER ID 83254

RON DICKMORE
USFS CARIBOU/TARGHEE
3659 E RIRIE HWY
IDAHO FALLS ID 83401

JEFF JONES
USFS CARIBOU/TARGHEE SODA
WESTSIDE RANGER DISTRICT
4350 CLIFFS DRIVE
POCATELLO ID 83204

JEFF HAMMES
USFS CARIBOU/TARGHEE
WESTSIDE RANGER DISTRICT
4350 CLIFFS DRIVE
POCATELLO ID 83204

ATTN: FOREST HYDROLOGIST
USFS CARIBOU/TARGHEE
1405 HOLLIPARK DRIVE
IDAHO FALLS ID 83401

BLM LIBRARY
DENVER FEDERAL CENTER
PO BOX 25047, BLDG. 50
DENVER CO 80225-0047

USDOI BLM WASHINGTON OFFICE (WO-210)
1849 C STREET NW, RM. 2665
WASHINGTON DC 20240

OFFICE OF ENVIRONMENTAL POLICY AND COMPLIANCE
1849 C STREET NW, RM. 2462
WASHINGTON DC 20240

DAVID FORTIER
BLM
3815 N SCHREIBER WAY
COEUR D ALENE ID 83815

MARGARET VAN GILDER
BLM IDAHO STATE OFFICE
1387 SOUTH VINNELL WAY
BOISE ID 83709

GARY WYKE
BLM IDAHO STATE OFFICE
1387 SOUTH VINNELL WY
BOISE ID 83709

KYLE FREE
BLM POCATELLO FO
4350 CLIFFS DRIVE
POCATELLO ID 83204

ATTN: FIELD MANAGER
BLM UPPER SNAKE FO
1405 HOLLIPARK DRIVE
IDAHO FALLS ID 83401-2100

ATTN: ECOSYSTEMS ANALYSIS
PN6550
BUREAU OF RECLAMATION
1150 NORTH CURTIS ROAD #100
BOISE ID 83706-1234

ATTN: FIELD SUPERVISOR
USFWS
1387 SOUTH VINNELL WY
BOISE ID 83709

DAVID KAMPWERTH
USFWS
4425 BURLEY DRIVE #A
CHUBBUCK ID 83202

RICHARD MUNOS
USFWS
4425 BURLEY DRIVE #A
CHUBBUCK ID 83202

SANDI FISHER
USFWS
4425 BURLEY DRIVE #A
CHUBBUCK ID 83202

TROY SMITH
USFWS
4425 BURLEY DRIVE #A
CHUBBUCK ID 83202

ATTN: DISTRICT CHIEF
US GEOLOGICAL SURVEY
2329 ORTON CIRCLE
SALT LAKE CITY UT 84119-2047

ATTN: SUPERINTENDENT
NATIONAL PARK SERVICE
CRATERS OF THE MOON NATL MON & PRES
PO BOX 29
ARCO ID 83213

ATTN: SUPERINTENDENT
NATIONAL PARK SERVICE
909 - 1ST AVE
SEATTLE WA 98104

ATTN: SHARON POWELL
NATIONAL PARK SERVICE
168 S JACKSON ST
SEATTLE WA 98104

REGIONAL ENVIRONMENTAL OFFICE
US DOI
620 SW MAIN ST #201
PORTLAND OR 97205

ATTN: DIRECTOR
US EPA
1435 NORTH ORCHARD
BOISE ID 83706

FRANK BORSUK
US EPA REGION 3
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INNOVATION DIVISION
1060 CHAPLINE STREET #303
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EVA C DEMARIA
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OW-133
SEATTLE WA 98101

TOM CONNOR
US EPA REGION 10
1200 - 6TH AVENUE
STOP WD 126A
SEATTLE WA 98101

DAVID TOMTEN
US EPA IDAHO OPERATIONS OFFICE
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WASATCH-CACHE NFS
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8230 FEDERAL BUILDING
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STATE

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DOUG TANNER
IDAHO DEPT OF ENVIRONMENTAL
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ERIC NEHER
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QUALITY
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CHAPTER 7

REFERENCES, ACRONYMS, GLOSSARY, AND INDEX

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REFERENCES, ACRONYMS, GLOSSARY AND INDEX

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7.2 ACRONYMS AND ABBREVIATIONS

ABA	Acid-Base Accounting
ACEC	Area of Critical Environmental Concern
AF	Acre Feet
AGP	Acid Generating Potential
AIRFA	American Indian Religious Freedom Act
amsl	Above Mean Sea Level
ANP	Acid Neutralizing Potential
ANR	Agriculture Natural Resource
AOC	Administrative Order on Consent
ARD	Acid Rock Drainage
ATV	All-terrain Vehicle
AUM	Animal Unit Month
AWHC	Available Water Holding Capacity
bcy	Bank Cubic Yard
BET	Brunauer, Emmett, and Teller Method
BLM	Bureau of Land Management
BMP	Best Management Practices
btoc	Below the Top of the Well Casing
$CaCO_3$	Calcium Carbonate
CCC	Criteria Continuous Concentration
CEA	Cumulative Effects Area
CEC	Cation Exchange Capacity
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFA	Carbonate Fluorapatite
CFR	Code of Federal Regulations
cfs	Cubic Feet Per Second
CMC	Criteria Maximum Concentration
CO	Carbon Monoxide
COPC	Constituent of Potential Concern
CP1	Central Pond 1
CP2	Central Pond 2
CTNF	Caribou-Targhee National Forest
CWA	Clean Water Act
dB	Decibels
dBA	A-weighted Decibels
°C	Degrees Celsius
°F	Degrees Fahrenheit
DEIS	Draft Environmental Impact Statement
EA	Environmental Assessment
EC	Electrical Conductivity
EE/CA	Engineering Evaluation/Cost Analysis
E.O.	Executive Order
EIS	Environmental Impact Statement
EOP	East Overburden Pile
EP1	East Pond 1
EP2	East Pond 2
EP3	East Pond 3
EP4	East Pond 4
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ET	Evapotranspiration
FCR	Fire-cracked Rock
FEIS	Final Environmental Impact Statement
ft	Feet
ft/d	Foot/feet per day
FONSI	Finding of No Significant Impact
FY	Fiscal Year
GCL	Geosynthetic Clay Liner
GCLL	Laminated Geosynthetic Clay Liner
GHG	Greenhouse Gas
gpm	Gallons Per Minute
G_s	Specific Gravity
HCO_3/l	Bicarbonate per Liter
HDPE	High-density Polyethylene
HUC	Hydrologic Unit Code

Hz	Hertz
ICP-AES /MS	Inductively-coupled plasma atomic emission spectrometry/mass spectrometry
IDAPA	Idaho Administrative Procedures Act
IDC	Idaho Department of Commerce
IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Department of Fish and Game
IDL	Idaho Department of Lands
IDWR	Idaho Department of Water Resources
IMA	Idaho Mining Association
in/yr	inches per year
IRA	Inventoried Roadless Area
ITD	Idaho Transportation Department
km	kilometer
KOP	Key Observation Point
KPLA	Known Phosphate Lease Area
k_{sat}	Saturated Hydraulic Conductivity
kV	Kilovolt
L_{eq}	Equivalent Continuous Noise Level
L_{dn}	Day-night Average Sound
lbs/yr	Pounds per year
LLDPE	Linear Low Density Polyethylene
µg/g	Micrograms Per Gram
µm	Micrometers
MBTA	Migratory Bird Treaty Act
MDT	Montana Department of Transportation
mg/L	Milligrams Per Liter
mg/kg	Milligrams Per Kilogram
mi	Miles
ml	Milliliters
mlcy	Million Loose Cubic Yards
mm	Millimeters
MOU	Memorandum of Understanding
MRC	Moisture Retention Curve
MSGP	Multi-sector General Permit
MSHA	Mine Safety and Health Act
MW	Monitoring Well
MWMP	Meteoric Water Mobility Procedure
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NFS	National Forest System
NHPA	National Historic Preservation Act
NOA	Notice of Availability
NOI	Notice of Intent
NO_x	Nitrogen Oxide
NPDES	National Pollution Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NTU	Nephelometric Turbidity Unit
NWI	National Wetland Inventory
NWOP	Northwest Overburden Pile
NWP1	Northwest Pond 1
NWP2	Northwest Pond 2
NWP3	Northwest Pond 3
NWP4	Northwest Pond 4
NWS	National Weather Service
OHV	Off-Highway Vehicle
OSMS	Overburden Seepage Management System
P4	P4 Production, LLC
pH (s.u.)	pH Standard Units
PM_{10}	Particulate Matter Less Than 10 Micrometers in Diameter
$PM_{2.5}$	Particulate Matter Less Than 2.5 Micrometers in Diameter
PPGM	Primary Plant Growth Medium
ppm	Parts Per Million
PSD	Prevention of Significant Deterioration
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
RMP	Resource Management Plan

ROD	Record of Decision
ROM	Run of Mine
SAR	Sodium Absorption Ratio
SARA	Superfund Amendments and Reauthorization Act
Se	Selenium
SeAWAC	Selenium Area-wide Advisory Committee
SEH	Soil Erosion Hazard
SNOTEL	Snow Telemetry
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SPCC	Spill Prevention Control and Countermeasures
SPLP	Synthetic Precipitation Leaching Procedure
SRMA	Special Recreation Management Area
SWPPP	Storm Water Pollution Prevention Plan
TCP	Traditional Cultural Properties
TDS	Total Dissolved Solids
TMDL	Total Maximum Daily Loads
TOC	Total organic carbon
USACE	United States Army Corps of Engineers
U.S.C.	United States Code
USD	United States Dollar
USDOT	United States Department of Transportation
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VOC	Volatile Organic Compound
VQO	Visual Quality Objective
VRM	Visual Resource Management
WEG	Wind Erodibility Group
WER	Water Effect Ratio
WMP1	Water Management Pond 1
WMP2	Water Management Pond 2
XRF	X-ray fluorescence spectroscopy
yd	Yards

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7.3 GLOSSARY

Acre-feet - The volume of liquid or solid required to cover 1 acre to a depth of 1 foot, or 43,560 cubic feet; measure for volumes of water, reservoir rock, etc.

Allotment - A unit of land suitable and available for livestock grazing that is managed as one grazing unit.

Alluvial - Pertaining to material or processes associated with transportation or deposition of soil and rock by flowing water (e.g., streams and rivers).

Alluvium - Unconsolidated or poorly consolidated gravel, sands, and clays, deposited by streams and rivers on riverbeds, floodplains, and alluvial fans.

Ambient - The environment as it exists at the point of measurement and against which changes or impacts are measured.

Animal Unit Months (AUMs) - The amount of forage consumed by a 1,000-pound cow and calf (less than 6 months of age) over a 1-month period (approximately 800 pounds of forage).

Anticline - A fold in rock, where the interior of the fold is composed of rocks that are older than the rocks on the exterior of the fold.

Aquatic Resources - Biological resources (plants, animals, and other life forms) present in or dependent on streams, lakes, and other surface water.

Aquifer - A body of rock that is sufficiently permeable to conduct groundwater and to yield economically significant quantities of water to wells and springs.

Aspect - The direction toward which a slope faces with respect to the compass or the sun.

Attenuation - The process of becoming thinner, or diminished, in dimension, concentration, or density.

Background - The viewing area of a distance zone that lies beyond the foreground-middleground. Usually from a minimum of 3 to 5 miles to a maximum of about 15 miles from a travel route, use area, or other observer position. Atmospheric conditions in some areas may limit the maximum to about 8 miles or increase it beyond 15 miles.

Baseflow - Groundwater discharge to streams and rivers.

Baseline Study - A study conducted to gather data prior to mining for the purpose of outlining conditions existing on an undisturbed site. Impacts are evaluated against the baseline data, and reclamation success is measured against baseline data.

Best Management Practices (BMPs) - Innovative, dynamic, and improved environmental protection practices applied to industry to help ensure that development is conducted in an environmentally responsible manner.

Bioaccumulation - A process by which chemicals are taken up by organisms from water or sediment directly or through consumption of food containing the chemicals.

Biodiversity - The diversity of species, ecosystems, and natural processes in an area.

Biological Assessment - Information prepared by or under the direction of the federal agency concerning listed species that may be present in the action area and the evaluation of potential effects of the action on such species and habitats. The purpose of the biological assessment is to evaluate the potential effects of the action on listed or proposed species or designated or proposed critical habitat, and determine whether any such species and habitats are likely to be adversely affected by the action. Biological assessments are conducted for major federal construction projects requiring an EIS.

Characteristic Landscape - The established landscape within an area being viewed. The term does not necessarily mean a naturalistic character, but may refer to features of the cultural landscape, such as a farming community, an urban landscape, or other landscape that has an identifiable character.

Chert - A hard, dense, microcrystalline sedimentary rock, consisting chiefly of interlocking crystals of quartz less than about 30 micrometers in diameter; it may contain amorphous silica (opal). It may be white or variously colored. Chert occurs primarily as nodular or concretionary segregations, or nodules in limestone or dolomite, and less commonly as layered deposits or bedded chert.

Code of Federal Regultions (CFR) - The compilation of federal regulations adopted by federal agencies through a rule-making process.

Colluvium - General term applied to loose and incoherent deposits, usually at the foot of a slope or cliff and brought there chiefly by gravity; such as talus and cliff debris.

Column Test - A leaching laboratory test where water or other leaching solution is percolated through a vertical column of earth material, and the resulting leachate is collected and analyzed for dissolved parameters.

Community Types (vegetation) - A group of plants living in a specific region under relatively similar conditions.

Contrast - The effect of a striking difference in the form, line, color, or texture of the landscape features within the area being viewed.

Critical (Crucial) Habitat - Habitat that is present in minimum amounts and is a determining factor for population maintenance and growth.

Cultural Resources - The archaeological and historical remains of human occupation or use. Includes any manufactured objects, such as tools or buildings. May also include objects, sites, or geological/geographical locations significant to Native Americans.

Cumulative Effects -As defined by 40 CFR 1508.7, cumulative effects are the impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

dBA - The sound pressure levels in decibels measured with a frequency weighing network corresponding to the A-scale on a standard sound level meter. The A-scale tends to suppress lower frequencies (e.g., below 1,000 Hz).

Decibel (dB) - A unit used in expressing ratios of electric or acoustic power. The relative loudness of sound.

Direct Effects - As defined by 40 CFR 1508.9, these are effects caused by the action and which occur at the same time and place as the action. Synonymous with direct impacts.

Discharge - The volume of water flowing past a point per unit time, commonly expressed as cubic feet per second (cfs), gallons per minute (gpm), or million gallons per day (mgd).

Disturbed Area - Area where natural vegetation and soils have been removed or disrupted.

Drainage - Natural channel through which water flows during some time of the year. Natural and artificial means for effecting discharge of water as by a system of surface and subsurface passages.

Drawdown - The lowering of the water level in a well as a result of withdrawal.

Electrical Conductivity (or Specific Conductance) - The ability of a water or a soil-water paste to transmit electrical current, used to estimate ion concentration.

Endangered Species - Any species in danger of extinction throughout all or a significant portion of its range. Plant or animal species identified by the Secretary of the Interior as endangered in accordance with the 1973 Endangered Species Act.

Ephemeral Stream - A stream or portion of a stream that flows briefly in direct response to precipitation in the immediate vicinity, and whose channel is at all times above the water table.

Erosion - The wearing away of soil and rock by weathering, mass wasting, and the action of streams, glaciers, waves, wind, and underground water.

Evapotranspiration - The portion of precipitation returned to the air through evaporation and plant transpiration.

Exploration - The search for economic deposits of minerals, ore, and other materials through practices of geology, geochemistry, geophysics, drilling, and/or mapping.

Fate and Transport - Description of the movement of a contaminant through a groundwater system which may include the effects of dilution, dispersion, attenuation, and various chemical reactions.

Fault - Surface of rock rupture along which there has been differential movement.

Fisheries - Streams and lakes used for fishing.

Floodplain - That portion of a river valley adjacent to the channel which is built of sediments deposited during the present regimen of the stream and is covered with water when the river overflows its banks at flood stages.

Footprint - The actual surface area physically disturbed by mining operations and ancillary facilities.

Forage - Vegetation used for food by wildlife, particularly big game wildlife and domestic livestock.

Forb - Any herbaceous plant other than a grass.

Foreground-Middleground - The area visible from a travel route, use area, or other observer position to a distance of 3 to 5 miles. The outer boundary of this zone is defined as the point where the texture and form of individual plants are no longer apparent in the landscape, and vegetation is apparent only in pattern or outline.

Fugitive Dust - Dust particles suspended randomly in the air from road travel, excavation, and rock loading operations.

Game Species - Animals commonly hunted for food or sport.

Geochemistry - The study of the distribution and amounts of the chemical elements in minerals, ores, rocks, soils, water, and the atmosphere, and their circulation in nature, on the basis of the properties of their atoms and ions.

Geotechnical - A branch of engineering concerned with the engineering design aspects of slope stability, settlement, earth pressures, bearing capacity, seepage control, and erosion.

Grade - A slope stated in terms of feet per mile or as feet per feet (percent); the content of precious metals per volume of rock (ounces per ton).

Groundwater - All subsurface water, especially that as distinct from surface water in the zone of saturation.

Groundwater Table - The surface between the zone of saturation and the zone of aeration; that surface of a body of unconfined groundwater at which the pressure is equal to that of the atmosphere.

Habitat - The place or type of site where a plant or animal naturally or normally lives and grows. Includes all biotic, climatic, and soils conditions, or other environmental influences affecting living conditions.

Haul Road - All roads utilized for transport of an extracted mineral, waste, overburden, or other earthen materials.

Heavy Metals - A group of elements that may be acquired by organisms in trace amounts that are toxic in higher concentrations. Includes copper (Cu), lead (Pb), mercury (Hg), molybdenum (Mo), nickel (Ni), cobalt (Co), chromium (Cr), iron (Fe), silver (Ag), etc.

Hydraulic Conductivity (K) - A coefficient of proportionality describing the rate at which water can move through a permeable medium.

Hydraulic Gradient - For groundwater, the rate of change of total head per unit of distance of flow at a given point and in a given direction.

Hydrograph - A graph that shows some property of groundwater or surface water as a function of time.

Hydrology - A science that deals with the properties, distribution, and circulation of surface and subsurface water.

Hydrophytic Vegetation - Plants that grow in and are adapted to an aquatic or very wet environment.

Hydrostratigraphic Unit - A formation, part of a formation, or group of formations in which there are similar hydrologic characteristics allowing for grouping into aquifers or confining layers.

Impoundment - The accumulation of any form of water in a reservoir or other storage area, generally resulting from a man-made embankment.

Indirect Effects - As defined by 40 CFR 1508.8, these are reasonably foreseeable effects that are caused by the action but occur later in time or are removed in distance from the action. Synonymous with indirect impacts.

Infiltration - The movement of water or some other liquid into the soil or rock through pores or other openings.

Infrastructure - The basic framework or underlying foundation of a community including road networks, electric and gas distribution, water and sanitation services, and facilities.

Intermittent Stream - 1) A stream that flows only at certain times of the year, as when it receives water from springs or from a surface source and 2) a stream that does not flow continuously, as when water losses from evaporation or seepage exceed the available stream flow.

Irretrievable - Applies to the loss of production, harvest, or use of natural resources. For example, some or all of the timber production from an area is lost irretrievably while an area is

serving as a winter sports site. The production lost is irretrievable, but the action is not irreversible. If the use changes, it is possible to resume timber production.

Irreversible - Applies primarily to the use of nonrenewable resources, such as minerals or cultural resources, or to those factors that are renewable only over long time spans such as soil productivity and aspen regeneration. Irreversible also includes loss of future options.

Jurisdictional Wetland - A wetland area identified and delineated by specific technical criteria, field indicators, and other information for purposes of public agency jurisdiction. The public agencies which administer jurisdictional wetlands are the US Army Corps of Engineers, US Environmental Protection Agency, US Fish and Wildlife Service, and USDA-Soil Conservation Service.

K-Soil Erosion Factor - A ranking of susceptibility of soils to erosion by water. Factors below 0.25 = low susceptibility, 0.25 to 0.4 = moderately susceptible, and 0.4 and above = highly susceptible.

Key Observation Point (KOP) - An observer position on a travel route used to determine visible area.

Land Use - Land uses determined for a given area that establish the types of activities allowed (e.g., mining, agriculture, timber production, residences, industry) and the size of buildings and structures permitted.

Landform - Any physical, recognizable form or feature of the Earth's surface, having a characteristic shape and produced by natural causes. Includes major features such as plains, plateaus, and mountains and minor features, such as hills, valleys, slopes, canyons, arroyos, and alluvial fans.

Landscape Character - The arrangement of a particular landscape as formed by the variety and intensity of the landscape features as defined by the four basic elements (form, line, color, and texture). These factors give the area a distinctive quality that distinguishes it from its immediate surroundings.

Lifts - Waste rock dumps constructed in a series of layers.

Limestone - A sedimentary rock consisting chiefly of the mineral calcite (calcium carbonate, CaCO3), with or without magnesium carbonate. Common impurities include chert and clay. It is the consolidated equivalent of limy mud, calcareous sand, and/or shell fragments.

Lithology - The description of rocks in terms of the physical character of a rock, mineral composition, grain size, color, and other physical characteristics.

Long-Term Effects - Long-term effects are effects that would remain following completion of the project. As an example, the loss of vegetation from the development of an open pit would be a long-term effect if the pit were not reclaimed and vegetation not re-established at the end of the project.

Mesic - Moist habitats associated with springs, seeps, and riparian areas.

Mitigate, Mitigation - To cause to become less severe or harmful to reduce impacts. Actions to avoid, minimize, rectify, reduce or eliminate, and compensate for impacts to environmental resources.

Modification - A visual quality objective in which human activity may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as background.

Monitor - To systematically and repeatedly watch, observe, or measure environmental conditions in order to track changes.

National Environmental Policy Act of 1969 (NEPA) - The national charter for protection of the environment. NEPA establishes policy, sets goals, and provides means for carrying out the policy. Regulations at 40 CFR 1500-1508 implement the act.

National Register of Historic Places (NRHP) - A list, maintained by the National Park Service, of areas which have been designated as being of historical significance.

Native Species - Plants that originated in the area in which they are found, i.e., they naturally occur in that area.

Noxious Weed - An alien, introduced or exotic species that is adventive, aggressive, or overly competitive with more desirable species.

Nutrients - Essential chemicals needed by plants or animals for growth and health. If other physical and chemical conditions are optimal, excessive amounts of nutrients can lead to degradation of water quality by promoting excessive growth, accumulation, and subsequent decay of plants, especially algae. Some nutrients can be toxic to animals in high concentrations.

One-hundred year, twenty four-hour storm event (100-year, 24-hour) - The maximum precipitation predicted to occur within any 24-hour period over 100 years.

Ore - A deposit of rock from which a valuable mineral or minerals can be economically extracted.

Overburden - Material (sub-economic, non-ore) which overlies a deposit of valuable material.

Pit Backfill - Placing waste rock in a mined-out pit.

Partial Retention - A visual quality objective in man's activities may be evident, but must remain subordinate to the characteristic landscape.

Perched Water - Unconfined groundwater separated from the underlying main body of groundwater by unsaturated sediments or rock.

Perennial Stream - A stream or reach of a stream that flows throughout the year.

Permeable - The property or capacity of a porous rock, sediment, or soil to transmit a liquid.

pH - The negative $\log_{10}$ of the hydrogen ion activity in solution; a measure of acidity or basicity of a solution. pH 1 is highly acidic, and pH 14 is strongly basic.

$PM_{2.5}$ - Particulate matter less than 2.5 microns in aerodynamic diameter.

PM_{10} - Particulate matter less than 10 microns in aerodynamic diameter.

Peak Flow - The greatest flow attained during melting of winter snowpack or during a large precipitation event.

Productivity - In reference to vegetation, productivity is the measure of live and dead accumulated plant materials.

Project Alternatives - Alternatives to the proposed project developed through the NEPA process.

Protohistoric - Time period when native culture is in contact with outside culture before written record.

Public Scoping - See Scoping.

Raptor - A bird of prey (e.g., eagles, hawks, falcons, and owls).

Recontouring - Restoration of the natural topographic contours by reclamation measures, particularly in reference to roads.

Record of Decision (ROD) - A decision document for an EIS or Supplemental EIS that publicly and officially discloses the responsible official's decision regarding the actions proposed in the EIS and their implementation.

Reserves - Identified resources of mineral-bearing rock from which the mineral can be extracted profitably with existing technology and under present economic conditions.

Resources (geologic) - Reserves plus all other mineral deposits that may eventually become available, either known deposits that are not presently recoverable or unknown deposits, that may be inferred to exist but have not yet been discovered.

Riparian - Situated on or pertaining to the bank of a river, stream, or other body of water. Riparian is normally used to refer to plants of all types that grow along streams, rivers, or at spring and seep sites.

Runoff - That part of precipitation that appears in surface streams; Precipitation that is not retained on the site where it falls and is not absorbed by the soil.

Run-of-Mine Overburden - Sub-economic rock mined from the ore body which is placed in surface dumps or as pit backfill.

Run-on - That part of precipitation that runs onto the site from adjacent areas.

Scoping - Procedures by which agencies determine the extent of analysis necessary for a proposed action, (i.e., the range of actions, alternatives, and impacts to be addressed; identification of significant issues related to a proposed action; and the depth of environmental analysis, data, and task assignments needed) (40 CFR 1501.7).

Sediment Load - The amount of sediment (sand, silt, and fine particles) carried by a stream or river.

Sediment - Material suspended in or settling to the bottom of a liquid. Sediment input comes from natural sources such as soil erosion, rock weathering, agricultural practices, or construction activities.

Seismicity - The likelihood of an area being subject to earthquakes; the phenomenon of earth movements.

Shale - A fine-grained sedimentary rock formed by the compaction of clay, silt, or mud. It has a finely laminated structure which gives it a natural plain along which the rock splits, especially on weathered surfaces. It may be red, brown, black, or gray.

Short-Term Effects - Short-term effects are defined as those effects that would not last longer than the life of the project. As an example, the loss of vegetation from the construction of a haul road would be a short-term effect because the road would be reclaimed and vegetation re-established following completion of the project.

Significant - As used in NEPA, determination of significance requires consideration of both context and intensity. Context means that the significance of an action must be analyzed in several contexts such as society as a whole, and the affected region, interests, and locality. Intensity refers to the severity of impacts (40 CFR 1508.27).

Soil - Loose, unconsolidated surface material including the A and E horizon (topsoil) and B horizon (subsoil).

Specific Yield - See Storativity.

Storage Coefficient (S) - Volume of water that an aquifer absorbs or releases from storage per unit surface area of aquifer per unit decline in the component of hydraulic head normal to the surface; S is dimensionless.

Storativity - The volume of water an aquifer releases from, or takes into storage per unit surface area of the aquifer per unit change in head. In an unconfirmed aquifer, the storativity is equivalent to the specific yield.

Swell - The increase in volume exhibited by certain soils and rocks on absorption of water; an enlarged place in an orebody; a general, imprecise term for dome or arch.

Syncline - A folded rock sequence where the interior of the fold is younger than the rock on the exterior.

Synthetic Precipitation Leachability Procedure (SPLP) Test - A laboratory testing procedure established by the U.S. Environmental Protection Agency where a prescribed amount of solid material is mixed for a set time with a prescribed amount of acidified water. The leachate is then separated from the solid and analyzed for parameters of interest.

Threatened Species - Any species of plant or animal which is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Tipple Facility - Area where ore is loaded onto haul trucks for transport to the processing plant.

Total Dissolved Solids (TDS) - Total amount of dissolved material, organic or inorganic, contained in a sample of water.

Transmissivity (T) - The rate at which water will flow through a vertical strip of aquifer of one unit width and extending through the full saturated thickness under a hydraulic gradient of 1.0.

Visual Quality Objective (VQO) - A desired level of excellence based on physical and sociological characteristics of an area. Refers to degree of acceptable alteration of the characteristic landscape.

Visual Resource - The composite of basic terrain, geologic features, water features, vegetation patterns, and land use effects that typify a land unit and influence the visual appeal the unit may have for viewers.

Waters of the United States - A jurisdictional term from Section 404 of the Clean Water Act referring to waterbodies, such as lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation, or destruction of which could affect interstate or foreign commerce.

Watershed - The geographic region from which water drains into a particular stream, river, or body of water. A watershed includes hills, lowlands, and the body of water into which the land drains. Watershed boundaries are defined by the ridges or divides separating watersheds.

Wetland Functions - Dynamic biological, chemical, and physical processes that characterize wetland ecosystems.

Wetlands - Areas inundated by surface or groundwater with a frequency sufficient to support, and under normal circumstances does or would support, a prevalence of vegetation or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

Wilderness - Land designated by the U.S. Congress as a component of the National Wilderness Preservation System.

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APPENDIX A

BLACKFOOT BRIDGE MINE ENVIRONMENTAL MONITORING PLAN

September 2010

Blackfoot Bridge Mine
Environmental Monitoring Plan

Prepared by
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APPENDICES

Appendix A – Surface Water and Groundwater Monitoring

Appendix B - Fish, Invertebrate, Amphibian, Reptiles, and Aquatic Habitat Quality Sampling and Analysis Plan

Appendix C - Soil and Vegetation Sampling Plan

Appendix D – Stormwater Monitoring

Appendix E - Overburden Suitability Analysis Plan

Appendix F – Cover System Monitoring Plan

Appendix G - Water Management Plan; Adaptive Management Plan; and Overburden Seepage Management Plan Monitoring Program

1.0 SUMMARY

The Blackfoot Bridge Mine (BFB) Environmental Monitoring Plan (EMP) addresses various proposed monitoring programs that would be implemented over the life of the proposed BFB project and post-closure period. The EMP is intended to be an evergreen document that would be updated periodically to reflect any new monitoring requirements. The frequency in which the EMP will be updated will be determined by Idaho Department of Environmental Quality (IDEQ), Idaho Department of Lands (IDL), Bureau of Land Management (BLM), and U.S. Army of Corps of Engineers (USACE). This EMP summarizes proposed monitoring programs that would be used to assess potential changes in environmental resource conditions, if any, on the mine property and adjacent areas that may occur as a result of development of the BFB project. The EMP also summarizes proposed monitoring program components that would be needed to meet specific requirements under applicable permits and other authorizations. The proposed monitoring programs described in this EMP will be finalized in conjunction with review and approval by BLM, IDEQ, IDL, and USACE, as appropriate, prior to initiation of the Blackfoot Bridge Project.

The accurate assessment of changes in environmental resources is facilitated by a structured monitoring program. P4 has conducted baseline studies to characterize existing environmental conditions in the BFB project area for the following resources:

- Surface Water
- Groundwater
- Fish
- Invertebrates
- Amphibians
- Reptiles
- Aquatic Resources
- Soil Resources
- Vegetation
- Birds (including eagles)
- Mammals (including carnivores)
- Bats

- Wetlands
- Cultural and Paleontological Resources

The EMP also includes descriptions of monitoring plans that would be used to assess the performance of various programs that would be initiated during the Project, including:

- Wetland mitigation program performance;
- Best management practices (BMPs) that would be implemented at locations throughout the project area to control stormwater;
- Assessment of construction materials (overburden) for use in road construction and ancillary facility yard areas;
- Monitoring of cover system installation and performance;
- Water Management Plan, Adaptive Management Plan, and Overburden Seepage Management System; and,
- Air quality monitoring (as required under Air Quality Permit).

Selected environmental baseline studies that were initiated to support permit applications and environmental review of the BFB may be continued throughout the mine life, while other studies would be one-time monitoring events. The rationale for the design of each monitoring program for each resource or program is discussed in the respective sections.

This EMP includes references to various monitoring plans that were developed to direct the collection of baseline environmental information for the proposed BFB Project. These referenced plans of study and subsequent reports document how prior studies were conducted.

The appendices in the EMP contain additional information for future anticipated monitoring (i.e., sampling and analysis plans). If the monitoring program for any of the resources identified above should change in response to new requirements or results from data collection, a revised or modified program would supersede this EMP for that resource or program. Any modification to sampling and analysis plans would be submitted to the appropriate agency for review and approval prior to implementation. Minor modifications may be addressed through letter communications for authorization. More extensive revisions may require updating entire sections of the EMP. The frequency at which the EMP will be updated will be determined in consultation with the agencies when the various monitoring programs are finalized.

Table 1 summarizes the baseline monitoring programs and describes anticipated monitoring for each resource during the Project life and post-closure period. Additionally, this EMP may be updated upon the issuance of a Record of Decision ("ROD") by the Bureau of Land Management ("BLM") for the Blackfoot Bridge Mine depending on stipulations or conditions that may be included in the ROD.

Table 1. Environmental Monitoring Details and Proposed Activities

Resource	Current Program	BASELINE DATA			Proposed Monitoring
		Reference Plan	Data Collected	Collection Period	
Monitoring Programs					
Surface Water	Ongoing bi-annual sampling program.	Surface Water Baseline Study Plan Blackfoot Bridge Mine (Whetstone, 2005a) Final Water Resources Baseline Characterization Report Blackfoot Bridge Mine (Whetstone, 2009a)	Surface water quality and quantity data	Spring, summer, and fall 2005-2007, spring, fall to present.	See Section 3.1.1 , and Appendix A for proposed monitoring details including objectives, sampling locations, sampling procedures and methods, frequencies, analyte list, and analytical methods. QA/QC plans will be developed in conjunction with agencies. Pre-mining and during mining operations at minimum of high flow (spring) and low flow (fall) each year or more often as specified by IDEQ and BLM, and continued post-mining at high flow and low flow conditions until data trends justify cessation. The monitoring program will also identify contingency / response plans based on analytical results.

Resource	Current Program	BASELINE DATA			Proposed Monitoring
		Reference Plan	Data Collected	Collection Period	
Groundwater	Bi-annual sampling program ongoing.	Groundwater Baseline Study Plan Blackfoot Bridge Mine (Whetstone, 2009a) Final Water Resources Baseline Characterization Report Blackfoot Bridge Mine (Whetstone, 2009a) Point of Compliance to be determined by IDEQ; will establish groundwater monitoring well locations for compliance with state regulations (P4 2010c)	Groundwater quality and quantity data	Spring, summer, and fall 2005-2007, spring, fall 2008 to present	See Section 3.1.2 and Appendix A for proposed monitoring program details including objectives, sampling locations, sampling procedures and methods, frequencies, analyte list, and analytical methods. QA/QC plans will be developed in conjunction with agencies. Pre-mining and during mining operations at minimum of high flow (spring) and low flow (fall) each year or more often as specified by IDEQ and BLM, and continued post-mining at high flow and low flow conditions until data trends justify cessation. The monitoring program will also identify contingency / response plans based on analytical results.
Fish	None	Final Aquatic Resources, Amphibian, and Reptile Baseline Study Plan for the Blackfoot Bridge Property , (Greystone, 2005)	Fish quality and quantity data	Summer 2005	See Section 3.1.3 and Appendix B. Re-conduct assessment in Years 5, 10, and post-mining. Design of future assessment / study will be developed with agencies.
Invertebrates	None	Final Aquatic Resources, Amphibian, and Reptile Baseline Study Plan for the Blackfoot Bridge Property (Greystone, 2005b)	Invertebrate quality and quantity data	Summer 2005	See Section 3.1.3 and Appendix B. Re-conduct assessment as part of post-reclamation monitoring. Future program / study to be developed with agencies.

Resource	Current Program	BASELINE DATA			Proposed Monitoring
		Reference Plan	Data Collected	Collection Period	
Amphibians	None	Final Aquatic Resources, Amphibian, and Reptile Baseline Study Plan for the Blackfoot Bridge Property (Greystone, 2005b)	Amphibian quality and quantity data	Summer 2005	See Section 3.1.3 and Appendix B. Re-conduct assessment as part of post-reclamation monitoring. Future program / study to be developed with agencies.
Reptiles	None	Final Aquatic Resources, Amphibian, and Reptile Baseline Study Plan for the Blackfoot Bridge Property (Greystone, 2005b)	Reptile quality and quantity data	2005	See Section 3.1.3 and Appendix B. Re-conduct assessment as part of post-reclamation monitoring. Future program / study to be developed with agencies.
Aquatic Resources	None	Final Aquatic Resources, Amphibian, and Reptile Baseline Study Plan for the Blackfoot Bridge Property (Greystone, 2005b)	Aquatic habitat quality data	Summer 2005	See Section 3.1.3 and Appendix B. Re-conduct assessment as part of post-reclamation monitoring. Future program / study to be developed with agencies.
Soil and Vegetation -	Pre-disturbance co-location soil and vegetation sampling program under development. Scheduled for implementation in 2010 or 2011.	Report-Soil Survey of the Blackfoot Bridge Project Area and the Ballard Mine Site, Caribou County, Idaho (Greystone, 2006b) Report-Vegetation Community and Sensitive Plant Technical Report for the Blackfoot Bridge Project (Greystone, 2006c) Report-Idaho Sedge (Carex Parryana ssp. Idahoa) Survey Results (Greystone, 2006e)	Order II soil survey data, classify and characterize soil materials for mine development and reclamation Vegetation population and community survey data	Soil: Summer 2004, 2005 Vegetation: Spring, summer, and fall 2005, summer 2006; P4 Backhoe Cover Material Test Pits (2008); AMEC Soil Test Pit – Geotechnical Study (Summer 2009).	See Section 3.1.4 and Appendix C. Soil and vegetation chemistry study once at pre-mining conditions, one round of sampling during mining operation years 1, 2, and 5 (on reclaimed areas), and once following mine closure when all areas have been reclaimed. Soil and vegetation baseline chemistry study to be conducted concurrently.

Resource	Current Program	BASELINE DATA			Proposed Monitoring
		Reference Plan	Data Collected	Collection Period	
Birds	Ongoing eagle nest observation and recordation.	Avian Study Plan for the Blackfoot Bridge and Ballard Mines (Greystone, 2005c) Eagle Management Plan (P4 2009a) Eagle Take Permit Application (P4, 2010d)	Avian habitat quality and population quantity data Seasonal eagle nest monitoring	Spring 2005 Monitoring of eagle nest activity 2004 to present;	See Section 3.1.5. Nest survey completed prior to tree cutting and annual surveys at water management ponds to ensure no nesting is being developed. Ongoing seasonal bald eagle monitoring during mining operations under the Bald Eagle Management Plan or as otherwise prescribed by USFWS under an Eagle Take Permit.
Mammals	None	Forest Carnivore Study Plan for the Blackfoot Bridge Mine (Greystone, 2005a)	Winter carnivore (and other mammals) quantity and habitat quality	Winter 2005	See Section 3.1.6. No ongoing monitoring proposed.
Bats	None	Bat Study Plan for the Blackfoot Bridge and Ballard Properties (Greystone, 2005d)	Bat quantity and habitat quality data.	Summer 2005	See Section 3.1.7. No ongoing monitoring proposed.
Cultural and Paleontological Resources Survey	None	A Cultural Resources Inventory of the Blackfoot Bridge Phosphate Exploration Project, Caribou County, Idaho (BLM, 2004) Evaluation of Cultural Resource Sites 10CU259, 261, and 263 (P4 2009b)	Inventory of known or suspected historic properties	Survey of archeological and historic resources	See Section 3.1.8. Annual employee training on identification and notification of archeological and historic resources.
Compensatory Mitigation Wetlands	COE review of Final Plan pending	Preliminary Section 404(b)(1) Showing Blackfoot Bridge Project Idaho (P4 2008) Compensatory Mitigation Plan for Waters of the U.S. (P4 2010e)	Wetland community survey	Winter 2008	See Section 3.1.9 Ongoing monitoring of the compensatory mitigation activities as specified in the 404 permit and Compensatory Mitigation Plan.

Resource	Current Program	BASELINE DATA			Proposed Monitoring
		Reference Plan	Data Collected	Collection Period	
NPDES Stormwater Permit Monitoring	CGP SWPPP and BMP guidance document.	SWPPP (P4 2009c) and National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from Construction Activities, July 2003 Report-Selenium Management Practices (Agrium et al., 2005)	BMPs for active and future mine sites	Ongoing, as required	See Section 3.1.10 and Appendix D. Installation, maintenance, and periodic inspections during mining activities, where required by the SWPPP.
Overburden and borrow materials which are used for roads, covers and liners	None	Baseline Study Plan for Geochemical Characterization Blackfoot Bridge Mine Project (Whetstone 2006) Baseline Soil Survey (Greystone 2006b).	Geochemical characterization (SPLP analyses and column leach tests)	2006, 2007	See Section 3.1.11 and Appendix E for Overburden Suitability Analysis Plan.
Cover System Monitoring	None	Manufacturer's installation guidelines and quality assurance program US EPA Test Section Installation Instructions from Alternative Cover Assessment Program (ACAP) – See Appendix F.	Manufacturer supplied information. Cover water balance including percolation, state variables within cover profile (water content, temperature, matric potential).	n/a	See Section 3.1.12 Quality assurance monitoring during installation of cover system. Ongoing water balance monitoring on north slope of the Mid-Pit and at two complementary test locations. Each would be monitored using pan lysimeters following US EPA methods. Periodic visual inspection of GCLL.

Resource	Current Program	BASELINE DATA			Proposed Monitoring
		Reference Plan	Data Collected	Collection Period	
Water Management Plan; Adaptive Management Plan; and Overburden Seepage Management System (OSMS)	None	Water Management Plan (P4 2010a) and Adaptive Management Plan for Water Management System (P4 2010b) Conceptual Overburden Seepage Management System (P4 2010e)	System not installed	Once construction completed and seepage collected.	Proposed monitoring program includes sampling to occur weekly or more as needed during runoff periods or periods when seepage is observed in conveyance systems. See Section 3.2.5. Monitoring would occur at select sites within the water management system at collection points established. Details of the monitoring program will be developed with agencies including sample locations, methods and protocols, frequency, duration, analyte list, and analytical methods. QA/QC Plan to also be developed in conjunction with agencies.
Air Quality	None	Air Quality Permit – P4 has applied to State of Idaho.	N/A	N/A	See Section 3.2.6.

2.0 INTRODUCTION

This EMP identifies the environmental monitoring that P4 would undertake at the BFB Mine. The plan describes the media of interest; the duration and frequency at which environmental monitoring would occur; the general locations at which P4 would sample environmental media; individuals responsible for the implementation and completion of the collection or monitoring events, where appropriate; and the methods by which the environmental media would be sampled and analyzed.

P4 has collected environmental data that characterizes baseline conditions at the proposed BFB Mine and adjacent areas. Adjacent areas includes those areas not in the proposed mine area, but may potentially be affected by mining activities. Consistent measurement during environmental monitoring activities is the most effective method for detecting system flux. The field methods, data collection protocols, and analysis used during baseline investigations will be used during operational monitoring programs to provide consistent measurements thereby allowing for comparison of data to baseline conditions as mining activity progresses. Triggers for additional monitoring and action plans, including decision statements, are also provided where appropriate.

3.0 ENVIRONMENTAL MONITORING

For each resource to be monitored during the life of the Blackfoot Bridge Mine project, the relevant baseline plans of study and reports, monitoring activities to date, proposed future monitoring, and the rationale for proposed future monitoring are presented in this section. To minimize duplication of baseline study reports in this EMP, the relevant report containing the investigation methods is referenced. This section also describes proposed monitoring measures that would be implemented to record the performance of various programs that would be initiated during the life of the Blackfoot Bridge Mine project. These programs include wetland mitigation; implementation of best management practices to control stormwater and sediment; monitoring of groundwater; geochemical characterization of overburden to be used in construction of mine components (e.g., haul road fill, tipple and loadout yard areas); overburden cover system installation and performance assessment; and monitoring associated with the Water Management System, including the Adaptive Management Plan and the Overburden Seepage Management System.

3.1 MONITORING PROGRAMS

3.1.1 Surface Water

Summary: To date, a comprehensive baseline surface water quality characterization report has been completed (Whetstone 2009a). The baseline study was conducted to support BLM's review of the proposed Project under the requirements of the Clean Water Act and for the development of an environmental impact statement ("EIS"). Surface water was sampled three times per year during the baseline period (2005—2007). Since publication of the Draft EIS in July 2009, P4 has continued to monitor water quality with collection of samples twice annually.

The baseline surface water quality investigation consisted of:

- Quarterly monitoring (excluding winter) of 15 surface water stations at the Blackfoot Bridge Mine site.
- Quarterly monitoring (excluding winter) of one station at Ballard Mine.
- Two gain-loss surveys on the Blackfoot River between State Land Creek and downstream monitoring station SW11-ST (Dredge Bridge).
- Two temperature, pH, and electrical conductivity profiles on Blackfoot River between USGS monitoring station 13063000 and downstream monitoring station SW11-ST (Dredge Bridge).
- Installation of a datalogger to monitor the stage height of Blackfoot River at Monitoring Station SW10-ST (Conlin Bridge).
- Installation of multiple pressure transducers within various project monitoring wells that continuously measure groundwater fluctuations.
- An extensive analytical suite for use in characterizing both surface water and springs/seeps/groundwater connection.
- Field parameters including temperature, pH, conductivity, and dissolved oxygen.

Future surface water quality monitoring activities proposed for the BFB area would be based on a revised analytical suite and field parameters (see **Appendix A, Table 1).** As set forth in this plan, P4 would continue to monitor water quality to demonstrate effective water management at the BFB project.

Referenced Reports:

- Final Water Resources Baseline Characterization Report Blackfoot Bridge Mine (Whetstone 2009a).
- Water Management Plan, Proposed Blackfoot Bridge Mine Caribou County, Idaho (P4 2010a).

Baseline Study Purpose:

- Establish the method used to characterize the baseline surface water conditions in the Project area including stream and river flow, seeps, and springs to support agency review of the Mine and Reclamation Plan and preparation of an EIS;
- Provide a basis for the evaluation of project, alternatives and their potential impacts to water resources.
- Develop surface water data for reclamation and mine closure planning. Monitor surface water quality and flow in drainages and wetlands originating in, and tributary to the project area.
- Establish quality assurance/quality control (QA/QC) and standard procedures for data collection, validation, shipping and reporting.
- Establish a framework for the periodic review, evaluation, and reporting of surface water, seep, spring and wetland data.
- Delineate streams, springs, seeps and wetlands that could be influenced by mining.
- Determine spatial and temporal flow variations in streams, springs and seeps. Evaluate surface water and groundwater interconnection.
- Develop a list of constituents of potential concern (COPC) that may be present in surface water under baseline conditions.

As discussed in Section 3.1.13, the purpose of the Water Management Plan (P4 2010a) is to present the conceptual design of the systems and practices that would be used by P4 to manage surface water and groundwater in the project area. The Adaptive Management Plan (P4 2010b) would be implemented in conjunction with Water Management Plan.

Activity to Date: Surface water monitoring was conducted in accordance with the following schedule: spring, summer, and fall 2005-2007; spring and fall 2008 to current.

Future actions: Continue monitoring surface water quality and quantity at the network of stations identified in the current surface water monitoring program for the BFB Mine (**Appendix A**). P4 proposes, at a minimum, to collect one sample each year at high flow (spring) conditions and at low flow (fall) conditions at each surface water monitoring station. Post-closure sampling would continue at high flow (spring) and low flow (fall) each year until there is enough trend data to justify ending monitoring.

Water quality monitoring in Fish Pond and the unnamed tributary drainage would be conducted as part of the water management system monitoring program (see Section 3.1.13).

Triggers for additional surface water sampling/inspections: Triggers for additional surface water sampling are set forth below:

Should analytical results from surface water samples collected from surface water stations located within the Blackfoot River or river bank springs detect selenium concentrations at levels statistically higher than those identified in modeling predictions (after being adjusted for seasonal and/or background levels), the results will be evaluated in conjunction with groundwater quality data associated with the Point of Compliance monitoring well system. If results of this evaluation indicate a possible correlation between groundwater quality in Point of Compliance wells and surface water quality results, the surface water stations would be re-sampled to confirm initial results. Re-sampling would occur as soon as possible upon receipt of laboratory results. If re-sampling confirms prior results, a sampling plan would be submitted to IDEQ and BLM to investigate possible causes.

Justification: Ongoing surface water monitoring allows P4 and government agencies to maintain a record of surface water quality and quantity in the BFB mine area. Continuation of the program extends the period of record for surface water which provides additional data that describes natural variability in water quantity and quality in the Project area. The program also provides P4 and government agencies with important information to ensure water quality and quantity requirements are met in the project area.

Appendix A contains the conceptual sampling plan which continues the baseline surface water monitoring program. An updated and detailed sampling and analysis plan would be prepared, including a Quality Assurance Project Plan (QAPP), upon issuance of the ROD.

3.1.2 Groundwater

Summary: Baseline groundwater studies for the Blackfoot Bridge Project were completed between July 2005 and November 2007. The studies were performed by Whetstone Associates under direction from BLM and IDEQ and included:

- Installation and quarterly monitoring (level and water quality) of sixteen monitoring wells at Blackfoot Bridge Project.
- Installation and quarterly monitoring (level and water quality) of two monitoring wells at Ballard Mine.

- Monitoring of groundwater levels and water quality in four monitoring wells at Ballard Mine.
- Quarterly monitoring of water levels in six piezometers at Blackfoot Bridge Project. The piezometers were installed in exploration boreholes by P4 as part of their 2006 drilling program.
- Performance of single-well permeability tests in baseline monitoring wells at Blackfoot Bridge Project.
- Installation of a 10-inch diameter pumping well (PW-1W) and two observation wells in the Wells Formation near the proposed North Pit.
- Performance of a 72-hour constant-discharge pumping test in PW-1W with observation wells and monitoring of recovery water levels.

Other sources of hydrogeologic information were reviewed, including the Idaho Department of Water Resources (IDWR) and United States Geologic Survey (USGS) publications. Eighteen monitoring wells were installed for the baseline study.

Groundwater monitoring would continue at the BFB area in the existing monitoring wells. New wells may be installed as part of the groundwater point of compliance (POC) application (P4 2010c). Any wells required by this point of compliance would be added to the sampling program, and sampling would occur in accordance with IDEQ requirements. Monitoring would continue until such time as IDEQ and BLM are satisfied that the program can be suspended.

Referenced report(s):

- Groundwater Baseline Study Plan Blackfoot Bridge Mine (Whetstone, 2005b).
- Final Water Resources Baseline Characterization Report (Whetstone 2009a)

Baseline Study Purpose:

- Establish the methodology that would be used to document the baseline characteristics of groundwater in the BFB Project Area to support review of the proposed project under Clean Water Act requirements and preparation of an EIS.
- Provide a basis for the evaluation of project alternatives and their potential impacts to water resources.
- Develop groundwater data for reclamation and mine closure planning.
- Monitor groundwater levels and groundwater quality in the project area.

- Determine hydrologic properties of water bearing strata in the project area including hydraulic conductivity, gradient, and flow direction.
- Establish QA/QC and standard procedures for data collection, evaluation, and reporting.
- Establish a framework for the periodic review, evaluation, and reporting of groundwater data.

Activity to date: Groundwater monitoring occurred during the following periods: spring, summer, and fall 2005-2007; spring and fall to the present.

Future actions: Continued monitoring during high and low water table periods each year through the life of mine and post-closure. At a minimum, one sample would be collected each year at high water table (spring) conditions and at low water table flow (fall) conditions (**Appendix A**). Post-closure monitoring would continue until there is sufficient trend data to justify ending the program.

Monitoring would include selected wells that represent the Point of Compliance under IDEQ regulations – Groundwater Quality Rule 58.01.11.401.01. The monitoring duration and frequency for this set of wells will be determined by IDEQ in review of P4's permit application (P4 2010c).

Triggers for additional sampling/inspections: Should analytical results from groundwater samples collected from any indicator groundwater wells or points of compliance wells, as required by IDEQ, detect selenium concentrations at levels statistically higher than background concentrations in groundwater, the well(s) would be re-sampled as soon as feasible. Statistical methods to be used to determine background concentrations are described in "Statistical Guidance for Determining Background Ground Water Quality and Degradation" (IDEQ 2009). If re-sampling confirms prior results, a sampling plan would be submitted to IDEQ and BLM to investigate possible causes.

Should any indicator groundwater wells or points of compliance wells, as assigned per IDEQ, exceed any of the groundwater quality standards assigned to the well(s), the well(s) would be re-sampled as soon as feasible to confirm the exceedance. If confirmed, an investigation plan to address possible causes and remedies would be submitted to BLM and IDEQ for their concurrence. This investigation plan may include, as appropriate, inspection and sampling of springs (e.g., SW10 and 11) and nearby surface water to assess any impacts. Secondary groundwater standards for constituents such as manganese would be addressed separately as set forth in the Point of Compliance application.

Justification: Ongoing groundwater monitoring during high and low water table conditions allows P4 and government agencies to maintain a record of groundwater quality and quantity in the BFB mine area. It also provides P4 and the agencies with important information to ensure that groundwater quality and quantity requirements are met in the project area. **Appendix A** summarizes components of the proposed groundwater monitoring program and future monitoring activities.

3.1.3 Fish, Invertebrates, Amphibians, Reptiles, Aquatic Habitat Quality

Summary: In 2005, P4 conducted baseline surveys for various aquatic species at both Ballard Mine and the proposed BFB Mine. Fish surveys for mark-recapture population estimates were conducted at three reaches along the Blackfoot River. Fish species collected included sucker, dace, shiner, carp, sculpin, cutthroat trout, and rainbow trout.

Baseline physical characteristics of surface water features including embeddedness, bank stability, substrate composition, pool/riffle/run ratios, and Rosgen stream type were also quantified. Invertebrate taxa and abundance measurements were collected, with the middle reach (Blackfoot 2) showing the greatest abundance. All three reaches contained approximately equal taxa numbers. Amphibian surveys were conducted at all locations where standing water was observed. Northern leopard frogs and tiger salamanders were identified at BFB. Chorus frogs were also heard in the project area. At Fish Pond, frogs and salamanders were observed. Leopard frogs were also observed along State Land Creek and in the Blackfoot River (Reach 3 during fish surveys). Reptiles observed in the area included the western skink and the common garter snake. Shannon Weiner indices for all three reaches indicate fair water quality (also described as moderately polluted). Fish studies, conducted consistently with the baseline study plan, are planned for years 5 and 10 of the BFB mining operation as well as a repeat of the entire aquatic investigation once mining is completed.

Referenced report(s):

- Final Aquatic Resources, Amphibian, and Reptile Baseline Study Plan for the Blackfoot Bridge Property (Greystone, 2005b).
- Final Aquatic Survey Report for the Blackfoot Bridge Project Environmental Impact Statement (Greystone, 2006d).

Original Baseline Study Purpose:

- Characterize the availability and suitability of existing habitats for fish species at and near the BFB project area.
- Evaluate existing fish, macroinvertebrate, amphibian, and reptile occurrence data relevant to the proposed BFB project area.

- Characterize the occurrence of BLM sensitive fish species including Yellowstone cutthroat trout (*Oncorhynchus clarki bouveri*), and other incidental, non-sensitive species in the BFB project area.
- Characterize the macroinvertebrate community composition in the BFB project area.
- Evaluate physical stream habitat characteristics such as flow, habitat type, surface fines, bank stability, substrate composition, large woody debris, and Rosgen stream morphology. Additionally, field water quality parameters including pH, temperature, dissolved oxygen (DO), conductivity, and turbidity would be recorded.
- Characterize the occurrence of BLM sensitive amphibian and reptile species including boreal toad (*Bufo boreas boreas*), northern leopard frog (*Rana pipiens*), western toad (*Bufo boreas*), and common garter snake (*Thamnophis sirtalis*) and other incidental species occurring at the proposed BFB mine and existing Ballard mine sites.
- Prepare a final report that presents the findings and conclusions based on the results of this survey and other available survey efforts.

Activity to date: Summer 2005 (fish, amphibians, invertebrates, aquatic habitat quality and reptiles).

Future actions: One sampling event in years 5, 10 and post-mining for fish; all other aquatic species scheduled for one post-reclamation monitoring event.

Triggers for Additional Sampling: As currently proposed, a single post-mining sampling event may not account for environmental changes unrelated to the BFB project and as such, P4 would review with the agencies the need for additional surveys to address natural conditions or other activities that may influence aquatic conditions in the Blackfoot River or tributary streams. The need for additional post mining surveys of aquatic resources will be evaluated by the agencies.

Justification: Due to the seasonal migration of spawning trout in the Blackfoot Reservoir and upper Blackfoot River watershed, as well as the recent low levels of returning fishes, continual electrofishing in the Blackfoot River each year during mining is unwarranted. Continual, seasonal electrofishing adds an extra measure of disturbance to springtime spawning in an already highly variable spawning return. Sampling events conducted in years 5, 10 and a one-time post mining survey of the aquatic community would be used to document significant changes to the aquatic community health within a portion of the Blackfoot River basin while also avoiding unnecessary disturbance to spawning trout.

The referenced study plan and survey report contain detailed information regarding the aquatic monitoring and are intended to be used as plan documents for any proposed future monitoring. The referenced study plan is included in **Appendix B.** Future surveys will be developed in conjunction with appropriate agencies and will recognize the dynamics in aquatic resources in response to the selected sampling period, season, and general drainage conditions at the time of the survey.

3.1.4 Soil and Vegetation

3.1.4.1 Soil

Summary: A baseline soil survey was conducted in August 2004 and September 2005. The soil survey encompassed the BFB project area and also included the Ballard Mine. Soil from the Ballard Mine area was assessed to determine the potential for availability of suitable soil for use in reclamation and whether the Ballard Mine site would be suitable as an alternative disposal site for overburden that would be mined at the BFB Project. Consideration of the Ballard Mine site as an alternative disposal site was deemed infeasible during the EIS review (BLM 2009).

The soil survey results for the BFB Project area indicate that ~1.2 and ~2.6 million cubic yards of secondary and primary salvageable plant growth media, respectively, are available within the proposed disturbance area for the Blackfoot Bridge Mine project. **Appendix C** contains sampling and analysis details for baseline soil and vegetation chemistry studies.

Referenced report(s):

- Soil Survey of the Blackfoot Bridge Project Area and the Ballard Mine Site, Caribou County, Idaho (Greystone, 2006b).
- Backhoe Cover Material Test Pits (2008);
- AMEC Soil Test Pit – Geotechnical Study (Summer 2009).

Original Baseline Study Purpose:

- Conduct an Order II soil survey in the project area to identify, map, and describe the dominant soil types in the Project area;
- Characterize physicochemical properties of soil within the proposed disturbance by collecting and analyzing soil samples.
- Evaluate suitability of soil within the proposed disturbance to assist P4 in the selection of salvageable growth medium for use in reclamation of mine-related disturbance.

- Estimate the depths and quantity of suitable soil in the proposed disturbance area using map unit and pedon descriptions, physicochemical data, and available information.
- Evaluate soil for potential use as low-permeability barrier material.
- Provide alternatives for selective handling and conditioning of available soil to improve their suitability as plant growth medium.

Activity to date: Soil survey conducted during the following periods: summer 2004-2005.

Future actions: Conduct soil study before mining is initiated (e.g., 2010 or 2011), after placement of growth media on reclaimed areas in the mine site at years 1, 2, 5, post-mining on reclaimed areas, and after reclamation activities are completed. Specific details on the sampling events during the post-reclamation phase will be coordinated with IDL and BLM specialists.

Justification: Conducting soil surveys before, during, and after mining reclamation is an effective tool to understand reclamation's effectiveness. Late June would be the target sampling period as this timeframe is indicative of robust plant health. Conducting the soil and vegetation study concurrently would assist in monitoring BMP effectiveness and capping design performance.

A proposed sampling plan for collecting soil and vegetation samples is presented as **Appendix C**. A final sampling / monitoring program will be developed in consultation with the agencies.

3.1.4.2 Vegetation

Summary: Three vegetation surveys were conducted in June, July, and September 2005. Vegetation communities were mapped and described, and the presence of BLM sensitive plant species was evaluated. Vegetation community types were characterized by dominant species. Potentially suitable habitats were searched for the presence of the selected BLM sensitive plant species. A supplemental Idaho sedge survey was conducted in summer 2006; none were found in the project area. Hoary willow, a BLM sensitive species, was observed in the project area at Wetland X located to the west of the proposed disturbance.

Referenced report(s):

- Final Sensitive Plant Species Study Plan for the Blackfoot Bridge Property (Greystone, 2005e).

- BLM Sensitive Rare Plant Survey Report for the Blackfoot Bridge Mine Project (Greystone, 2005f).
- Final Vegetation Community and Sensitive Plant Technical Report for the Blackfoot Bridge Project (Greystone, 2006c).
- Idaho Sedge (Carex Parryana ssp. Idahoa) Survey Results (Greystone, 2006e).

Original Baseline Study Purpose: Characterize the availability and suitability of sensitive plant species habitats; identify suitable habitat and document occurrences of BLM sensitive plant species; and prepare a report that presents the findings and conclusions of this survey.

Activity to date: Vegetation community survey during the following periods—spring, summer, and fall 2005 and summer 2006.

Future actions: Conduct vegetation and community study concurrently with the soil study proposed above in Section 3.1.4.1. Vegetation sampling would be co-located with soil samples. Revegetated areas on overburden piles where GCLL covers have been installed would be observed for any potential deep rooting plant species.

Vegetation established on reclaimed areas would be monitored for appropriate diversity and sustainability in accordance with revegetation goals established by BLM, IDL, and USACE. P4 would also monitor noxious weeds and would develop a treatment plan in conjunction with the agencies.

Justification: Conducting vegetation surveys before, during, and after mining reclamation is an effective tool to determine reclamation's effectiveness. Late June would be the target sampling period as this timeframe is indicative of robust plant health. Conducting the soil and vegetation study concurrently in years 1, 2, 5, and post-mining would assist in determining BMP effectiveness. Vegetation and soil indicators to measure performance of the reclamation program will be developed in conjunction with the agencies.

The referenced reports contain detailed information of plant community surveys. No disturbance to the hoary willow population surveyed in 2005 is anticipated and no future surveys of this community are planned.

3.1.5 Birds

Summary: Bird surveys were conducted in the project area for the northern goshawk, owls, grouse, and migratory bird species. Data from 2004 and 2005 provide the baseline survey data. No goshawks were detected in the study area from 78 locations where calling was initiated. Four owl species were found at 54 survey locations. Sixteen (16)

locations were surveyed for sage grouse during baseline studies. No sage grouse were observed in the BFB project area, but were observed at Ballard Mine. The habitat in the BFB project area was determined to be unlikely to support sage grouse. No ospreys were observed in the project area. Approximately 64 migratory bird species were observed during surveys.

A pair of bald eagles was observed nesting in the project area in 2004. Since that time, P4 has conducted annual eagle monitoring, noting nesting and fledging habits. P4 would continue seasonal bald eagle monitoring, as per the Eagle Management Plan and any future permits issued by USFWS. Provisions in the Eagle Management Plan to minimize nesting disturbance include maintaining distances for mining and blasting operations from the nest sites as well as scheduling restrictions during the nesting season (February 1 through the fledgling date). Observations would also be conducted during blasting in the North Pit to catalogue eagle behavior and report to BLM and USFWS.

Annual surveys at Water Management Ponds would be conducted to ensure no nesting/habitat is being developed. Additionally, observation of birds in the Water Management Ponds would be added as a line item note during stormwater inspections. Measures would be implemented to eliminate the attraction of birds to the Water Management Ponds.

To the extent practicable, P4 would observe the next year's mining area for nesting sites and participate, where feasible, in discouraging nesting by clearing and grubbing areas during the non-nesting season.

Referenced report(s):

- Final Avian Study Plan for the Blackfoot Bridge and Ballard Properties (Greystone, 2005c).
- Final Wildlife Technical Report for the Blackfoot Bridge Project (Greystone, 2006a).
- Eagle Management Plan, Blackfoot Bridge Project Southeastern Idaho (P4 2009a).
- Eagle Take Permit Application (P4 2010d).

Original Baseline Study Purpose:

- Characterize the availability and suitability of nesting habitats for raptors, owls, grouse and migratory birds.
- Evaluate existing nesting data and observations relevant to the proposed project area. Characterize the occurrence of several raptor and owl species listed by the USFWS and designated as sensitive by the BLM.

- Characterize the occurrence of migratory bird species and establish a list of potentially nesting species. Occurrence of several migratory bird species listed by the USFWS and BLM would be evaluated.
- Characterize the availability and suitability of lekking and brood-rearing habitats for greater sage grouse (*Centrocercus urophasianus*) and Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*) within the project site and the surrounding 2-mile buffer.
- Characterize bald eagle (*Haliaeetus leucocephalus*) nesting activity at the active nesting sites near the Blackfoot Bridge property.
- Prepare a report that presents the results of this survey.

Activity to date: Avian habitat quality and population quantity data survey—spring 2005. Bald eagle nest monitoring has been ongoing from 2004 to the present.

Future actions: Seasonal, ongoing bald eagle monitoring during mining operations within the project site as specified in the Eagle Management Plan. This includes eagle behavior monitoring during blasting events. Any monitoring requirements set forth in future permit to be potentially issued by USFWS for bald eagle take will also be followed. Song bird monitoring would be conducted prior to exploration activities, as currently practiced. Additionally, nest survey would be completed prior to tree clearing and annual surveys at Water Management Ponds to ensure no nesting areas are being developed.

Justification: Bird nesting in areas scheduled to be disturbed during the following years' mining activity may be undesirable. P4 would participate in activities to discourage nesting in areas to be mined the following year. These actions may include removal of portions of the vegetation (mowing) to eliminate cover vegetation while preserving the root mass below ground.

P4 would conduct seasonal bald eagle monitoring throughout mining operations to determine what effects, if any, mining has on bald eagle breeding. P4 has conducted yearly bald eagle monitoring at the BFB Mine's northern extent where bald eagles are known to nest. P4 has conducted this monitoring since 2004 and would continue on a yearly basis when bald eagles are breeding and nesting in this area.

3.1.6 Mammals

Summary: Forest carnivores were surveyed in winter 2005. No tracks or individuals of the American marten, fisher, Canada lynx, or wolverine were observed at the Blackfoot Bridge site during this survey. Wolverine and Red fox tracks were observed at Ballard

Mine, as well as a predator kill. The presence of other mammals observed in the area includes hare, coyote, moose, and mountain lion. No future surveys are anticipated for mammals. Sensitive or special status species were not recorded in the project area.

Referenced report(s):

- Final Forest Carnivore Study Plan for the Blackfoot Bridge Mine Project (Greystone, 2005a).
- Final Wildlife Technical Report for the Blackfoot Bridge Project (Greystone, 2006a).

Original Baseline Study Purpose:

- Characterize availability and suitability of existing habitats at the Blackfoot Bridge Mine Project and Ballard Mine sites.
- Evaluate existing carnivore data and observations relevant to the proposed project area.
- Determine presence/absence of target forest carnivore species including American marten (*Martes americana*), fisher (*Martes pennanti*), Canada lynx (*Lynx canadensis*), and wolverine (*Gulo gulo*) in the project area. Record sightings or sign of other sensitive species or species of interest).
- Record sightings or sign of other sensitive species or species of interest (such as bald eagle nesting activity).
- Prepare a final report that presents findings and conclusions based on results of this survey and other available survey efforts.

Activity to date: Winter carnivore survey conducted during winter 2005. Bird surveys are discussed in Section 3.1.5 above. Bats are discussed in Section 3.1.7 below.

Future actions: No ongoing monitoring for mammals proposed.

Justification: No observed indicators of the four target species were found in the BFB project area.

3.1.7 Bats

Summary: Surveys conducted in 2005 indicate a lack of caves, mine tunnels, or abandoned buildings that may provide highly suitable bat roosting habitats on the Blackfoot Bridge Property. Habitat surveys and capturing occurred at three locations at the BFB property, including beaver ponds, stock ponds, and the Blackfoot River.

Approximately 3 - 3.5 hours were spent at each location. During this period, nets were deployed to capture feeding bats. At each location, bats were observed, but capturing success was limited.

Referenced report(s):

- Final Bat Study Plan for the Blackfoot Bridge and Ballard Properties (Greystone, 2005d).
- Final Wildlife Technical Report for the Blackfoot Bridge Project (Greystone, 2006a).
- Final Bat Survey Report for the Blackfoot Bridge Project (Greystone, 2005g).

Original Baseline Study Purpose was to:

- Characterize the availability and suitability of bat roosting and foraging habitats at the proposed Blackfoot Bridge and existing Ballard Mine sites.
- Evaluate existing bat distribution data and observations relevant to the proposed project area.
- Characterize bat use and occurrence of the Townsend's big-eared bat (Corynorhinus townsendii), the only bat species included on the BLM Sensitive Species List (January 19, 2005), Yuma myotis (*Myotis yumanensis*), long-eared bat (*Myotis evotis*), long-legged myotis (*Myotis volans*), and by other non-listed bat species.
- Prepare a report that presents the findings and conclusions of this survey and other available survey efforts.

Activity to date: Bat habitat survey conducted summer 2005.

Future actions: No future monitoring for bats are proposed, based on the minimal information generated from this baseline investigation.

Justification: Survey results indicate the bat population is small, roosting habitat appears to be scarce, and foraging opportunities are limited.

Referenced reports include detail on the studies conducted, as well as the observations and conclusions of these studies.

3.1.8 Cultural and Paleontological Resources

Summary: Archaeological baseline surveys have been completed in the project area. One historic property has been identified in the mine permit area and has received

SHPO concurrence. This site would be avoided by all mine-related disturbances. Three other sites that may be disturbed during development of the BFB Project have been investigated in more detail and have been recommended as not eligible (not historic properties) and SHPO has concurred. No effects to historic properties are anticipated to result from the proposed project.

Referenced report(s):

- Evaluation of Cultural Resource Sites: 10cu259, t0cu261 and 10cu263. Caribou County, Idaho. P4 Production, LLC. 2009b. Blackfoot Bridge Mine. Prepared by Arcadis.
- A Cultural Resources Inventory of the Blackfoot Bridge Phosphate Exploration Project, Caribou County, Idaho (BLM, 2004).
- Blackfoot Bridge Mine. ASI Archaeological and Historical Inventory Record, Idaho Archaeological Survey, Bureau of Land Management, Idaho Falls District, Pocatello Field Office. (Lapp 2007).
- Blackfoot Bridge Mine (amended). ASI Archaeological and Historical Inventory Record, Idaho Archaeological Survey, Bureau of Land Management, Idaho Falls District, Pocatello Field Office. (Lapp 2008).

Original Baseline Study Purpose: Identify, document, and evaluate prehistoric and historic cultural sites through review of archival sources and intensive field survey.

Activity to date: Survey and research to inventory cultural resources in the BFB project area. A baseline cultural resources inventory was completed for the Blackfoot Bridge mine project in 2004. The study included a records search and overview and a report of pedestrian survey of the lease area. The pedestrian survey covered most of the proposed mine permit area. In 2007, two small blocks of land (83 acres) were added to the project, and in 2008, an additional two blocks (15 acres) were added. Both of these additional areas were surveyed by the Pocatello Field Office Archaeologist. ARCADIS revisited sites 10CU259, 10CU261 and 10CU263 on 11 and 12 September 2009. In total, six sites were identified during the field surveys and of these, five sites were determined to be not eligible for the National Register of Historic Places. The remaining site was determined to be eligible for the National Register however, this site would not be disturbed by the proposed BFB Project. The State Historic Preservation Office has concurred with these findings.

Future Actions: P4 would provide annual training to mining workers to avoid and protect any historic sites discovered during mining operations. If alterations to the project to avoid and protect these sites are not feasible, appropriate mitigation measures would be developed and implemented as required by applicable laws and

regulations. Additionally, any new cultural and/or paleontological resources discovered during mining operations would be reported to the BLM Pocatello Field Office. Activities in the immediate vicinity of the cultural and/or paleontological resource would be suspended until a determination of future action can be made.

Justification: Mining operations are currently not expected to disturb any eligible cultural resources in the Project area. Should any cultural or historic sites be discovered during the construction period or during mining, an inventory would be completed by qualified individuals to evaluate the discovery. Any paleontological, cultural, or historic site discoveries made during mining would be dealt with on an as-needed basis as directed by BLM.

3.1.9 Compensatory Wetlands Mitigation

Summary: P4 has applied to the US Army Corps of Engineers (Corps) for a permit to place fill or dredged materials into wetlands and non-wetland waters as part of the water management system. The application process is currently underway. As part of this process, a Compensatory Mitigation Plan for Waters of the US (P4 2010e) was prepared and submitted to the Corps. Monitoring would be conducted to determine the effectiveness of the compensatory mitigation for at least three years after completion of construction.

Referenced report(s):

- Joint Application for Section 404 Permit, Preliminary 404(b)(1) Showing and Conceptual Monitoring Plan (P4 2008).
- Compensatory Mitigation Plan for Waters of the U.S. (P4 2010e)

Activity to date: Survey and identification of potential compensatory mitigation projects to offset the wetlands and non-wetland waters that would be impacted as part of the BFB mine.

Future actions: As specified in the above referenced application and reports, the Compensatory Wetland Mitigation Plan includes plans for stream bank riparian and wetlands restoration, wetlands creation, and fencing abandoned oxbows.

Monitoring wetland mitigation areas would be initiated immediately after construction and would include assessment of biological, hydrological, and structural characteristics of restored and enhanced wetland and riparian areas. Assessment of performance standards based on functional assessment methods may be incorporated into the performance standard evaluations to determine if the sites are achieving the desired functional capacity.

Justification: Required and necessary to offset any impacts to existing wetlands and non-wetland waters of the U.S. in the BFB project area in accordance with Final Rule, Compensatory Mitigation for Losses of Aquatic Resources (33 CFR Parts 325 and 332, and 40 CFR Part 230) for projects regulated by the Corps and EPA.

The Compensatory Mitigation Plan contains details on proposed mitigation for loss of wetland and non-wetland waters of the U.S.

3.1.10 NPDES Stormwater Permit Monitoring

Summary: The BFB Mine construction general permit Stormwater Pollution Prevention Plan (SWPPP) was revised in April 2009 (P4 2009c). Stormwater monitoring includes inspection of BMPs placed during exploration drilling. Documentation, including photos and site descriptions, are recorded during each inspection. Monthly inspections are suspended during winter months, but resume again as soon as the site is accessible. During mining activities, P4 would continue stormwater monitoring and related compliance activities per applicable SWPPP and other requirements of any applicable NPDES permit. In conjunction with the appropriate agencies, these monitoring programs will likely overlap in many facets (e.g., sampling locations, analyte list, analytical methods, schedule, reporting, decision criteria) and as such, these programs will be developed to ensure all monitoring requirements are met.

Referenced report(s):

- SWPPP for Blackfoot Bridge Mine, Revision 11. April 2009. (P4 2009c).
- NPDES General Permit for Storm Water Discharges from Construction Activities, July 2003. P4 would also be submitting NPDES applications, as required by EPA, for an Individual NPDES Permit and/or a Multi-Sector General Permit (MSGP) for Stormwater Discharges Associated with Industrial Activity.
- Selenium Management Practices (Agrium et al., 2005).

Original Study Purpose:

- To document stormwater management practices and compliance with NPDES permit requirements using BMPs and good engineering practices; and
- To provide a framework for required reporting pursuant to the construction general permit.

Activity to date: Exploration activities in the BFB project area included installation of stormwater control structures when needed and reclamation of disturbed areas.

Future actions: The SWPPP will be revised as required by the applicable stormwater NPDES permit. Monitoring actions will continue as specified in the current and any future SWPPP or NPDES permit.

Additional monitoring points would be added to future NPDES stormwater monitoring actions as a result of additional construction during mining operations. These include expected discharges at CP-1, NWP1/2, NW3/4 and NEP1 and water transfers at EP1, CP-2, Fish Pond (existing), NWP1/2, NW3/4, and NEP1.

No discharges associated with mining activity would be allowed to Wetland A. Wetland A would be part of the overall routine SWPPP inspection program. Any inadvertent discharges identified to Wetland A during mining activity will be followed by development of corrective actions to eliminate the source of discharge into the wetland. Water sampling would be conducted to determine the nature and extent of the effects of the discharge.

Discharges of stormwater to surface water would be monitored as required by an applicable NPDES permit. To ensure that discharge of stormwater complies with the requirements of the applicable NPDES permit, additional monitoring will be undertaken as follows: prior to any discharge from CP-1, water quality measurements (selenium, manganese, total suspended solids, turbidity, and pH) would be obtained to determine if stored water meets Idaho surface water quality standards and applicable NPDES permit requirements and can be released from storage. Concurrent with the sampling at CP-1, sampling at Fish Pond would be conducted to identify selenium concentration trends up gradient of CP-1. Thereafter, water quality monitoring would occur on at least a weekly basis during discharge conditions.

If water contained in the water management dams, Fish Pond, or CP1 does not meet discharge criteria, the water would be pumped to the WMP1/2 pond system for management. Details on the process of sample collection, analysis, and decision timeframe will be developed in conjunction with IDEQ and BLM representatives.

In other situations where runoff does not have the potential to contact seleniferous materials (NWP1/2, NW3/4, and NEP1), P4 proposes to monitor monthly for selenium, total suspended solids, turbidity and pH when water has ponded. Sampling may be modified to a less frequent program if authorized by IDEQ and BLM.

Annual comprehensive site inspections as set forth in the SWPPP would be conducted each spring by qualified personnel. The comprehensive site inspections would cover all areas of the facility affected by the mining activities, including the areas where groundwater seeps may potentially form (e.g., below the eastern side of the EOP). Inspectors would consider the previous year's monitoring results when planning and conducting inspections. In addition to inspecting stormwater control measures to

ensure that they are functioning correctly, any groundwater seeps that have the potential to commingle with stormwater would be identified and recorded. The seep would be sampled for selenium (EPA Method 200.8) and manganese (EPA Method 200.7), which would serve as indicator analytes to determine whether the seep is potentially affected by mining activities. If selenium is not detected above method detection limits (1 part per billion [ppb]), commingled stormwater would be allowed to discharge at authorized outfalls. If selenium concentrations in seeps are reported above detection limits, commingled water would not be allowed to discharge. If flow from a seep within the wetlands needs to be isolated in response to elevated concentrations of selenium as a result of the mining operation, the method implemented to capture and control flow from the seep would comply with the Adaptive Management Plan for water management system (P4 2010b). Sampling of the seeps would be conducted annually with the annual comprehensive site inspection. The frequency of inspection for and monitoring of any seeps may be increased should selenium issues develop in the water management system. A final sampling protocol will be developed in collaboration with the agencies. In the event that an individual NPDES permit is required for the project by EPA, the permit would set forth the requirements for addressing the seeps, including the circumstances under which the seeps could be allowed to commingle with stormwater and discharge requirements. Possible corrective actions will be developed in conjunction with IDEQ and BLM.

Sediment collected in water management dams and WMP1 and 2 throughout the Project site would be sampled prior to removal. Samples will be analyzed for selenium content to determine whether the material is suitable for use as growth media or would be placed in locations where GCLL covers will be installed. A list of analytes that would be used for testing sediment will be developed with the agencies.

Additional monitoring of components of the mine's water management system are described in Section 3.1.13.

Triggers for additional sampling/inspection: Should stormwater exceed any of the surface water quality standards within the water management system (e.g., at Fish Pond or EP-1), additional inspection and sampling would be conducted to determine possible cause or source. See Section 3.1.13 of this Plan. This monitoring and possible use of the EP dam system would be conducted within the context of the Adaptive Management Plan for the water management system.

Justification: SWPPP revisions are required following any required inspection that identifies ineffective BMPs or following changes in design, construction, operation, or maintenance at the permitted site covered by the current SWPPP.

Appendix D provides detail on the stormwater water monitoring and includes an excerpt from the current SWPPP. The current SWPPP for the Blackfoot Bridge project area would also be maintained onsite, as well as copies of any applicable NPDES permits.

3.1.11 Overburden Suitability Analysis Plan

Summary: An extensive inventory of selenium-bearing materials at the BFB Property has been conducted, through drilling and exploration at the Property and as part of the permitting process. An additional source of modeled information is the BFB groundwater model report (Whetstone 2009b). The combination of these information sources provides a framework for overburden management. Managing overburden would consist of selective placement of those materials which are known or suspected to be significant sources of selenium. Materials would be selectively handled such that their placement would be chosen to minimize air and water contact that may result in potential selenium mobilization. See **Appendix E** for a more detailed explanation of these selective handling and sampling procedures.

Suitable overburden materials would be used for construction of ponds, roads and fills, covers, and other uses. Suitable materials include low or non-seleniferous materials (i.e., materials with selenium (Se) content of less than 13 ppm total Se or less than 0.1 ppm extractable Se per the 2003 USFS Soil Guidelines). To ensure that the overburden materials used in these covers meet these guidelines, P4 proposes to perform sampling practices as outlined in **Appendix E** of this plan. A final sampling plan will be developed in consultation with the agencies.

Soil and cover materials would be identified by the baseline soil chemistry survey. Overburden materials that would be used in areas where GCLL covers would not be installed would be included in the "sampled materials" for operational geochemical monitoring. Materials to be included in this program include the Rex Chert, Grandeur Tongue, and Wells Formation. Proposed sampling would involve staggering trenches on each mining lift (20-40 foot vertical intervals). Samples would be analyzed using SW-846 Method 6020 for total selenium and Method 80-3.2.2 to determine hot water extractable selenium. See **Appendix E** for more information.

Referenced report(s):

- Overburden Suitability Analysis Plan (**Appendix E**).

Original Baseline Study Purpose: Determine the selenium content of different geologic materials for construction purposes.

Activity to date: A baseline geochemical study was conducted to characterize the chemical constituents, including selenium, in various geologic strata.

Future actions: P4 would construct project facilities, roads, and overburden piles and backfills aligned with the guidance provided in the Overburden Suitability Analysis Plan provided in **Appendix E**.

Justification: P4 is committed to maintaining optimum water quality and protect off-site areas from mobilized selenium.

3.1.12 Cover System Monitoring

Summary: Monitoring of the cover systems at BFB would be conducted to determine both cover stability and effectiveness. The cover system monitoring program would consist of visual inspection for surface indications of cover distress, periodic direct inspection of the GCLL, and continuous hydrologic monitoring with pan lysimeters. The cover system monitoring plan is described in **Appendix F**. Final details and SOPs of the cover system monitoring program will be developed in conjunction with appropriate agencies.

Three monitoring stations are proposed for installation: two would be used to monitor the laminated geosynthetic clay liner (GCLL) cover and the third would be used to monitor the Simple I cover. Two of the monitoring stations (one GCLL, one Simple I) would be constructed during the first year of mining so that a performance record can begin immediately. These monitoring stations would be located on the mine property and adjacent to the pit (specific location to be determined). The third monitoring station would be constructed as part of installation of the cover system per the mine schedule (estimated at approximately Year 5). This third station would monitor the GCLL cover, and would be located on the north slope of the Mid Pit section.

Each monitoring station would be instrumented with a pan lysimeter to collect percolation from the base of the cover along with systems to collect surface runoff and lateral drainage. Sensors would also be installed to monitor hydrologic variables throughout the cover profile (e.g., water content, temperature, matric potential in each layer, including growth medium) as well as meteorological data. Additional information on the monitoring stations is included in **Appendix F**. The monitoring stations would be constructed and operated in general accordance with the procedures that EPA developed for the Alternative Cover Assessment Program (ACAP), as described in Benson et al. (1999).

The lysimeter monitoring would provide performance data and permit differentiation of the percolation rates for the Simple I and the GCLL covers. Additionally, the OSMS at the NWOP and EOP would be monitored for any flow after final reclamation of those areas for cover performance throughout the mine life and post-closure period.

Monitoring and annual assessment of the data would be performed for 10 years after reclamation of the mine. Monitoring would continue thereafter and would be evaluated

as part of a long-term cover review every 5 years as part of a 5-Year Cover Performance Review.

Visual inspection of the GCLL would also be conducted every 5 years after installation of the monitoring stations, and then every 10-years after mine closure (i.e., every other 5-year review) as part of the long-term monitoring program. Inspection would consist of excavating test pits to expose the GCLL at randomly selected locations adjacent to the lysimeters in the GCLL monitoring area established during Year 1. The purpose of these inspections is to assess the physical condition and durability of the GCLL.

Annual visual surveys over the completed cover system would be conducted for any physical signs of cover distress. Significant changes in the physical conditions of the cover (e.g., subsidence, cracking, erosion) would be noted. Depending on the changes observed, corrective actions would be conducted in a manner appropriate to maintain cover integrity. This visual survey would be performed annually up to 10 years after closure and reclamation of the mine and then every 5 years thereafter as part of the 5-Year Cover Performance Review.

The seepage collection system associated with the Overburden Seepage Management System (OSMS) as described in Section 3.1.13 would also provide an indication of cover failure for both overburden piles.

Appendix F contains the cover system monitoring plan, which includes information on lysimeter design, data collection, selection and inspection of test pit areas, visual cover surveys, and reporting.

Referenced report(s):

- Test Section Installation Instructions; Alternative Cover Assessment Program, Benson et al, December 1999.

Future Actions: Final engineering drawings will be provided to IDEQ, IDL and BLM along with GCLL installation and implementation of quality assurance procedures to ensure correct GCLL installation as per manufacturer's guidelines.

Justification: P4 is committed to ensuring performance of the cover systems.

3.1.13 Water Management Plan; Adaptive Management Plan; and Conceptual Overburden Seepage Management Systems

Summary: A Water Management Plan (P4 2010a) has been prepared that describes how on-site water would be managed over the life of the Blackfoot Bridge Mine project. This management system would route water appropriately based on water quality results. An Overburden Seepage Management System (OSMS) has been included in the external overburden piles (P4 2010f). Additionally, an Adaptive Management Plan (AMP)

(P4 2010b) provides for implementation of management actions that would allow P4 to avoid or minimize placement of fill and/or sediment in selected areas that currently contain wetlands and non-wetland waters of the U.S. Additional water management points at the proposed BFB Mine include collection points, spillways, ditches, sumps, underdrain discharge pipes and water management ponds.

Referenced report(s):

- Adaptive Management Plan for Water Management System Blackfoot Bridge Project, Idaho (P4 2010b);
- Conceptual Overburden Seepage Management System. Blackfoot Bridge Mine Project, Idaho (P4 2010f); and
- Water Management Plan (P4 2010a).

Purpose: The site-wide water management system is designed to control water (runoff and seepage) whose quality may be affected by the mining operation. The objectives of the water management system are to protect aquatic resources and minimize any adverse environmental impact. In addition, the management system is designed to control water contact with the mine area such that the quality of run-on and run-off water would not be affected. This will allow P4 to maximize the amount of water that can be reintroduced back into the water shed and the aquatic ecosystem (P4 2010a).

The Adaptive Management Plan (AMP) provides for placement of dredged or fill material in waters of the U.S. associated with portions of the unnamed tributary and Fish Pond only when needed to manage site water.

The OSMS is included in the design for the EOP and NWOP. Seepage collected from this system would be conveyed to the Water Management Ponds for on-site management.

Activity to date: The Water Management Plan, Adaptive Management Plan, and OSMS designs have been prepared.

Future actions: P4, in conjunction with IDEQ, IDL, USACE, and BLM, will develop a monitoring program that will address these three interrelated systems and plans. As part of the monitoring program, standard operating procedures would be developed to address water management and monitoring. **Appendix G** provides proposed operating procedures for the overall program.

Justification: P4 is committed to preserving water quality in the BFB project area.

The referenced reports contain detailed information regarding the Adaptive Management Plan and the OSMS including future monitoring.

3.1.14 Air Quality Monitoring

Fugitive Dust Monitoring – Periodic Inspections

Summary: The Air Quality Permit would denote any required monitoring during construction and operation at the mine site.

Future Actions: A revised application for an Air Quality Permit to Construct will be submitted to IDEQ in the near future. This permit will ensure P4 meets requirements that all reasonable precautions are taken to prevent particulate matter from becoming airborne during the Project life. Any monitoring for visible emissions and control measures will be documented in a Fugitive Dust Control Plan. Monitoring requirements will be added to this EMP once the permit is issued by IDEQ.

4.0 Reporting, Responsibility, Contact Information, and Laboratory Selection

This environmental monitoring plan may be subject to changes or modification. Modifications to this monitoring plan would be agreed upon by the BLM, IDL, IDEQ, and P4, prior to revision. Requests and approval for modifications will be documented in letters, and then incorporated in periodic revisions of this plan.

P4 would report results of ongoing monitoring activities as part of the annual operations reports to the BLM, IDL, and IDEQ in an Annual Environmental Monitoring Report (AEMR). The reporting would be provided on or before March 30 of each year and contain information related to the previous year's monitoring programs and results. P4 would maintain the information collected in connection with any ongoing monitoring programs in an internal database. The cumulative database would be submitted to BLM in digital format on an annual basis.

Reporting for various programs (e.g., SWPPP, wetland mitigation, Water Management Plan, OSMS, Adaptive Management Plan, overburden suitability analyses, cover system reporting) would be submitted to BLM and the governing agency or authority for that particular activity, on the basis as specified in the applicable guidance and/or regulations. Post-closure monitoring under the 5-Year Cover Performance Review will review data from the prior 5 years of continuing lysimeter monitoring and results of the visual cover survey and inspection of exhumed portion of the test pit, if completed during that review.

P4's BFB project leader is responsible for ensuring that the currently ongoing monitoring programs continue. Once a mining permit is issued, continuation of monitoring programs becomes the responsibility of the BFB mine manager. The BFB mine manager would be responsible for the implementation of the EMP. The BFB mine manager may designate these activities to whomever the mine manager decides. The BFB mine manager would also be responsible for ensuring the previous year results of any ongoing monitoring programs described in this document are submitted to BLM, IDL, IDEQ and the Corps as part of the annual operations report.

4.1 CONTACT INFORMATION

Various baseline plans of study contain contact information that may no longer be accurate. To avoid confusion associated with baseline study plans anticipated for future monitoring, the following address would be used for P4:

P4 Production, LLC.
PO Box 816
Soda Springs, ID 83276
208-547-4300

Changes to other contracted companies may occur, and may not be known at this time. Contact P4 to confirm any contracted companies performing work on this project.

4.2 ANALYTICAL LABORATORY SELECTION

Laboratory selection would occur with BLM, IDL, and IDEQ approval. P4 would select an analytical laboratory that uses appropriate analytical methods (approved USEPA analytical methods) to ensure good quality laboratory data are produced on a consistent basis. The selected laboratory would also have a QA/QC process and be certified (e.g., NELAC, CLP, or other as appropriate) for any environmental samples which need to meet regulatory compliance. P4's in-house capabilities may be used for management decisions not requiring regulatory approval for rapid screening and decision-making (e.g., adaptive management).

References

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Greystone, 2005b. Final Aquatic Resources, Amphibian, and Reptile Baseline Study Plan for the Blackfoot Bridge Property. Prepared by Greystone Environmental Consultants, Inc. May 2005.

Greystone, 2005c. Final Avian Study Plan for the Blackfoot Bridge and Ballard Properties. Prepared by Greystone Environmental Consultants, Inc. May 2005.

Greystone, 2005d. Final Bat Study Plan for the Blackfoot Bridge and Ballard Properties. Prepared by Greystone Environmental Consultants, Inc. May 2005.

Greystone, 2005e. Final Sensitive Plant Species Study Plan for the Blackfoot Bridge Property. Prepared by Greystone Environmental Consultants, Inc. June 2005.

Greystone, 2005f. Draft BLM Sensitive Rare Plant Survey Report for the Blackfoot Bridge Mine Project. Prepared by Greystone Environmental Consultants, Inc. August 2005.

Greystone, 2005g. Final Bat Survey Report for the Blackfoot Bridge Project Environmental Impact Statement. Prepared by Greystone Environmental Consultants, Inc. December 2005.

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P4, 2008. Joint Application for Section 404 Permit, Preliminary 404(b)(1) Showing and Conceptual Monitoring Plan. Prepared by P4 Production, LLC. December 2008.

P4, 2009a. Eagle Management Plan, Blackfoot Bridge Project Southeastern Idaho. Prepared by AMEC Geomatrix, Inc. March 17, 2009.

P4. 2009b. Blackfoot Bridge Mine. Evaluation of Cultural Resource Sites: 10cu259, t0cu26l and l0cu263. Caribou County, Idaho. Prepared by Arcadis.

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P4, 2010a. Water Management Plan. Prepared by AMEC Geomatrix, Inc. April 2010.

P4, 2010b. Adaptive Management Plan for Water Management System Blackfoot Bridge Project, Idaho. Prepared by AMEC Geomatrix, Inc. September, 2010.

P4, 2010c. Request for Setting Points of Compliance. Proposed Blackfoot Bridge Mine. Caribou County, Idaho. Prepared by AMEC Geomatrix, Inc. July 12, 2010.

P4, 2010d. Eagle Take Permit Application, Prepared by AMEC Geomatrix, Inc. Submitted to the U.S. Fish & Wildlife Service on March 22, 2010.

P4, 2010e. Compensatory Mitigation Plan for Waters of the U.S. Blackfoot Bridge Project, Caribou County, Idaho. Prepared AMEC Geomatrix. April 2010.

P4, 2010f. Conceptual Overburden Seepage Management System. Blackfoot Bridge Project, Caribou County, Idaho. Prepared AMEC Geomatrix. May 2010.

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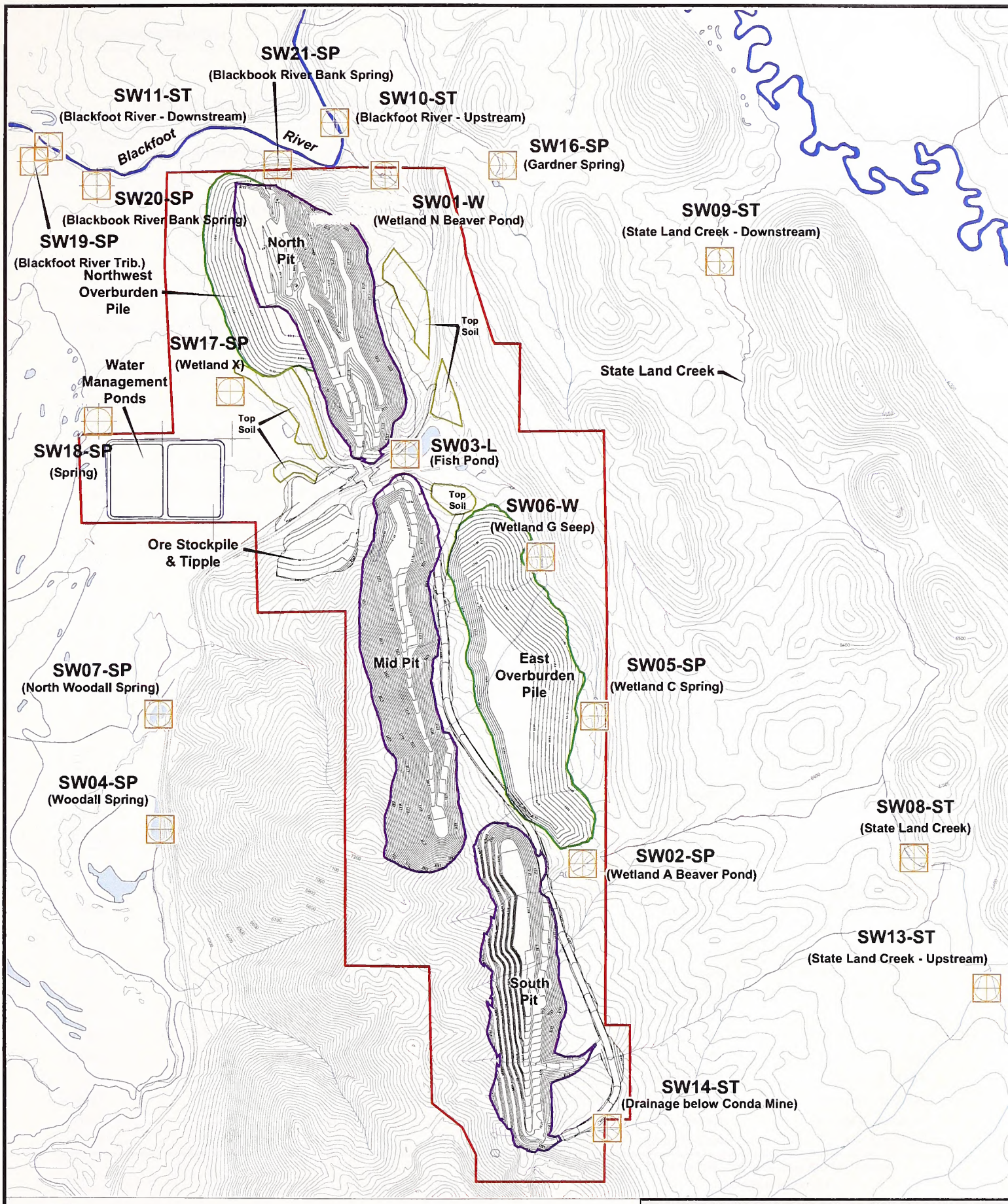
Appendix A: Surface Water and Groundwater Monitoring

Locations, Frequency, Analyte List, and Analytical Methods

Surface Water

Table 1 lists the analytical suite and methods from the water resources baseline characterization for continued spring and fall surface water monitoring during the life of the BFB Project and post-closure period. **Figure 1** shows the monitoring locations from the baseline report which are proposed for monitoring during the life of the BFB Project.



BLACKFOOT BRIDGE PROJECT EIS

FIGURE 1
Surface Water
Monitoring Stations

ANALYSIS AREA: Caribou County, Idaho	
Date: 09/22/10	File: FIGURE 1.dwg
Drawn By: SE	Layout: Surface Water

Table 1 - Analyte List for Surface Water Monitoring –Blackfoot Bridge

Parameter	Container	Preservation	Holding Time	Analytical Method	Quantification Limit (mg/l)
Field Parameters					
pH	--	--	Immediate	Field Meter	0.1-13.5 s.u.
Temperature	--	--	Immediate	Thermometer	0.1 °C
Specific conductance	--	--	Immediate	Field Meter	20 µhos/cm
Dissolved oxygen	--	--	Immediate	Field Meter	0.2
Laboratory Parameters and Major Ions					
pH (Lab) *	Polyethylene	Cool to 4°C	Immediate	150.1	0.1-13.5 s.u.
Temperature *	Polyethylene	Cool to 4°C	Immediate	Thermometer	0.1 °C
Specific conductance *	Polyethylene	Cool to 4°C	28 Days	2510B	10 µhos/cm
Alkalinity, bicarbonate *	Polyethylene	Cool to 4°C	14 days	2320B	1
Alkalinity, carbonate *	Polyethylene	Cool to 4°C	14 days	2320B	1
Alkalinity, total *	Polyethylene	Cool to 4°C	14 days	2320B	1
Calcium, dissolved	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	6 months	200.7 / 200.8	0.5
Chloride *	Polyethylene	Cool to 4°C	28 days	325.3	1
Fluoride *	Polyethylene	Cool to 4°C	28 days	4500-FC	0.1
Hardness, calculated	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	14 days	2340B	5
Magnesium, dissolved	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	6 months	200.7 / 200.8	0.5
Nitrogen, nitrate *	Polyethylene	H_2SO_4 to pH<2 / Cool to 4°C	28 days	353.2	0.05
Nitrogen, nitrite *	Polyethylene	H_2SO_4 to pH<2 / Cool to 4°C	2 days	4500-NO2B	0.01
Nitrogen, nitrate/nitrite *	Polyethylene	H_2SO_4 to pH<2 / Cool to 4°C	28 days	353.2	0.01
Nitrogen, ammonia *	Polyethylene	H_2SO_4 to pH<2 / Cool to 4°C	28 days	350.1	0.05
Phosphorous, total*	Polyethylene	H_2SO_4 to pH<2 / Cool to 4°C	28 days	365.2	0.01
Potassium, dissolved	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	6 months	200.7 / 200.8	0.5
Sodium, dissolved	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	6 months	200.7 / 200.8	0.5
Sulfate *	Polyethylene	Cool to 4°C	28 days	375.2	5
TSS *	Polyethylene	Cool to 4°C	7 days	160.2	5
TDS *	Polyethylene	Cool to 4°C	7 days	160.1	20
Turbidity (Lab) *	Polyethylene	Cool to 4°C, dark	2 days	180.1	0.2 NTU
Cations	Polyethylene	Cool to 4°C	---	1030F	<0.30 meq/l
Anions	Polyethylene	Cool to 4°C	---	1030F	<0.38 meq/l
Cation/Anion Balance	Polyethylene	Cool to 4°C	---	AWWA/APHA	<0.20%
Metals					
Aluminum, dissolved	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	6 months	200.7 / 200.8	0.05
Arsenic, dissolved	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	6 months	200.7 / 200.8	0.003
Barium, dissolved	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	6 months	200.7 / 200.8	0.05
Cadmium, dissolved	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	6 months	200.8	0.0001
Chromium, dissolved	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	6 months	200.8	0.001
Copper, dissolved	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	6 months	200.8	0.001
Iron, dissolved	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	6 months	200.7	0.05
Manganese, dissolved	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	6 months	200.7 / 200.8	0.005
Mercury, dissolved	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	28 days	200.8	0.00001
Nickel, dissolved	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	6 months	200.7 / 200.8	0.02
Selenium, total rec. *	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	6 months	200.8	0.001
Selenium, dissolved	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	6 months	200.8	0.001
Zinc, dissolved	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	6 months	200.7 / 200.8	0.01

Notes: All samples are field filtered (0.45µm) unless otherwise noted
* Unfiltered samples

Groundwater

Groundwater would be monitored during active mining operations to ensure that groundwater quality requirements are met in the project area. Monitoring would be conducted during high (spring) and low (fall) groundwater conditions at the locations shown on **Figure 2**. Additional point-of-compliance monitoring wells may be installed at future dates, and would be included in the groundwater monitoring program. Wells within the mine pit boundaries would be monitored until removed by the mining sequence. Wells MW-12W and MW-1W fall into this category.

Table 2 summarizes the construction details of the wells included in the groundwater monitoring program. Groundwater samples would be collected in accordance with the SOPs provided as in the final version of this plan and would be submitted for laboratory analysis of the parameters in **Table 2,** below. **Figure 2** shows the groundwater well locations. If not otherwise specified in this plan, field parameters listed in **Table 3** would be measured in the field at each location during sampling. Groundwater samples for metals analysis would be analyzed for both total and dissolved fractions.

TABLE 2

Well Construction Details

Well	Geologic Unit	Total Depth (ft below top of casing)	Screen Interval (ft)	Casing Type
MW-1W	Wells	237.9	222.9 – 232.9	3-in Sch. 80 PVC
MW-2R	Rex Chert	357.9	342.9 – 352.9	2-in Sch. 40 PVC
MW-3A	Alluvium/Dinwoody	32.05	17.05 – 27.05	2-in Sch. 40 PVC
MW-4W	Wells	96.8	81.8 – 91.8	2-in Sch. 40 PVC
MW-5A	Alluvium/Fill	48.2	33.2 – 43.2	2-in Sch. 40 PVC
MW-6D	Dinwoody	125.25	110.25 – 120.25	2-in Sch. 40 PVC
MW-7A	Alluvium/Dinwoody	36.5	21.5 – 31.5	2-in Sch. 40 PVC
MW-8W	Wells	87.6	72.6 – 82.6	2-in Sch. 40 PVC
MW-9A	Alluvium	31.8	16.8 – 26.8	2-in Sch. 40 PVC
MW-10A	Alluvium/Dinwoody	30.0	16.0 – 26.0	2-in Sch. 40 PVC
MW-11Da	Dinwoody	45.4	30.4 – 40.4	2-in Sch. 40 PVC
MW-11Db	Dinwoody	164.6	149.6 -1 59.6	2-in Sch. 40 PVC
MW-17W	Grandeur	275.9	260.9 – 270.9	3-in Sch. 80 PVC
MW-13A	Alluvium	23.75	8.75 – 18.75	2-in Sch. 40 PVC
MW-17W	Wells	122.5	85.0 – 90.0	314 Stainless
MW-17W	Wells	221.8	196.8 – 216.8	3-in Sch. 80 PVC
MW-18Da	Alluvium	30.0	20.5 – 25.5	2-in Sch. 40 PVC
MW-18Db	Dinwoody	124.9	109.9 – 119.9	2-in Sch. 40 PVC
MW-WMP1	Alluvium	~15	5 – 15	2-in Sch. 40 PVC
MW-WMP2	Alluvium	~15	5 – 15	2-in Sch. 40 PVC
MW-WMP3	Alluvium	~15	5 – 15	2-in Sch. 40 PVC

Source: Construction details of existing wells from Whetstone, 2008.

Table 3 - Analyte List for Groundwater Monitoring – Blackfoot Bridge

Parameter	Container	Preservation	Holding Time	Analytical Method	Quantification Limit (mg/l)
Field Parameters					
pH	--	--	Immediate	Field meter	0.1 s.u.
Dissolved Oxygen	--	--	Immediate	Field Meter	0.2
Temperature	--	--	Immediate	Thermometer	0.1 °C
Specific Conductance	--	--	Immediate	Field meter	20 µhos/cm
Laboratory Parameters and Major Ions					
pH (Lab) *	Polyethylene	Cool to 4°C	Immediate	150.1	0.1-13.5 s.u.
Temperature *	Polyethylene	Cool to 4°C	Immediate	Thermometer	0.1 °C
Specific conductance *	Polyethylene	Cool to 4°C	Immediate	2510B	10 µhos/cm
Alkalinity, bicarbonate *	Polyethylene	Cool to 4°C	14 days	2320B	1
Alkalinity, carbonate *	Polyethylene	Cool to 4°C	14 days	2320B	1
Alkalinity, total *	Polyethylene	Cool to 4°C	14 days	2320B	1
Calcium, dissolved	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	6 months	200.7 / 200.8	1
Chloride *	Polyethylene	Cool to 4°C	28 days	325.3	1
Fluoride *	Polyethylene	Cool to 4°C	28 days	4500-FC	0.1
Hardness, calculated	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	14 days	2340B	7
Magnesium, dissolved	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	6 months	200.7 / 200.8	1
Nitrogen, nitrate *	Polyethylene	H_2SO_4 to pH<2 / Cool to 4°C	28 days	353.2	0.01
Nitrogen, nitrite *	Polyethylene	H_2SO_4 to pH<2 / Cool to 4°C	2 days	4500-NO2 B	0.01
Nitrogen, nitrate/nitrite *	Polyethylene	H_2SO_4 to pH<2 / Cool to 4°C	28 days	353.2	0.01
Nitrogen, ammonia *	Polyethylene	H_2SO_4 to pH<2 / Cool to 4°C	28 days	350.1	0.05
Phosphorous, total *	Polyethylene	H_2SO_4 to pH<2 / Cool to 4°C	28 days	365.2	0.01
Potassium, dissolved	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	6 months	200.7 / 200.8	1
Sodium, dissolved	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	6 months	200.7 / 200.8	1
Sulfate *	Polyethylene	Cool to 4°C	28 days	375.2	5
TSS *	Polyethylene	Cool to 4°C	7 days	160.2	5
TDS *	Polyethylene	Cool to 4°C	7 days	160.1	20
Turbidity (Lab) *	Polyethylene	Cool to 4°C	2 days	180.1	0.2 NTU
Cations	Polyethylene	Cool to 4°C	---	1030F	<0.30 meq/l
Anions	Polyethylene	Cool to 4°C	---	1030F	<0.38 meq/l
Cation/Anion Balance	Polyethylene	Cool to 4°C	---	AWWA/APHA	<0.20%
Metals (analyze for dissolved and total concentrations)					
Aluminum **	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	6 months	200.7 / 200.8	0.05
Arsenic **	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	6 months	200.7 / 200.8	0.003
Barium **	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	6 months	200.7 / 200.8	0.05

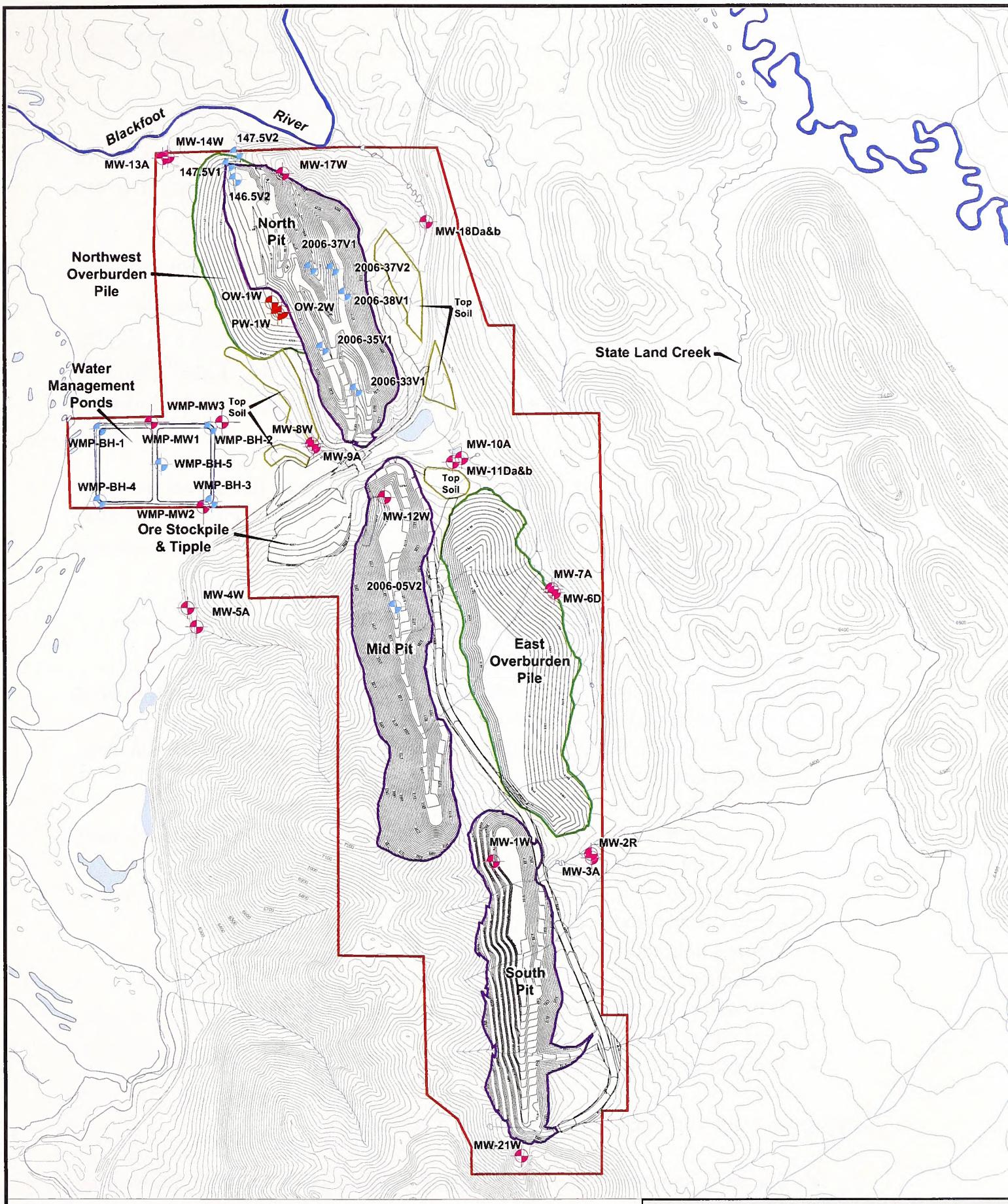
Cadmium **	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	6 months	200.8	0.0001
Chromium **	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	6 months	200.8	0.001
Copper **	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	6 months	200.8	0.001
Iron **	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	6 months	200.7	0.05
Manganese **	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	6 months	200.7 / 200.8	0.005
Mercury **	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	6 months	200.8	0.00001
Nickel **	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	6 months	200.7 / 200.8	0.02
Selenium **	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	6 months	200.8	0.001
Zinc **	Polyethylene	HNO_3 to pH<2 / Cool to 4°C	6 months	200.7 / 200.8	0.01

Notes: All samples are field filtered (0.45µm) unless otherwise noted
* Unfiltered samples
** Both filtered and unfiltered samples

Source: Technical Memorandum (Whetstone 2008)

Notes: dissolved samples to be field filtered (0.45µm)
IDEQ GW Quality Rule IDAPA 58.01.11 Primary Constituent Standards are based only on total fractions

Source: Technical Memorandum (Whetstone 2008)



LEGEND

- PROJECT BOUNDARY
- PROPOSED OPEN PIT
- PROPOSED OVERBURDEN PILE
- PROPOSED TOPSOIL STOCKPILE
- MONITORING WELL
- PIEZOMETER
- PUMPING WELL OR OBSERVATION WELL

Contour Interval = 20 ft.

NORTH

1,000' 0 1,000' 2,000'

BLACKFOOT BRIDGE PROJECT EIS

FIGURE 2
Groundwater
Monitoring Stations

ANALYSIS AREA: Caribou County, Idaho	
Date: 07/14/10	File: FIGURE 2.dwg
Drawn By: SE	Layout: Groundwater

Post Mining Surface and Groundwater Monitoring

Surface and groundwater water monitoring would continue as described above following the completion of mining and reclamation activities at the site until after the water management system is removed and data trends justify cessation.

Quality Assurance and Quality Control – Surface and Groundwater Monitoring

Quality assurance and quality control (QA/QC) samples and procedures would be incorporated into the monitoring program in accordance with the quality assurance project plan (QAPP) that would be established for the surface and groundwater monitoring program.

The QA/QC program would be developed in conjunction with IDEQ and BLM and would be based on EPA's Guidance for Quality Assurance Project Plans, EPA/240/R-02/009 (EPA, 2002). The QA/QC for the surface water and groundwater monitoring program would contain the following principal QA components:

- Statement of program goals and objectives
- Description of monitoring locations
- Specification of analyte lists, analytical methods, quantification limits, holding times, and container and preservative requirements.
- Description of program management and organization including identification of individuals responsible for specific tasks and functions
- Schedule for monitoring and reporting
- Identification of data quality objectives (i.e criteria for precision, accuracy, representativeness, comparability, completeness etc.)
- Identification of special training requirements and certifications for project personnel and laboratories
- General procedures for sampling and data acquisition
- Procedures for program assessment corrective actions if required
- Procedures for laboratory selection, assessment, and oversight
- Procedures for data validation
- Procedures for data evaluation and reporting

The program would also include the following QC elements:

- Standard operating procedures (SOPs)for sampling at each monitoring location
- SOPs for calibration, operation, and decontamination of field sampling equipment
- SOPs for sample identification and documentation

- Requirements for record keeping and reporting including, field notes and sampling forms,
- SOPS for sample handling and chain of custody
- Specification of field duplicate and quality control samples
- Specification of laboratory duplicate and quality control samples

The selected laboratory for completing analysis of samples would also be required to adhere to standard QA/QC procedures for the analysis of water and soil samples and maintain the proper certification.

APPENDIX B - Aquatic Resources, Amphibian, and Reptile Monitoring Plan for the Blackfoot Bridge Property

Introduction

P4 Production LLC (P4) has proposed to expand its phosphate mining operation at the Blackfoot Bridge (BFB) site, located approximately 9 miles north of Soda Springs, Idaho. P4 has developed this monitoring plan to augment baseline survey data collected for aquatic resources, amphibians, and reptiles conducted in 2005 and to document any changes in these resources that may result from the BFB Project.

Monitoring Objectives

The objectives of this aquatic resources, amphibian, and reptile monitoring program include:

- Monitor fish, macroinvertebrate, amphibian, and reptile occurrence during the life of mine and post-closure period to compare to baseline data.
- Monitor the presence of BLM sensitive fish species including Bonneville cutthroat trout (*Oncorhynchus clarki utah*), Yellowstone cutthroat trout (*Oncorhynchus clarki bouveri*), Bear Lake cutthroat trout (*Oncorhynchus clarki ssp.*), Bear Lake whitefish (*Prosopium abyssicola*), Bonneville whitefish (*Prosopium spilonotus*), Bonneville cisco (*Prosopium gemmiferu*), Bear Lake sculpin (*Cottus extensus*), and leatherside chub (*Gila copei*) and other incidental, non-sensitive species in the project area during the mine life to compare to baseline data.
- Monitor macroinvertebrate community composition in the project area for comparison to baseline data.
- Monitor occurrence of BLM sensitive amphibian and reptile species including boreal toad (*Bufo boreas boreas*), northern leopard frog (*Rana pipiens*), western toad (*Bufo boreas*), and common garter snake (*Thamnophis sirtalis*) and other incidental species occurring at the Blackfoot Bridge sites.
- Prepare monitoring reports that presents the findings and conclusions.

Study Area

The Blackfoot Bridge site is located in Caribou County, Idaho, approximately 9 miles north of Soda Springs, Idaho. The Blackfoot Bridge project site occupies approximately 1,440 acres located in T7S R42E, Sections 22, 23, 26, 27, and 35.

Aquatic sampling sites to be monitored under this program will be the same as those used for the baseline survey. The sites include delineated wetlands that are suitable habitats for amphibians and reptiles. Other sites include stream sites, and lake sites.

Schedule

One sampling event would be conducted in years 5, 10 and post-mining for fish; all other aquatic species would be sampled during one post-reclamation monitoring event. Aquatic resources monitoring will be conducted in August or September during low flow conditions to maximize sampling efficiency. The reptile monitoring episode will be conducted from May to August.

Methodology

The objectives of the aquatic resources monitoring program are to characterize gather data on fish populations, macroinvertebrate community composition, and observe presence or absence of BLM sensitive amphibian and reptile species for comparison to baseline survey results. This information can provide an indication as to whether the BFB Project is having an effect on aquatic resources within the Blackfoot River basin. Methods for monitoring each of these resources is described below.

Multiple fish sampling sites are proposed for the project area including:

- Station on State Lands Creek;
- Station on the unnamed tributary flowing into the Blackfoot River (downstream of the confluence with State Lands Creek and upstream of confluence with Blackfoot River; and
- Three stations on the Blackfoot River (one above the confluence with the unnamed tributary, one below this confluence, and one upstream of Blackfoot Reservoir below the project area.

Fish

Three different methods may be used for stream sampling. Stream sampling will include electrofishing (bank and/or backpack) and seining where necessary. A three-pass depletion method (Lockwood and Schneider 2000; Zippen 1958) will be used with block nets at the upstream and downstream ends of each reach. All habitat types present within each reach will be electrofished (e.g., pools, riffles, backwaters).

Consistent with the baseline survey, representative reaches, approximately 100 meters in length, will be sampled. Three passes will be made with the electrofisher (bank and/or backpack). Bank electrofishing will only be used if conductivities are too high for efficient backpack electrofishing, or if the creeks or rivers are too wide to be efficiently surveyed with two backpack electrofishers. Seining will be conducted where electrofishing is not efficient or in combination with electrofishing to maximize taxa collection. A backpack shocker, bank shocker, and beach seine will be brought to the site to provide the maximum flexibility in sampling method. A Smith Root Model 12B backpack electrofisher or Coffelt VVP-15B bank electrofisher will be used.

Collected fish will be kept in an aerated live car until all fish can be processed. Fish will be identified to species, measured, and several fish of each species will be photographed, and then

released into the stream either above or below the block nets. Additionally, voucher specimens of each species will be preserved. Voucher specimens are used to confirm the identity of a species of fish after sampling has been completed. This process will be repeated for all three passes for each sampled reach. In the rare case that a fish cannot be identified, it will be preserved with formaldehyde and identified in the laboratory.

A variety of data will be recorded for each fish. A log sheet will be completed for each sample site that includes date of collection, scientific name (genus and species/subspecies), general description, and other comments noted by the collectors in the field that may facilitate identification description. Finally, the site will be recorded on the upstream and downstream ends using a global positioning system (GPS) unit to allow for replicate surveys in the future.

If any state- or BLM-listed sensitive species are encountered, special care will be taken not to harm the specimens or their habitat. All species collected will be photographed and released unharmed. Fish collection permit from IFGD will be obtained prior to the monitoring episodes.

Macroinvertebrates

Macroinvertebrates monitoring will be conducted after reclamation of the project site at all stream sampling stations. To be consistent with the baseline monitoring, a one-sample composite of three 1-ft2 Surber samples will be collected in representative riffle-habitat (cobble substrate) at each station. The same area and substrate (micro habitat) will be sampled at each site to provide for quantitative comparison among sites. Samples will be emptied into a standard number 30 sieve (594-micron screen) for washing, and preserved with 90 percent ethyl alcohol for transport to the laboratory. The data will be collected and processed using a method modified from the U.S. Environmental Protection Agency's (EPA's) Rapid Bioassessment Protocol level III (Barbour et al. 1999).

Once in the laboratory, the macroinvertebrate samples will be lightly rinsed in a standard number 30 sieve and transferred to a white pan for segregation. For samples with low numbers of organisms (< 100), all will be removed from the sample. If samples have high numbers (> 100), half fractions will be sorted. For these samples, the appropriate coefficient will be used to adjust the abundance of taxa to equal a full sample. Macroinvertebrates will be identified to the lowest taxonomic level practical, enumerated, and recorded on laboratory bench sheets. Organisms will be identified using Merritt and Cummins (1996), and Pennak (1989).

Several macroinvertebrate metrics will be calculated and compared to baseline conditions including total abundance, number of taxa, richness of Ephemeroptera-Plecoptera-Trichoptera (EPT) taxa, percent contribution of the dominant taxon, percent Chironomidae, EPT-Chironomidae abundance ratio, Shannon Weiner diversity index, evenness, and Hilsenhoff Biotic Index (Hilsenhoff 1987). IDEQ's Stream Macroinvertebrate Index will also be consulted as an additional metric (2002).

Amphibians and Reptiles

A single monitoring episode will be conducted after reclamation of the mine site in amphibian habitats including wetlands, springs, and other suitable habitats in the project area (on the

Proposed Blackfoot Bridge Mine Project site) including observation for the presence or absence of BLM sensitive amphibian species and other incidental species during the monitoring period.

Reptile habitats including xeric shrublands, aspen forest, mixed conifer forest, barren land, (exposed rock and playas) riparian, and wetland areas will be monitored after reclamation of the project site for the presence or absence of reptile species. These surveys will be conducted from May to August during other terrestrial transect survey efforts. Transects established for goshawk surveys will include calling stations spaced at 300 meter intervals throughout the project area. These transects will bisect suitable reptile habitats and thus facilitate pedestrian reptile surveys.

Monitoring using visual encounter and cover-turning will be conducted for both amphibians and reptiles. Habitats identified during baseline surveys will be traversed on foot within the project area while visually searching for amphibian and reptile species. Shed snake skins will be collected whenever encountered and will be characterized to species, when possible. Visual encounter monitoring will also be conducted for amphibians around the perimeter of the wetland sites. Cover-turning methods will involve turning over cover habitats such as rocks and logs to search for hidden amphibians and reptiles.

Dip netting and cover-turning are monitoring methods that will be used to complement the visual encounters. These sampling methods will be employed to maximize the possibility of detecting species that generally remain hidden within vegetation or underneath cover. The dip netting method is effective at locating amphibian species hidden in submerged vegetation (Crisafulli 1997). A fine-mesh dipnet will be used to dip approximately every 5 steps around wetland and pond perimeters. The cover-turning method incorporates the lifting and shifting of cover objects, such as rocks and logs, to locate reptiles and amphibians hidden beneath. All cover objects will be returned to the original position after turning. This method will primarily be used in terrestrial sites, especially where rocks and downed logs are abundant. Additionally, incidental amphibian and reptile observations will be recorded at the stream sampling sites downstream of the project area and at the "fish pond" site.

Data Analysis and Reporting

Fish population estimates for stream sites will be calculated according to the number of passes completed using the 95 percent confidence interval (Zippen 1958, Lockwood and Schneider 2000). In some cases, an insufficient number of fish may be captured to support population estimates with statistics. In those cases, the number captured will be used to estimate the minimum population, but no estimation of the population maximum would be made. GPS locations will be recorded and a digital image will be taken of all sites. The actual stream reaches that are sampled will be plotted on a map. Overall reptile and amphibian abundance in different habitat types will also be presented.

A monitoring report will be prepared after the field surveys are completed and data will be compared to baseline data. Fish population data, macroinvertebrate abundance data, physical stream habitat data, and reptile and amphibian data will be summarized in tabular format.

Macroinvertebrate metrics will be summarized in an appendix and site photographs will be provided in an appendix.

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Appendix C - Soil and Vegetation Sampling Plan

P4 will establish a mine map with 500 foot grid spacing between nodes overlaying the BFB Mine for the proposed soil (and vegetation) chemistry study. At each intersection, co-located soil and vegetation samples will be collected. A composite sample will be created by combining all sampled intersections into one sample. Laboratory sample preparation will sufficiently homogenize each sample. Up to three soil and three vegetation samples (replicate samples) will be collected to provide an accurate mean concentration of the soil and vegetation chemistry at background conditions. Sample depths will be developed in conjunction with the agencies.

Surface soil analytes will include:

Measured by the analytical laboratory.

- Total selenium (analytical method: SW-846 Method 6020)
- Extractable selenium (analytical method: 80-3.2.2 with Method 6020)
- Cadmium (analytical method: SW-846 Method 6020)
- Moisture content

Vegetation analytes will include:

Measured by the analytical laboratory.

- Total selenium (analytical method: SW-846 Method 6020)
- Moisture content

In addition to the above list of analytes, a general description of the vegetation communities (and surface soil) and identification of species sampled will be included during each event.

SOP – Soil Sampling Procedures

Scope

The purpose of this section is to define the SOP for the collection and handling of soil samples using hand-operated devices.

Responsibilities

This part identifies those responsible for various aspects of the project and the roles they play throughout the field investigation. All personnel involved in this investigation and in the generation of data are implicitly a part of the overall project and quality assurance program.
The Reclamation Specialist is responsible for supervising soil sample collection and accurate completion of data sheets by field staff. Field staff is responsible for reporting deviations or nonconformance of the procedure to the Reclamation Specialist. The Reclamation Specialist is responsible for maintaining generated data and project files, filing project documents, relevant correspondences, chain of custody forms, field sampling forms and other pertinent project information.

Procedure

The methods described by this procedure may be used to acquire soil samples for chemical analysis. The sampling methods described in this SOP are suitable for collecting soil samples. Because of the potentially high degree of heterogeneity found in soil, collection of representative samples requires careful planning and technical judgment. Sampling locations will be as specified above; however, in general, the preferred sampling strategy requires collection of samples from a specified sample location and compositing of those samples in the field to form a single sample before shipment.

Equipment List

The following is a list of equipment for performing soil sampling:

- Balance with a 250-gram capacity calibrated to ± 0.1 grams (optional)
- Bound field notebook
- Copy of this SOP
- Decontamination equipment and waste containers
- Detergent solution (0.1 to 0.3 percent Alconox or equivalent detergent)
- Distilled water
- Protective gloves
- Hand-operated soil collection device or devices as specified in the workplan or SAP
- 100-ft measuring tape
- 10-ft steel measuring tape (optional)
- Sample bags
- Sample containers
- Sample labels and seals
- U.S. Standard Sieve No. 10 with collection pan and cover (optional)
- Site map of sampling area
- Stainless steel mixing bowl
- Stainless steel spoon

General Considerations

The procedures for collecting one soil sample at a given location are as follows:

- Collect equal amounts of soil from the interval of concern or to refusal of the equipment.
- If the equipment is refused, record the depth of refusal.
- Place each surface soil sample in Ziploc bag.
- If compositing, combine samples until desired composite number is achieved.
- Label each bag and place in storage container for shipment to laboratory.

Any sieving required, or composite sample homogenization, will be conducted at the analytical laboratory. Analytical laboratories are much more able to sieve and homogenize soil samples under controlled conditions, as compared to the field setting.

Sample Acquisition Method

Grab samples may be taken with a decontaminated punch, shovel, or trowel and directly transferred to an appropriate sample container or decontaminated compositing bowl.

During soil sampling operations, the proper personal protective equipment will be worn to minimize cross-contamination.

Decontamination

Sample acquisition and compositing tools shall be decontaminated as follows:

- Ensure that the cleaning solutions and rinseate containers required are available
- Scrub the sample acquisition or compositing tool with a brush saturated with Alconox and water, then rinse with deionized or distilled water.
- Dispose of the rinseate and wiping rags appropriately.
- Wrap the decontaminated device in clean plastic sheeting or bags and tape securely pending next use.

SOP—Vegetation Sampling Procedures

Scope

The purpose of this section is to define the standard operating procedure (SOP) for vegetation sampling performed by P4 personnel. This SOP is intended to be used in conjunction with applicable plans.

Responsibilities

The Reclamation Specialist is responsible for supervising vegetation sample collection and accurate completion of data sheets by field staff. Field staff is responsible for reporting deviations or nonconformance of the procedure to the Reclamation Specialist. The Reclamation Specialist is responsible for maintaining generated data and project files, filing project documents, relevant correspondences, chain of custody forms, field sampling forms and other pertinent project information.

Procedure

The following is a list of equipment and procedures necessary for vegetation sampling. If compositing, combine samples until desired composite number is achieved.

Equipment List

The following is a list of equipment that may be necessary to perform vegetation sampling:

- Bound field notebook
- Copy of this SOP
- Detergent solution (0.1 to 0.3 percent Alconox)
- Distilled water
- Hand scoop, trowel, or shovel
- 100-foot long tape measure with 0.1-inch subdivisions
- Plant identification handbook
- Protective gloves
- Stainless steel scissors or other equivalent cutting instrument
- Sample analysis request forms
- Sample containers (polyethylene bags having at least an one-quart capacity)
- Sample labels and seals
- Sample location maps or sketches
- Balance with a 250-gram capacity calibrated to ±0.1 gram
- Balance calibration mass
- Camera

Vegetation Sampling

Accurate identification of plants to be sampled is important as individual species may take up and accumulate contaminants and naturally occurring substances at dissimilar rates and may store these constituents in different plant tissues. Plant samples should not to be washed if the investigation goal is to determine potential contamination transfer to animal food chains under existing site conditions. Specific collection requirements for herbaceous and woody species are presented in the following text. Homogenization will occur at the analytical laboratory.

Herbaceous Species

Herbaceous species include grasses, sedges, forbs, and other non-woody plants. Samples are collected and processed either as whole plants or as selected plant tissues.

Specific Plant Tissues

Specific plant tissues are collected either by cutting the desired parts from the plant with stainless steel scissors or shears or by manually breaking the parts off the plant. Fold, cut, or break sample plant tissues so that the plant tissues fit into a plastic bag. Weigh and store sample as previously stated. Clean or replace scissors or shears after collecting each sample.

If the specific plant tissue requires washing to remove surface dust or contamination, then wash the tissues before cutting them. If retention of investigation derived waste (IDW) is required, all wash and rinse fluids shall be captured and returned to the decontamination staging area for disposal. Field weigh washed samples with the hand-held spring balance or other measuring device to the nearest 0.1 gram after shaking off residual wash water.

Woody Species

Woody species include trees and shrubs. Samples are normally of specific plant tissues such as branches and leaves of the current year's growth rather than the entire plant since individual plants are too large to be considered for whole-plant analysis. Typically, target plant tissues are leaves, stems, and mature fruits. Specimens for woody species require a minimum 12 inch length of the current year's stem with mature leaves, flowers, and/or fruits attached.

Specific Tissues

Follow the same general procedures for collecting the leaf and stem tissues from woody plants as those described for herbaceous tissue samples. If stems and leaves will be analyzed separately, manually cut, break, or separate the individual leaf from the branch and leaf stem. The leaves would then constitute one sample and the stems without leaves would constitute another. Because woody plants are larger and the individuals are more widely spaced than herbaceous plants, the radius of sampling may be significantly larger than the radii for herbaceous plants.

Decontamination

Sample acquisition and compositing tools shall be decontaminated as follows:

- Ensure that the cleaning solutions and rinseate containers required are available
- Scrub the sample acquisition or compositing tool with a brush saturated with Alconox and water, then rinse with deionized or distilled water.
- Dispose of the rinseate and wiping rags appropriately.
- Wrap the decontaminated device in clean plastic sheeting or bags and tape securely pending next use.

Lab selection will be as discussed in Section 4 above. Analysis will be conducted per approved EPA analytical methods.

Appendix D – Stormwater Monitoring

Stormwater monitoring would be conducted during mining and reclamation operations at the site to ensure that runoff that does not meet surface water criteria is not discharged from the mine's water management system to waters of the U.S. As discussed in the Water Management Plan, the mine is designed to prevent discharge of stormwater that exceeds discharge criteria to the Blackfoot River. Runoff that meets surface water quality criteria would be discharged in accordance with the requirements of an NPDES permit. An NPDES permit may include additional monitoring requirements.

Samples would be collected from Fish Pond and water management ponds CP1, CP2, and EP1 on a periodic basis during the spring runoff event each year when appreciable runoff has collected in the ponds and on a weekly basis thereafter (if any discharges at CP1 occur). Samples would be collected from water management ponds NWP1 through NWP4 (or NWP1-2 and NWP3-4 if Alternative 1A or 1B is selected) on a periodic basis during the spring runoff event each year when appreciable runoff has collected in the ponds and on a monthly basis thereafter if any discharges at MWP1-2. Samples would be collected at NEP1 on an annual basis during spring runoff. See **Figure 1** and Appendix G of this plan.

Stormwater samples would be collected in accordance with the SWPPP. If not otherwise specified in the plan, samples would be submitted for laboratory analysis of the parameters in **Table 1**. Field parameters listed in **Table 1** would be measured in the field at all sample locations during monitoring. Stormwater samples for selenium analysis would be analyzed for both total and dissolved fractions. Seeps identified for sampling during annual comprehensive site inspections as set forth in the SWPPP would be sampled for selenium (EPA Method 200.8) and manganese (EPA Method 2007).

Stormwater monitoring would continue as described above following completion of mining and reclamation activities at the site until it is demonstrated that runoff from the reclaimed project area meets surface water quality standards. The majority of the water management system would then be removed and stormwater monitoring would cease.

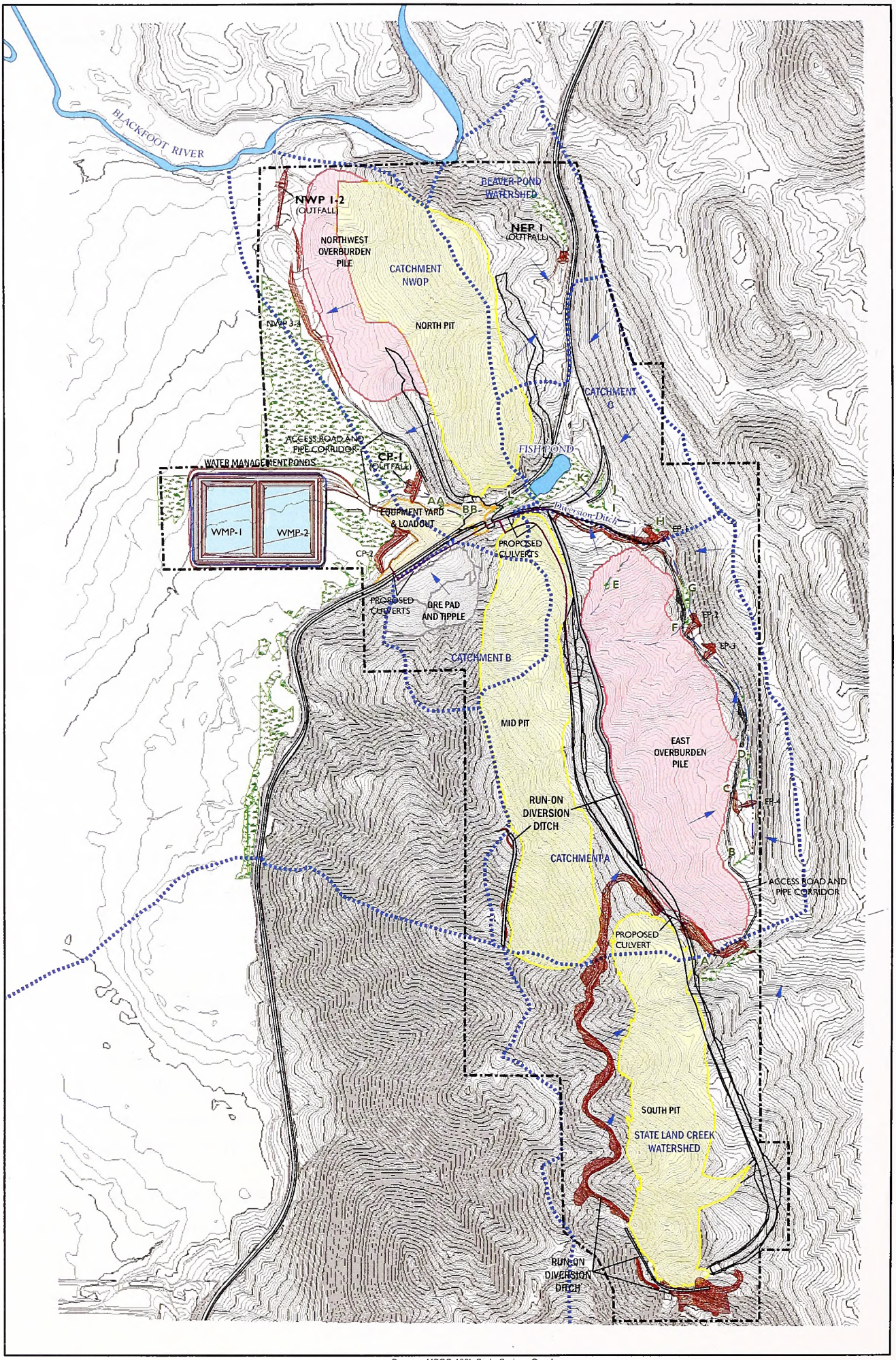
TABLE 1

Stormwater Monitoring Analyte List

Parameter	Preservation	Holding Time	Analytical Method
Field Parameters			
pH	---	Field measurement	Field meter
Temperature	---	Field measurement	Field meter
Turbidity	---	Field measurement	Field meter
Specific Conductance		Field measurement	Field meter
Laboratory Parameters			
Selenium, total and dissolved	4°C and HNO_3	6 months	200.8
Manganese, total	4°C and HNO_3	6 months	200.7
Cadmium	4°C and HNO_3	6 months	200.8
Total suspended solids	4°C	7 days	160.2

P4 currently maintains a Stormwater Pollution Prevention Plan (SWPPP) that addresses current levels of activity at the BFB project site. The SWPPP would be updated periodically as site conditions change and stormwater controls are modified to accommodate the changed conditions. The SWPPP will also be updated as required by the EPA, and DEQ and BLM will review and comment on the proposed changes to address water management issues. Once agreement is reached on revisions, the EMP will be updated to reflect those modifications.

The SWPPP document contains descriptions of methods and procedures that the operator will used to meet the various aspects of stormwater management. These descriptions are provided in the following principle areas:



Source: USGS 100k Soda Springs Quad

Project Boundary — Watersheds

Drainage Channel — Culverts

A Wetland Area — Water Management Structures

Flow Direction

N

Feet

0 1,200

AMEC Geomatrix

Site Map
Water Management System
Caribou County, Idaho
FIGURE 1

- Minimize Exposure – location and type of structural controls or practices used to minimize the exposure of industrial activities to rain, snow, snowmelt, and runoff.
- Good Housekeeping – location and description of practices to be implemented to keep exposed areas clean.
- Maintenance – Identify procedures (1) to maintain industrial equipment so that spills/leaks are avoided, and (2) to maintain control measures in effective operating condition. Include the schedule you will follow for such maintenance activities. Describe where each applicable procedure is being implemented at the site
- Spill Prevention and Response - structural controls or procedures used to minimize the potential for leaks, spills, and other releases.
- Erosion and Sediment controls - structural or non-structural controls used at the site to stabilize exposed areas and contain runoff to minimize onsite erosion and potential offsite discharges of sediment.
- Management of Runoff - Describe controls to divert, infiltrate, reuse, contain, or otherwise reduce stormwater runoff.
- MSGP Sector Specific – Non-Numeric Effluent Limits - Describe controls or procedures that will be used to comply with any sector-specific requirements that apply to you in Part 8 of the MSGP. Describe the location at your site where each control and/or procedure will be implemented.
- Employee Training - Describe training the employees who work in areas where industrial materials or activities are exposed to stormwater, or who are responsible for implementing activities necessary to meet the conditions of the MSGP, including all members of your Pollution Prevention Team.
- Non-Stormwater Discharges - Describe how unauthorized non-stormwater discharges would be eliminated at the site.
- Waste, Garbage, or Floatable Debris - Describe controls and procedures that will be used at your site to minimize discharges of waste, garbage, and floatable debris. Describe the location at your site where each control and/or procedure will be implemented.
- Dust Generation and Vehicle Tracking of Industrial Materials - Describe controls and procedures to minimize generation of dust and off-site tracking of raw, final, or waste materials.

Schedules and Procedures for Monitoring

A description of the procedures for conducting the five types of analytical monitoring specified by the MSGP, where applicable, will be developed including the following:

- Benchmark monitoring (MSGP, Part 6.2.1 and relevant requirements in Part 8 and/or Part 9);
- Effluent limitations guidelines monitoring (MSGP, Part 6.2.2 and relevant requirements in Part 8);
- State- or Tribal-specific monitoring (MSGP, Part 6.2.3 and relevant requirements in Part 9);
- Impaired waters monitoring (MSGP, Part 6.2.4); and
- Other monitoring as required by EPA (MSGP, Part 6.2.5).

For each type of monitoring, the SWPPP will include the following information:

1. Sample Location(s).
2. Pollutant Parameters to be Sampled.
3. Monitoring Schedules.
4. Numeric Limitations.
5. Procedures.

Inspections

A description of the procedures for performing the three types of inspections required by the SWPPP permit will be included in the plan including:

- Routine facility inspections (MSGP, Part 4.1);
- Quarterly visual assessment of stormwater discharges (MSGP, Part 4.2); and
- Comprehensive site inspections (MSGP, Part 4.3).

Appendix E - Overburden Suitability Analysis Plan

The Blackfoot Bridge Preferred Alternative 1A incorporates the use of robust cover systems for both pit backfills and external overburden piles. Specifically, this alternative proposes the use of a dual cover system having both a "Store and Release Cover" component and a Laminated Geosynthetic Clay Liner (GCLL). The GCLL cover would be utilized on over 380 acres of reclaimed pit backfill and just over 90 acres of the 145 acre East Overburden Pile (EOP). A "Store and Release Cover" is planned to be used on both external overburden piles including 50 plus acres of the EOP not covered by the GCLL cover system and some 45 acres of the Northwest Overburden Pile (NWOP). Non–seleniferous or relatively low selenium containing materials are planned for use exclusively in any and all areas not covered by the GCLL cover. These areas may include roads, yards and stockpile pads. Non-seleniferous or relatively low-selenium bearing materials would be defined as materials having Se content of less than 13ppm total selenium or 0.1 ppm extractable selenium, consistent with the 2003 USFS Soil Suitability Guidelines[1].

A final sampling and analysis plan will be developed in consultation with the agencies. The proposed sampling and analysis plan included in this Appendix is based on P4's experience in southeast Idaho. Specific details on material sampling, characterization, and handling practices will be developed in the final plan.

Selective Handling Practices

Selective handling of overburden materials would be a basic requirement of this plan. Phosphate mining standard practices involve mine plans that schedule specific mine ore zone and overburden material movement and placement. These materials are located as part of the project geologic model definition and are visually distinct and readily identifiable in the field. In summary, the intent of this plan would be to avoid the placement of shale-containing materials in any disposal or construction areas not covered by GCLL cover systems, with the exception of those areas where drainage is controlled within a pit or to a lined facility, or in construction fills using practices as described below. P4's experience together with that of other phosphate mining companies is that the highest and most problematic materials with the potential to leach selenium are almost exclusively lithologic units that contain phosphatic shale such as the center waste shale (low grade phosphatic shale located between upper and lower ore beds), the hanging wall mud (located just above the upper ore zone), and the footwall mud (located just below the lower ore unit). Therefore, materials comprising the non-seleniferous overburden are expected to include the following:

- Limestone (located greater than 10 ft from the footwall mud);
- Chert located above the hanging wall mud;
- Alluvium located above the suitable limestone and chert zones described in 1 and 2 plus from all planned external overburden piles, stockpile pad and yard areas including growth media; and

[1] See special considerations for Chert placement.

- Volcanics known to occur in the Mid and South pit areas.

Assurance of proper selective handling practices would be based on P4's mine planning and scheduling plans and practices that include identification of all geologic strata prior to excavation. These plans are revised and updated at least annually and are shared and discussed with all personnel including P4 and its contractors involved with mining or construction activities on at least a weekly basis.

P4's baseline soil and vegetation chemistry study, anticipated to begin in 2010 or 2011, would provide the chemical basis for soil and growth media selenium concentrations. This information would also be used as a decision-making tool for topsoil selective handling and would be used in conjunction with this plan's guidance for handling seleniferous and non-seleniferous material.

Sampling

P4, in conjunction with the agencies, will develop a final sampling plan to ensure that material suitability is determined prior to use in areas of the project where GCLL covers would not be used. As indicated above, it is P4's experience that adhering to the selective handling practices would be sufficient to comply with the material suitability guidelines. However, periodic sampling would be performed in order to ensure adherence with the appropriate guidelines. Based on P4's experience, a proposed sampling plan would include the following:

- Chert materials and limestone sourced within 10 feet or less from the hanging wall mud shale and foot wall mud shale would be the units identified for sampling as part of the overburden suitability plan and are hereby referred to as "sampled materials".

- These sampled materials would be identified and scheduled in advance of mining in order to guarantee availability when needed.

- Once the pit bench level to be used is graded and cleaned of loose overburden materials, shallow (<1 foot deep) channel trenches would be cut perpendicular to the bedding layers.

- The channel trenches would be placed at nominal 500 foot intervals along the strike of the phosphate ore deposit. More frequent intervals would be developed as dictated by lithology.

- A trained, qualified employee would insert stakes or flags along a 10-foot long sample interval within the sampled material trench and collect representative samples from the interval.

- Each sample zone interval would be assigned a sample identification number. In addition, the date of collection, elevation and a sample description (e.g., color and texture, etc.) would be recorded. Each flagged/staked trench would be photographed and assigned a corresponding identification number. Each sample stake or flag would also be located by survey or tape measurement referenced to a trench top or bottom reference stake having been located by survey.

- Samples would be analyzed in-house or sent to a 3rd party laboratory for analysis of the total selenium, extractable selenium content using appropriate test methods. Samples would be analyzed using SW-846 Method 6020 for total selenium and Method 80-3.2.2 to determine hot water extractable selenium. If analysis is completed in-house, SOPs for the in-house lab will be developed in conjunction with the agencies.

- When sample analyses are received from the laboratory, a qualified employee would identify and mark at the appropriate locations colored dig stakes, clearly identifying the material selenium content and therefore its allowable disposal destination (i.e. >13ppm total selenium or 0.1 ppm extractable selenium must be placed under GCLL covered areas or as discussed in the Chert Placement in Fill Areas without Cover Systems section described below). The qualified employee would also communicate with mining contractor supervision/employees such that material destinations based on Se content are clearly understood. The present Forest Service guideline of 13 ppm total selenium or 0.1 ppm extractable selenium for growth media would be used as a cutoff level for the placement of sampled materials. Acceptable material (those which pass USFS guideline levels) would be used for placement of overburden in all areas not located beneath GCLL cover systems including road fills and stockpile pads. Materials which have unacceptable selenium content would only be placed under appropriate GCLL covered overburden areas.

- All the chert handling data would be reported annually to the agencies.

If new reclamation technology affecting this chert handling plan becomes available through additional studies and research, P4 may incorporate this technology into the practices and procedures described in this plan.

Chert Placement in Fill Areas External to Pits, without Cover Systems

P4 would incorporate enhanced BMPs into the BFB Project that exceed the performance of those typically used in mine projects of the past. To this extent, procedures will be developed for low selenium chert materials that may be used in the following applications:

- Road Surfaces— Low selenium chert materials may be used on road surfaces in any pit areas (where drainage is contained within the pit) or external areas that drain exclusively to lined ditches or ponds provided for elevated selenium waters as described in P4's Water Management System report.

- Road fill, stockpile base, construction or miscellaneous fills, external to pits or areas that drain to lined facilities— Low selenium chert materials used in areas that do not drain to a pit or a lined pond or ditch would not be placed within 5 feet of the original ground surface at the base of the fill or within 2 feet of the top surface of the fill. The materials above or below the low selenium chert would consist of other appropriate low selenium containing materials which would likely consist of limestone, volcanics or soil like materials such as alluvium or clay depending on the appropriate size distribution of the specific material application.

Procedures on chert use in these applications will be developed in consultation with the agencies.

Appendix F – Cover System Monitoring

1. INTRODUCTION

This appendix describes a monitoring plan that would be implemented to ensure that the final cover at Blackfoot Bridge functions as intended. The cover system monitoring program would consist of the following elements: (1) visual inspection for indications of distress (e.g., mass movement, cracking, differential settlement), (2) periodic inspection of the GCLL, and (3) continuous hydrologic monitoring with pan lysimeters. Both the GCLL cover and the store-and-release "Simple 1" cover would be monitored. Each of these elements is described in sections that follow.

This monitoring plan pertains to the as-constructed cover. A separate construction quality assurance (CQA) plan will be developed once the ROD is complete that is commensurate with the final cover design specified in the final EIS. The CQA plan will document the methods to be used for construction and measurements/testing to verify that the cover that is constructed in a manner consistent with the final EIS. The CQA plan will also describe administration of the CQA program, including construction documentation.

2. VISUAL INSPECTION

Visual inspection of the cover surface will be conducted annually by conducting a "walkover survey." Given the large areal extent of the cover, these surveys may be conducted using low-speed off-road vehicles (e.g., utility ATVs) rather than by walking. Nevertheless, the emphasis will be on low-speed close-range visual inspection. The purpose of the inspection will be to identify significant changes in the cover that might be precursors to alterations in performance. These changes could include major features such as sloughing or slumping due to mass movement, distortion due to differential settlement, excessive or focused erosion, or the presence of cracks. The extent and magnitude of observed changes in the cover profile would be documented and, if the changes are large or over a significant area, direct inspections would be conducted to ensure that the cover profile has not been adversely affected. The walkover inspection will also include a visual assessment of the drainage layer where it daylights to the surface. Any signs of blockage or erosion would be documented.

Depending on the outcomes of the inspection, decisions would be made regarding corrective actions (if needed). For example, deep and/or wide cracks would be repaired by reconstituting the adjacent cover soil. Similarly, surface features causing excessive erosion or significant drainage blockage would be modified.

Recommendations for corrective actions would be submitted to the Bureau of Land Management (BLM) for review along with a report documenting the outcomes of the inspection. Any repairs made in response to the inspection would be approved by BLM and would be conducted and documented in accordance with procedures in the CQA plan.

All inspections will be adaptive based on the information gathered over time. For example, experience with crack inspections may show that visual inspection can immediately distinguish cracks in need of repair, precluding the need for test pitting during each annual inspection.

3. GCLL INSPECTION

The GCLL will be inspected directly by excavating a test pit in the cover profile. This pit would be located in the peripheral areas of designated monitoring stations (see subsequent section) so that a consistent temporal record of the condition of the GCLL is documented. Locations for the test pit would be selected randomly within the monitoring station.

An inspection will consist of removing the cover soils over the GCLL over an area approximately 1 m x 1 m, visually inspecting the GCLL, and then reconstituting the cover soils. Machinery could be used to remove soils overlying the GCLL. However, all soils within 300 mm of the GCLL would be removed by hand. Soils corresponding to different layers (topsoil, drainage layer, etc.) would be segregated during the excavation.

Photographs of the GCLL will be collected during each inspection. The location coordinates of the GCLL inspection will also be recorded. If the GCLL exhibits deterioration or damage, a sample will be collected following the procedures in ASTM D6072. The GCLL will then be patched following the manufacturer's instructions and the cover soils reconstituted in accordance with the CQA plan. The sample will be submitted for laboratory evaluation to determine if its engineering properties have deteriorated following the methods in ASTM D6766 and D5890. Based on the outcome of these tests, a corrective action would be recommended if necessary.

Inspection of the GCLL would be conducted every 5 yr after installation of the monitoring stations, and then every 10-yr after mine closure (i.e., every other 5-yr review). A report documenting outcomes of the inspection would be submitted to BLM along with recommendations for corrective actions, if needed. Any repairs made in response to the inspection would be approved by BLM and would be conducted and documented in accordance with procedures in the CQA plan.

4. HYDROLOGICAL MONITORING

Performance confirmation of the cover (both GCLL and the Store-and-Release cover) will be evaluated by continuous monitoring using pan lysimeters similar to the lysimeters developed by US EPA for the Alternative Cover Assessment Program (ACAP), as described in Benson et al. (1999, 2001). A cross-section of a lysimeter is shown in **Figure F1** and a plan (overhead) view of the monitoring area is shown in **Figure F2**. The objective of the lysimeter is to capture all components of the water balance so that a comprehensive assessment of performance can be made. Most importantly, the lysimeter is used to directly monitor percolation from the bottom of the cover, and therefore can be used for performance verification as well as for model validation and calibration.

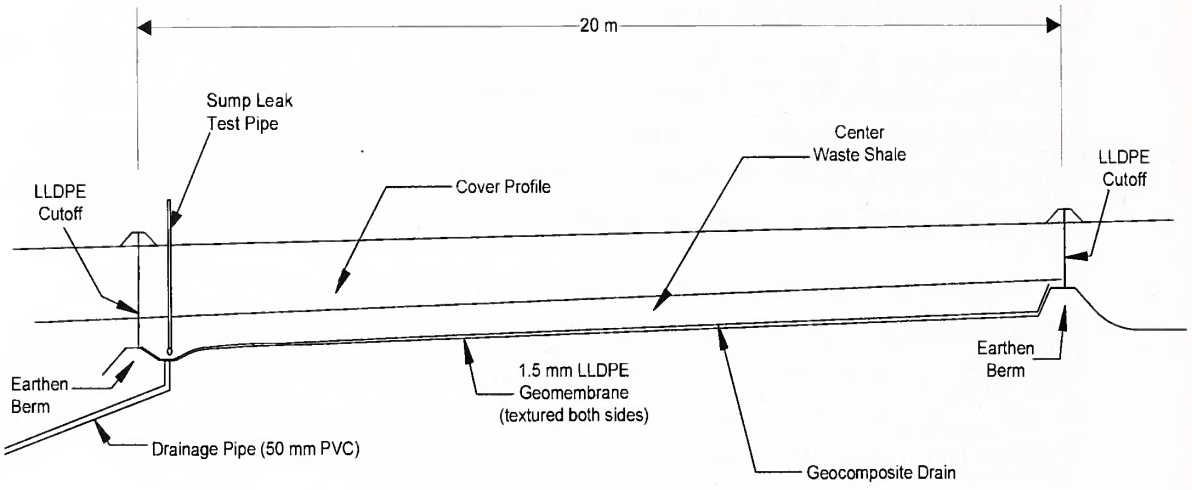


Figure F1. Cross-section of lysimeter in GCLL monitoring area (adapted from Benson et al. 1999).

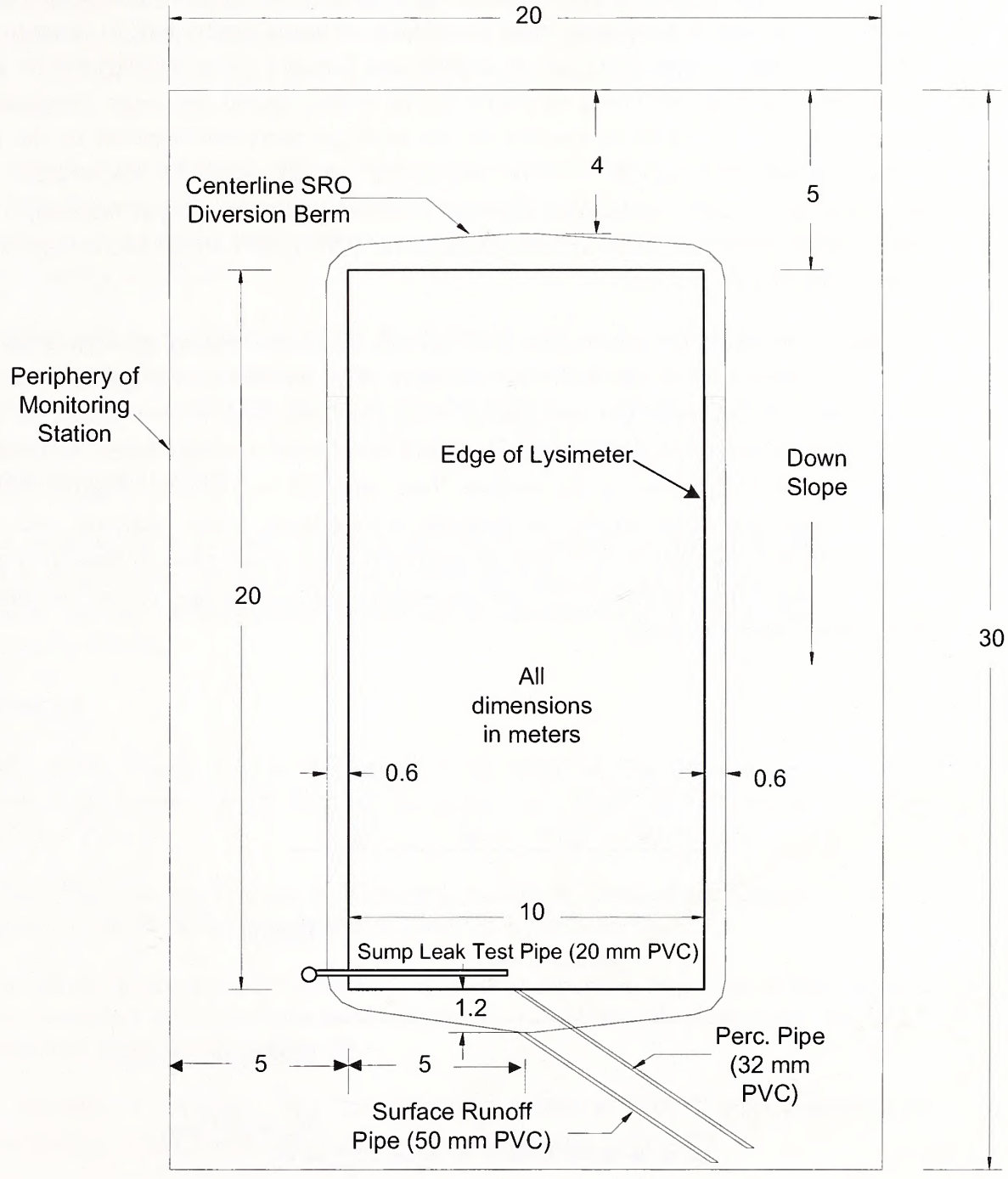


Figure F2. Plan view of monitoring area with lysimeter in center (adapted from Benson et al. 1999).

Each lysimeter will be installed at a monitoring station consisting of a monitoring area containing the lysimeter and a peripheral area for GCLL sampling (described in Section 4). Two monitoring stations (one GCLL cover profile, one Simple I cover profile) will be constructed during the first year of mining so that a performance record can begin immediately. These monitoring stations would be located on the mine property and adjacent to the pit (specific location to be determined). A third monitoring station would be constructed as part of installation of the cover system per the mine schedule (estimated at approximately Year 5). This third station would also monitor the GCLL cover profile, and would be located on the north slope of the Mid Pit section.

The lysimeter would be constructed with durable linear-low density geomembrane and would be completely tested to ensure it is watertight. A geosynthetic drainage layer would extend across the base for collecting percolation from the cover and a sump would be constructed along the downstream lysimeter wall to collect flow in the drainage layer. A runoff collection system would be installed at the surface. Two nests of instruments (**Figure F3**) would be placed within the cover profile to measure temperature, water content, and pore water pressure (matric suction) as a function of depth and time, as described in Benson et al. (1999). A sump test pipe (**Figures F1** and **F2**) will be included that can be used to test the integrity of the percolation system annually.

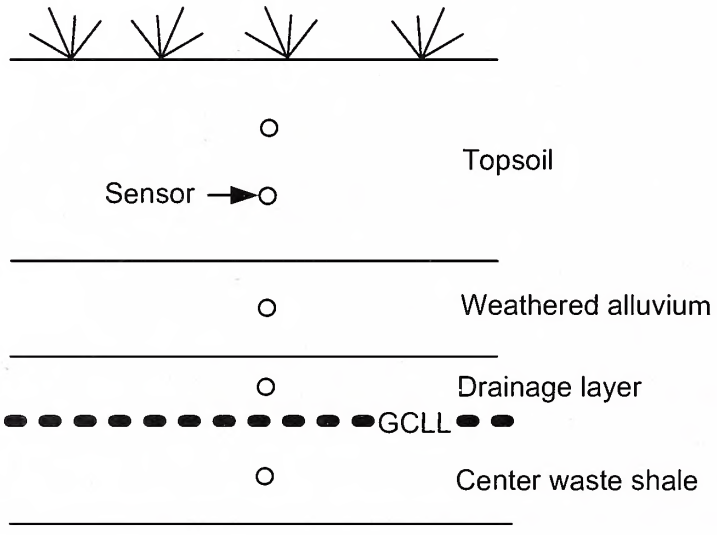


Figure F3. Schematic of instrumentation nest with five levels of sensors.

A datalogger equipped with meteorological sensors would be used to collect data from the flow monitoring system, sensors embedded within the cover profile, and the meteorological instruments. The flow monitoring system will be designed so that percolation rates < 0.1 mm/yr can be resolved.

A complete design of the lysimeter will be created once the cover design is final and the ROD is complete. Modeling exercises may be conducted during the design activity to ensure that the size, orientation, and geometric design details provide data that represent conditions in the full-scale cover as reliably as possible.

The cover profile will be constructed within the lysimeter and in the peripheral area using the same methods planned for use in full-scale construction, including independent CQA testing and documentation. Construction of the lysimeter and the associated instruments will be conducted in general accordance with the methods described in US EPA's ACAP Test Section Installation Instructions (Benson et al. 1999).

Data will be collected from all sensors hourly and will be synthesized into daily quantities. A report summarizing the data will be submitted to BLM annually while mining is active and for the first 10 yr after closure. Subsequently, reports will be submitted every 5 yr as part of a 5-yr cover performance review.

5. REFERENCES

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APPENDIX G

WATER MANAGEMENT PLAN; ADAPTIVE MANAGEMENT PLAN; AND OVERBURDEN SEEPAGE MANAGEMENT SYSTEM MONITORING PROGRAM STANDARD OPERATING PROCEDURES

Standard operating procedures (SOPs) would be developed for the water management systems that include internal monitoring in addition to the storm water monitoring set forth in Section 3.1.10. A detailed monitoring program that addresses these interrelated plans will be developed in conjunction with IDEQ, IDL, and BLM. Proposed SOPs to be included in the monitoring program would address the following:

Unnamed Tributary to Fish Pond (Water Management Ponds EP1-4)

- To manage sediment loading in the unnamed tributary to Fish Pond above EP1- 4: turbidity would be measured at EP1-4 at least weekly during runoff conditions. If turbidity (tested weekly) results exceed 25 NTU for the water management dam(s) EP1-4 would be used as set forth in the Adaptive Management Plan. P4 may switch to daily monitoring in which the trigger for the Adaptive Management Plan is 25 NTU for 10 days consecutively, or 50 NTU instantaneously.

- To manage, isolate and control potentially selenium (Se) containing water above EP1-4: Samples taken at EP1-4 weekly during runoff would also be analyzed for Se at P4's laboratory utilizing EPA method 200.7. The laboratory would have a 24-36 hour turnaround time with an anticipated elemental Se detection limit of 5 µg/L. Any sample registering as positive for detectable Se would trigger daily monitoring from the same location plus monitoring at EP1 to monitor Se concentrations in water moving through the EP1-4 dam system. Depending on the analytical results from the laboratory, the following actions would be taken:

    - If the sample at EP1 exceeded 5 ppb, the decant pipe valve would be closed such that all water that would normally flow from EP1 to Fish Pond would be diverted to the lined CP2/ WMP's system. Water would be diverted to CP2/WMP's until monitoring results are less than 5 ppb. Monitoring frequency may be adjusted accordingly as long as water is being diverted to CP2/WMP's.

    - If the sample at EP-1 was less than 5 ppb (i.e., no detection for Se), water would continue to flow from EP1 to Fish Pond.

    - If the sample(s) taken from EP1-4 is/are greater than 5 ppb, actions as set forth by the Adaptive Management Plan would be initiated.

    - Monitoring frequency may be adjusted as flow conditions change.

Fish Pond

- Monitoring would be conducted as specified in Section 3.1.13 and **Appendix D** of this Plan (e.g., weekly when discharging at CP-1 to Wetland X). If Se concentrations of 4 µg/L or greater are observed, water at CP1 would be pumped to the CP2/WMP's lined system for evaporation.

EOP - OSMS

- Each discharge point from the OSMS groundwater underdrain systems would be monitored weekly using P4's laboratory analysis when water is present to ensure discharge from the underdrain to the unnamed tributary of Fish Pond can continue. If Se content is elevated (i.e., 4 ppb or greater), the water would be directed to the OSMS conveyance pipe (P4 2010f). Underdrain water elevated in Se would be directed to the lined CP2/WMP's pond systems.

- P4 anticipates an aggressive monitoring schedule for the first year (weekly sampling) to determine underdrain effectiveness. The monitoring schedule may include more frequent sampling during runoff or snowmelt periods. Provided the EOP underdrain functions effectively, P4 would adopt, with concurrence from the agencies, a less aggressive schedule for subsequent years (e.g., monthly monitoring instead of weekly).

Northwest Pond System

- No seleniferous materials would be placed in the Northwest Overburden Pile (NWOP). Proposed monitoring would be conducted as specified in Section 3.1.13 and **Appendix D** of this EMP for the northwest pond system (i.e, monthly). More frequent monitoring may be necessary during storm events and snowmelt periods. A less frequent monitoring schedule may be adopted should results of the program indicate and agencies concur.

- P4 proposes construction of four water retention structures (NWP1-4), to control water and sediment from the NWOP area. Under Alternatives 1A and 1B, the four water control structures would be combined to form two structures identified as NWP1-2 and NWP3-4. The design of these two dams is such that surface water flow is connected by a spillway. If NWP3-4 becomes full, water from this dam would gravity flow to NWP1-2. Runoff water that meets discharge criteria would be discharged at NWP1-2 to Wetland X under a NPDES permit. If the water quality is unacceptable, water would be pumped back to CP2/WMP's. These structures would also be included as part of the SWPPP. Detail regarding additional inspections or monitoring would be provided in the SWPPP, once these structures are in place.

NWOP - OSMS

- Seepage collected in the OSMS would be contained in a centrally located sump, independent of the sediment/water control structures in the NWOP area. Seepage water in this sump would be pumped to CP2/WMP's.

Northeast Pond

- NEP1, once constructed, would also be included as part of the SWPPP. Water quality monitoring would occur as outlined in Section 3.1.13 and **Appendix D** of this EMP (i.e, annually). This pond would collect water from a small area where a growth media (topsoil) stockpile would be located. No effects to water quality are anticipated. Water that meets discharge criteria would be discharged under a NPDES permit. If water quality does not meet discharge criteria, the water would be transferred from NEP1, using water trucks or temporary pumping systems, to CP2/WMP's. Details regarding additional inspections or monitoring would be provided in the SWPPP, once these structures are in place.

South Pit Area

- No planned outfalls have been developed for the South Pit area as part of the mining phase. Monitoring or inspection requirements for BMP's would be addressed under the SWPPP.

APPENDIX B

BLACKFOOT BRIDGE MINE ADAPTIVE MANAGEMENT PLAN

ADAPTIVE MANAGEMENT PLAN
FOR
WATER MANAGEMENT SYSTEM
P4 Production, LLC
BLACKFOOT BRIDGE PROJECT, IDAHO

September 2010

ADAPTIVE MANAGEMENT PLAN
For
WATER MANAGEMENT SYSTEM

BLACKFOOT BRIDGE PROJECT, IDAHO

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1.0 INTRODUCTION AND BACKGROUND

P4 Production, LLC (P4), in consultation with the U.S. Army Corps of Engineers (Corps) and U.S. Bureau of Land Management (BLM), developed this Adaptive Management Plan (AMP) for implementation of the Water Management System for P4' s proposed Blackfoot Bridge Project. The AMP has been developed in response to comments received by the Corps on the Public Notice of Application for Permit (NWW No. 043200012) and the Blackfoot Bridge Mine Draft EIS (BLM 2009). The Blackfoot Bridge Mine Project, a proposed open pit phosphate mine, is located approximately 10 miles north of Soda Springs, Idaho (**Figure 1**).

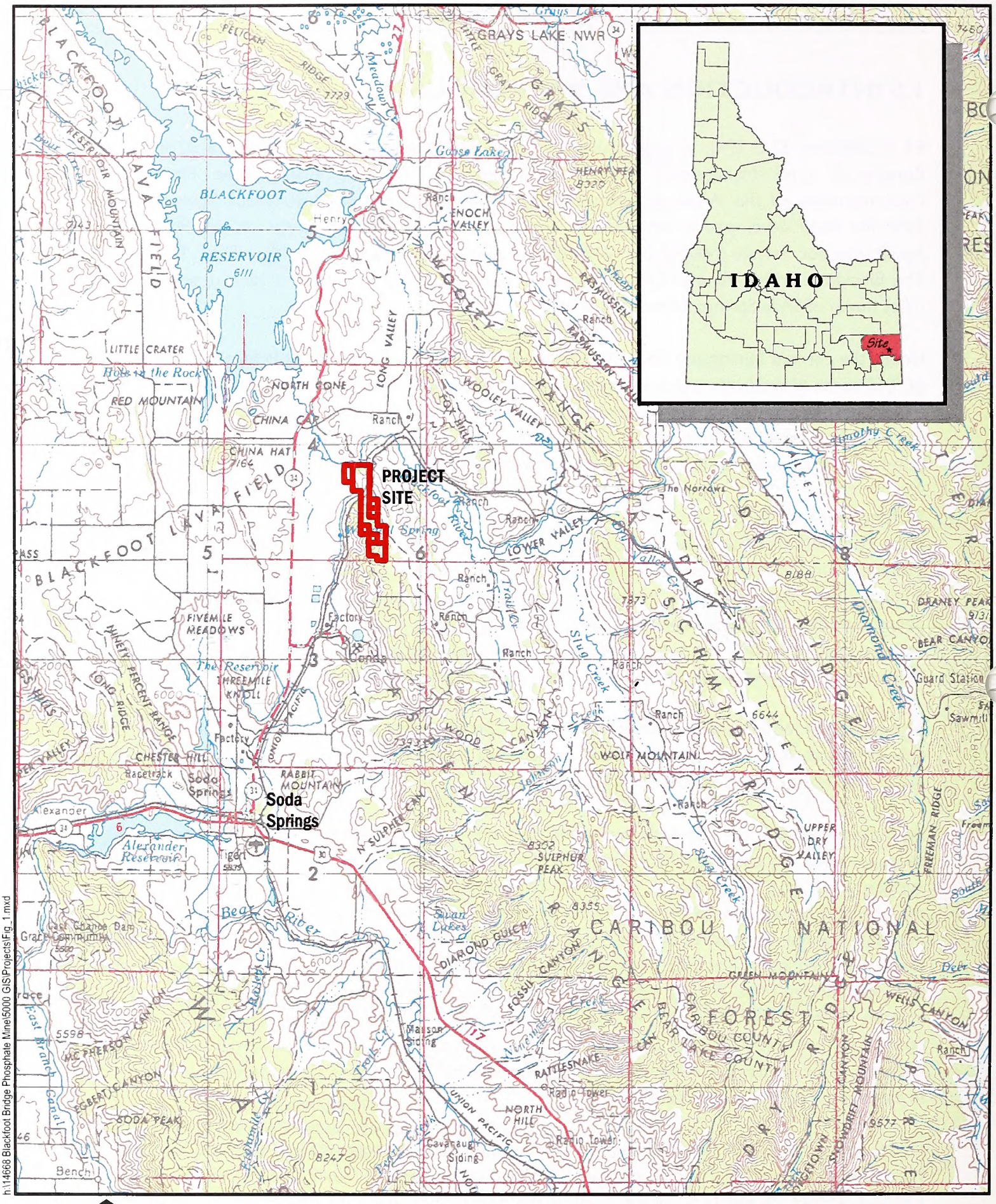
Under the current Mining and Reclamation Plan (P4 2008a) for the Blackfoot Bridge Mine Project, a total of 9.43 acres of wetlands and non-wetland waters of the U.S. would be affected by development of the mine. These wetlands and non-wetland areas are located in an ephemeral unnamed tributary drainage to the Blackfoot River. This unnamed tributary drainage also includes Fish Pond, a man-made retention pond located between an existing haul road and railroad bed. Fish Pond does not support a fishery.

Existing wetlands in the unnamed tributary have been categorized as Class III. Class III wetlands are more common than Class I or II wetlands and are often smaller and more isolated. Class III wetlands can provide many functions and values although are not typically highly rated. Wetlands in the unnamed tributary have been extensively trampled by livestock and have an ecological function rating of 45 percent of their total potential (JBR 2003, 2006; P4 2008b). Connecting channels between wetlands in the unnamed tributary are ephemeral and normally flow in response to spring snowmelt for two to three weeks each year or in response to major precipitation events.

The proposed water management system, a portion of which would be constructed in the unnamed tributary, is designed to control capture and control runoff from the mine area and to protect off-site water quality that may be affected by mining activity.

As indicated above, the site-wide water management system is designed to control water (runoff and seepage) whose quality may be affected by the mining operation and as such, could commingle with surface water and groundwater within the unnamed tributary drainage. The objectives of the water management system are to protect aquatic resources and minimize any adverse environmental impact, including maintaining control of water quality to maximize the water that can be reintroduced back into the water shed and the aquatic ecosystem. Topography, geology, and lease boundaries for the proposed Blackfoot Bridge Mine Project site pose limitations for location and design of project components to achieve these water management system design goals. These limitations preclude the ability to completely prevent discharge of sediment and constituents of potential concern (COPCs) to stream channels and commingling of water which may be affected by the mine development with water located in ephemeral drainages and Fish Pond.

Under an approved 404 Permit Application (P4 2008b) for the Proposed Action at the Blackfoot Bridge Mine, P4 would be authorized to discharge dredged or fill material into 9.43 acres of wetlands and non-wetland waters of the U.S. located within the permit boundary for the construction of the water management system. P4's development of the Blackfoot Bridge Project would occur in sequences that include mine pit excavation, placement of overburden in external overburden piles, placement of overburden as backfill in mined-out pits, and concurrent reclamation of overburden disposal areas upon



h:\14668 Blackfoot Bridge Phosphate Mine\5000 GIS\Projects\Fig_1.mxd

AMEC Geomatrix

Location Map
Blackfoot Bridge Project
Caribou County, Idaho
FIGURE 1

completion. In recognition of the phases or sequence of Project development and implementation of site water management, the need to capture sediment, contain water whose quality has been affected by the Project, and/or the need for additional water management system storage capacity within specific wetlands and/or non-wetland waters of the U.S., P4 has designed the water management system to address the predicted volume of runoff water for each catchment area within the Project site.

This AMP provides for implementation of management actions that would allow P4 to avoid or minimize the placement of fill and/or sediment in selected areas that currently contain wetlands and non-wetland waters of the U.S. unless prompted due to specific monitored conditions of concern.

2.0 OBJECTIVES

The objective of this AMP is to accomplish the following goals:

- Implement the water management system with appropriate engineering controls to avoid or limit discharging dredged or fill material to selected areas currently containing wetlands and non-wetland waters of the U.S. unless necessary to manage site water.
- Protect the quality of off-site water by isolating and controlling on-site water as necessary.
- Maintain adequate water storage capacity within the water management system to meet project requirements[1].
- Provide for restoration of affected wetlands and non-wetland waters at closure of the Project.
- Establish criteria for implementation of water management actions included in this AMP.

The preferred management action for site water associated with the proposed Blackfoot Bridge Project is to minimize discharge of dredged or fill materials to areas currently containing wetlands and non-wetland waters of the U.S., while maintaining control of sediment, COPCs, and water quality throughout the life of mine and post-closure period.

3.0 CONSULTATION

This Adaptive Management Plan for water management for the proposed Blackfoot Bridge Mine Project was developed in consultation with the Corps, BLM, and the Idaho Department of Environmental Quality (IDEQ).

The Corps administers Section 404 of the Clean Water Act (33 USC 1344) which pertains to discharge of dredged or fill material into wetlands and non-wetland waters of the U.S. Applicants that propose to discharge dredged or fill materials to jurisdictional waters must first obtain a permit from the Corps.

IDEQ ensures conformance with state of Idaho water quality standards through its administration of Section 401 of the Clean Water Act. IDEQ must certify that a proposed project will not exceed surface water standards. IDEQ also regulates compliance with groundwater quality standards.

[1] See Revised Water Management Plan (P4 2010a) and Water Balance Report (P4 2010b) for calculations of annual storm water volumes.

BLM is the surface management agency for public land included within the proposed Blackfoot Bridge Mine Project area. BLM also administers phosphate leases.

P4 is the Blackfoot Bridge Project proponent and has developed a site-wide Water Management Plan (P4 2010a) to control runon water, runoff water, seepage water, and water that would be produced during occasional pit dewatering episodes. The proposed water management plan is described in this AMP.

4.0 BLACKFOOT BRIDGE PROJECT – WATER MANAGEMENT PLAN

This section describes the proposed Water Management Plan that has been reviewed by BLM, IDEQ, and the Corps under their various jurisdictions and statutes as part of the permit application review process.

4.1 Pond and Diversion Ditch System

The water management system and best management practices (BMPs) that would be employed during the Project have been designed to protect the quality of surface and subsurface water in and adjacent to the proposed Blackfoot Bridge Mine Project area. See Revised Water Management Plan (P4 2009a).The Water Management Plan is designed with the intent to prevent discharge of impacted water to the Blackfoot River. Water collected in the water management system that meets surface water quality criteria, however, may be discharged in accordance with requirements of the Storm Water Multi-Sector General Permit issued by US Environmental Protection Agency (EPA) and/or an individual National Pollutant Discharge Elimination System (NPDES) permit, if required for the project by EPA. Water that does not meet surface water quality criteria would be stored and managed on-site. Run-on diversion ditches would be used to intercept runoff from undisturbed areas and return the flow to the natural channels. Diversion of runon water would reduce the volume of water that may report to the water management system.

A layout of water management facilities for the project is presented in **Figure 2**. Components of the water management system include two water management ponds (designated WMP1 and WMP2) to be constructed in the flat area west of the equipment yard and loadout area. The water management system would also include diversion ditches and pump/piping systems.

A total of 11 water management ponds/dams would be constructed in drainages immediately adjacent to proposed disturbance areas. Four water management dams (EP1 through EP4) would be constructed along the unnamed tributary channel to the east of the East Overburden Pile (EOP) between current wetland areas within the drainage. The four EP pond dams would not be constructed in wetlands; however, the dams would cross over currently non-wetland waters of the US. (narrow channels between wetlands). When at full capacity, ponds that form behind each dam could pool into wetlands upstream of each EP dam in the unnamed tributary.

Four dams (NWP1 through NWP4) would be constructed along the west side of the Northwest Overburden Pile (NWOP). These water management ponds would not be located directly in the channel of the unnamed tributary or in Wetland X. Dam NEP1 would be constructed on the east side of the North Pit upstream of Wetland M. Dam CP1 would be the farthest downgradient pond in the unnamed

N 414,000
N 412,000
N 410,000
N 408,000
N 406,000
N 404,000
N 402,000
E 832,000
E 830,000
E 828,000
E 826,000
EP4
EP3
EP2
EP1
ACCESS ROAD
EAST OVERBURDEN PILE (EOP)
EOP DIVERSION DITCH
MID PIT DIVERSION CHANNEL
HAUL ROAD
SOUTH PIT
PROPOSED CULVERT
SOUTH END DIVERSION DITCH
SOUTH PIT DIVERSION CHANNEL
NEP1
FISH POND
PROPOSED CULVERTS
MID PIT
MID PIT NORTH DIVERSION CHANNEL
MID PIT DIVERSION DITCH
NORTH PIT
ORE STOCKPILE
CP1
LOADOUT AREA
PROPOSED CULVERTS
NORTHWEST OVERBURDEN PILE (NWOP)
CP2
ACCESS ROAD/ PIPE CORRIDOR
NWP3-4
WMP 2
NWP1-2
WMP 1
BLACKFOOT RIVER

500 0 500 1000 FEET

LEGEND:

- EXISTING GROUND SURFACE CONTOUR AND EL. FEET
- PROPOSED WATER MANAGEMENT SYSTEM GROUND SURFACE CONTOUR AND EL. FEET
- PROPOSED RECLAIMED PIT, RECLAIMED OVERBURDEN PILE AND HAUL ROAD GROUND SURFACE CONTOUR AND EL. FEET
- PROPOSED TOPSOIL STOCKPILES
- EXISTING ROADS
- EXISTING DRAINAGES
- WETLAND AREA
- EXISTING RAILROAD
- PROJECT BOUNDARY

PRELIMINARY CONCEPTUAL DESIGN
SUBJECT TO CHANGE

CLIENT: P4 PRODUCTION LLC
PROJECT: BLACKFOOT BRIDGE
TITLE: WATER MANAGEMENT SYSTEM GENERAL ARRANGEMENT PLAN

amec EARTH AND ENVIRONMENTAL

DESIGNED BY	CCL	CHECKED BY	RTB	DATE
DRAWN BY	CCL	APPROVED BY	RTB	02/01/10

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tributary channel just upstream of Wetland X, and dam CP2 would be constructed in the vicinity of the proposed equipment yard and loadout area and would not discharge to waters of the U.S. Dam CP1 is designed to prevent release of water downstream to the Wetland X, if necessary, to ensure compliance with water quality standards. Under the Water Management Plan, the capacity of Fish Pond (man-made retention pond) would be increased by enlarging the pond and raising the elevation of the dam and spillway by 5 feet. The dam would also be sealed in places to reduce potential leakage to Wetland L below Fish Pond. Water storage capacities of the water management ponds are provided in **Table 1**.

TABLE 1
Capacity of Water Management Ponds
Blackfoot Bridge Mine Project

Pond	Description	Capacity	
		Acre-feet	Million Gallons
WMP1	Storage pond for pit dewatering. May also receive runoff from EOP and NWOP.	363	118.3
WMP2	Storage pond for pit dewatering. May also receive runoff from EOP and NWOP.	341	111.1
CP1	Water management pond for equipment yard and loadout area. May also receive runoff from upper Unnamed Tributary drainage, including Fish Pond.	9.5	3.2
CP2	Water management pond for ore pad and tipple, and equipment yard and loadout area. May also receive runoff from EOP.	10.0	3.3
EP1	Water management pond in Unnamed Tributary (above Fish Pond).	8.5	2.8
EP2	Water management pond in Unnamed Tributary (above Fish Pond).	4.5	1.5
EP3	Water management pond in Unnamed Tributary (above Fish Pond).	2.8	0.9
EP4	Water management pond in Unnamed Tributary (above Fish Pond).	6.3	2.1
NWP1/2	Water management pond at toe of NWOP.	14.4	4.7
NWP3/4	Water management pond at toe of NWOP.	21.0	6.8
NEP1	Water management in Beaver Pond watershed east of North Pit.	6.5	2.1
Fish Pond	Existing pond. Would receive runoff from drainage north of diversion ditch. May also receive runoff from all of Unnamed Tributary.	21.8	7.1

Periodic maintenance of sediment ponds would be required within the currently existing wetlands and non-wetland waters to ensure proper operation of the systems as well as to maintain capacity of the sediment ponds and flow of water. Maintenance would include repairing spillways and minimizing erosion, improving hydraulic sloping where needed, and removal of sediment in areas authorized by the Section 404 permit for the Project. P4 would monitor and maintain sediment pond facilities and remove sediment seasonally as needed to maintain pond capacities.

4.2 Overburden Seepage Management System

P4 would construct a seepage management system which is described in the Overburden Seepage Management System (OSMS) plan (P4 2010c). The plan includes installation of the following system components to intercept and control seepage that may form in the EOP and NWOP:

- Groundwater Underdrain System – Collects and directs shallow groundwater occurrences within the footprint of the NWOP and EOP through a system of perforated pipes which would direct natural groundwater to a discharge point outside of the footprint of each overburden pile.

The Groundwater Underdrain System would protect the stability of each overburden pile by preventing upward hydraulic pressure and would protect groundwater quality by preventing contact with overburden materials.

- Compacted Clay Subgrade – P4 would construct a clay amended subgrade to form the foundation of each overburden pile. This subgrade would be 1-foot thick and would form a low-permeability layer which, prior to installation of the GCLL cover, or in the event of a significant cover failure after installation of the cover, would collect and direct seepage to collection drains.
- Seepage Underdrain System – Seepage collected on top of the clay subgrade layer would be directed to perforated pipes that would direct the flow to a pipeline at the toe of each overburden pile.
- Toe Drain Collection and Seepage Conveyance Pipeline – Seepage delivered from the Seepage Underdrain System would be collected in this system and would be conveyed as follows:
    - EOP - collected seepage would be directed to pond EP1 or to the EOP Diversion Ditch where the seepage would be directed to pond CP2 and/or the Water Management Pond System (WMP1 and WMP2) for evaporation; and
    - NWOP – collected seepage would be pumped to pond CP1 and discharged to Wetland X if water quality is acceptable for discharge; if water quality exceeds standards, collected seepage would be pumped to pond CP2 and/or the Water Management Ponds (WMP1 and WMP2) for evaporation.
- Hydraulic Break – P4 would install a hydraulic break on the up-hill side of the Meade Peak material (seleniferous overburden) cell to intercept meteoric water that infiltrates from adjacent areas and directs the seepage away from the Meade Peak material.
- An access road would be constructed along the toe of the EOP to allow maintenance equipment to access all sediment ponds, BMPs, and seepage collection facilities within the unnamed tributary. The road is designed and located to minimize impacts to wetlands and non-wetland waters of the US and would augment other BMPs included in the Revised Mine and Reclamation Plan (P4 2008a)

This system would be monitored for flow and seepage quality as part of the site-wide water monitoring program.

4.3 Best Management Practices

Best Management Practices (BMPs) would be employed throughout the proposed Blackfoot Bridge Mine Project area to direct runoff water, runon water, and capture sediment that moves from disturbance areas in response to precipitation events. Many of these BMPs are described under Section 4.1 above. Other BMPs that would be used include the following:

- Reclaiming disturbed areas as soon as practical;
- Installing toe berms at the edges of growth media stockpiles to capture runoff from the piles;
- Constructing shallow depressions along roadways to reduce sediment runoff in road-side ditches;

- Conventional seeding or hydromulching disturbed areas including growth media stockpiles plus appropriate cut or fill slopes to bind the soil;
- Installing rock-check dams and silt fences to trap sediment on slopes and upland areas; and
- Using silt fences and/or straw wattles to capture and retain sediment.

Vehicle and construction equipment would not be allowed within the currently existing wetlands and non-wetlands unless specifically required for the construction and maintenance of those areas (see Section 4.1).

4.4 Wetlands and Waters of the U.S.

As indicated in the Section 1.0, the site-wide Water Management System would be constructed in areas that include 9.43 acres of wetlands and non-wetland waters of the US. Wetlands and waters of the US that would be affected are shown in **Table 2**. The Water Management System is designed to prevent discharge of impacted surface water and all water generated during mine pit dewatering to the Blackfoot River, while maximizing the volume of water meeting surface water quality criteria that can be returned into the water shed.

P4 has developed a report, "Assessment of Potential Wetland Mitigation Sites and Preliminary Design" (P4 2009a), that identifies methods and sites where wetland habitat would be restored to offset the loss of 9.43 acres associated with the proposed Blackfoot Bridge Mine Project. A final compensatory mitigation plan is in the process of being revised in cooperation with the Corps in response to public comments.

TABLE 2
Wetlands and Waters of U.S.

Mine Component	Affected Unit	Waters of the US Affected (acres)	Wetlands Affected (acres)	Total Acres Affected
EOP	Wetland E	0.0	0.08	0.08
Truck-Railroad Crossing	Wetland L	0.0	0.67	0.67
Truck Turnaround	Wetlands AA and BB	0.11	0.08	0.19
Fish Pond Liner Fill	Wetland K and Fish Pond	2.82	3.27	6.09
Water Mgmt Structures	Wetlands B, C, D, F, G, H, I, J	0.39	2.01	2.40
Total		3.32	6.11	9.43

4.5 Reclamation

P4 would continue to use the site-wide Water Management System during the reclamation and post-closure period of the Project. The system would continue to control runon and runoff water to ensure that off-site water quality and wetland areas are protected. P4 would coordinate the management and monitoring of the system with BLM.

Once BLM has determined that the Water Management System or portions of the system area no longer needed to support reclamation, P4 would remove ponds, ditches, and non-biodegradable water management BMPs. Natural drainages would be restored such that surface water flow would be reestablished. Sediment or fill material deposited in wetland areas would be carefully removed, as feasible, to allow the wetland to recover, thereby reestablishing pre-disturbance habitat.

5.0 ADAPTIVE MANAGEMENT PLAN

As described in Section 4.0 above, P4 has designed the Water Management System to control water that could require management (i.e., impacted stormwater and pit sump water) associated with the Blackfoot Bridge Mine Project. Each pond and ditch in the system has been designed with a specified capacity to allow P4 to maintain water within the system and to discharge water to surface water only if it meets Idaho water quality standards.

As shown on **Figure 2**, many of the water management ponds are situated in between or above wetlands within the ephemeral drainages (i.e., ponds EP1 – EP4 located in the unnamed tributary above Fish Pond; NEP1 located in unnamed tributary that includes Beaver Pond). Water collected in the water management pond system would be stored to allow P4 to sample and analyze the water to determine whether it can be discharged to Wetland X (water that meets discharge criteria) near the Blackfoot River or directed to pond CP2 and the water management ponds (WMP1 and WMP2). The ponds would also be used to capture sediment that would result from runoff from the EOP and NWOP that is not trapped by the BMPs to be employed on the site.

Given the variability in weather patterns and annual moisture conditions from one year to the next in the Blackfoot Bridge Mine Project area and the sequence of mining and concurrent reclamation, there is variability in whether any particular pond's storage capacity would be needed to manage site water during any given year or season.

The primary area of focus of this AMP is the EOP and the nearby unnamed tributary that extends down to Wetland X and includes Fish Pond. This ephemeral drainage would contain water management ponds to control surface water quality and quantity in the project site. The areas currently containing wetlands and waters of the U.S. located within the unnamed tributary that includes Fish Pond present the best opportunity for an adaptive water management approach. All other water management dams and runon control structures proposed for the Blackfoot Bridge Project are located outside of wetlands.

To achieve the objectives of the Water Management Plan, P4 developed an AMP Water Management Plan for the unnamed tributary and Fish Pond to be implemented during initial construction of the project and subsequent operation of the system. The AMP Water Management Plan would be implemented on an adaptive management basis when certain criteria are met and are identified as Adaptive Management Actions for the plan. Using this type of approach, P4 would be able to minimize impacts to current wetlands and non-wetland waters of the US in the unnamed tributary and Fish Pond while ensuring adequate capacity for water storage is available when necessary to protect off-site water quality. The AMP Water Management Plan is first discussed below followed by a description of each Adaptive Management Action including the criteria that would be used by P4 to implement specific management actions.

5.1 AMP Water Management Plan

Most of the infrastructure needed to implement this AMP is the same as that associated with the Water Management Plan for the Blackfoot Bridge Project; however, some design modification to selected facilities would be necessary to ensure the AMP would be effective and meet the objectives outlined in Section 2.0. The design of water management dams (EP1 – 4) would be modified to include a decant piping system with valves that would be opened to allow water to flow through the dam or closed to allow water to pond behind each dam (**Figure 3**). In addition, a layer of coarse rock would be placed in the stilling basins below each dam to control velocity of discharge from each decant pipe and/or spillway. Coarse rock would also be placed in downstream portions of the existing channel for approximately 20 feet below each dam to reduce erosion that would be caused by flow from the stilling basins thereby protecting the wetland areas It is not anticipated that placement of coarse fill rock would extend into individual wetlands located between each water management dam; however, should erosion begin to occur in the wetland areas, P4 would extend the layer of coarse rock as needed to check flow velocity and protect remaining portions of each wetland.

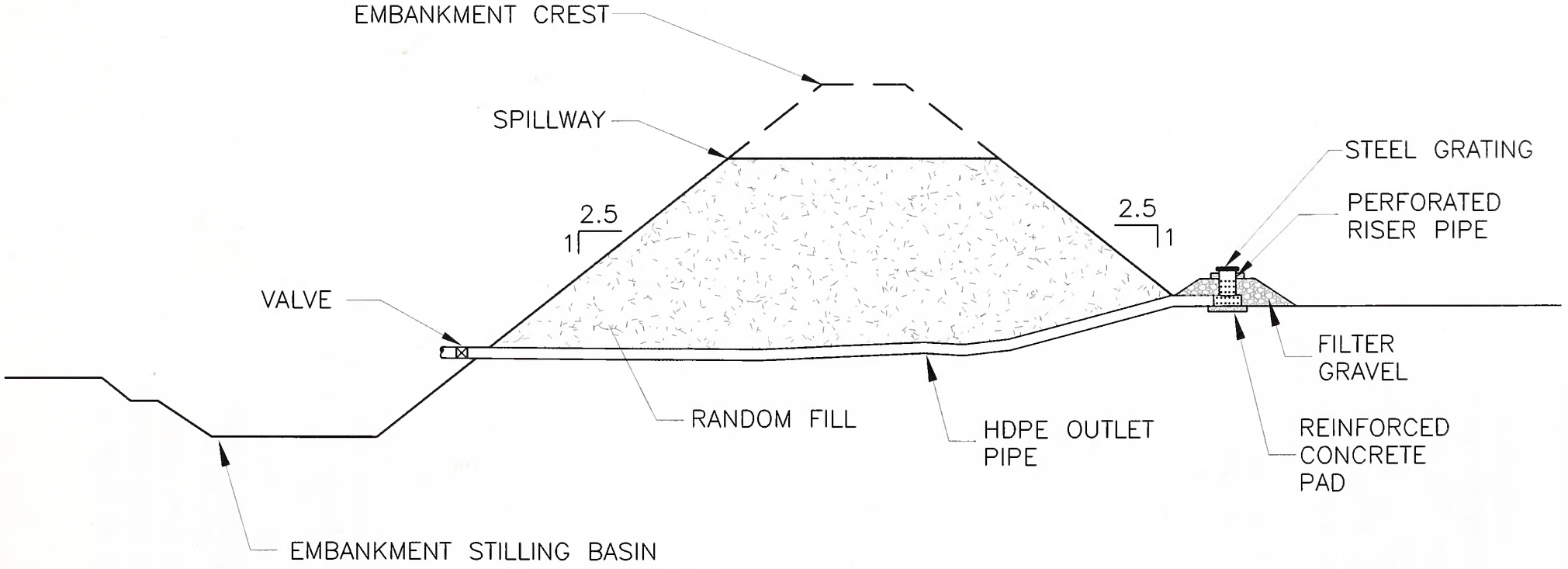
As described in the Revised Water Management Plan (P4 2010a), all sediment ponds (EP1-4) are designed to contain a 100-year/24-hour storm event and would be constructed during initial stages of project development to ensure that P4 would have the ability to respond rapidly to changing water management conditions during operations at the Project site. Construction of these facilities during the initial phase of project development would also allow the dams and flow-through valve systems to be installed when site conditions are optimum for construction activity and would reduce the potential for sediment from dam construction to flow into areas that currently contain wetlands in the unnamed tributary.

Under this AMP, water management for the unnamed tributary and Fish Pond would allow all water that reports to the drainage to pass through a series of sediment ponds. Piping (with a valve) would be installed at the base of each dam to allow (when the valve is open) uninterrupted flow to Fish Pond as long as the surface water meets water quality criteria. Under this management condition, water quality and areas currently containing wetlands and waters of the U.S. would be minimized by mine development.

Closure of the valve would allow P4 to impound water in each EP pond for a variety of reasons including responding to water quality issues, to settle sediment, or for monitoring purposes. The system would allow P4 to manage each pond independent of the other ponds. Impounding the water behind the dams would facilitate sediment settling in the wetland areas. See Section 4.5 for removal of sediment as part of reclamation.

The total water storage capacity represented by these sediment ponds is as follows (total capacity of all four ponds is 18.6 acre-feet):

- EP1 = 8.8 acre-feet
- EP2 = 4.0 acre-feet
- EP3 = 2.5 acre-feet
- EP4 = 3.3 acre-feet



CLIENT	P4 PRODUCTION LLC
PROJECT	BLACKFOOT BRIDGE
TITLE	TYPICAL POND OUTLET STRUCTURE

amec EARTH AND ENVIRONMENTAL

DESIGNED BY	CMT	CHECKED BY	RTB	DATE
DRAWN BY	CMT	APPROVED BY	RTB	2/9/2010

CADD FILENAME	FIGURE No.	REV
1222F130	3	B

Construction of the EP dams would include excavation and regrading portions of the existing channel (currently non-wetland waters of the U.S.) to install each dam to key the dam into the subgrade of the unnamed tributary. As indicated above, coarse rock or small riprap would be placed in the stilling basin for approximately 20 feet below each dam and potentially, placed along the natural channel that receives discharge from each stilling basin.

Based on current designs, approximately 4,350 cubic yards of fill material including clean rock or small riprap would be placed in non-wetland waters in the unnamed tributary associated with construction of the water management dams, stilling basins, and discharge channels. The total surface area represented by non-wetland waters in the EP dam footprints is approximately 6 percent of the total dam footprints (6,017 square feet of non-wetland waters and 105,414 square feet of total dam footprint). Applying this percentage of surface area for non-wetland waters to the total volume of material that would be required to build the EP dams (22,500 cubic yards) results in approximately 1,350 cubic yards being placed in non-wetland waters of the US. The remaining fill material, approximately 3,000 cubic yards, would be used as coarse rock or riprap placed in the stilling basins and approximately 20 feet of non-wetland waters channels to control flow velocity and protect the wetlands. As part of this Adaptive Management Plan, no rock fill will be placed in the wetlands unless specified by Section 5.2 of this Plan.

Construction of a lift on the Fish Pond dam to increase the storage capacity is a component of the Water Management Plan (P4 2010a). Increasing the capacity of Fish Pond by raising the dam and spillway height is included as an Adaptive Management Action in this section (see Adaptive Management Action No. 4 below). P4 would however, repair the existing dam on Fish Pond during the initial stages of project development. Repairs would include the addition of clay materials to the dam and selected locations in the bottom of the pond to seal the pond and decrease leakage as described in the Water Management Plan. Total pond capacity of Fish Pond without raising the dam is approximately 10 acre-feet.

5.2 Adaptive Management Actions

This section includes descriptions of Adaptive Management Actions that would be implemented by P4 to reduce or minimize effects of the proposed Blackfoot Bridge Project on currently existing wetlands and non-wetland waters of the US located within the unnamed tributary and Fish Pond. Specific site water conditions that would serve as a "trigger" to implement each Management Action are also identified.

5.2.1 Adaptive Management Action No.1

Site Water Condition

Analysis of surface water samples collected at monitoring stations in the unnamed tributary exceed the state of Idaho water quality turbidity standard [turbidity, below any applicable mixing zone set by the Department, shall not exceed background turbidity by more than fifty (50) NTU instantaneously or more than twenty-five (25) NTU for more than ten (10) consecutive days and/or visual observation of overland flow of sediment-laden water from the toe of the EOP and access road into the unnamed tributary].

Management Response

P4 would close valves on the pass-through pipe in EP1-4 to prevent discharge of water resulting in water ponding behind each EP dam. The decant system would be monitored to ensure each pond of water is retained for sufficient time to allow settlement of suspended solids. Once sediment has been settled and water meets discharge criteria, the water would be decanted to Fish Pond and/or CP1 for discharge to Wetland X.

As water fills the pond area behind each EP dam, the pool formed would extend to currently existing wetlands and non-wetland waters of the US located within the unnamed tributary to Fish Pond. Suspended sediment in the water would settle into the currently existing wetlands and non-wetland waters as the water velocity slows.

If water quality does not meet discharge criteria (for turbidity or COPCs), the water would be discharged to CP2 for storage and evaporation through the OSMS pipeline system or the EOP diversion ditch at EP1.

5.2.2 Adaptive Management Action No.2

Site Water Condition

Selenium concentration in surface water samples collected at monitoring stations in the unnamed tributary along the toe of the EOP exceed the water quality standard (0.005 mg/L).

Management Response

P4 would close valves on some or all of the EP dam system to impound water that exceeds discharge standards. P4 would continue to sample and analyze water in each pond to confirm and isolate selenium loadings. Should water quality in the EP pond system improve to meet discharge criteria, water in the ponds would be released to Fish Pond and/or pond CP1 for discharge to Wetland X. Additionally, any initial exceedance of the water quality standard for selenium would prompt an inspection for potential causes including seeps (see Section 5.2.3).

Several options are available in the circumstance where water quality of specific EP ponds does not meet discharge criteria. In addition to possible implementation of actions identified in Section 5.2.3, actions may include the following:

- The water could be pumped into the OSMS seepage collection pipe and sent to CP2;
- Water in EP2-4 water could be discharged to EP1 and conveyed for storage and evaporation to CP2 using the northern diversion ditch;

5.2.3 Adaptive Management Action No. 3

Site Water Condition

Seep(s) is/are discovered in the foundation of the EOP, the toe area of the EOP, or within the unnamed tributary drainage basin; water quality of the seep(s) indicates elevated selenium and/or COPC concentrations.

Management Action

P4 would complete an excavation of the seep(s) for the purpose of creating a collection sump for water associated with the seep(s). Water collected in the sump would be pumped or gravity drained through a lined ditch to the OSMS seepage collection pipeline system. Seepage from the sump would be discharged into the pipeline and transported to CP2 and/or the WMP system.

Depending on the location of the seep(s) within the unnamed tributary, construction of the sump and collection facility could result in sediment, soil materials, and clean rock/fill material being placed into the currently existing wetlands and non-wetland waters of the US authorized by the Section 404 permit. P4 would implement BMPs (such as silt fences and runon control ditches) to control and minimize the movement of sediment into the currently existing wetlands and non-wetland waters of the US associated with sump and ditch construction.

In the circumstance where water quality associated with a seep reflects natural groundwater conditions, P4 would review the need to capture and convey the seep water. A decision as to whether to take action on this type of seep would be dependent on the volume of water emanating from the seep and what effect that flow would have on the overall capacity requirements of the water management system. Diversion of this source of water to eliminate its flow into the water management system may require similar actions as described above including placement of clean rock fill for road access, construction of a sump, pipeline, and/or lined ditch to convey this water.

If needed, only after attempts in isolating seeps or sources are unsuccessful, clean rock may be used to protect wildlife from exposure to the impacted waters. See Section 6.0 for notifications requirements.

5.2.4 Adaptive Management Action No. 4

Total storage capacity of the EP pond system and Fish Pond will be 40.4 acre-feet when the Water Management Plan is fully implemented. This plan includes raising the Fish Pond dam by 5-feet which would result in increasing the capacity of Fish Pond from 10 acre-feet to 21.8 acre-feet. For purposes of this Adaptive Management Action, it is assumed that the dam on Fish Pond would initially remain at its current elevation. At Fish Pond's current dam elevation, the total storage capacity of the EP ponds and Fish Pond is reduced to 28.6 acre-ft.

Site Water Condition

Total suspended sediment (TSS) and/or turbidity concentrations in runoff water for EP ponds (EP1- EP4) and Fish Pond indicate the need for additional retention time to ensure the water meets permit limits

prior to discharge. Additional capacity in the EP ponds and Fish Pond is needed to provide adequate retention time necessary to manage the water before it is discharged at CP1 under a NDPES permit and to avoid mixing Fish Pond water with impacted water (e.g., pit dewatering water) in CP2 and/or the WMP1-2 pond system.

Management Response

P4 would raise the height of the dam and spillway associated with Fish Pond up to five feet. The maximum increase in storage capacity would be approximately 11.8 acre-feet in Fish Pond bringing the total capacity of Fish Pond to 21.8 acre-feet. With this additional capacity, the total capacity of the EP and Fish Pond system would increase to 40.4 acre-feet. The additional capacity in Fish Pond would provide additional retention time that would allow more water to be managed by providing time for suspended sediment to settle, provide additional time to determine the quality of the water, and help ensure that water meets discharge criteria prior to discharging at CP1.

The increased capacity of Fish Pond would also increase the likelihood that more water could be discharged to CP-1 during the life of the Blackfoot Bridge Mine project. Once the EOP is reclaimed, runoff water would contact growth media that had been placed over the entire EOP surface. Therefore, the primary function of the EP ponds and Fish Pond would be to allow sufficient time for sediment to settle and meet discharge criteria for TSS and/or turbidity.

5.2.5 Adaptive Management Action No. 5

Section 4.2 provides the details of the OSMS, including the Groundwater Underdrain System. The groundwater underdrains would direct natural groundwater within the footprint of the EOP and NWOP to a discharge point outside of the footprint of each overburden pile. The Groundwater Underdrain System would protect the stability of each overburden pile by preventing upward hydraulic pressure and would protect groundwater quality by preventing contact with overburden materials. Periodic monitoring of the discharge points of this underdrain system is set forth in the Environmental Monitoring Plan.

Site Water Condition

Selenium concentration in the groundwater underdrain samples collected at monitoring stations in the unnamed tributary along the toe of the EOP exceed the surface water quality standard (0.005 mg/L).

Management Response

The underdrains discharge points that exceed 0.005 mg/L for selenium will be redirected to the seepage underdrain system for management in the WMP1-2.

6.0 NOTIFICATION

P4 would provide notification to COE, BLM, IDEQ and U.S. Environmental Protection Agency 5 business days prior to dredging or placement of fill materials in currently existing wetlands and non-wetland waters of the US that would be affected by this AMP. Notification may include phone call or e-mail as

long as written notification is provided within 5 business days of such notification. Written notification shall include a description of the issue that triggered this AMP and estimated amount of dredging or filling anticipated as part of responding to the issue. Sample results from surface water monitoring stations would be reported in accordance with Environmental Monitoring Plan (P4 2009b).

7.0 REFERENCES

BLM 2009. Draft Environmental Impact Statement, Blackfoot Bridge Mine. BLM Pocatello Field Office, Pocatello, Idaho.

JBR Environmental Consultants (JBR). 2003. Waters of the US/Wetland Delineation. Monsanto Company Blackfoot Bridge Property, Caribou County, Idaho, September 2003, 27 pp. plus figures.

JBR 2006. Addendum: Monsanto Company Blackfoot Bridge Property – Waters of the U.S./Wetland Delineation. Caribou County, Idaho. January 2006. 94 pages.

P4 Production LLC (P4). 2008a. Revised Blackfoot Bridge Mine and Reclamation Plan. P4 Production LLC, Soda Springs, Idaho.

P4 2008b. Joint Application for Section 404 Permit, Preliminary 404(b)(1) Showing and Conceptual Mitigation Plan. Prepared for P4 by AMEC Geomatrix, Inc., Helena, MT.

P4 2009a. Assessment of Potential Wetland Mitigation Sites and Preliminary Design. Prepared for P4 by AMEC Geomatrix, Inc., Helena, MT.

P4 2009b. Draft Environmental Monitoring Plan, Blackfoot Bridge Mine, P4 Production LLC, Soda Springs, Idaho.

P4. 2010a. Blackfoot Bridge Revised Mine Water Management Plan. Submitted to: Bureau of Land Management, Pocatello Field Office. Prepared for P4 by AMEC Geomatrix, Inc., Helena, MT

P4 2010b. Water Balance Report, Blackfoot Bridge Project, Prepared for P4 Production LLC by AMEC Geomatix, Inc. and Ecological Resource Consultants, Inc. Englewood, Colorado.

P4 2010c. Conceptual Overburden Seepage Management System. Prepared for P4 by AMEC Geomatrix, Inc., Helena, MT, May 2010.

APPENDIX C

BLACKFOOT BRIDGE MINE
DEIS COMMENTS REPORT

Comments and Responses

Public Comments

The NEPA regulations at 50 CFR 1503.1 require the action agency, in this case the BLM, to request public comment on a Draft EIS prior to preparing a Final EIS. Comments should be obtained from Federal, State and local agencies, Indian tribes and those persons or organizations who may be interested or affected by the proposed project. The Notice of Availability for the Blackfoot Bridge DEIS was published in the Federal Register on August 17, 2009. The 45-day comment period was scheduled to end September 30, 2009. A 30-day extension to the comment period was granted by the BLM, extending the comment period to November 2, 2009.

Three public meetings were held on September 15, 16, and 17, 2009. The locations of these meetings were Pocatello, Fort Hall Indian Reservation, and Soda Springs, Idaho, respectively.

Agencies, organizations, and interested parties provided comments on the DEIS via mail, email, and public meetings. Comments also came in the form of post cards, form letters, and comment forms. A total of 6,760 comments were received.

Comment Analysis

All of the DEIS comments received by the close of the comment period were processed on behalf of the BLM by the Content Analysis Team at ARCADIS. Public input on the Blackfoot Bridge DEIS was documented and analyzed using a process called "content analysis", which is a systematic method of compiling and categorizing the full range of public viewpoints and concerns regarding a plan or project. This process has been used in a number of other federal NEPA projects. Content analysis is intended to facilitate good decision-making by helping the planning team clarify, adjust, or incorporate information into the preparation of the Final EIS for a project. All responses (e.g., letters, emails, and other types of input) are included in this analysis. In the content analysis process used for the Blackfoot Bridge Mine Project, each response is given a unique identifying number, which allows analysts to link specific comments to original letters. Respondents' names and addresses are then entered into a project-specific database, enabling creation of a complete mailing list of all respondents. The database is also used to track pertinent demographic information such as responses from groups of commenters or federal, state, tribal, county, and local governments. Comments from specific groups are given unique identifying numbers even if they are form letters, although the associated comments from form letters are processed only once under the master letter (i.e., the first of that form letter processed).

All input is considered and reviewed by two analysts. Each response is first read by one analyst and sorted into comments addressing various concerns and themes. A second analyst reviews the sorted comments to ensure accuracy and consistency of the analysis. Comments are then entered verbatim into the database. In preparing the final summary analysis, public comments are reviewed again using database printouts. These reports track all coded input and allow analysts to identify a wide range of public comments and analyze the relationships among them. The final product includes a list of issues addressing the DEIS and all public comments relating to the issues.

It is important for the public to understand that this process makes no attempt to treat comments as votes. In no way does content analysis attempt to sway decision-makers toward the will of any majority. Content analysis provides the means to ensure that every original comment is considered at some point in the decision process. The content analysis method employs both qualitative and quantitative approaches. It is a systematic process designed to provide specific demographic information, to compile a mailing list of respondents, to identify individual comments by topic in each response, to evaluate similar comments from different responders, and to summarize like comments as specific public issue statements. The breadth, depth, and rationale of each comment are especially important. In addition to capturing relevant factual input, analysts try to capture the relative emotion and strength of public sentiment behind particular viewpoints in order to represent the public's values and concerns as fairly as possible. Analysts then organize the concern statements to facilitate systematic review and response by decision-makers.

Each public issue statement is an analyst's brief rephrasing of one or more comments expressing similar views of what management action the agency should take. Each public issue statement is assigned a unique number. Organized by topic, chapter, or resource, the public issue statements and responses appear in DEIS Topics, Issues and Responses section of this Appendix. Under each public issue statement, similar comments were paraphrased and a response is given. Letter number and comment number are provided and can be cross-referenced to identify the comment author in **Table A** and **Table B**. **Table A** is a list (alphabetical by author) of all the comment letters that generated original comments captured in the content analysis process. This list of 960 comment letters does not include the form letters that were essentially duplicates of master comment letters, but these are still represented because each of the comments duplicated by these letters is considered at least once. **Table B** is the same list organized numerically by letter number. To help the reader of this FEIS understand how their comments were considered, they should find their comment letter number from the list in **Table A** and then observe the comment letter numbers in DEIS Topics, Issues and Responses section of this Appendix where the specific comments and responses are shown. For readers having specific interest in how all their comments were coded into the database, copies of the comment database are available on CD and can be requested from the BLM EIS project manager.

Original Response Demographic Summary

Demographic coding allows managers to form an overall picture of who is submitting comments, where they live, their general affiliation with various organizations or government agencies, and the manner in which they respond. The database can be used to isolate specific combinations of information about public comment. For example, a report can include public comments only from people in a certain state or a report can identify specific types of land users such as recreational groups, agricultural organizations, or businesses. Demographic coding allows managers to identify specific areas of concern linked to respondent categories, geographic areas, and response types. Although demographic information is captured and tracked, it is important to note that the consideration of public comment is not swayed by demographics. Every comment and suggestion has value, whether expressed by one or many respondents, and whether or not the comment originates from an address local to the project. All input has been considered, and the analysis team attempted to capture all relevant issues raised by the public in the analysis process.

In the tables displayed below, demographic figures are given for original responses including number of responses and respondents. For the purposes of this analysis, the following definitions apply: "response" refers to a discrete piece of correspondence; and "respondent" refers to each individual or organization to whom a mail identification number is assigned (e.g., a single response may represent several organizations without one primary author). In the 6,760 original responses, 5,822 responses were received from organized response (form letter) campaigns. A form letter was identified as multiple correspondences with identical text. When a new form letter was identified, it was considered to be a comment letter and a "form", and was entered into the content analysis process to extract the various comments from the letter. Thereafter, all other identical copies of this same exact form that were received were logged as being received but were not considered to be additional "comment letters". In this manner, many pieces of individual form correspondence, all being identical to each other, were considered to be one form letter. This was repeated a number of times as a number of different form letters, each with many exact duplicates, were received. This is how 6,760 individual pieces of public comment correspondence became 960 original comment letters.

Geographic Representation

Geographic representation is tracked for each original response during the course of content analysis (**Table C**). Letters and emails were received from 31 States of the United States, the District of Columbia and four other countries. The response format did not reveal geographic origin for 286 responses. States or countries of residence for each individual signature were not tracked for multi-signature responses. Signatures on multi-signature responses were all assigned to the state or country of the person or organization originating the response.

Organizational Affiliation

Responses were received from various organizations and unaffiliated individuals. Respondents include businesses, state and local governments, mining support industries, as well as unaffiliated individuals and others. Organization types were tracked for each post card, form letter, and comment form (**Table D**).

Delivery Type

Delivery types were tracked for each response received on the project (**Table E**). Responses were received in the form of email, fax, U.S. mail or commercial carrier, and presented in person at the public meetings.

Form Responses

Forms are defined as responses received separately, but containing identical text. Once a form is identified, a "form master" is entered into the database with all of the content information. All responses with matching text are then linked to this master form within the database with a designated "form number." If a response does not contain all of the text presented in a given form, it is entered as an individual letter. Forms are designated with a number for the purpose of tracking subsequent submissions. Form numbers are assigned as each "form master" is identified. There were a total of 22 form letters submitted on the project accounting for 5,822 submittals. **Table F** presents the number of signatures associated with each form as well as brief content summaries.

Table A — Comment Letters Alphabetically by Author

Lastname, Firstname	Affiliation	Letter Number	Number of Comments
, Brent	Self	357	1
, Confidential	Self	955	3
, Vern	Self	150	1
Aasmundstad, Eric	Organization	546	2
Ahearn, Ken	Self	407	2
Alleman, John	Self	233	2
Alleman, Vern	Self	222	1
Allen, Adele (FORM 9)	Self	977	3
Allen, Carol	Self	253	2
Allen, Norman G	Business	849	2
Allen, Sandra	Self	476	1
Allgood, Lane	Organization	206	2
Allred, Steve	Self	132	3
Alvarez, Abel (FORM 7)	Self	975	1
Alver, Sheldon	Self	874	2
Andersen, Bruce	Self	730	2
Andersen, Ethel	Self	20	5
Andersen, Kay & Ethel	Self	60	1
Anderson, Brian	Self	454	3
Anderson, Donald P	Self	425	1
Anderson, Joseph	Self	236	2
Anderson, Ronald	Organization	542	2
Anderson, Trinitie	Self	144	1
Andrade, Terry	Self	137	2
Andrews, R Verlen	Self	903	1
Andrus, Cecil	Business	890	4
Angstadt, William	Organization	572	2
Antonioli, Ted	Organization	836	1
Apel, Jodi	Business	48	2
Aplanalp, Dwight Dee	Self	15	1

Lastname, Firstname	Affiliation	Letter Number	Number of Comments
Arndt, Edna	Self	748	1
Arrington, Joyce	Self	434	1
Ashley, Thomas	Self	138	3
Auth, Phil		208	1
Bagshaw, Brent	Self	727	2
Baker, Glen & Margaret	Self	297	1
Baker, Jerry	Self	403	1
Baker, Thomas K	Self	517	3
Ballard, Kirt	Business	238	2
Balls, Jonathan	Self	377	2
Balls, Shari	Self	830	2
Barden, Kathleen	Self	777	3
Barker, Brent	Business	445	3
Barnes, Boyce J	Business	934	2
rnes, Brandon J	Business	950	3
Barnes, Daniel V	Self	401	1
Barnes, Jan	Self	179	1
Barnes, Ronda	Self	215	3
Barnes, Tracy	Self	142	1
Barnes, Travis	Self	450	1
Barnes, Trudy	Self	221	4
Barrett, James	Business	551	4
Barthlome, Bud	Self	942	2
Barthlome, Jackie	Self	177	2
Bartholomay, Gracie	Self	671	2
Bartholomew, Sidney	Self	391	2
Bartschi, Erin	Self	576	1
Bartschi, Melba	Self	437	3
Bassett, Jacob	Self	892	2
Bassett, Tom	Self	139	3
iteman, Chris	Business	457	3

Lastname, Firstname	Affiliation	Letter Number	Number of Comments
Baumann, Jim A	Self	915	2
Baumeister, Bart	Self	560	1
Baxter, Patty Jo & Larry	Self	784	1
Beauregard, Doug	Self	482	4
Bedke, Representative Scott	State Official	873	2
Beebe, Colton	Self	658	2
Beins, Farrell	Self	490	1
Bell, Maxine T	State Agency	632	1
Berg, Shannon	Self	829	2
Bersanti, Dan	Business	567	1
Berube, Anne	Self	556	1
Bingham, EM	Self	19	4
Bird, Dennis L	Self	256	1
Black, Gary	Organization	578	4
Black, Representative Max C	State Official	869	3
Blackstock, Ted	Self	316	1
Blain, Jeff	Self	43	2
Blair, Senator Steve	State Official	825	2
Blakeslee, John	Self	51	3
Blankenship, Brett	Organization	843	3
Blau, Terry	Self	396	3
Blevins, Dawn		241	3
Bloxham, Kurt	Self	896	1
Bolton, Clair R	Self	741	3
Boots, Larry	Self	188	2
Borchert, Vernon & Heather	Self	451	1
Borné, Dan S	Business	309	3
Bourg, Lionel G	Self	785	1
Bowen, Jeff	Self	44	2
Bower, Dalton	Self	858	1
Bowers, Boni	Self	938	1

Lastname, Firstname	Affiliation	Letter Number	Number of Comments
Bowman, Aaron	Self	713	1
Bowman, Eric	Self	714	1
Braatz, Frank	Self	888	3
Brackett, Senator Bert		477	2
Bramhall, Scott	Business	23	2
Brammer, Bob	State Agency	877	4
Brand, Norma Meyer	Self	204	1
Bredenkamp, Troy	Organization	740	2
Brennan, Andrew	Business	469	3
Brewer, Kris	Self	67	9
Brewer, Terri J	Self	602	2
Briggs, Miranda	Self	87	2
Brinkerhoff, Mae Dee		794	1
Broadsword, Senator Joyce M	State Official	705	5
ogan, Gary	Self	755	1
Bronson, Bruce A	Self	732	2
Brotherton, Devin	Federal Agency	604	1
Brower, Brittany	Self	652	1
Brown, Cody	Business	399	2
Brown, Dean I	Business	420	2
Brown, Donna	Self	503	2
Brown, Janene	Self	36	2
Brown, Jonathan	Self	584	2
Browning, Carol Felt	Self	229	3
Brune, Richard (Rick)	Business	300	3
Bruner, Dan	Self	922	2
Bryant, Elizabeth	Self	257	3
Bryant, Greg	Self	260	3
Bullard, Hailey	Self	672	2
Bullock, Ken	Local Agency	738	5
llock, Wayne	Business	605	1

Lastname, Firstname	Affiliation	Letter Number	Number of Comments
Bult, Scott	Business	311	1
Burdin, Christy	Self	526	1
Burg, Marilyn	Self	79	1
Burgin, Marshall	Local Agency	530	2
Burroughs, C	Self	252	1
Bushner, Trent	Business	352	1
Butcher, George	Self	26	2
Butikofer, Kaylee	Self	685	2
Byars, Robert	Self	108	3
Byington, Drew	Self	664	1
Byington, Troy	Business	148	2
Callihan, Robert	Self	109	4
Callihan, Wesley J	Self	353	1
Callister, Wade W (FORM 20)	Self	988	3
Calliston, David R	Self	863	3
Cameron, Dean L	State Agency	703	2
Campbell, Arlene	Self	933	2
Campbell, Chayce	Self	655	2
Cantrell, Jerrod		181	3
Carlson, Linda	Self	72	3
Carlson, Serena	Self	599	2
Carpenter, Chuck & Helen	Self	657	3
Carpenter, David	Self	884	4
Carpenter, Olivia	Self	312	1
Casper, Kray	Self	690	2
Casperson, Thayne	Self	912	2
Cay, Chris	Self	481	2
Chan, Peter W	Self	810	1
Chandler, Kirk R	Self	380	2
Chapin, Kelly	Self	61	1
Chase, Roger W	Local Agency	82	2

Lastname, Firstname	Affiliation	Letter Number	Number of Comments
Chavez, Liz		787	1
Chepote, Jorge	Self	585	1
Cheung, Kwok	Federal Agency	458	2
Christensen, Ashly	Self	333	1
Christensen, Cassie	Self	358	4
Christensen, Jason P	Self	39	2
Christensen, Timothy L	Business	318	2
Christenson, Kirk	Business	228	2
Christiansen, Beverly	Self	561	2
Ciletti, Mike	Self	796	1
Clark, April	Self	649	1
Clark, Carolyn T	Self	161	1
Clark, Kathleen	Self	897	3
Clark, Trent L	Local Agency	914	1
etell, AC (FORM 17)	Self	985	3
Clenderon, Daren	Self	422	1
Coby, Alonzo	Tribe	966	46
Cofer, Brian	Self	939	1
Collins, Jeremy Sasser	Self	375	3
Colton, David L	Self	9	3
Compton, Mark	Organization	790	3
Conlin, Cindy	Self	294	1
Conn, Michael	Self	345	2
Contreras, Luz	Self	854	2
Cook, Corey (FORM 4)	Self	972	1
Cook, Jerry D	Self	678	2
Cook, Stanley V	Self	394	2
Cook, Ted M	Self	638	3
Cooksey, Jerry	Organization	616	1
ooper, Gordon	Business	156	2
ooper, Roy J		819	2

Lastname, Firstname	Affiliation	Letter Number	Number of Comments
Corder, Senator Tim	State Official	216	3
Coyner, Tom	Self	140	6
Craft, Fred	Self	851	1
Craig, Charles & Karen	Self	946	2
Craig, Darol	Self	7	1
Crane, Don L	Self	13	1
Crane, Stuart D	Self	249	2
Crawford, Alan	Self	486	3
Cullen, Chris	Self	421	1
Cullen, Shannon J	Self	447	1
Culver, Chester J	State Agency	698	1
Cunningham, Jason T	Self	586	3
Currie, John	Business	52	5
Curtis, Richard	Self	815	1
Dahlke, Tucker	Self	710	1
Danko, Michael J	Self	795	3
Darrington, Denton	State Agency	704	3
Darrington, Lyn	Self	789	1
Davis, Bill	Self	949	2
Davis, Don C	Self	569	3
Davis, James F	Self	581	2
Davis, Kreg L	Business	338	1
Day, Chris (FORM 5)	Business	973	3
Decker, Lundyn	Self	899	1
DeClark, Joseph & Connie	Self	680	1
DeVeny, Bill & Betty	Self	356	2
Dickey, Bob	Organization	96	3
Dietrich, Donald A	State Agency	620	1
Dobbins, Eric	Self	504	4
Dodd, Sheree	Self	516	2
Dodson, Johnny	Organization	555	4

Lastname, Firstname	Affiliation	Letter Number	Number of Comments
Doll, Wendy	Business	520	2
Dollar, Rodney	Self	904	3
Doman, Brad	Business	290	3
Donahoo, Ben	Self	494	3
Dooley, Danelle	Self	455	1
Dooley, Julie	Self	404	2
Dooley, Laurie	Self	381	4
Dooley, Mark C	Self	329	5
Dowling, Greg	Business	682	3
Dowling, Greg	Business	304	3
Downie, Keegan	Self	686	2
Drayton, Brad	Business	339	2
Dunker, Rhonda		813	3
Dunker, Robert		820	5
nker, Robert	Business	533	3
Duran, Jon	Business	12	4
Dutson, Leora	Self	189	2
Duval, Frank	Self	754	4
Eck, Cody	Self	400	1
Edmo-Suppah, Lori	Media Outlet	382	1
Egan, Scott	Self	596	2
Elder, Glen & Jane	Self	259	1
Engle, Mike	Business	293	2
Erickson, Alan	Self	487	1
Erickson, Brent	Self	562	3
Erickson, Cindy	Self	948	2
Ericsson, Chad & Paulette	Self	500	4
Escher, Eckhard (FORM 12)	Business	980	3
Eskelson, Rick	Business	313	1
Evangelho, Susan	Self	219	1
Evans, Katharine	Self	921	2

Lastname, Firstname	Affiliation	Letter Number	Number of Comments
Evans, Richard	Self	514	4
Even, Bill	State Agency	597	2
Facer, Dennis	Business	882	2
Farmer, Roy		246	1
Farnsworth, David W	Self	665	2
Farnsworth, Nina K	Self	902	3
Fausett, David	Self	501	5
Fausett, Jessica		623	1
Fenton, Kevin	Business	506	2
Feuerborn, Richard	Business	475	3
Filiaga, Isley	Self	261	1
Filiaga, James & Chrystal	Self	262	1
Filiaga, KJ	Self	266	1
Filiaga, Tiana	Self	285	1
Filiaga, TJ	Self	286	1
Filiaga, Tui	Self	288	1
Finck, Max	Business	931	1
Firth, Carolyn	Self	923	2
Firth, Phillip	Self	102	2
Flemming, Jim	Self	376	3
Fliesher, David	Self	164	3
Ford, Tim	Self	838	1
Foster, Dean	Self	532	1
Foster, Fess	Self	752	3
Foster, Lee & Pam	Self	543	1
Francis, Scott M		832	1
Franke, Travis	Self	957	3
Frankos, Janet	Self	337	2
Frankos, Tom	Self	141	1
Franson, John	Self	234	2
Frazier, Ron	Self	594	3

Lastname, Firstname	Affiliation	Letter Number	Number of Comments
Freeman, Todd	Self	518	1
Frolic, John	Self	769	2
Fry, AH	Business	176	3
Fuller, Richard	Self	106	2
Gaines, Judy A	Business	692	1
Gamblin, Mark	Federal Agency	968	14
Gannon, Patrick J	Self	99	1
Gardner, Lance	Self	69	6
Gardner, Rex	Self	279	1
Garvin, Kristina	Self	68	1
Gates, Edward E	Self	575	3
Geddes, Senator Robert L	State Official	952	2
Geddes, Tammy	Self	449	1
Gentry, Anna		355	1
rhardt, Mike	Self	511	2
Gibbs, Representative Marc	State Official	211	3
Gibson, Val	Business	452	3
Gilbert, Denise	Self	885	3
Gilliam, Gynii A	Business	558	4
Gilliam, John W	Self	325	1
Gilliam, John W		182	1
Gilmer, Flora	Self	753	2
Gilmer, Steve	Self	393	1
Gilpin, Jackie	Self	764	2
Glader, Paul	Business	758	3
Gnesa, Art	Self	319	1
Goedde, Senator John W	State Official	478	3
Goehring, Doug	State Agency	629	1
Gohl, Clarence (FORM 16)	Self	984	1
Goode, Jon	Self	235	2
odenough, Robert	Business	461	1

Lastname, Firstname	Affiliation	Letter Number	Number of Comments
Gough, George	Self	619	2
Gould, Celia R	State Agency	538	2
Gould, Celia R	State Agency	448	1
Gould, Steve	Self	910	1
Gower, Kim	Self	782	2
Graunke, Colleen & Doug	Self	862	2
Green, Jennifer	Self	768	2
Green, Rebecca	Self	277	1
Greene, Dennis & Karen	Self	321	2
Griffin, Randy	Business	230	1
Griffiths, Dave	Self	165	4
Grupp, Larry & Carol	Self	186	2
Guentz, Gerald		173	2
Gunnell, Dean R & Karleen L		166	2
Gunnell, Roven	Self	116	1
Gunter, Natalie	Self	94	1
Gustafson, Dave	Self	568	1
Guthrie, Mike	Business	535	1
Gutterball,	Self	30	1
Guyton, Adam	Self	715	1
Hadley, Steve	Local Agency	524	4
Hahn, James F	State Agency	637	2
Hakemack, Travis	Self	840	4
Hale, Amanda	Self	648	2
Hale, Don	Organization	370	1
Hall, Debie	Self	660	2
Hall, Jason	Self	40	1
Hall, Jason		299	1
Hall, Jon C	Business	180	1
Hamilton, Ken	Organization	711	1
Hamilton, Linda	Self	73	2

Lastname, Firstname	Affiliation	Letter Number	Number of Comments
Hamilton, Tyler	Self	841	1
Hammond, Bruce	Self	733	1
Hamp, Ron	Self	492	1
Hance, Earl	State Agency	694	2
Hanley, Rick	Business	416	1
Hans, Mansij	Self	196	1
Hansen, Kirk L	Local Agency	954	3
Hardcastle, James & Shannan	Self	35	2
Hardy, John		770	1
Harper, Zach	Self	522	2
Harris, Tom	Business	223	6
Harrison, Lance	Public Agency	307	1
Hasselquist, Eliza	Self	364	1
Hasselstrom, Eric	Organization	911	2
sz, William K	Self	918	3
Hatch, Tyson		147	2
Hatley, Sherman	Self	247	1
Haun, RJ	Self	387	3
Havili, Lesli		786	2
Hayden, Hans	Self	31	3
Haynie, Lacey	Self	691	3
Hays, Anita	Self	251	1
Hedden, Michael	Self	510	1
Hegemann, Edward	Self	17	4
Hein, Shirley	Self	283	4
Heiner, Paul	Business	131	3
Heins, VJ	Self	151	3
Heins, Warren W	Self	152	4
Held, Michael	Organization	598	1
Hemmert, Dan	Self	5	1
mmert, Debra	Self	473	2

Lastname, Firstname	Affiliation	Letter Number	Number of Comments
Hendickson, F Lee	Local Agency	531	3
Hendren, William L	Business	289	2
Hendricks, Russ	Self	118	3
Henning, Ronica	Self	115	1
Hepworth, Allan	Self	225	1
Herman, Richard	Self	816	3
Herman, Ryan	Self	119	2
Herr, Christian R	Business	409	2
Hess, Norman B	Business	24	6
Heywood, Mike	Self	797	3
Hill, Curt	Self	566	3
Hill, Dorsey	Business	721	2
Hillman, Kerry	Self	342	1
Hindmarch, Michelle	Self	589	3
Hodgin, Ed	Self	18	2
Hofeldt, Nicholas	Self	801	2
Hoffman, Rick	Business	614	2
Hogan, Leland J	Organization	811	2
Holcomb, Gerald & DeEtta	Self	456	2
Hollingsworth, Greg	Self	367	2
Hollingsworth, Jaron G	Self	893	2
Hoopes, John L	Business	159	5
Hopkins, Ammon	Self	418	3
Hopkins, Desiree	Self	424	5
Hopkins, Larry	Self	327	1
Hopkins, Vicky	Self	331	2
Hopkins, Wade	Self	844	4
Hosman, Scott	Business	239	2
Hotlos, Andrzej	Business	282	2
Hovis, Lu-Ann & Jim	Self	898	1
Howard, Cody	Business	675	1

Lastname, Firstname	Affiliation	Letter Number	Number of Comments
Howell, Ken & Mary Beth	Self	62	1
Hoyt, Marv	Organization	960	12
Hoyt, Marv	Organization	961	39
Hubbard, Mike	Organization	870	1
Hubbard, R Brent & Karen	Self	348	2
Humble, Delvin L	Self	90	2
Humble, Mark	Self	199	2
Humble, Miles C	Self	85	2
Humble, Shelly	Self	707	2
Humble, Shelly	Self	126	2
Hunzeker, Sue	Self	350	2
Huseman, Brad	Self	498	2
Husman, James	Self	853	4
Hyatt, Rick	Self	818	2
mas, Glade C & Judy J	Self	258	3
Imhoff, Edgar A	Organization	962	7
Imler, Lisa	Business	641	3
Inman, Gracie	Self	536	1
Inman, Jake	Self	539	1
Inman, Noah	Self	548	1
Isaacson 1, John	Self	771	2
Isaacson 2, John	Business	772	3
Isbell, Scott	Business	515	3
Issacson, Dominique	Self	663	3
Izatt, Drew	Business	412	1
Jackson, Dan S	Self	747	1
Jackson, Rocky	Self	444	1
Jeffries, Paul	Self	100	1
Jensen, Etta	Self	365	1
ensen, Robert	Business	639	2
nsen, Shania	Self	706	2

Lastname, Firstname	Affiliation	Letter Number	Number of Comments
Johansson, Mike	Self	695	1
Johns, Quey	Self	440	1
Johnson, Ron (FORM 13)	Business	981	4
Johnson, Albert K	Local Agency	528	2
Johnson, Ben	Business	439	2
Johnson, James B	Self	373	3
Johnson, Jonas D	Self	55	1
Johnson, Karin	Self	684	4
Johnson, Melanie Sue	Self	270	1
Johnson, Randy	Business	149	1
Johnson, Robert 1	Organization	608	2
Johnson, Roger	Organization	800	2
Johnson, Tammy		835	3
Jolley, Joel	Local Agency	859	4
Jolley, Kendall & Janine	Self	63	4
Jones, Michael	Self	201	2
Jones, Tracy L	Self	913	3
Jurgen, Meghan	Self	200	4
Just, J Kent	Organization	507	1
Justice, Dawn	Organization	867	4
Kalmegh, Manish	Self	460	1
Kalyani, Jitendra V	Business	183	1
Kaumo, Mike	Self	798	1
Keefner, Elizabeth	Self	749	3
Keefner, John	Self	582	2
Keely, Jerry	Self	894	2
Keller, Caron	Self	735	2
Keller, Clint	Self	565	3
Keller, Joshua	Self	681	2
Keller, Kevin J	Self	265	1
Keller, Nancy B	Business	274	1

Lastname, Firstname	Affiliation	Letter Number	Number of Comments
Keller, R Dwain		209	3
Keller, Rick	Self	107	2
Kelly, Jared	Self	37	1
Kemmerer, Brian	Self	879	2
Kennedy, Keith	Organization	521	4
Kenyon, Craig	Self	742	1
Ketterling, Elmer & Atta	Self	169	1
Kim, F	Self	750	1
Kimball, Scott	Self	120	2
Kimber, Gerald	Self	756	2
King, Glenda	State Agency	218	4
Kirkbride, Jim	Self	621	4
Kirkbride, Rebecca	Self	631	4
Klieve, Jeffrey R	Self	871	3
ne, Daniel S	Self	883	3
Knox, David E	Self	570	1
Koch, Barry	Self	559	4
Koehler, Charles	Self	947	1
Koritnik, Carla	Business	346	2
Kotek, John	Self	485	2
Kotwick, John	Self	53	1
Kowallis, Kaye	Self	778	1
Kowallis, Paul C	Self	808	1
Kramer, Lin	Self	436	1
Kretzschmar, Johann	Self	303	1
Kummeth, Brian	Self	651	2
Kunz, Corey	Self	4	3
Kunz, Kent	Self	780	1
Kunz, Montain	Local Agency	525	3
Kuperus, Henry	Organization	463	3
ther, Mary Ann	Self	195	1

Lastname, Firstname	Affiliation	Letter Number	Number of Comments
Kyle, Mr & Mrs Dale	Self	203	1
LaBeau, Alex	Organization	676	3
Lake, Representative Dennis M	State Agency	442	1
Langedyke, Jefferey	Business	767	2
Laraway, James W	Business	846	3
Larsen, Janet	Self	677	1
Larson, Vicki	Self	852	3
Lau, Robert	Self	314	1
Lau, Todd	Self	603	2
Lauer, Kent	Self	781	2
Lawhead, Nick	Self	802	2
Lawhead, Nick	Self	803	1
Leatherman, Chris	Self	737	1
Lee, Lynda & Denny	Business	343	1
Lee, Tony	Business	276	3
Leferink, Richard		817	3
Lent, Amy	Self	226	3
Lester, William	Local Agency	527	2
LeVake, Barbara	Organization	722	1
Likes, Evelyn	Self	323	1
Lindsley, Ted	Self	135	2
Lish, Steve	Business	405	2
Lish, Tim	Self	414	2
Litterer, Ron	Organization	97	3
Little, Dwight	Self	16	4
Little, Richard	Self	410	1
Lloyd, Gillian	Self	174	3
LoBianco, Sal	Public Agency	696	3
Lodge, Senator Patti Anne	Self	438	1
Lodge, Senator Patti Anne	State Official	908	2
Loveland, Karl	Business	194	3

Lastname, Firstname	Affiliation	Letter Number	Number of Comments
Ludwig, John	Self	433	1
Lutes, Mary Kay	Self	202	3
Lyman, Jack	Organization	761	1
Lyon, Matt	Self	900	2
Lytle, Steven	Business	642	3
Mabe, Janice	Business	839	2
Machen, Kegan (FORM 22)	Self	990	3
Madsen, Courtney	Self	659	2
Madsen, Roger B	State Agency	369	1
Mai, Aaron (FORM 8)	Self	976	2
Majhanovich, Rick	Self	814	4
Malone, Donna	Business	554	5
Manning, Leon & LeeAnn	Self	71	1
Maronick, Mark	Business	268	1
rtin, Janene D	Self	429	1
Martin, Linda K	Self	308	2
Martinsen, Jeff	Self	580	2
Mateos, Tonya	Self	287	3
Mathews, Don		363	1
Matthews, David H	Local Agency	861	6
Matyus, David		255	3
May, Margo	Self	78	1
Mazza, Doug	Self	14	3
McAtee, Kelly	Self	779	1
McBride, Elizabeth	Self	472	1
McClellan, Alan	Self	291	2
McCown, Robert	Self	701	1
McCulloch, James	Self	178	1
McCulloch, Kallie	Self	541	1
McCulloch, Lonnie	Self	544	1
Culloch, Lori	Self	545	1

Lastname, Firstname	Affiliation	Letter Number	Number of Comments
McCulloch, Rinnie	Self	550	1
McCurdy, Bendell	Business	653	2
McGee, Senator John	State Official	827	2
McGregor, Wallace	Self	845	2
McKay, Frances	Self	170	1
McKenzie, Curtis	Business	826	2
Mckinley, Forrest	Self	366	1
McLain, Sandi	Self	702	2
McManus, Jonathon	Self	540	1
McManus, RaLyn	Self	549	1
Medina, Tony	Business	822	1
Mendenhall, Karen	Self	58	2
Mendenhall, Robert	Self	330	2
Mendenhall, Tab	Self	133	2
Mendez-Torres, Sergio	Business	683	2
Merritt, Mick D	Self	83	2
Messenger, Cheryl		292	2
Messenger, Louise	Self	383	3
Michel, Brad	Self	480	2
Mickelsen, Ben	Self	650	2
Mickelson, Clisty	Self	1	1
Mickelson, Todd	Self	220	3
Miller, Paul	Self	386	1
Miller, Paul	Self	101	1
Miller, Roy D	Self	280	2
Miller, Sue	Business	406	3
Mills, Damien	Federal Agency	967	27
Mitchell, TD	Self	395	3
Moncrief, Gil & Jo	Self	296	2
Monk, Bob A	Self	937	3
Moon, Marv	Business	872	2

Lastname, Firstname	Affiliation	Letter Number	Number of Comments
Moore, Cindy	Self	564	1
Moore, Darrel & Marie	Self	662	2
Moore, Hannah	Self	673	2
Morgan, Ronald	Self	214	1
Mortimer, Dean	Self	124	3
Moser, Heather	Self	674	1
Mossman, Ralph	Self	104	1
Moultrie, Trisha	Self	145	3
Muir, Frank W	Organization	762	1
Mullinix, Coleen	Self	361	1
Mumford, Neil	Self	310	1
Munson, Blake	Self	936	1
Murdock, Norris M & Doris B	Self	205	1
Murray, Greg	Self	29	1
ers, Ron	Business	103	3
Myers, Tom	Organization	963	68
Myres, Robert	Self	111	1
Myres, Robert	Self	110	1
Myres, Robert	Self	113	1
Nauman, Jeff C	Business	609	2
Neilsen, Nicole	Self	592	2
Neilsen, Troy	Business	146	1
Nelson, Clyde G	Self	2	2
Nelson, Craig	Business	231	3
Nelson, Dan	Business	413	1
Nelson, Lori	Self	76	2
Neuschaefer, Kate	Self	341	1
Nield, Elva K	Self	617	2
Nield, Jocelyn	Self	625	2
Nield, Kenneth	Self	627	1
ield, Keven	Self	628	1

Lastname, Firstname	Affiliation	Letter Number	Number of Comments
Nield, Michael	Self	588	3
Nield, Samantha	Self	636	3
Nield, Teresa	Self	640	2
Nielsen, Linda	Self	74	3
Nielson, Lane	Self	783	2
Niesen, LuAnn	Self	916	1
Nikkel, James Kim	Self	624	3
Noble, Elisa	Organization	734	2
Noleen, Jeff	Self	402	1
Norman, Kathleen	Self	305	1
Northey, Bill	State Agency	371	3
Obray, Jared	Self	38	2
O'Brien, Richard W	Local Agency	615	2
Obrocto, Douglas	Business	776	3
O'Dell, Daniel	Self	334	2
Olmstead, Alan	Self	928	2
Olmstead, Stephanie	Self	392	3
Olorenshaw, Tim	Business	332	2
Olson, Mark	Self	269	1
Ordonez, Carlos	Self	943	1
Orr, Linda	Self	693	2
Packer, A Milo (FORM 15)	Self	983	2
Page, Cheyenne	Self	656	2
Pallante, Bruce	Self	880	3
Pariseau, William G	Self	607	4
Parker, Doug	Self	746	2
Parker, Mark	Self	81	2
Parkin, Richard B	Federal Agency	958	20
Parkin, Richard B	Federal Agency	959	40
Parkinson, Jed (FORM 19)	Self	987	3
Parsons, Teryl	Self	709	1

Lastname, Firstname	Affiliation	Letter Number	Number of Comments
Patton, Heather	Self	427	1
Paul, Gregory	Business	547	4
Paulsen, Kellie	Self	435	1
Payne, Dan	Business	489	3
Peach, Terry L	State Official	804	2
Pearhill, Scott	Organization	298	2
Peck, Eldon	Business	666	1
Peck, Eldon	Local Agency	667	1
Peck, Gloria	Self	670	1
Peebles, Travis	Business	98	1
Peirce, Bob	Self	925	3
Perez, Wilma & Oscar	Self	224	1
Permann, Marcia	Self	197	1
Perry, Carol	Self	924	2
ters, Gene C	Self	25	2
Petersen, Darlene	Self	6	1
Petersen, Gary Pete	Self	22	4
Petersen, Jodi	Self	432	2
Peterson, Collin (FORM 2)	Self	970	3
Peterson, Carolyn	Business	553	2
Peterson, Jim	Self	302	2
Peterson, Ralph	Self	441	1
Peterson, Reed	Local Agency	860	6
Peterson, Robert	Self	917	3
Pfister, Stephen	Business	799	2
Pherigo, Charles T & Ellen G	Self	162	2
Phillips, Joe	Self	49	5
Phillips, Karen	Self	59	1
Pickard, Clay & Laura (FORM 1)	Self	969	3
Plemel, Adrienne	Self	716	4
othow, Roger	Organization	474	2

Lastname, Firstname	Affiliation	Letter Number	Number of Comments
Powell, Craig	Business	335	3
Pratt, Jim	Business	467	2
Pratt, Robert	Self	388	1
Pratt, Seth	Self	390	3
Prescott, Randall E	Self	512	3
Priestley, Frank	Organization	866	3
Public, Jean	Self	42	2
Purcell, Russell	Self	446	1
Raap, Aaron	Self	417	1
Rasmussen, Billy	Self	497	1
Rasmussen, Linda	Self	75	2
Rasmussen, Linda	Organization	28	2
Rasmussen, Vaughn 2	Business	593	2
Rauch, Michael	Self	956	3
Ray, Kathy S	Business	712	5
Raybould, Representative Dell	State Official	210	3
Reading, Jason	Self	41	3
Reisinger, Mark		523	2
Rembelski, Ron	Self	595	2
Renfroe, Allen	Self	717	2
Rice, Joe E	Self	50	2
Richard, Byron	Organization	462	3
Richeal, Kevin	Business	775	1
Rigby, Carmela	Self	563	2
Rigby, Robert L		821	2
Riggers, Nathan	Organization	385	1
Ringling, Sherwood L	Self	128	1
Robbins, Nate	Business	33	3
Robertson, Larry	Business	121	2
Robinson, Rick	Organization	579	2
Robison, John	Organization	964	46

Lastname, Firstname	Affiliation	Letter Number	Number of Comments
Rogers, Joel	Organization	86	2
Rogers, Kevin	Organization	557	4
Rollinson, Matt	Self	792	1
Rosa, Quinton	Business	464	3
Rosa, Ted	Business	155	1
Rothwell, Lois		193	1
Ruchti, Representative James W	State Official	465	4
Ruocco, Raphael	Self	105	2
Rusche, Representative John	State Official	244	3
Russell, Luke J	Business	881	2
Salisbury, Ron & Vickie	Self	114	3
Sandretto, Paul	Self	806	2
Sands, Thomas R	State Agency	633	3
Santos, Adriano (FORM 10)	Self	978	3
unders, Denise	Self	423	1
Saunders, Lloyd	Self	328	3
Sayer, Douglas A	Business	275	3
Scales, Vicki	Self	842	3
Scales, William	Self	848	2
Schade, Warren	Business	3	2
Schneider, Janice M	Business	965	8
Schroeder-Munson, Dianne	Self	573	2
Schvaneveldt, Kirsten	Self	509	1
Schwenk, Denis	Self	11	1
Scott, Seth (FORM 21)	Self	989	4
Scott, John	Business	697	1
Scott, Tabitha	Self	468	4
Searle, Bryan	Self	941	3
Sebesta, Viola (FORM 11)	Business	979	1
Sebesta, Viola	Business	643	1

Lastname, Firstname	Affiliation	Letter Number	Number of Comments
Seedall, Jay	Self	263	1
Semanko, Norm	Organization	891	3
Sexton, Bob	Business	32	2
Sharp, Michael	Self	240	3
Shea, Debbie	Organization	744	3
Shea, Edward	Self	483	2
Shears, Wayne	Self	415	1
Shepherd, Aaron (FORM 6)	Self	974	1
Shepherd, Representative Mary	State Official	212	3
Sherman, Francis X	Business	647	2
Shields, Justin	Self	932	1
Shippen, Eliza	Self	668	1
Shooter, Deanna	Self	743	3
Shuler, George & Nola	Self	171	3
Shumway, Steven	Self	505	4
Siddoway, Jeff	Self	125	3
Siek, Rob	Business	245	1
Siemann, Bob	Business	315	5
Siepert, Spence	Self	130	3
Simcox, Adrienne (FORM 18)	Self	986	3
Simmons, Richard L	Self	213	1
Simons, Janice	Self	430	1
Sims, Jeffery C	Self	622	3
Singleton, Samuel	Self	907	2
Sisk, Robert & Rodna	Self	856	1
Skaer, Laura	Self	587	4
Skinner, Brian	Self	729	1
Skinner, Kent A	Self	64	2
Skinner, Lucille	Self	267	1
Skinner, Terie	Self	136	2
Slagowski, Steve	Business	10	1

Lastname, Firstname	Affiliation	Letter Number	Number of Comments
Slagowski, Steve	Business	571	2
Smith, Carolyn (FORM 14)	Self	982	1
Smith, Alicia R	Self	610	4
Smith, Alyssa	Self	453	1
Smith, Brandi Ann	Self	612	4
Smith, Chance	Self	654	2
Smith, Greg	Business	824	3
Smith, Greg	Business	466	3
Smith, Helen K	Self	537	3
Smith, James Weston	Self	626	4
Smith, Jeff	Self	508	2
Smith, Jim	Self	46	3
Smith, Leann	Self	70	3
Smith, Les	Self	191	1
ith, Ned	Self	272	2
Smith, Paul	Business	158	1
Smith, Randy C	Self	243	1
Smith, Richard J	Self	700	2
Smith, Ricky P	Self	823	3
Smith, Robert Burke	Self	630	4
Smith, Robert Phillip	Self	635	4
Smith, Shaun	Self	600	1
Smitt, Jeffcoat	Business	232	1
Snider, CH	Self	359	1
Snider, Kay	Self	379	3
Sodjum, Marguerite	Self	198	1
Somsen, Earl	Local Agency	953	4
Sorensen, Jill Ann	Business	45	8
Sparks, Bob	Self	320	2
Sparks, Steve	Business	340	2
arks, Tad	Self	134	2

Lastname, Firstname	Affiliation	Letter Number	Number of Comments
Sparrow, Coral	Self	362	1
Spencer, LuCus	Self	408	2
Spencer, Sheri	Self	909	2
Standley, J Casey	Business	751	1
Stanton, Marsha	Self	791	2
Staples, Todd	State Agency	397	2
Steel, Natalie	Self	95	2
Steele, Mark	Media Outlet	499	2
Stein, Luiz C		788	2
Stein, Molly	Educational Institution	552	2
Stein, Ron D	Business	349	1
Steiner, John	Self	708	1
Stenhouse, Angela	Self	227	2
Stenhouse, Paul	Self	207	5
Stenner, Samantha	Self	906	2
Stevenson, Representative John A	State Official	491	3
Stillman, William C	Self	606	1
Stirrat, Barbara	Self	723	2
Stirrat, Barbara	Self	724	2
Stoddard, Jayden	Self	372	3
Stoor, Jim	Self	47	6
Strain, Mike	State Agency	190	5
Stringer, Cam Arthur	Self	720	3
Strolberg, Theresa	Self	837	1
Strolberg, Theresa	Self	855	1
Strong, Ed	Self	426	2
Struhsacker, Debra	Self	745	2
Stubbens, Joan	Self	431	1
Sturgess, James A	Self	763	2
Sturgis, George	Self	577	4
Sturm, Jack	Self	34	2

Lastname, Firstname	Affiliation	Letter Number	Number of Comments
Suda, Michael P	Self	591	2
Sutorius, Mike	Self	84	2
Swain, Carter	Self	944	1
Swann, Steve & Tawni	Self	248	1
Swendsen, Mike	Business	273	2
Swensen, Kerry W	Self	687	2
Swore, Wendy	Self	154	2
Tauzin, Brian A	Self	940	3
Taylor, Danny L	Self	574	3
Taylor, Dorothy	Self	322	1
Taylor, Jack	Business	56	3
Taylor, Jesse	Local Agency	301	2
Taysom, Terry W	Organization	905	1
Terteling, AJ	Business	493	1
sla, Arthur	Self	398	1
Tews, Gerald	Self	172	2
Thomas, Brent J	Self	728	2
Thomas, Kerry	Self	688	1
Thomas, Steve	Self	601	1
Thomasson, B	Self	419	1
Thompson, Bret L	Self	878	2
Thompson, Chris	Self	360	1
Thompson, Phillip	Business	428	1
Thompson, Senator Francis C	State Official	281	2
Thomson, Sheryl	Self	129	3
Thomson, Wayne R	Self	153	2
Thron, S Scott	Business	93	2
Tidwell, Carl & Myrna	Self	160	2
Tillotson, Sherril	Self	127	3
Tingey, Matt	Self	793	3
ppets, John H	Self	264	2

Lastname, Firstname	Affiliation	Letter Number	Number of Comments
Titcomb, Charles	Local Agency	529	2
Titcomb, Charles	Self	736	4
Titcomb, Pennie	Self	809	3
Tomchak, Jordan	Self	679	2
Torgesen, Bradley C	Self	857	1
Torgeson, Shannon S	Self	876	1
Toups, Todd	Self	519	3
Trail, Representative Tom	State Agency	443	1
Traylor, Ricky D	Self	812	3
Tridle, Bob	Self	726	2
Troxel, Rob	Business	618	1
Tufts, Leland W	Self	459	3
Tufts, Wayne	Self	470	2
Tunnell, Tom	Organization	184	3
Turner, Mrs	Self	92	1
Utley, Christian	Business	930	3
Valentine, Mandy	Self	344	3
Van Bree, Frank	Self	889	1
Van Bree, Frank	Self	864	1
Van Dam, Cornel (FORM 3)	Self	971	2
van den Broek, Hans	Self	336	1
Varilone, Anthony	Self	351	3
Vaughn, Anthony	Self	495	3
Veile, Mike	Self	590	3
Vernon, Shaye F	Self	831	2
Veselka, Dave	Self	8	2
Vice, Michael	Self	901	4
Vicini, John L	Self	773	1
Vidmer, Gary	Business	634	3
Viehweg, Allen	Self	354	1
Vitucci, Claire	Self	295	1

Lastname, Firstname	Affiliation	Letter Number	Number of Comments
Vorsteveld, Andre & Lydia	Self	77	3
Vranes, John R	Self	774	2
Vranes, Randy	Self	699	3
Vroom, Jay	Business	471	2
Wahlen, Val	Self	250	1
Waite, Curt	Business	488	1
Waldemar, Dan	Business	317	2
Walker, John	Business	583	1
Wallace, Scott	Self	411	1
Watson, Kent	Self	65	2
Wayment, Joyce	Self	237	3
Weaver, Darwin	Self	254	1
Webb, Ila & Norman	Self	175	1
Webley, Jared	Self	766	2
eks, Larry & Nancy	Self	187	2
Weitz, Joe	Organization	368	1
Wells, Casey	Self	945	3
Wells, Kevin	Self	66	5
West, Judith C	Self	374	4
West, Stephen E	Business	834	2
Westerberg, Richard	Local Agency	534	2
Westerberg, Russell	Self	389	2
Wheatley, Kyle	Self	185	4
White, Amity	Self	719	1
Whitmore, Dan	Business	163	1
Wilkinson, Robert F	Business	759	1
Williams, Arizona	Self	926	1
Williams, Eric	Business	887	2
Williams, Gina	Self	27	2
Williams, James	Self	765	2

Lastname, Firstname	Affiliation	Letter Number	Number of Comments
Williams, Kristine	Self	919	1
Williams, Marcie	Organization	718	1
Williamson, John	Self	54	5
Wilson, Galen L	Self	91	4
Wilson, Matthew	Self	384	1
Wind, Donald R	Self	168	1
Winder, Charles	State Agency	122	3
Winegar, Bruce	Self	725	4
Winner, Warren	Self	850	1
Winter, Monty C	Self	242	1
Winward, Blair L	Self	935	1
Withers, Diana	Self	661	2
Wittman, Greg	Self	757	2
Wolff, Dennis C	State Official	805	3
Wood, Representative Fred	State Official	278	2
Wooley, Kent	Business	306	3
Wright, Bill	Self	496	2
Wright, Eugene	Self	21	2
Wright, H Norman	Self	347	3
Wright, Hal	Business	157	3
Wright, Kevin	Self	689	3
Wright, Lester	Self	192	1
Wright, Mitzi	Self	89	2
Wright, Mitzi	Self	88	1
Wrigley, Bryce	Self	951	1
Wrubell, Allan	Self	929	1
Yamauchi, Ryan	Self	920	2
Yancey, Paul	Self	807	2
Young, Gerald L	Self	324	2
Young, Shayley		217	4

Lastname, Firstname	Affiliation	Letter Number	Number of Comments
Young, Tracy	Self	143	4
Young, Wendi 1	Self	479	5
Zerr, Terry J	Business	760	2
		TOTAL:	**2312**

Table B — Comment Letters Numerically

Letter Number	Lastname, Firstname	Affiliation	Number of Comments
1	Mickelson, Clisty	Self	1
2	Nelson, Clyde G	Self	2
3	Schade, Warren	Business	2
4	Kunz, Corey	Self	3
5	Hemmert, Dan	Self	1
6	Petersen, Darlene	Self	1
7	Craig, Darol	Self	1
8	Veselka, Dave	Self	2
9	Colton, David L	Self	3
10	Slagowski, Steve	Business	1
11	Schwenk, Denis	Self	1
12	Duran, Jon	Business	4
13	Crane, Don L	Self	1
14	Mazza, Doug	Self	3
15	Aplanalp, Dwight Dee	Self	1
16	Little, Dwight	Self	4
17	Hegemann, Edward	Self	4
18	Hodgin, Ed	Self	2
19	Bingham, EM	Self	4
20	Andersen, Ethel	Self	5
21	Wright, Eugene	Self	2
22	Petersen, Gary Pete	Self	4
23	Bramhall, Scott	Business	2
24	Hess, Norman B	Business	6
25	Peters, Gene C	Self	2
26	Butcher, George	Self	2
27	Williams, Gina	Self	2
28	Rasmussen, Linda	Organization	2
29	Murray, Greg	Self	1
30	Gutterball,	Self	1
31	Hayden, Hans	Self	3
32	Sexton, Bob	Business	2
33	Robbins, Nate	Business	3
34	Sturm, Jack	Self	2

Letter Number	Lastname, Firstname	Affiliation	Number of Comments
35	Hardcastle, James & Shannan	Self	2
36	Brown, Janene	Self	2
37	Kelly, Jared	Self	1
38	Obray, Jared	Self	2
39	Christensen, Jason P	Self	2
40	Hall, Jason	Self	1
41	Reading, Jason	Self	3
42	Public, Jean	Self	2
43	Blain, Jeff	Self	2
44	Bowen, Jeff	Self	2
45	Sorensen, Jill Ann	Business	8
46	Smith, Jim	Self	3
47	Stoor, Jim	Self	6
48	Apel, Jodi	Business	2
49	Phillips, Joe	Self	5
50	Rice, Joe E	Self	2
51	Blakeslee, John	Self	3
52	Currie, John	Business	5
53	Kotwick, John	Self	1
54	Williamson, John	Self	5
55	Johnson, Jonas D	Self	1
56	Taylor, Jack	Business	3
58	Mendenhall, Karen	Self	2
59	Phillips, Karen	Self	1
60	Andersen, Kay & Ethel	Self	1
61	Chapin, Kelly	Self	1
62	Howell, Ken & Mary Beth	Self	1
63	Jolley, Kendall & Janine	Self	4
64	Skinner, Kent A	Self	2
65	Watson, Kent	Self	2
66	Wells, Kevin	Self	5
67	Brewer, Kris	Self	9
68	Garvin, Kristina	Self	1
69	Gardner, Lance	Self	6
70	Smith, Leann	Self	3
71	Manning, Leon & LeeAnn	Self	1

Letter Number	Lastname, Firstname	Affiliation	Number of Comments
72	Carlson, Linda	Self	3
73	Hamilton, Linda	Self	2
74	Nielsen, Linda	Self	3
75	Rasmussen, Linda	Self	2
76	Nelson, Lori	Self	2
77	Vorsteveld, Andre & Lydia	Self	3
78	May, Margo	Self	1
79	Burg, Marilyn	Self	1
81	Parker, Mark	Self	2
82	Chase, Roger W	Local Agency	2
83	Merritt, Mick D	Self	2
84	Sutorius, Mike	Self	2
85	Humble, Miles C	Self	2
86	Rogers, Joel	Organization	2
87	Briggs, Miranda	Self	2
88	Wright, Mitzi	Self	1
89	Wright, Mitzi	Self	2
90	Humble, Delvin L	Self	2
91	Wilson, Galen L	Self	4
92	Turner, Mrs	Self	1
93	Thron, S Scott	Business	2
94	Gunter, Natalie	Self	1
95	Steel, Natalie	Self	2
96	Dickey, Bob	Organization	3
97	Litterer, Ron	Organization	3
98	Peebles, Travis	Business	1
99	Gannon, Patrick J	Self	1
100	Jeffries, Paul	Self	1
101	Miller, Paul	Self	1
102	Firth, Phillip	Self	2
103	Myers, Ron	Business	3
104	Mossman, Ralph	Self	1
105	Ruocco, Raphael	Self	2
106	Fuller, Richard	Self	2
107	Keller, Rick	Self	2
108	Byars, Robert	Self	3

Letter Number	Lastname, Firstname	Affiliation	Number of Comments
109	Callihan, Robert	Self	4
110	Myres, Robert	Self	1
111	Myres, Robert	Self	1
113	Myres, Robert	Self	1
114	Salisbury, Ron & Vickie	Self	3
115	Henning, Ronica	Self	1
116	Gunnell, Roven	Self	1
118	Hendricks, Russ	Self	3
119	Herman, Ryan	Self	2
120	Kimball, Scott	Self	2
121	Robertson, Larry	Business	2
122	Winder, Charles	State Agency	3
124	Mortimer, Dean	Self	3
125	Siddoway, Jeff	Self	3
126	Humble, Shelly	Self	2
127	Tillotson, Sherril	Self	3
128	Ringling, Sherwood L	Self	1
129	Thomson, Sheryl	Self	3
130	Siepert, Spence	Self	3
131	Heiner, Paul	Business	3
132	Allred, Steve	Self	3
133	Mendenhall, Tab	Self	2
134	Sparks, Tad	Self	2
135	Lindsley, Ted	Self	2
136	Skinner, Terie	Self	2
137	Andrade, Terry	Self	2
138	Ashley, Thomas	Self	3
139	Bassett, Tom	Self	3
140	Coyner, Tom	Self	6
141	Frankos, Tom	Self	1
142	Barnes, Tracy	Self	1
143	Young, Tracy	Self	4
144	Anderson, Trinitie	Self	1
145	Moultrie, Trisha	Self	3
146	Neilsen, Troy	Business	1
147	Hatch, Tyson		2

Letter Number	Lastname, Firstname	Affiliation	Number of Comments
148	Byington, Troy		Business 2
149	Johnson, Randy	Business	1
150	, Vern	Self	1
151	Heins, VJ	Self	3
152	Heins, Warren W	Self	4
153	Thomson, Wayne R	Self	2
154	Swore, Wendy	Self	2
155	Rosa, Ted	Business	1
156	Cooper, Gordon	Business	2
157	Wright, Hal	Business	3
158	Smith, Paul	Business	1
159	Hoopes, John L	Business	5
160	Tidwell, Carl & Myrna	Self	2
161	Clark, Carolyn T	Self	1
162	Pherigo, Charles T & Ellen G	Self	2
163	Whitmore, Dan	Business	1
164	Fliesher, David	Self	3
165	Griffiths, Dave	Self	4
166	Gunnell, Dean R & Karleen L		2
168	Wind, Donald R	Self	1
169	Ketterling, Elmer & Atta	Self	1
170	McKay, Frances	Self	1
171	Shuler, George & Nola	Self	3
172	Tews, Gerald	Self	2
173	Guentz, Gerald		2
174	Lloyd, Gillian	Self	3
175	Webb, Ila & Norman	Self	1
176	Fry, AH	Business	3
177	Barthlome, Jackie	Self	2
178	McCulloch, James	Self	1
179	Barnes, Jan	Self	1
180	Hall, Jon C	Business	1
181	Cantrell, Jerrod		3
182	Gilliam, John W		1
183	Kalyani, Jitendra V	Business	1
184	Tunnell, Tom	Organization	3

Letter Number	Lastname, Firstname	Affiliation	Number of Comments
185	Wheatley, Kyle	Self	4
186	Grupp, Larry & Carol	Self	2
187	Weeks, Larry & Nancy	Self	2
188	Boots, Larry	Self	2
189	Dutson, Leora	Self	2
190	Strain, Mike	State Agency	5
191	Smith, Les	Self	1
192	Wright, Lester	Self	1
193	Rothwell, Lois		1
194	Loveland, Karl	Business	3
195	Kuther, Mary Ann	Self	1
196	Hans, Mansij	Self	1
197	Permann, Marcia	Self	1
198	Sodjum, Marguerite	Self	1
199	Humble, Mark	Self	2
200	Jurgen, Meghan	Self	4
201	Jones, Michael	Self	2
202	Lutes, Mary Kay	Self	3
203	Kyle, Mr & Mrs Dale	Self	1
204	Brand, Norma Meyer	Self	1
205	Murdock, Norris M & Doris B	Self	1
206	Allgood, Lane	Organization	2
207	Stenhouse, Paul	Self	5
208	Auth, Phil		1
209	Keller, R Dwain		3
210	Raybould, Representative Dell	State Official	3
211	Gibbs, Representative Marc	State Official	3
212	Shepherd, Representative Mary Lou	State Official	3
213	Simmons, Richard L	Self	1
214	Morgan, Ronald	Self	1
215	Barnes, Ronda	Self	3
216	Corder, Senator Tim	State Official	3
217	Young, Shayley		4
218	King, Glenda	State Agency	4
219	Evangelho, Susan	Self	1
220	Mickelson, Todd	Self	3

Letter Number	Lastname, Firstname	Affiliation	Number of Comments
221	Barnes, Trudy	Self	4
222	Alleman, Vern	Self	1
223	Harris, Tom	Business	6
224	Perez, Wilma & Oscar	Self	1
225	Hepworth, Allan	Self	1
226	Lent, Amy	Self	3
227	Stenhouse, Angela	Self	2
228	Christenson, Kirk	Business	2
229	Browning, Carol Felt	Self	3
230	Griffin, Randy	Business	1
231	Nelson, Craig	Business	3
232	Smitt, Jeffcoat	Business	1
233	Alleman, John	Self	2
234	Franson, John	Self	2
235	Goode, Jon	Self	2
236	Anderson, Joseph	Self	2
237	Wayment, Joyce	Self	3
238	Ballard, Kirt	Business	2
239	Hosman, Scott	Business	2
240	Sharp, Michael	Self	3
241	Blevins, Dawn		3
242	Winter, Monty C	Self	1
243	Smith, Randy C	Self	1
244	Rusche, Representative John	State Official	3
245	Siek, Rob	Business	1
246	Farmer, Roy		1
247	Hatley, Sherman	Self	1
248	Swann, Steve & Tawni	Self	1
249	Crane, Stuart D	Self	2
250	Wahlen, Val	Self	1
251	Hays, Anita	Self	1
252	Burroughs, C	Self	1
253	Allen, Carol	Self	2
254	Weaver, Darwin	Self	1
255	Matyus, David		3
256	Bird, Dennis L	Self	1

Letter Number	Lastname, Firstname	Affiliation	Number of Comments
257	Bryant, Elizabeth	Self	3
258	Hymas, Glade C & Judy J	Self	3
259	Elder, Glen & Jane	Self	1
260	Bryant, Greg	Self	3
261	Filiaga, Isley	Self	1
262	Filiaga, James & Chrystal	Self	1
263	Seedall, Jay	Self	1
264	Tippets, John H	Self	2
265	Keller, Kevin J	Self	1
266	Filiaga, KJ	Self	1
267	Skinner, Lucille	Self	1
268	Maronick, Mark	Business	1
269	Olson, Mark	Self	1
270	Johnson, Melanie Sue	Self	1
272	Smith, Ned	Self	2
273	Swendsen, Mike	Business	2
274	Keller, Nancy B	Business	1
275	Sayer, Douglas A	Business	3
276	Lee, Tony	Business	3
277	Green, Rebecca	Self	1
278	Wood, Representative Fred	State Official	2
279	Gardner, Rex	Self	1
280	Miller, Roy D	Self	2
281	Thompson, Senator Francis C	State Official	2
282	Hotlos, Andrzej	Business	2
283	Hein, Shirley	Self	4
285	Filiaga, Tiana	Self	1
286	Filiaga, TJ	Self	1
287	Mateos, Tonya	Self	3
288	Filiaga, Tui	Self	1
289	Hendren, William L	Business	2
290	Doman, Brad	Business	3
291	McClellan, Alan	Self	2
292	Messenger, Cheryl		2
293	Engle, Mike	Business	2
294	Conlin, Cindy	Self	1

Letter Number	Lastname, Firstname	Affiliation	Number of Comments
295	Vitucci, Claire	Self	1
296	Moncrief, Gil & Jo	Self	2
297	Baker, Glen & Margaret	Self	1
298	Pearhill, Scott	Organization	2
299	Hall, Jason		1
300	Brune, Richard (Rick)	Business	3
301	Taylor, Jesse	Local Agency	2
302	Peterson, Jim	Self	2
303	Kretzschmar, Johann	Self	1
304	Dowling, Greg	Business	3
305	Norman, Kathleen	Self	1
306	Wooley, Kent	Business	3
307	Harrison, Lance	Public Agency	1
308	Martin, Linda K	Self	2
309	Borné, Dan S	Business	3
310	Mumford, Neil	Self	1
311	Bult, Scott	Business	1
312	Carpenter, Olivia	Self	1
313	Eskelson, Rick	Business	1
314	Lau, Robert	Self	1
315	Siemann, Bob	Business	5
316	Blackstock, Ted	Self	1
317	Waldemar, Dan	Business	2
318	Christensen, Timothy L	Business	2
319	Gnesa, Art	Self	1
320	Sparks, Bob	Self	2
321	Greene, Dennis & Karen	Self	2
322	Taylor, Dorothy	Self	1
323	Likes, Evelyn	Self	1
324	Young, Gerald L	Self	2
325	Gilliam, John W	Self	1
327	Hopkins, Larry	Self	1
328	Saunders, Lloyd	Self	3
329	Dooley, Mark C	Self	5
330	Mendenhall, Robert	Self	2
331	Hopkins, Vicky	Self	2

Letter Number	Lastname, Firstname	Affiliation	Number of Comments
332	Olorenshaw, Tim	Business	2
333	Christensen, Ashly	Self	1
334	O'Dell, Daniel	Self	2
335	Powell, Craig	Business	3
336	van den Broek, Hans	Self	1
337	Frankos, Janet	Self	2
338	Davis, Kreg L	Business	1
339	Drayton, Brad	Business	2
340	Sparks, Steve	Business	2
341	Neuschaefer, Kate	Self	1
342	Hillman, Kerry	Self	1
343	Lee, Lynda & Denny	Business	1
344	Valentine, Mandy	Self	3
345	Conn, Michael	Self	2
346	Koritnik, Carla	Business	2
347	Wright, H Norman	Self	3
348	Hubbard, R Brent & Karen	Self	2
349	Stein, Ron D	Business	1
350	Hunzeker, Sue	Self	2
351	Varilone, Anthony	Self	3
352	Bushner, Trent	Business	1
353	Callihan, Wesley J	Self	1
354	Viehweg, Allen	Self	1
355	Gentry, Anna		1
356	DeVeny, Bill & Betty	Self	2
357	, Brent	Self	1
358	Christensen, Cassie	Self	4
359	Snider, CH	Self	1
360	Thompson, Chris	Self	1
361	Mullinix, Coleen	Self	1
362	Sparrow, Coral	Self	1
363	Mathews, Don		1
364	Hasselquist, Eliza	Self	1
365	Jensen, Etta	Self	1
366	Mckinley, Forrest	Self	1
367	Hollingsworth, Greg	Self	2

Letter Number	Lastname, Firstname	Affiliation	Number of Comments
368	Weitz, Joe	Organization	1
369	Madsen, Roger B	State Agency	1
370	Hale, Don	Organization	1
371	Northey, Bill	State Agency	3
372	Stoddard, Jayden	Self	3
373	Johnson, James B	Self	3
374	West, Judith C	Self	4
375	Collins, Jeremy Sasser	Self	3
376	Flemming, Jim	Self	3
377	Balls, Jonathan	Self	2
379	Snider, Kay	Self	3
380	Chandler, Kirk R	Self	2
381	Dooley, Laurie	Self	4
382	Edmo-Suppah, Lori	Media Outlet	1
383	Messenger, Louise	Self	3
384	Wilson, Matthew	Self	1
385	Riggers, Nathan	Organization	1
386	Miller, Paul	Self	1
387	Haun, RJ	Self	3
388	Pratt, Robert	Self	1
389	Westerberg, Russell	Self	2
390	Pratt, Seth	Self	3
391	Bartholomew, Sidney	Self	2
392	Olmstead, Stephanie	Self	3
393	Gilmer, Steve	Self	1
394	Cook, Stanley V	Self	2
395	Mitchell, TD	Self	3
396	Blau, Terry	Self	3
397	Staples, Todd	State Agency	2
398	Tesla, Arthur	Self	1
399	Brown, Cody	Business	2
400	Eck, Cody	Self	1
401	Barnes, Daniel V	Self	1
402	Noleen, Jeff	Self	1
403	Baker, Jerry	Self	1
404	Dooley, Julie	Self	2

Letter Number	Lastname, Firstname	Affiliation	Number of Comments
405	Lish, Steve	Business	2
406	Miller, Sue	Business	3
407	Ahearn, Ken	Self	2
408	Spencer, LuCus	Self	2
409	Herr, Christian R	Business	2
410	Little, Richard	Self	1
411	Wallace, Scott	Self	1
412	Izatt, Drew	Business	1
413	Nelson, Dan	Business	1
414	Lish, Tim	Self	2
415	Shears, Wayne	Self	1
416	Hanley, Rick	Business	1
417	Raap, Aaron	Self	1
418	Hopkins, Ammon	Self	3
419	Thomasson, B	Self	1
420	Brown, Dean I	Business	2
421	Cullen, Chris	Self	1
422	Clenderon, Daren	Self	1
423	Saunders, Denise	Self	1
424	Hopkins, Desiree	Self	5
425	Anderson, Donald P	Self	1
426	Strong, Ed	Self	2
427	Patton, Heather	Self	1
428	Thompson, Phillip	Business	1
429	Martin, Janene D	Self	1
430	Simons, Janice	Self	1
431	Stubbens, Joan	Self	1
432	Petersen, Jodi	Self	2
433	Ludwig, John	Self	1
434	Arrington, Joyce	Self	1
435	Paulsen, Kellie	Self	1
436	Kramer, Lin	Self	1
437	Bartschi, Melba	Self	3
438	Lodge, Senator Patti Anne	Self	1
439	Johnson, Ben	Business	2
440	Johns, Quey	Self	1

Letter Number	Lastname, Firstname	Affiliation	Number of Comments
441	Peterson, Ralph	Self	1
442	Lake, Representative Dennis M	State Agency	1
443	Trail, Representative Tom	State Agency	1
444	Jackson, Rocky	Self	1
445	Barker, Brent	Business	3
446	Purcell, Russell	Self	1
447	Cullen, Shannon J	Self	1
448	Gould, Celia R	State Agency	1
449	Geddes, Tammy	Self	1
450	Barnes, Travis	Self	1
451	Borchert, Vernon & Heather	Self	1
452	Gibson, Val	Business	3
453	Smith, Alyssa	Self	1
454	Anderson, Brian	Self	3
455	Dooley, Danelle	Self	1
456	Holcomb, Gerald & DeEtta	Self	2
457	Bateman, Chris	Business	3
458	Cheung, Kwok	Federal Agency	2
459	Tufts, Leland W	Self	3
460	Kalmegh, Manish	Self	1
461	Goodenough, Robert	Business	1
462	Richard, Byron	Organization	3
463	Kuperus, Henry	Organization	3
464	Rosa, Quinton	Business	3
465	Ruchti, Representative James W	State Official	4
466	Smith, Greg	Business	3
467	Pratt, Jim	Business	2
468	Scott, Tabitha	Self	4
469	Brennan, Andrew	Business	3
470	Tufts, Wayne	Self	2
471	Vroom, Jay	Business	2
472	McBride, Elizabeth	Self	1
473	Hemmert, Debra	Self	2
474	Plothow, Roger	Organization	2
475	Feuerborn, Richard	Business	3
476	Allen, Sandra	Self	1

Letter Number	Lastname, Firstname	Affiliation	Number of Comments
477	Brackett, Senator Bert	2	
478	Goedde, Senator John W	State Official	3
479	Young, Wendi 1	Self	5
480	Michel, Brad	Self	2
481	Cay, Chris	Self	2
482	Beauregard, Doug	Self	4
483	Shea, Edward	Self	2
485	Kotek, John	Self	2
486	Crawford, Alan	Self	3
487	Erickson, Alan	Self	1
488	Waite, Curt	Business	1
489	Payne, Dan	Business	3
490	Beins, Farrell	Self	1
491	Stevenson, Representative John A	State Official	3
492	Hamp, Ron	Self	1
493	Terteling, AJ	Business	1
494	Donahoo, Ben	Self	3
495	Vaughn, Anthony	Self	3
496	Wright, Bill	Self	2
497	Rasmussen, Billy	Self	1
498	Huseman, Brad	Self	2
499	Steele, Mark	Media Outlet	2
500	Ericsson, Chad & Paulette	Self	4
501	Fausett, David	Self	5
503	Brown, Donna	Self	2
504	Dobbins, Eric	Self	4
505	Shumway, Steven	Self	4
506	Fenton, Kevin	Business	2
507	Just, J Kent	Organization	1
508	Smith, Jeff	Self	2
509	Schvaneveldt, Kirsten	Self	1
510	Hedden, Michael	Self	1
511	Gerhardt, Mike	Self	2
512	Prescott, Randall E	Self	3
514	Evans, Richard	Self	4
515	Isbell, Scott	Business	3

Letter Number	Lastname, Firstname	Affiliation	Number of Comments
516	Dodd, Sheree	Self	2
517	Baker, Thomas K	Self	3
518	Freeman, Todd	Self	1
519	Toups, Todd	Self	3
520	Doll, Wendy	Business	2
521	Kennedy, Keith	Organization	4
522	Harper, Zach	Self	2
523	Reisinger, Mark		2
524	Hadley, Steve	Local Agency	4
525	Kunz, Montain	Local Agency	3
526	Burdin, Christy	Self	1
527	Lester, William	Local Agency	2
528	Johnson, Albert K	Local Agency	2
529	Titcomb, Charles	Local Agency	2
530	Burgin, Marshall	Local Agency	2
531	Hendickson, F Lee	Local Agency	3
532	Foster, Dean	Self	1
533	Dunker, Robert	Business	3
534	Westerberg, Richard	Local Agency	2
535	Guthrie, Mike	Business	1
536	Inman, Gracie	Self	1
537	Smith, Helen K	Self	3
538	Gould, Celia R	State Agency	2
539	Inman, Jake	Self	1
540	McManus, Jonathon	Self	1
541	McCulloch, Kallie	Self	1
542	Anderson, Ronald	Organization	2
543	Foster, Lee & Pam	Self	1
544	McCulloch, Lonnie	Self	1
545	McCulloch, Lori	Self	1
546	Aasmundstad, Eric	Organization	2
547	Paul, Gregory	Business	4
548	Inman, Noah	Self	1
549	McManus, RaLyn	Self	1
550	McCulloch, Rinnie	Self	1
551	Barrett, James	Business	4

Letter Number	Lastname, Firstname	Affiliation	Number of Comments
552	Stein, Molly	Educational Institution	2
553	Peterson, Carolyn	Business	2
554	Malone, Donna	Business	5
555	Dodson, Johnny	Organization	4
556	Berube, Anne	Self	1
557	Rogers, Kevin	Organization	4
558	Gilliam, Gynii A	Business	4
559	Koch, Barry	Self	4
560	Baumeister, Bart	Self	1
561	Christiansen, Beverly	Self	2
562	Erickson, Brent	Self	3
563	Rigby, Carmela	Self	2
564	Moore, Cindy	Self	1
565	Keller, Clint	Self	3
566	Hill, Curt	Self	3
567	Bersanti, Dan	Business	1
568	Gustafson, Dave	Self	1
569	Davis, Don C	Self	3
570	Knox, David E	Self	1
571	Slagowski, Steve	Business	2
572	Angstadt, William	Organization	2
573	Schroeder-Munson, Dianne	Self	2
574	Taylor, Danny L	Self	3
575	Gates, Edward E	Self	3
576	Bartschi, Erin	Self	1
577	Sturgis, George	Self	4
578	Black, Gary	Organization	4
579	Robinson, Rick	Organization	2
580	Martinsen, Jeff	Self	2
581	Davis, James F	Self	2
582	Keefner, John	Self	2
583	Walker, John	Business	1
584	Brown, Jonathan	Self	2
585	Chepote, Jorge	Self	1
586	Cunningham, Jason T	Self	3
587	Skaer, Laura	Self	4

Letter Number	Lastname, Firstname	Affiliation	Number of Comments
588	Nield, Michael	Self	3
589	Hindmarch, Michelle	Self	3
590	Veile, Mike	Self	3
591	Suda, Michael P	Self	2
592	Neilsen, Nicole	Self	2
593	Rasmussen, Vaughn 2	Business	2
594	Frazier, Ron	Self	3
595	Rembelski, Ron	Self	2
596	Egan, Scott	Self	2
597	Even, Bill	State Agency	2
598	Held, Michael	Organization	1
599	Carlson, Serena	Self	2
600	Smith, Shaun	Self	1
601	Thomas, Steve	Self	1
602	Brewer, Terri J	Self	2
603	Lau, Todd	Self	2
604	Brotherton, Devin	Federal Agency	1
605	Bullock, Wayne	Business	1
606	Stillman, William C	Self	1
607	Pariseau, William G	Self	4
608	Johnson, Robert 1	Organization	2
609	Nauman, Jeff C	Business	2
610	Smith, Alicia R	Self	4
612	Smith, Brandi Ann	Self	4
614	Hoffman, Rick	Business	2
615	O'Brien, Richard W	Local Agency	2
616	Cooksey, Jerry	Organization	1
617	Nield, Elva K	Self	2
618	Troxel, Rob	Business	1
619	Gough, George	Self	2
620	Dietrich, Donald A	State Agency	1
621	Kirkbride, Jim	Self	4
622	Sims, Jeffery C	Self	3
623	Fausett, Jessica		1
624	Nikkel, James Kim	Self	3
625	Nield, Jocelyn	Self	2

Letter Number	Lastname, Firstname	Affiliation	Number of Comments
626	Smith, James Weston	Self	4
627	Nield, Kenneth	Self	1
628	Nield, Keven	Self	1
629	Goehring, Doug	State Agency	1
630	Smith, Robert Burke	Self	4
631	Kirkbride, Rebecca	Self	4
632	Bell, Maxine T	State Agency	1
633	Sands, Thomas R	State Agency	3
634	Vidmer, Gary	Business	3
635	Smith, Robert Phillip	Self	4
636	Nield, Samantha	Self	3
637	Hahn, James F	State Agency	2
638	Cook, Ted M	Self	3
639	Jensen, Robert	Business	2
640	Nield, Teresa	Self	2
641	Imler, Lisa	Business	3
642	Lytle, Steven	Business	3
643	Sebesta, Viola	Business	1
647	Sherman, Francis X	Business	2
648	Hale, Amanda	Self	2
649	Clark, April	Self	1
650	Mickelsen, Ben	Self	2
651	Kummeth, Brian	Self	2
652	Brower, Brittany	Self	1
653	McCurdy, Bendell	Business	2
654	Smith, Chance	Self	2
655	Campbell, Chayce	Self	2
656	Page, Cheyenne	Self	2
657	Carpenter, Chuck & Helen	Self	3
658	Beebe, Colton	Self	2
659	Madsen, Courtney	Self	2
660	Hall, Debie	Self	2
661	Withers, Diana	Self	2
662	Moore, Darrel & Marie	Self	2
663	Issacson, Dominique	Self	3
664	Byington, Drew	Self	1

Letter Number	Lastname, Firstname	Affiliation	Number of Comments
665	Farnsworth, David W	Self	2
666	Peck, Eldon	Business	1
667	Peck, Eldon	Local Agency	1
668	Shippen, Eliza	Self	1
670	Peck, Gloria	Self	1
671	Bartholomay, Gracie	Self	2
672	Bullard, Hailey	Self	2
673	Moore, Hannah	Self	2
674	Moser, Heather	Self	1
675	Howard, Cody	Business	1
676	LaBeau, Alex	Organization	3
677	Larsen, Janet	Self	1
678	Cook, Jerry D	Self	2
679	Tomchak, Jordan	Self	2
680	DeClark, Joseph & Connie	Self	1
681	Keller, Joshua	Self	2
682	Dowling, Greg	Business	3
683	Mendez-Torres, Sergio	Business	2
684	Johnson, Karin	Self	4
685	Butikofer, Kaylee	Self	2
686	Downie, Keegan	Self	2
687	Swensen, Kerry W	Self	2
688	Thomas, Kerry	Self	1
689	Wright, Kevin	Self	3
690	Casper, Kray	Self	2
691	Haynie, Lacey	Self	3
692	Gaines, Judy A	Business	1
693	Orr, Linda	Self	2
694	Hance, Earl	State Agency	2
695	Johansson, Mike	Self	1
696	LoBianco, Sal	Public Agency	3
697	Scott, John	Business	1
698	Culver, Chester J	State Agency	1
699	Vranes, Randy	Self	3
700	Smith, Richard J	Self	2
701	McCown, Robert	Self	1

Letter Number	Lastname, Firstname	Affiliation	Number of Comments
702	McLain, Sandi	Self	2
703	Cameron, Dean L	State Agency	2
704	Darrington, Denton	State Agency	3
705	Broadsword, Senator Joyce M	State Official	5
706	Jensen, Shania	Self	2
707	Humble, Shelly	Self	2
708	Steiner, John	Self	1
709	Parsons, Teryl	Self	1
710	Dahlke, Tucker	Self	1
711	Hamilton, Ken	Organization	1
712	Ray, Kathy S	Business	5
713	Bowman, Aaron	Self	1
714	Bowman, Eric	Self	1
715	Guyton, Adam	Self	1
716	Plemel, Adrienne	Self	4
717	Renfroe, Allen	Self	2
718	Williams, Marcie	Organization	1
719	White, Amity	Self	1
720	Stringer, Cam Arthur	Self	3
721	Hill, Dorsey	Business	2
722	LeVake, Barbara	Organization	1
723	Stirrat, Barbara	Self	2
724	Stirrat, Barbara	Self	2
725	Winegar, Bruce	Self	4
726	Tridle, Bob	Self	2
727	Bagshaw, Brent	Self	2
728	Thomas, Brent J	Self	2
729	Skinner, Brian	Self	1
730	Andersen, Bruce	Self	2
732	Bronson, Bruce A	Self	2
733	Hammond, Bruce	Self	1
734	Noble, Elisa	Organization	2
735	Keller, Caron	Self	2
736	Titcomb, Charles	Self	4
737	Leatherman, Chris	Self	1
738	Bullock, Ken	Local Agency	5

Letter Number	Lastname, Firstname	Affiliation	Number of Comments
740	Bredenkamp, Troy	Organization	2
741	Bolton, Clair R	Self	3
742	Kenyon, Craig	Self	1
743	Shooter, Deanna	Self	3
744	Shea, Debbie	Organization	3
745	Struhsacker, Debra	Self	2
746	Parker, Doug	Self	2
747	Jackson, Dan S	Self	1
748	Arndt, Edna	Self	1
749	Keefner, Elizabeth	Self	3
750	Kim, F	Self	1
751	Standley, J Casey	Business	1
752	Foster, Fess	Self	3
753	Gilmer, Flora	Self	2
754	Duval, Frank	Self	4
755	Brogan, Gary	Self	1
756	Kimber, Gerald	Self	2
757	Wittman, Greg	Self	2
758	Glader, Paul	Business	3
759	Wilkinson, Robert F	Business	1
760	Zerr, Terry J	Business	2
761	Lyman, Jack	Organization	1
762	Muir, Frank W	Organization	1
763	Sturgess, James A	Self	2
764	Gilpin, Jackie	Self	2
765	Williams, James	Self	2
766	Webley, Jared	Self	2
767	Langedyke, Jefferey	Business	2
768	Green, Jennifer	Self	2
769	Frolic, John	Self	2
770	Hardy, John		1
771	Isaacson 1, John	Self	2
772	Isaacson 2, John	Business	3
773	Vicini, John L	Self	1
774	Vranes, John R	Self	2
775	Richeal, Kevin	Business	1

Letter Number	Lastname, Firstname	Affiliation	Number of Comments
776	Obrocto, Douglas	Business	3
777	Barden, Kathleen	Self	3
778	Kowallis, Kaye	Self	1
779	McAtee, Kelly	Self	1
780	Kunz, Kent	Self	1
781	Lauer, Kent	Self	2
782	Gower, Kim	Self	2
783	Nielson, Lane	Self	2
784	Baxter, Patty Jo & Larry	Self	1
785	Bourg, Lionel G	Self	1
786	Havili, Lesli		2
787	Chavez, Liz		1
788	Stein, Luiz C		2
789	Darrington, Lyn	Self	1
790	Compton, Mark	Organization	3
791	Stanton, Marsha	Self	2
792	Rollinson, Matt	Self	1
793	Tingey, Matt	Self	3
794	Brinkerhoff, Mae Dee		1
795	Danko, Michael J	Self	3
796	Ciletti, Mike	Self	1
797	Heywood, Mike	Self	3
798	Kaumo, Mike	Self	1
799	Pfister, Stephen	Business	2
800	Johnson, Roger	Organization	2
801	Hofeldt, Nicholas	Self	2
802	Lawhead, Nick	Self	2
803	Lawhead, Nick	Self	1
804	Peach, Terry L	State Official	2
805	Wolff, Dennis C	State Official	3
806	Sandretto, Paul	Self	2
807	Yancey, Paul	Self	2
808	Kowallis, Paul C	Self	1
809	Titcomb, Pennie	Self	3
810	Chan, Peter W	Self	1
811	Hogan, Leland J	Organization	2

Letter Number	Lastname, Firstname	Affiliation	Number of Comments
812	Traylor, Ricky D	Self	3
813	Dunker, Rhonda		3
814	Majhanovich, Rick	Self	4
815	Curtis, Richard	Self	1
816	Herman, Richard	Self	3
817	Leferink, Richard		3
818	Hyatt, Rick	Self	2
819	Cooper, Roy J		2
820	Dunker, Robert		5
821	Rigby, Robert L		2
822	Medina, Tony	Business	1
823	Smith, Ricky P	Self	3
824	Smith, Greg	Business	3
825	Blair, Senator Steve	State Official	2
826	McKenzie, Curtis	Business	2
827	McGee, Senator John	State Official	2
829	Berg, Shannon	Self	2
830	Balls, Shari	Self	2
831	Vernon, Shaye F	Self	2
832	Francis, Scott M		1
834	West, Stephen E	Business	2
835	Johnson, Tammy		3
836	Antonioli, Ted	Organization	1
837	Strolberg, Theresa	Self	1
838	Ford, Tim	Self	1
839	Mabe, Janice	Business	2
840	Hakemack, Travis	Self	4
841	Hamilton, Tyler	Self	1
842	Scales, Vicki	Self	3
843	Blankenship, Brett	Organization	3
844	Hopkins, Wade	Self	4
845	McGregor, Wallace	Self	2
846	Laraway, James W	Business	3
848	Scales, William	Self	2
849	Allen, Norman G	Business	2
850	Winner (1), Warren	Self	1

Letter Number	Lastname, Firstname	Affiliation	Number of Comments
851	Craft, Fred	Self	1
852	Larson, Vicki	Self	3
853	Husman, James	Self	4
854	Contreras, Luz	Self	2
855	Strolberg, Theresa	Self	1
856	Sisk, Robert & Rodna	Self	1
857	Torgesen, Bradley C	Self	1
858	Bower, Dalton	Self	1
859	Jolley, Joel	Local Agency	4
860	Peterson, Reed	Local Agency	6
861	Matthews, David H	Local Agency	6
862	Graunke, Colleen & Doug	Self	2
863	Calliston, David R	Self	3
864	Van Bree, Frank	Self	1
866	Priestley, Frank	Organization	3
867	Justice, Dawn	Organization	4
869	Black, Representative Max C	State Official	3
870	Hubbard, Mike	Organization	1
871	Klieve, Jeffrey R	Self	3
872	Moon, Marv	Business	2
873	Bedke, Representative Scott	State Official	2
874	Alver, Sheldon	Self	2
876	Torgeson, Shannon S	Self	1
877	Brammer, Bob	State Agency	4
878	Thompson, Bret L	Self	2
879	Kemmerer, Brian	Self	2
880	Pallante, Bruce	Self	3
881	Russell, Luke J	Business	2
882	Facer, Dennis	Business	2
883	Kline, Daniel S	Self	3
884	Carpenter, David	Self	4
885	Gilbert, Denise	Self	3
887	Williams, Eric	Business	2
888	Braatz, Frank	Self	3
889	Van Bree, Frank	Self	1
890	Andrus, Cecil	Business	4

Letter Number	Lastname, Firstname	Affiliation	Number of Comments
891	Semanko, Norm	Organization	3
892	Bassett, Jacob	Self	2
893	Hollingsworth, Jaron G	Self	2
894	Keely, Jerry	Self	2
896	Bloxham, Kurt	Self	1
897	Clark, Kathleen	Self	3
898	Hovis, Lu-Ann & Jim	Self	1
899	Decker, Lundyn	Self	1
900	Lyon, Matt	Self	2
901	Vice, Michael	Self	4
902	Farnsworth, Nina K	Self	3
903	Andrews, R Verlen	Self	1
904	Dollar, Rodney	Self	3
905	Taysom, Terry W	Organization	1
906	Stenner, Samantha	Self	2
907	Singleton, Samuel	Self	2
908	Lodge, Senator Patti Anne	State Official	2
909	Spencer, Sheri	Self	2
910	Gould, Steve	Self	1
911	Hasselstrom, Eric	Organization	2
912	Casperson, Thayne	Self	2
913	Jones, Tracy L	Self	3
914	Clark, Trent L	Local Agency	1
915	Baumann, Jim A	Self	2
916	Niesen, LuAnn	Self	1
917	Peterson, Robert	Self	3
918	Hasz, William K	Self	3
919	Williams, Kristine	Self	1
920	Yamauchi, Ryan	Self	2
921	Evans, Katharine	Self	2
922	Bruner, Dan	Self	2
923	Firth, Carolyn	Self	2
924	Perry, Carol	Self	2
925	Peirce, Bob	Self	3
926	Williams, Arizona	Self	1
928	Olmstead, Alan	Self	2

Letter Number	Lastname, Firstname	Affiliation	Number of Comments
929	Wrubell, Allan	Self	1
930	Utley, Christian	Business	3
931	Finck, Max	Business	1
932	Shields, Justin	Self	1
933	Campbell, Arlene	Self	2
934	Barnes, Boyce J	Business	2
935	Winward, Blair L	Self	1
936	Munson, Blake	Self	1
937	Monk, Bob A	Self	3
938	Bowers, Boni	Self	1
939	Cofer, Brian	Self	1
940	Tauzin, Brian A	Self	3
941	Searle, Bryan	Self	3
942	Barthlome, Bud	Self	2
943	Ordonez, Carlos	Self	1
944	Swain, Carter	Self	1
945	Wells, Casey	Self	3
946	Craig, Charles & Karen	Self	2
947	Koehler, Charles	Self	1
948	Erickson, Cindy	Self	2
949	Davis, Bill	Self	2
950	Barnes, Brandon J	Business	3
951	Wrigley, Bryce	Self	1
952	Geddes, Senator Robert L	State Official	2
953	Somsen, Earl	Local Agency	4
954	Hansen, Kirk L	Local Agency	3
955	, Confidential	Self	3
956	Rauch, Michael	Self	3
957	Franke, Travis	Self	3
958	Parkin, Richard B	Federal Agency	20
959	Parkin, Richard B	Federal Agency	40
960	Hoyt, Marv	Organization	12
961	Hoyt, Marv	Organization	39
962	Imhoff, Edgar A	Organization	7
963	Myers, Tom	Organization	68
964	Robison, John	Organization	46

Letter Number	Lastname, Firstname	Affiliation	Number of Comments
965	Schneider, Janice M	Business	8
966	Coby, Alonzo	Tribe	46
967	Mills, Damien	Federal Agency	27
968	Gamblin, Mark	Federal Agency	14
969	Pickard, Clay & Laura (FORM 1)	Self	3
970	Peterson, Collin (FORM 2)	Self	3
971	Van Dam, Cornel (FORM 3)	Self	2
972	Cook, Corey (FORM 4)	Self	1
973	Day, Chris (FORM 5)	Business	3
974	Shepherd, Aaron (FORM 6)	Self	1
975	Alvarez, Abel (FORM 7)	Self	1
976	Mai, Aaron (FORM 8)	Self	2
977	Allen, Adele (FORM 9)	Self	3
978	Santos, Adriano (FORM 10)	Self	3
979	Sebesta, Viola (FORM 11)	Business	1
980	Escher, Eckhard (FORM 12)	Business	3
981	Johnson, Ron (FORM 13)	Business	4
982	Smith, Carolyn (FORM 14)	Self	1
983	Packer, A Milo (FORM 15)	Self	2
984	Gohl, Clarence (FORM 16)	Self	1
985	Cleetell, AC (FORM 17)	Self	3
986	Simcox, Adrienne (FORM 18)	Self	3
987	Parkinson, Jed (FORM 19)	Self	3
988	Callister, Wade W (FORM 20)	Self	3
989	Scott, Seth (FORM 21)	Self	4
990	Machen, Kegan (FORM 22)	Self	3
		TOTAL:	**2312**

Table C — Geographic Representation of Comments

State/Country	Number of Comments
	294
AK	1
AZ	6
CA	15
CO	22
DC	12
GA	5
IA	28
ID	1451
IL	9
IN	2
KS	3
LA	33
MA	5
MD	9
MO	45
MT	23
ND	6
NE	6
NJ	6
NV	8
NY	7
OH	7
OK	5
OR	7
PA	7
SC	1
SD	3
TN	2

State/Country	Number of Comments
TX	15
UT	99
WA	108
WY	62
TOTAL:	**2312**

Table D — Number of Comments by Organization Affiliation

Organization Type	Number of Comments
	62
Business	344
Educational Institution	2
Federal Agency	104
Local Agency	56
Media Outlet	3
Organization	269
Public Agency	4
Self	1325
State Agency	45
State Official	52
Tribe	46
TOTAL:	2312

Table E — Number of Comments by Delivery Type

Delivery Type	Number of Comments
	9
Email	1261
Letter	1042
TOTAL:	2312

Table F – Form Letters

Form Number	Total Received	Description of Form
1	76	Support Alternative 1A because phosphorous is an important ingredient for glyphosate-based herbicides, the mine is important to the regional economy, and the use of the advanced technology liner to contain selenium protects the Blackfoot River and other water resources.
2	68	Support Alternative 1A because phosphorous is an important ingredient for glyphosate-based herbicides, the mine is important to the regional economy, this alternative requires crucial environmental safeguards, and this option also provides for reclamation to maintain healthy wildlife and productive grazing.
3	102	Support Alternative 1A because phosphorous is an important ingredient for glyphosate-based herbicides, and this option gives significant consideration to minimizing and mitigating the mines impacts.
4	107	Support Alternative 1A because phosphorous is an important ingredient for glyphosate-based herbicides.
5	73	Support Alternative 1A because phosphorous is an important ingredient for glyphosate-based herbicides, the mine is important to the regional economy, and P4 needs the opportunity to demonstrate their commitment to protecting the environment.
6	40	Support Alternative 1A because the mine benefits the economy of southeast Idaho.
7	50	Support Alternative 1A because phosphorous is an important ingredient for Roundup and other glyphosate-based herbicides and is crucial for the development of Roundup-Ready seeds.
8	60	Support Alternative 1A because this alternative will protect the environment while continuing to provide phosphorous which is an important ingredient for Roundup.
9	305	Support the proposed mine because the mine will employ environmental safeguards such as a laminated geosynthetic clay liner that will protect the Blackfoot River, the land will be responsibly restored after mining, the mine is important to the economy of southeast Idaho, and phosphorous is an important ingredient for Roundup.
10	585	Support Alternative 1A because phosphate mining is important to the regional economy and to other states, phosphorous is an important ingredient for Roundup and other glyphosate-based herbicides, and P4 takes extra steps every day to protect the environment.
11	70	Support P4's Blackfoot Bridge Mine.
12	3	Support P4's Blackfoot Bridge Mine because phosphorous is an important ingredient for Roundup and other glyphosate-based herbicides, P4 is important to local economy as well as our facilities in North Carolina and Poland, and P4 has gone to great lengths to develop measures for safe mining and protection of the environment.
13	2	Support Alternative 1A because phosphorous is an important ingredient for Roundup and many other products that we use, the land at the mine will be responsibly restored, P4 is important to the economy of Idaho, and P4 will use BMPs and advanced

Form Number	Total Received	Description of Form
		techniques to ensure water quality and restore the mine sites.
14	4	Oppose granting a permit to P4 because the short-term economic gains of a few are not worth long-term environmental damage.
15	1,961	Support Alternative 1A because it would be a safe and reliable source for phosphorous which is an important ingredient for Roundup and because the mine would benefit the regional economy.
16	23	Support Alternative 1A because phosphorous is an important ingredient for Roundup and other glyphosate-based herbicides.
17	1,286	Support the Blackfoot Bridge Mine because it is critical to the regional economy, because phosphorous is an important ingredient for Roundup, and because P4 has demonstrated a commitment to ecological stewardship and restoration.
18	968	Oppose P4's Blackfoot Bridge Mine because the proposed technology for protecting the environment from phosphate has not been proven, provisions for monitoring the effectiveness of the technology are inadequate, and cleanup at Ballard and South Rasmussen should be completed before starting another mine.
19	4	Support P4's mine because phosphorous is an important ingredient for Roundup and other glyphosate-based herbicides, it is important to the regional economy, and the alternative includes the use of an advanced technology liner to contain selenium and protect the Blackfoot River and other water resources.
20	11	Support Alternative 1A because phosphorous is an important ingredient for Roundup and other glyphosate-based herbicides, the mine will benefit the regional economy, and the alternative requires crucial environmental safeguards.
21	18	Support Alternative 1A because the mine will protect the environment and the Blackfoot River, the mine is important to the regional economy, P4 is an environmentally conscious company, and the alternative will implement technologically advanced environmental measures.
22	6	Oppose the Blackfoot Bridge Mine because the Blackfoot River is one of the remaining strongholds of the Yellowstone cutthroat trout, selenium released from previous phosphate mining has poisoned over 100 miles of the river and its tributaries, and permitting of any new mine needs rigorous environmental analysis and proven safeguards assuring the protection of water quality.
Total	**5,822**	

DEIS TOPICS, ISSUES AND RESPONSES

TOPIC: ***1. GENERAL COMMENTS***

Issue: **1a. Commenters expressed support for the project.**

Response: This support is addressed in **Section 1.2** Purpose and Need. The general issue of P4 as a positive element of the community is discussed in **Sections 4.13** and **5.13**.

Letter/Comment: 18/a, 19/a, 30/a, 38/b, 40/a, 41/a, 72/a, 73/a, 74/a, 76/a, 77/a, 82/a, 90/a, 95/c, 107/a, 108/a, 109/a, 114/a, 116/a, 118/a, 119/a, 121/b, 122/a, 130/a, 134/a, 139/a, 140/a, 141/a, 142/a, 143/a, 144/a, 145/a, 146/a, 147/a, 148/b, 150/a, 152/a, 154/a, 155/a, 156/b, 157/a, 157/c, 161/a, 173/a, 182/a, 189/a, 192/a, 194/b, 203/a, 205/a, 230/a, 236/b, 242/a, 246/a, 247/a, 251/a, 254/a, 266/a, 267/a, 268/a, 279/a, 286/a, 316/a, 322/a, 323/a, 325/a, 334/a, 335/a, 362/a, 365/a, 366/a, 373/c, 376/c, 383/c, 387/c, 388/a, 390/c, 392/c, 396/c, 401/a, 410/a, 411/a, 412/a, 416/a, 417/a, 423/a, 425/a, 430/a, 431/a, 433/a, 435/a, 440/a, 444/a, 449/a, 451/a, 454/a, 455/a, 456/a, 457/c, 458/a, 460/a, 461/a, 462/c, 463/c, 468/b, 470/a, 490/a, 493/a, 496/b, 497/a, 500/a, 507/a, 508/b, 512/c, 526/a, 535/a, 536/a, 537/a, 539/a, 542/a, 543/a, 544/a, 545/a, 546/a, 546/b, 548/a, 555/c, 555/d, 557/c, 560/a, 563/b, 565/c, 567/a, 569/b, 573/b, 575/c, 579/c, 581/d, 582/b, 584/a, 585/a, 589/a, 592/b, 643/a, 666/a, 680/a, 688/a, 692/a, 730/d, 750/a, 755/a, 770/a, 778/a, 780/a, 785/a, 787/a, 792/a, 910/a, 914/a, 935/a, 938/a, 979/a

Comment Count: 163

Issue: **1b. Commenters noted P4's dedication to the environment and willingness to protect and improve the environment as evidenced in past projects and reclamation. P4 follows regulatory requirements and utilizes progressive and environmentally responsible technologies and best management practices in their operations.**

Response: Comment noted.

Letter/Comment: 2/a, 3/a, 4/a, 10/a, 14/a, 14/c, 16/c, 16/d, 17/a, 17/c, 17/d, 20/e, 21/a, 21/b, 22/a, 22/b, 23/a, 24/c, 24/e, 26/b, 27/b, 28/a, 32/a, 33/a, 34/A, 39/a, 41/b, 45/e, 46/b, 46/c, 47/c, 47/d, 50/b, 51/b, 52/b, 52/e, 53/a, 54/b, 54/c, 56/a, 58/b, 61/a, 64/a, 65/a, 66/b, 66/c, 67/a, 67/c, 72/c, 74/c, 75/b, 77/b, 82/b, 83/b, 84/b, 85/b, 86/b, 87/b, 90/b, 93/a, 95/a, 101/a, 103/b, 109/d, 118/b, 120/c, 122/c, 124/b, 126/b, 127/b, 130/b, 131/a, 132/a, 133/a, 134/b, 136/a, 138/b, 140/b, 140/e, 143/b, 145/c, 148/a, 151/b, 152/b, 152/c, 156/a, 157/b, 158/a, 159/b, 159/c, 160/b, 162/b, 164/a, 164/b, 165/A, 165/B, 168/a, 171/a, 171/b, 172/a, 174/a, 174/b, 176/a, 178/b, 180/a, 181/b, 181/c, 183/a, 184/b, 185/c, 190/e, 194/a, 196/a, 199/b, 200/c, 200/d, 201/b, 202/c, 206/B, 207/a, 207/d, 209/a, 209/d, 211/a, 212/c, 213/a, 215/a, 216/B, 217/b, 220/c, 221/d, 223/a, 223/c, 223/d, 225/a, 226/a, 226/b, 227/b, 228/a, 229/c, 231/a, 231/b, 233/a, 234/a, 235/a, 236/a, 237/c, 238/a, 239/a, 240/c, 241/a, 243/a, 249/a, 250/a, 253/a, 255/a, 257/a, 257/c, 258/c, 260/a, 261/a, 262/a, 264/a, 265/a, 269/a, 273/a, 274/a, 275/a, 275/c, 276/b, 280/a, 280/b, 281/b, 282/b, 283/d, 285/a, 287/b, 288/a, 290/b, 291/a, 292/B, 293/b, 294/b, 296/b, 298/b, 299/a, 300/c, 301/a, 302/b, 304/a, 305/a, 306/d, 307/a, 308/a, 309/c, 310/a, 315/c, 317/a, 318/a, 320/b, 321/a, 324/a, 327/a, 328/a, 329/a, 329/b, 329/c, 330/a, 331/b, 332/b, 335/b, 337/a, 338/a, 339/a, 342/a, 343/a, 344/c, 345/a, 346/a, 347/a, 348/a, 349/a, 350/b, 351/a, 354/a, 356/a, 358/c, 367/a, 371/c, 372/a, 373/a, 374/a, 374/c, 375/a, 376/a, 377/b, 379/a, 381/a, 381/c, 383/a, 384/a, 387/a, 389/a, 390/a, 391/a, 392/a, 393/a, 395/a, 396/a, 397/b, 399/b, 403/a, 404/b, 405/a, 406/b, 407/b, 408/a, 414/a, 418/a, 418/b, 420/a, 424/a, 424/c, 424/d, 426/a, 432/a, 437/a, 439/a, 441/a, 443/a, 445/a, 446/a, 450/a, 452/a, 453/a, 454/c, 462/b, 463/b, 465/a, 466/c, 467/a, 469/b, 470/b, 471/b, 473/a, 474/a, 475/b, 478/c, 479/b, 479/c, 480/a, 481/b, 482/c, 483/a, 485/b, 486/a, 489/a, 491/b, 494/a, 495/c, 496/a, 498/b, 499/b, 500/b, 501/c, 501/d, 504/a, 504/d, 505/d, 506/a, 511/a, 512/a, 514/b, 514/D, 515/c, 516/b, 517/c, 520/a, 521/d, 523/b, 524/b, 529/a, 531/a, 532/a, 533/a, 537/c, 547/a, 547/b, 549/a, 550/a, 551/a, 551/b, 553/a, 554/e, 555/b, 557/b, 558/c, 559/a, 561/a, 562/a, 563/a, 565/b, 571/b, 572/b, 573/a, 574/b, 575/b, 577/c, 578/c, 579/b, 580/a, 580/b, 582/a, 584/b, 586/b, 587/c, 588/a, 589/c, 590/a, 593/a, 596/a, 597/b, 600/a, 601/a, 605/a, 607/c, 610/c, 612/c, 614/b, 617/b, 621/c, 622/c, 624/c, 625/b, 626/c, 628/a, 630/c, 631/c, 633/c,

634/c, 635/c, 636/b, 638/a, 641/a, 642/a, 647/b, 648/b, 649/a, 650/b, 651/b, 652/a, 653/a, 654/b, 655/b, 656/b, 657/c, 658/b, 659/a, 659/b, 660/a, 661/b, 662/b, 663/a, 663/c, 664/a, 665/a, 667/a, 668/a, 671/a, 672/b, 673/b, 674/b, 676/c, 679/a, 681/b, 682/a, 683/b, 684/a, 684/b, 685/b, 686/a, 687/a, 689/b, 690/b, 691/a, 693/b, 694/b, 695/a, 696/c, 697/a, 699/a, 699/b, 699/c, 700/b, 701/a, 702/b, 705/b, 705/E, 706/a, 707/b, 709/a, 712/a, 712/c, 713/a, 714/a, 715/a, 716/a, 719/a, 720/b, 721/b, 724/a, 725/a, 725/c, 726/b, 727/a, 728/b, 729/b, 732/a, 734/b, 735/a, 736/c, 737/a, 738/b, 738/c, 740/b, 741/c, 743/b, 744/c, 745/b, 746/b, 749/a, 751/a, 752/b, 753/b, 754/b, 754/c, 756/a, 757/b, 758/a, 759/a, 760/a, 763/a, 764/b, 765/a, 766/b, 767/a, 768/a, 771/a, 772/a, 774/a, 775/a, 776/c, 779/a, 782/a, 783/b, 786/a, 788/b, 790/a, 793/c, 795/c, 796/a, 797/b, 799/a, 800/b, 801/b, 802/a, 804/b, 805/a, 805/c, 807/b, 808/a, 809/c, 810/a, 811/b, 812/b, 813/a, 814/b, 816/c, 817/c, 819/a, 820/a, 820/e, 821/a, 823/a, 824/c, 826/a, 830/a, 831/b, 834/a, 835/b, 839/b, 840/b, 841/a, 842/a, 842/c, 843/c, 844/a, 844/c, 845/b, 846/c, 848/a, 848/b, 853/b, 857/a, 859/b, 860/b, 860/c, 860/e, 861/a, 861/c, 861/e, 861/f, 862/b, 863/c, 866/d, 867/b, 867/d, 869/b, 871/c, 872/a, 874/a, 876/a, 877/a, 878/a, 880/a, 881/a, 882/a, 882/b, 884/c, 884/d, 885/c, 887/a, 888/b, 890/a, 891/a, 893/a, 894/a, 897/b, 901/a, 901/b, 901/c, 901/d, 902/c, 903/a, 904/a, 906/a, 907/b, 911/b, 913/a, 913/b, 915/b, 917/b, 918/a, 920/b, 921/b, 922/b, 924/a, 924/b, 925/a, 928/a, 930/b, 933/a, 937/c, 940/a, 941/c, 942/a, 945/b, 946/b, 948/a, 949/b, 950/b, 952/b, 953/c, 954/b, 955/c, 956/c, 957/c, 969/c, 970/c, 971/b, 973/c, 976/a, 977/a, 978/c, 980/c, 981/b, 981/d, 985/c, 987/c, 988/c, 989/a, 989/c, 989/d

Comment Count: 633

***Issue*:** **1c. Commenters expressed support of the mine because phosphate is a required component of herbicides used in local as well as national agricultural operations and residential applications.**

***Response*:** Like Issue 1a, these comments relate to the **Section 1.2** Purpose and Need and to **Sections 4.13** and **5.13** Social and Economic Conditions addressing P4 as a positive element of the community and the region. However, the more specific issue is the importance of herbicides as a product of phosphate. The importance of herbicides is outside the scope of this impact assessment.

Letter/Comment: 4/c, 8/a, 9/a, 16/a, 19/b, 24/d, 25/b, 31/a, 31/c, 33/c, 35/a, 44/a, 45/a, 45/h, 47/f, 48/a, 49/b, 52/c, 54/a, 63/a, 67/f, 69/A, 69/f, 77/c, 86/a, 89/b, 91/d, 93/b, 94/a, 96/a, 96/b, 96/c, 97/a, 97/b, 97/c, 102/a, 106/a, 107/b, 108/b, 109/b, 114/b, 119/b, 120/a, 122/b, 124/a, 125/b, 127/a, 131/c, 135/a, 137/a, 140/c, 143/d, 151/a, 151/c, 159/e, 164/c, 165/C, 166/a, 174/c, 176/b, 177/a, 184/a, 184/c, 185/b, 187/a, 190/a, 190/b, 190/d, 191/a, 200/b, 202/a, 204/a, 207/b, 209/b, 210/a, 211/c, 212/a, 215/b, 216/a, 217/c, 219/a, 220/b, 221/a, 222/a, 223/f, 229/b, 233/b, 237/a, 238/b, 240/b, 241/b, 244/a, 245/a, 248/a, 249/b, 258/a, 270/a, 276/a, 278/a, 281/a, 282/a, 283/b, 287/a, 289/a, 290/c, 293/a, 296/a, 300/a, 304/b, 306/a, 309/a, 309/b, 315/a, 315/e, 328/b, 334/b, 336/a, 340/b, 344/a, 345/b, 347/c, 352/a, 356/b, 358/b, 359/a, 361/a, 368/a, 370/a, 371/a, 372/b, 372/c, 373/b, 374/b, 375/b, 376/b, 379/b, 379/c, 380/a, 381/b, 383/b, 385/a, 387/b, 390/b, 391/b, 392/b, 394/b, 395/b, 395/c, 396/b, 397/a, 400/a, 409/a, 424/b, 437/b, 438/a, 448/a, 452/c, 456/b, 457/b, 458/b, 459/c, 462/a, 463/a, 464/b, 469/a, 471/a, 475/c, 476/a, 477/a, 478/b, 479/a, 479/e, 481/a, 482/b, 485/a, 486/c, 488/a, 489/c, 491/c, 494/b, 495/a, 498/a, 501/e, 503/b, 504/c, 505/a, 505/c, 508/a, 515/b, 517/a, 519/a, 519/c, 521/a, 521/c, 522/b, 523/a, 524/a, 525/b, 527/a, 528/a, 530/a, 531/b, 533/c, 534/a, 547/d, 551/d, 553/b, 554/a, 554/c, 555/a, 557/a, 558/b, 559/e, 562/c, 566/b, 566/c, 569/a, 570/a, 571/a, 572/a, 574/c, 577/d, 578/a, 578/b, 578/d, 586/c, 587/a, 588/c, 591/b, 593/b, 594/b, 595/a, 597/a, 598/a, 599/a, 607/b, 610/a, 612/a, 615/a, 616/a, 618/a, 619/b, 621/a, 622/a, 624/b, 626/a, 629/a, 630/a, 631/a, 632/a, 633/b, 634/b, 635/a, 636/a, 637/a, 638/c, 639/a, 640/b, 641/c, 642/b, 647/a, 648/a, 650/a, 654/a, 655/a, 656/a, 658/a, 661/a, 663/b, 671/b, 672/a, 673/a, 676/b, 679/b, 681/a, 682/b, 684/d, 685/a, 690/a, 691/c, 694/a, 696/b, 698/a, 702/a, 703/b, 704/c, 705/c, 711/a, 712/e, 716/c, 717/b, 718/a, 722/a, 723/a, 727/b, 732/b, 733/a, 734/a, 736/b, 738/d, 740/a, 741/b, 743/a, 744/b, 747/a, 748/a, 749/b, 752/c, 753/a, 754/d, 756/b, 758/b, 762/a, 766/a, 768/b, 769/a, 769/b, 773/a, 776/a, 777/c, 781/a, 782/b, 784/a, 789/a, 790/b, 791/a, 793/a, 795/a, 797/c, 798/a, 800/a, 802/b, 803/a, 804/a, 805/b, 806/b, 809/b, 811/a, 813/c, 814/d, 816/b, 817/a, 820/c, 823/b, 825/a, 827/a, 829/a, 830/b, 831/a, 835/d, 839/a, 840/d, 843/a, 844/d, 845/a, 846/b, 849/a, 853/c, 854/b, 859/c, 860/d,

861/g, 863/a, 867/a, 869/a, 870/a, 871/b, 873/a, 874/b, 879/b, 880/b, 883/b, 885/a, 887/b, 888/c, 890/c, 891/b, 891/c, 897/c, 898/a, 908/a, 909/a, 911/a, 912/a, 922/a, 923/a, 925/c, 928/b, 930/c, 934/b, 937/b, 939/a, 941/a, 946/a, 948/b, 950/c, 951/a, 953/a, 955/b, 956/b, 969/a, 970/a, 971/a, 972/a, 973/a, 975/a, 976/b, 977/c, 978/b, 980/a, 981/a, 983/a, 984/a, 985/b, 987/a, 988/a

Comment Count: 416

Issue: **1d. Commenters expressed support for the mine and indicated that environmental groups and the opinions of individuals from outside the area should be disregarded in decisions regarding the project.**

Response: NEPA regulations require that an agency shall "request comments from the public, affirmatively soliciting comments from those persons or organizations who may be interested or affected" (40 CFR § 1503.1 (a)(4)). There is no restriction on who can comment. Further, NEPA requires that all comments be assessed and considered (40 CFR § 1503.4).

Letter/Comment: 70/c, 91/b, 103/c, 106/b, 129/b, 132/c, 138/c, 255/d, 405/b, 406/c, 482/d, 557/d, 678/b, 772/c, 774/B, 878/b, 893/b, 900/b, 902/b, 913/c, 940/b, 945/c

Comment Count: 22

Issue: **1e. Commenters expressed opposition to the project citing existing selenium contamination and future selenium contamination as a result of mining.**

Response: Several federal and state agencies including the BLM have carefully considered the potential impacts from selenium in their analyses of all the alternatives and believe these impacts have been sufficiently mitigated in the Agency Preferred Alternative. Multiple sections of the FEIS address the selenium issue. The Agency Preferred Alternative includes environmental protection measures proposed by P4 and mitigation measures developed by the agencies that would reduce selenium as a potential contaminant in the surface environment. The agencies are working with P4 and other mine operators to remediate selenium issues at the ongoing mining operations and apply these lessons to future mine expansions so the current problems are not expanded. Existing contamination is covered under the CERCLA process. Environmental control measures discussed in the FEIS include:

- Construction and capping EOP to prevent infiltration of surface and subsurface water through the segregated Meade Peak overburden;
- Placement of only non-segregated overburden in the NWOP;
- Place overburden as backfill in South Pit to cover Phosphoria exposure in pit and direct runoff and infiltration into the Wells limestone;
- Construct surface water control structures including water control ponds, rock check dams, silt fences, straw wattles, dikes, swales, and run-on/run-off diversion ditches to allow all runoff that does not meet water quality standards to be retained and managed on-site;
- Concurrent reclamation to reduce sediment load in runoff; and
- Installation of the OSMS to intercept seepage that may form in the NWOP and EOP. Managed seepage would be conveyed to CP2 for management on site. (**Sections 2.4.1.1, 4.3.2, 4.5.1.1.2** and **Appendix C** of the Water Management Plan [P4 2010c]).

An Environmental Monitoring Plan is included as **Appendix A** in the FEIS.

The Mineral Leasing Act does not require the evaluation of potential "clean-up" cost when determining whether a valuable deposit of phosphates has been discovered by the proponent. Alternatives, BMPs and mitigation steps were included to address selenium in the design. Cost/benefit analysis is not required under NEPA.

These agencies are working with P4 and other mine operators to remediate selenium issues at the ongoing mining operations and apply these lessons to future mines and mine expansions so the current issues are not expanded. Past mining practices and natural erosion in the Blackfoot River drainage have resulted in seasonal fluctuations of the concentration of

selenium and other COPCs. To the extent that a portion of the selenium concentration in the basin is attributable to mining, the Mine and Reclamation Plan developed for the Blackfoot Bridge Mine Project has incorporated water management plans designed to limit potential impacts to groundwater and surface water and to control COPCs from affecting offsite resources. The Water Management Plan (P4 2010c) and the OSMS are separate plans associated with the Mine and Reclamation Plan. Existing levels of selenium in the basin are being addressed under the CERCLA process and actions being taken under the Clean Water Act.

Letter/Comment: 43/a, 67/i, 79/a, 186/a, 188/a, 208/a, 341/a, 364/a, 794/a, 815/a, 818/a, 818/b, 864/a, 892/b, 960/b, 966/a, 966/d, 966/ff, 966/g, 966/hh, 966/nn, 966/q, 986/a, 986/b, 986/c, 990/b

Comment Count: 26

Issue: **1f. Commenters expressed opposition to the mine stating that the short-term economic gains are not worth the long-term environmental impacts.**

Response: The economic impacts of the project as well as environmental impacts by resource are described in the FEIS. Resource values of public lands are managed and utilized in the combination that best meets the present and future needs of the American people. The Agency Preferred Alternative has been designed to comply with all legally applicable requirements for environmental protection. The socio-economic benefits and impacts related to this project are described in **Sections 3.9, 4.13** and **5.13** of the FEIS.

Letter/Comment: 42/b, 43/b, 92/a, 104/a, 110/a, 111/a, 112/a, 113/a, 115/a, 176/c, 252/a, 295/a, 375/c, 609/b, 837/a, 889/b, 899/a, 943/a, 960/h, 966/kk

Comment Count: 20

Issue: **1g. The DEIS refers to the ore stockpile pad as having an 800,000 ton capacity and either a 22-acre (DEIS Section 2.3.7.3) or 6-acre footprint (DEIS Section 4.3.1.1.1). The FEIS should clarify the size of this pad.**

Response: The description has been revised in **Sections 2.3.7.3** and **4.3.1.1.1**. The 22 acre foot print refers to the entire ore stockpile facility including hoppers, feeders, screening and crushing plant, tipple, and truck loading areas. Six acres is the expected footprint of the stockpiled material excluding the ancillary facilities.

Letter/Comment: 964/o

Comment Count: 1

Issue: **1h. The Tribes request a written response to their comments from BLM.**

Response: Response to tribal concerns is a part of the consultation process. The BLM is working with the Shoshone-Bannock Tribes in addressing their concerns and in the development of the FEIS and ROD.

Letter/Comment: 966/ll

Comment Count: 1

Issue: **1i. DEIS misuses the term "historic mining" when addressing selenium contamination in southeast Idaho.**

Response: The FEIS has been revised to read, "previously permitted mining" or "previous mining" depending on the context.

Letter/Comment: 961/j

Comment Count: 1

Issue: **1j. Editorial comments on Figure 2.3-6, Tables 4.3-15, 4.3-17, 4.3-22 and 6.4-3.**

Response: The referenced figures and tables have been revised to address the editorial comments. There are not two **Tables 4.3-15**. **Table 4.3-15** continues from one page to the next with the table

name and header row clearly repeated on the second page. **Section 6.4** List of Preparers and Reviewers has been revised to include seven tables listing individuals by affiliation (**Tables 6.4-1** through **7**). Information on all of the individuals listed has been included.

Letter/Comment: 965/h

Comment Count: ***1***

TOPIC: ***2. CHAPTER 1***

Issue: **2b. Financial assurance is not discussed in the DEIS, but is critical to the effectiveness of the reclamation, closure, and post-closure activities proposed for this project. Discussion of financial assurance (bonding) in the FEIS should include objective, transparent, and measurable reclamation standards that must be achieved prior to bond release. In addition, the title of Section 2.3.8.1 should be changed from "Proposed Method of Abandonment" to "Proposed Post-Closure Operations."**

Response: **Section 1.3.2** describes what bonding will be required. The BLM will require an actual cost bond to be calculated and posted prior to mining. Bonds would be calculated to cover actual reclamation costs associated with the approved closure plan. These reclamation bonds will be calculated and reviewed by BLM, IDL, and P4 after a ROD is signed. **Sections 2.3.6.12** and **2.3.8.1** discuss the requirements for reclamation and closure. **Section 2.3.6.12** further explains that the water management system would operate until the reclamation areas have fully stabilized and monitoring demonstrates that runoff from the reclaimed project area meets surface water quality standards. All measures of the Mine and Reclamation Plan must be fully completed and satisfactorily demonstrated prior to bond release. **Section 2.3.8.1** is a subsection of the reclamation discussion and the proposed change for the title of the section would not clarify or address long-term management and maintenance of the site.

Although financial assurance is an important part of BLM's inspection and enforcement program, it is not an environmental impact or mitigation to be addressed under NEPA and is outside the scope of this EIS. Financial assurance including bonding is however an important part of BLM's administration of any post NEPA activities that may be approved by the agency's Record of Decision. Bonding would be used to ensure P4's compliance with any Mine and Reclamation Plan approval and conditions, the federal lease terms, royalty and reclamation requirements, and other established requirements.

Letter/Comment: 959/ff, 959/mm, 964/bb, 964/pp

Comment Count: ***4***

Issue: **2c. Three alternatives that were considered but eliminated should be fully evaluated: 2.7.1 Mining only above the water table; 2.7.2 No permanent external overburden piles; and 2.7.3 Interception ditch along toe of east overburden pile. For example, it appears that material produced in the North Pit in years 3-7 could potentially be backfilled into the Mid Pit instead of using the Northwest Overburden Pile.**

Response: In response to this comment, BLM and the USACE reevaluated these alternatives. **Section 2.7.3** of the FEIS, which evaluates the interception ditch along toe of EOP, has been updated based on additional information obtained since issuance of the DEIS. The other two alternatives are discussed in **Sections 2.7.1** and **2.7.2** of the FEIS. These discussions are summarized in this response.

The "Mining Above the Water Table" alternative was considered as part of the NEPA review of the Proposed Action. In the FEIS **Section 2.7.1** - Mining Only Above the Water Table, the rationale for dismissal of this alternative was that implementation of this alternative would result in a 12 percent reduction in recoverable ore volume and no reduction in potential release of COPCs entering groundwater and surface water resources. External overburden piles would still need to be constructed and the potential for release of contaminants under this alternative would be comparable to the Proposed Action.

An alternative that considered No External Overburden Piles (**Section 2.7.2.2**) was eliminated because temporary external overburden piles would still be required to develop the various pits

and recover ore. Temporary placement of external overburden piles would result in similar impact to the environment as described for the Proposed Action. In the example cited, the material produced from the North Pit in years 3-7 would still need to be placed in a temporary overburden pile to allow backfilling to the North and Mid Pits. The mine development between the North Pit and the Mid Pit would still require placement of overburden in the NWOP. P4 has considered alternatives that would minimize, but not eliminate external overburden piles.

The toe ditch alternative has also been extensively evaluated and was determined to be impracticable. Construction of a toe ditch along the eastern edge of the EOP would not intercept all sediment or water flow (groundwater or surface water) that flows to the unnamed tributary. The amount of physical space between the toe of the EOP, the access road, and the unnamed tributary to Fish Pond does not allow sufficient space to construct a toe ditch of the size needed to manage the volume of annual runoff calculated to occur over the life of the project, manage the 100-year/24-hour storm event, and avoid release of sediment to the unnamed tributary. Additionally, the larger toe ditch is not technically feasible at the site because, in order to effectively achieve control run-off and seepage from entering the unnamed tributary adjacent to the EOP, the toe ditch would have to be constructed into bedrock with the assumption that seepage from the overburden piles would be limited to alluvial and colluvial material located above bedrock. The deepest alluvium and depth to bedrock in this area is in excess of 120 feet. Of the borings advanced within 200 feet of the projected toe of the EOP, depth to weathered bedrock ranged from 15 feet to over 120 feet. Construction of a ditch to bedrock would not be possible given the thicknesses of the alluvium.

Additional details regarding alternatives incorporating an interception ditch are discussed in Water Issue 6u.

Letter/Comment: 960/e, 960/g, 960/i, 961/k, 961/o, 961/p, 964/nn

Comment Count: ***7***

Issue: **2d. The Purpose and Need statement should be revised to emphasize environmental protection (explicitly put compliance with laws and regulations for mining on public lands on equal footing with the recovery of ore).**

Response: The Purpose and Need statement accurately states the BLM's purpose and need for action (in responding to an application for development of a project) and the applicant's purpose and need for the project. No changes to the Purpose and Need statement were made in the FEIS. The project would comply with all applicable federal laws, as required for all projects.

Letter/Comment: 961/ll

Comment Count: ***1***

TOPIC: ***3. CHAPTER 2***

Issue: **3f. The DEIS has not adequately addressed reasonable alternatives as required by the Clean Water Act Section 404(b)(1) guidelines and the NEPA regulations at 40 CFR § 1502.14. The proposed project may not be the least environmentally damaging practicable alternative (LEDPA); appropriate and practicable steps must be taken to minimize potential adverse impacts on the aquatic ecosystem.**

Response: Additional alternatives to the Proposed Action were evaluated for the FEIS to address issues related to environmental impacts as provided under NEPA. P4 has completed a Supplemental 404(b)(1) Alternatives Analysis for the water management system to address EPA's concerns. This analysis included consideration of additional water management system alternatives designed to reduce impacts to wetlands and non-wetland waters of the U.S. to identify the LEDPA. An Adaptive Management Plan (**Appendix B** of FEIS) for the water management system has also been developed by P4. This will result in placement of dredged or fill material in areas currently containing wetlands and non-wetland waters of the U.S. only as necessary to manage the runoff water. An OSMS was also developed by P4 to prevent or reduce seepage of selenium contaminated water to wetlands and non-wetland waters. These modifications of the project provide the LEDPA. Additional discussion is included in Responses 3h and 3i.

Letter/Comment: 959/b, 960/d

Comment Count: 2

Issue: **3g. ICL recommends a new alternative (1C) combining elements of Alternatives 1A and 1B. "Specifically, the BLM should analyze the effects of replacing the Simple 1 Cover over the 120 acres of non-segregated Meade Peak formation in EOP with a GCL layer. This alternative should retain the GCLL cover over the 41 acres of segregated Meade Peak material, given the high risks of selenium mobilization. For the purposes of this discussion we refer to this option as Alternative 1C. Applying the GCL over the remainder of the EOP has already been approximated with models for Alternative 1B and should be a reasonable alternative for the BLM to further develop.**

Response: No Meade Peak overburden is scheduled to be placed in the EOP outside of the segregation cell. As discussed in **Section 2.4.1.1** of the FEIS, and in response to comments, the revised Alternative 1A would include an expanded GCLL cover that would be placed over 90 acres of the EOP including the Meade Peak overburden segregation cell and the surrounding non-Meade Peak overburden. The area covered by the GCLL in Alternative 1A as presented in the DEIS was 21 acres. The "cell" of Meade Peak overburden material would be located within the center of the EOP using the underlying topography of the surface drainages to enhance isolation of the reactive material. The revised GCLL cover design would overlap the entire local drainage containing the isolation cell, and would minimize the potential for meteoric water to infiltrate laterally into the seleniferous material. Numerical modeling results indicate that Alternative 1A with the expanded GCLL would meet surface water quality standards in Fish Pond drainage below the EOP. The addition of a GCL cover over the remaining area of the EOP would not be required to meet applicable groundwater and surface water standards. The proposed alternative is within the range of alternatives already evaluated in the FEIS.

In addition to the expanded footprint of the GCLL, Alternative 1A has been revised to include an OSMS. The OSMS would also be a component of Alternative 1B. Components of the OSMS include an underdrain system and a hydraulic break on the up-gradient portion of the Meade Peak segregation cell. The hydraulic break would consist of a zone of coarse, free-draining non-seleniferous overburden material placed around the west, north, and south sides of the Meade Peak cell. This zone of coarse material would effectively conduct water away from these areas during high runoff (saturated) conditions and would act as a hydraulic break by interrupting unsaturated flow towards the seleniferous Meade Peak material during dryer periods. Seepage from the bottom of the hydraulic break would report to the Compacted Clay Subgrade layer below the EOP and the underdrain system.

Letter/Comment: 964/d, 966/ss

Comment Count: 2

Issue: **3h. The DEIS does not adequately analyze the available range of least environmentally damaging alternatives (LEDPAs). Specifically, the alternatives primarily address the reduction of selenium loading and only one of the three alternatives avoids impacts to waters of the U.S.**

Response: Additional alternatives to the Proposed Action were evaluated for the FEIS. P4 has completed a Supplemental 404(b)(1) Alternatives Analysis for the water management system to address EPA's concerns. This analysis included consideration of additional water management alternatives designed to reduce impacts to wetlands and non-wetland waters of the U.S. to identify the LEDPA. None of the additional alternatives considered in this analysis were found to meet project objectives, were technically feasible, or would result in less adverse environmental consequences; therefore none are practicable alternatives.

An Adaptive Management Plan (**Appendix B** of FEIS) for the water management system has also been developed by P4. This will result in placement of dredged or fill material in areas currently containing wetland and non-wetland waters of the U.S. only as necessary to manage the runoff water. An OSMS was also developed by P4 to prevent or reduce seepage of selenium contaminated water to wetlands and non-wetland waters. These modifications of the project provide the LEDPA. Additional mitigation and discussion regarding impacts to waters of

the U.S. have been provided in the FEIS in **Sections 2.3.9.5.1, 4.5.1.1** and **4.7.4** and in P4's Water Management Plan (P4 2010c). P4's design of the Blackfoot Bridge Project included measures to avoid wetland areas, to the extent practicable. These measures included locating the EP1 - 4 water control ponds at locations along the unnamed tributary to avoid mapped wetlands; locating NWP1-4 water control ponds at locations outside of mapped wetlands; and selecting the location and design for ponds CP1 and CP2 to avoid placement of fill into wetlands. P4 has also selected the location and design of various project components (e.g., ore truck turnaround; ore stockpile; crusher and tipple site; haul road routes) to avoid wetlands and non-wetland waters of the U.S. to the extent possible.

The USACE thoroughly analyzed alternatives presented, including the dismissed alternatives. The USACE is not required to perform the NEPA analysis of impracticable alternatives that have been dismissed pursuant to the USACE's LEDPA analysis in connection with issuing a Section 404 permit. Rather, the USACE has sufficiently evaluated other alternatives when selecting the LEDPA, including carefully collecting data, conducting multiple meetings with P4 and other interested parties, site visits, and documenting its decision making process, together with independently evaluating data and reports prepared by P4. The USACE sufficiently analyzed other alternatives, and accordingly, those dismissed alternatives need not be carried through the NEPA document.

The site is constrained by its topography, geography, hydrogeology and lease boundaries. Given the site limitations for locating the EOP and NWOP, and the need to ensure that all impacted surface and alluvial flows, mine pit dewatering and sediment from disturbed areas would be controlled to protect off-site water quality, the LEDPA is the alternative that would potentially affect 9.43 acres of wetlands and non-wetland waters of U.S., given implementation of the Adaptive Management Plan. Implementation of new mitigation measures for the project added in response to public comments (including the OSMS) would further reduce the potential selenium load that could affect alluvial aquifer systems in the project area; however, these measures would not intercept all water that could infiltrate into the EOP and the NWOP. Consequently, P4 has included areas currently containing the unnamed tributary and Fish Pond in the site-wide water management system to be constructed for the project. Inclusion of the unnamed tributary and Fish Pond in the water management system would allow P4, should seeps appear in the system, to reduce the potential release of suspended solids and COPCs to offsite surface water and groundwater resources, thereby maintaining water quality of the Blackfoot River.

Letter/Comment: 958/b, 958/g, 958/j

Comment Count: ***3***

Issue: **3i. Construction of sediment control dams in the unnamed tributary upstream and downstream of Fish Pond and using waters of the U.S. as a wastewater conveyance would result in significant degradation of waters of the U.S. Sediment control alternatives that avoid constructing these dams and enlarging the Fish Pond should be considered.**

Response: Alternatives that would avoid wetlands degradation are discussed in **Sections 2.7.3, 2.7.4** and **2.7.5** in the FEIS. P4 has developed an Adaptive Management Plan (**Appendix B** of FEIS) for implementation of the site-wide Water Management Plan (P4 2010c). The Adaptive Management Plan avoids or minimizes potential effects on areas currently containing wetlands and non-wetland waters unless necessary to maintain water management objectives to protect offsite water resources during the life of the project. Additionally, mitigation measures that would be implemented under Alternative 1A would reduce the amount of sediment that could enter the unnamed tributary that contains Fish Pond.

The proposed project is not predicted to cause or contribute to significant degradation of waters of the U.S. Under the Section 404(b)(1) Guidelines, effects contributing to significant degradation include significantly adverse effects of the discharge of pollutants on human health or welfare; on life stages of aquatic life and other wildlife dependent on aquatic ecosystems; on aquatic ecosystem diversity, productivity and stability; and on recreational, aesthetic, and economic values (40 C.F.R. 230.10(c)). Under this regulation, the USACE is directed to

consider the effects of the project while placing "special emphasis on the persistence and permanence of the effects" of the project. Construction of water control ponds on the unnamed tributary upstream and downstream of Fish Pond would not result in significant adverse effects on wildlife and aquatic ecosystem functions in the project area, and would not be persistent and permanent. Potential effects associated with the water management system would be localized. Wildlife habitat values and wildlife use of the area are already low given the proximity of the unnamed tributary to an existing haul road and railroad. The habitat value of the wetlands and non-wetland waters in the unnamed tributary have been affected by trampling and grazing effects of livestock. Additionally, the wetlands that would be filled are not unique to the site and have been determined to be Class III wetlands. The impacts from the project would be limited in time. Accordingly, the construction of the water management system would not cause or contribute to significant degradation of aquatic ecosystems. The 9.43 acres of wetlands and non-wetland waters that would be impacted would be fully mitigated under P4's Compensatory Mitigation Plan for Waters of the U.S. (P4 2010b).

A thorough analysis and review of potential alternatives to the proposed water management system was conducted and lead to the conclusion that the proposed Water Management Plan (P4 2010c), which includes the AMP, is the LEDPA.

Letter/Comment: 958/c, 958/o

Comment Count: ***2***

Issue: **3j. The alternatives that are presented would have impacts in the wetland complex which is critical for supporting the Blackfoot River, an aquatic resource of national importance. The DEIS should consider other alternatives that do not result in these impacts.**

Response: The wetland complex is not critical to supporting the Blackfoot River and impacts to the wetland complex would not significantly affect the Blackfoot River. Surface water originating in or flowing through wetland areas on the site only contributes flow to the Blackfoot River during seasonal runoff periods (e.g., spring runoff and large precipitation events) for approximately two to three weeks each year. During the remainder of each year, surface flow from these areas to the Blackfoot River ceases, including flow to Wetland X, the wetland located nearest the Blackfoot River. Most wetlands in the project area are supported seasonally by groundwater, rather than surface water. Interception and control of run-off water from mine disturbance areas would not affect alluvial systems that support most wetlands in the project area, including Wetlands X and W. Wetlands that could be affected by mining and related activities include the unnamed tributary that contains Fish Pond, which is an intermittent drainage that has been impacted by livestock use. This drainage is not considered a primary source of recharge water to wetlands adjacent to the Blackfoot River.

As described in **Section 4.5.1.1.2** of the FEIS, Wetland A may be indirectly affected by mining operations in the South Pit with reduction in flow of up to 94 percent. Wetland A would not receive dredged or fill material and, therefore, is not subject to 404 permit requirements. Although Wetland A contributes a portion of the flow throughout the year to State Lands Creek, flow from Wetland A averaged 4 percent (0.3 cfs) of State Lands Creek flow during spring runoff, with the volume of flow reducing to an average of 0.07 cfs during the fall, low flow period. Wetland A is a groundwater sourced wetland located in alluvium and colluvium and is not connected to the bedrock water table (FEIS **Section 3.3.1.4.4**). As indicated in the FEIS, some flow is expected to be reestablished during reclamation of the South Pit (**Section 4.5.1.1.2**). Additional mitigation measures to reduce potential impacts to the wetlands have been added to the project. For additional detail on potential release of selenium and other COPCs see issue 6g1.

Letter/Comment: 958/a, 958/m, 958/q

Comment Count: ***3***

Issue: **3k. Given that the DEIS states that Alternative 1B "would decrease the potential for selenium to enter wetlands," explain in more detail why this alternative was not chosen.**

Response: **Section 2.4** describes Alternatives 1A and 1B and **Section 2.6** explains that Alternative 1A would meet water quality standards and all applicable regulatory requirements. The additional measures associated with Alternative 1B (e.g., expanding the area to receive a GCLL cover in the cap design to the degree provided for in Alternative 1B) would not increase protection for selenium and would increase project costs. Alternative 1A was revised to include additional GCLL cover (from 21 acres to 86 acres) over the segregated Meade peak overburden associated with the EOP in response to comments.

Letter/Comment: 967/c

Comment Count: ***1***

Issue: **3l. A new alternative that would meet the purpose and need for this proposal and potentially comply with all laws and regulations for mining on public lands should be considered. This additional alternative would involve allowing P4 to develop the Mid Pit as an initial panel in the mining sequence. If rigorous monitoring of the Mid Pit demonstrates the GCLL successfully protects the environment, mining could then be permitted to advance to the South Pit with decisions on a North Pit panel deferred.**

Response: Changing the mine pit sequence or schedule for development would not avoid impacts to wetlands and other waters of the U.S. and, therefore, is not a practicable alternative under Section 404. Overburden, including seleniferous material generated during development of any of the proposed pits, would still need to be removed from the pits and placed in the EOP, which would require implementation of similar water management and water control systems as those associated with the Proposed Action. Additionally, BLM is requiring mitigation steps (GCLLs, OSMS, and other BMPs) to address the potential selenium issues associated with this project.

The current mine plan general sequence is based on a number of environmental factors, including mining backfill logistics, visual impacts, and location of partially-backfilled final pits away from the Blackfoot River. Additionally, mining cost considerations and the associated return on investment were key factors in developing the proposed mining sequence. Specifically, it is P4's intent to initially mine the north end of the Mid Pit and use materials there to establish mine road systems and project infrastructure such as the tipple pad, ore stockpile areas and water management ponds. Soon after this initial pit is developed, operations would transition to the north end of the project and then generally proceed in a north to south sequence for the entire life of the mine. This proposed mine sequence ensures that active operations advance away from the Blackfoot River and other potentially sensitive areas, and that mined pits are filled, covered and reclaimed while achieving near pre-mining, natural ridge shaped landforms. By utilizing this sequence, the final pit, which is only partially backfilled, is designed to be located hundreds of feet above the regional water table and over 10,000 feet away from the Blackfoot River. Visual impacts from the project would also be minimized. With this mining sequence, all of these environmental advantages are obtained while allowing P4 to optimize mine material movement (e.g., maintaining overburden haulage generally downhill) in order to recover, early in the project life, the highest value phosphate ore associated with the least amount of overburden available at the Blackfoot Bridge Project.

The approach suggested in the comments could lead to a partially-filled pit near the Blackfoot River because the North Pit would not be mined and backfilled to the Mid Pit. Moreover, mining only the Mid Pit would utilize a net uphill haulage that would require greater fuel consumption and increased generation of greenhouse gases, among other environmental impacts. If future pits were later permitted, the highest value ore would likewise not be recovered until the end of the project. Approval of future mining based on performance during development of one pit at a time would negatively affect the economic feasibility of the project in that it would not allow for the necessary return on investment in order to sustain the entire mineral development. Accordingly, one-pit-at-a-time mining would disrupt the continuity of the mining operations, create potential environmental impacts, and contravene the goals of the Mineral Leasing Act and P4's phosphate leases, which are to maximize recovery of the federal phosphate resource. This proposed approach was not reasonable or practicable and was not carried forward for further analysis.

Letter/Comment: 960/a, 960/c, 960/j, 960/k, 960/l

Comment Count: *5*

Issue: **3m. The FEIS should clarify that the measures at the South Rasmussen and Ballard Mines are independent of development plans for the Blackfoot Bridge Mine Project and would likely be implemented regardless.**

Response: **Section 2.3.9.9** has been revised to address this comment. Environmental control measures at the South Rasmussen and Ballard Mines are required by other regulatory programs (e.g., the Clean Water Act and CERCLA) and are currently being implemented by P4. These measures would result in decreases in overall selenium load in the basin. However, the environmental control measures discussion for Ballard Mine was removed from the FEIS because it was a pilot scale operation and would not be permanent.

Letter/Comment: 959/nn, 964/tt

Comment Count: *2*

TOPIC: ***4. GEOLOGY, MINERALS, AND PALEONTOLOGY***

Issue: **4c.** **The DEIS fails to describe how important paleontological resources will be identified and protected during mining operations.**

Response: Text has been added to the FEIS in **Section 4.1.1.1.3** explaining that discovery of vertebrate fossils or dense accumulations of invertebrate fossils would result in suspension of operations in that area until the appropriate BLM representative, typically the project inspector or Authorized Officer (AO), is notified. The BLM or designated paleontologist will evaluate the discovery and identify what course of action should be taken.

Letter/Comment: 964/ll

Comment Count: *1*

TOPIC: ***5. AIR, CLIMATE AND NOISE***

Issue: **5b. P4 has revised air emission estimates, reflecting refined emission factors approved by IDEQ. Please update tables 4.2-1 and 4.2-2 accordingly.**

Response: **Tables 4.2-1** and **4.2-2** have been updated.

Letter/Comment: 965/g

Comment Count: *1*

Issue: **5c. The DEIS does not adequately address climate change including effects of the proposed project on climate change as well as the effects of climate change on the environmental impacts of the project. The FEIS needs to include a balanced discussion of human induced climate change that reflects the state of scientific understanding and consensus on this topic. The FEIS should adequately address climate change including evaluating how climatic changes may affect the environmental impacts of the proposal, including to reconsider the groundwater and transport models and the seepage models in light of a range of potential climactic changes; and account for the distribution and use of the end products. Mitigation measures to reduce GHG emissions should be implemented such as available alternative engines and diesel fuels for mine equipment, control devices for construction equipment, idling limits for equipment, prohibiting tampering with engines, and implementation of a construction air pollutant emissions control plan. Adaptive management should be built in to post-closure monitoring and management so that measures can be taken in response to potential changes in site conditions resulting from climate change.**

Response: **Sections 3.2.2** and **5.2.2.2.1** of the FEIS describe the current state of scientific understanding of climate change and notes that ongoing scientific research has identified the potential impacts of greenhouse gases. The agencies believe that the description of scientific research is

accurate and does not need to be rewritten. NEPA requires disclosure of the existence of scientific debate on issues.

The FEIS adequately addresses how climate changes may affect the environmental impacts of the proposal and appropriately concludes that the Proposed Action and Alternatives 1A and 1B contribution to climate change is negligible. Existing climatic conditions in the vicinity of the proposed project are described in Air Resources section of **Chapter 3** in the FEIS. The period of record (29 years) for the local weather station at the Soda Springs Airport provides the basis for characterization of the existing climate in and near the project. Over the period of record for the Soda Springs Airport, daily and monthly temperature extremes, and precipitation vary by month and year. No discernable pattern is identified in terms of an increase or decrease in annual temperatures or precipitation over the period of record for the local climate base.

In terms of the potential future condition of changing climate, it is not clear how the climate in Idaho will change over the life-time of the project. Computer model predictions indicate that increases in temperature would not be equally distributed, but are likely to be accentuated at higher latitudes. Warming during the winter months is expected to be greater than during the summer, and increases in daily minimum temperatures are more likely than increases in daily maximum temperatures. Increases in temperatures would increase water vapor in the atmosphere, and reduce soil moisture, increasing generalized drought conditions, while at the same time enhancing heavy storm events. Although large-scale spatial shifts in precipitation distribution may occur, these changes are more uncertain and difficult to predict.

As discussed in **Section 5.2.2.2.5** of the FEIS, Chambers (2006) indicates that precipitation as rain may increase over most areas (IPCC 2007) with increases in summer precipitation predicted at 10 percent, fall by 30 percent, and winter by 40 percent. Snowfall would be reduced, and snowmelt would occur earlier in the spring. While BLM acknowledges the uncertainty inherent in the modeling, even if this were to occur, potential effects of the changes in precipitation pattern over the life of the project is not expected to result in any changes in vegetation community or wildlife habitat given the variability of local weather and climate patterns influenced by mountainous terrain. Additionally, and importantly, because the GCLL cover over the seleniferous overburden and pits associated with Alternatives 1A and 1B is anticipated to last hundreds of years, the potential impact of changing climate on the area resources in combination with the project is expected to be very low to non-existent. Because Alternatives 1A and 1B are a more rigorous cover design than the Proposed Action (that does not include GCLLs), those Alternatives are less susceptible to potential effects from climate change.

In terms of the project's effect on climate change, as discussed in revised **Section 4.2.1.1.2**, mining involves combustion of diesel and gasoline, which contribute CO_2 to the atmosphere. Projected fuel consumption for the project would be approximately 1.2 million gallons diesel and 24,000 gallons gasoline annually. Development of the proposed project would occur over an approximate 17-year period, throughout which direct emissions of carbon dioxide from mining activities would total approximately 13,000 tons per year (CO_2 equivalent) (**Section 4.2**). Estimated GHG emissions attributable to electricity used at the South Rasmussen mine are approximately 1,400 tons. The electricity used at the new mine will be slightly higher than the existing mine because of the use of the evaporators as part of the water management system. The volume of fuel consumption, and emissions associated with this mining operation would not represent an increase over current levels associated with P4's mining operations in Idaho, as P4's mining operations at the South Rasmussen Mine would begin to cease as development of the proposed Blackfoot Bridge project is initiated and equipment associated with the South Rasmussen Mine operation would be transferred to the Blackfoot Bridge Project. Similarly, the processing plant in Soda Springs would be expected to continue operations at existing levels, including potential indirect estimated annual emissions of GHG (as CO_2 equivalent) (approximately 652,000 tons estimated in 2009). Estimated annual indirect emissions of GHG related to hauling ore from the mine to the processing plant are approximately 1,400 tons, which would be slightly less than the emissions from the existing haul road from the South Rasmussen Mine because of the shorter distance from the proposed project to the processing plant. Therefore, the potential contribution to global climate change that may be associated with emission of CO_2 from the project is not expected to change materially from current levels,

unless the processing plant closes under the No-Action Alternative. Likewise, energy requirements and conservation potential of the various alternatives would be the same, unless the processing plant closes under the No-Action Alternative.

The cumulative effects associated with the mining operation and climate change are evaluated in **Section 5.2.2**. The FEIS recognizes that climate change is a global issue and contributions to climate change come from a variety of sources. While not considered an incremental effect for the reasons stated above, assuming that all 13,000 tons of direct carbon dioxide emissions are absorbed into the state of Idaho pool of carbon dioxide (37 million tons annually), the project could directly contribute approximately 0.035 percent of state-wide emissions, and 0.00004 percent on an annual basis of total world CO_2 levels cumulatively over the life of the mine in contrast to the No-Action alternative (assuming plant closure). Cumulative percentages are higher if indirect emissions are also considered, however, the addition of CO_2 to regional or global atmospheric conditions is not expected to affect development of the Proposed Action or implementation of the alternatives, as discussed in **Section 5.2.2.5**.

The FEIS identifies that it is not yet possible to know with confidence the net impact of the project to climate, making such analysis uncertain. The agencies have evaluated the existing credible scientific evidence, but information relating to the precise impacts of the project on climate change, and of climate change on the project, is unavailable. The agencies do not agree with the commenters that the models should take into account a range of potential climactic changes, particularly given that the Agency Preferred Alternative would require the use of a GCLL. Similarly, the distribution and use of the end products of mine production is outside the scope of this impact assessment and is not dependent on the implementation of the project.

Mitigation measures specific to GHG emissions are not required for the project given its low level of emissions. Standard BMPs would be implemented to control fugitive dust and vehicle emissions, and project design features including a phased approach and cover materials would also reduce impacts from air emissions. P4 has also developed an Adaptive Management Plan (**Appendix B** of FEIS) to address issues associated with its water management system, which could be used to respond to potential changes in site conditions relating to climate change during mining operations. The agencies do not agree that an adaptive management strategy is necessary for post-closure monitoring and management related specifically to potential changes in site conditions related to climate change.

Letter/Comment: 959/hh, 961/gg

Comment Count: ***2***

Issue: **5d. BLM needs to ensure that P4 is complying with all of the necessary components of the federal and state air statutes.**

Response: BLM's authorization under 43 CFR Part 3590 and issuance of a Record of Decision does not preempt the need for the applicant to satisfy other permit requirements. P4 would need to comply with applicable federal and state laws and obtain any necessary permits required to implement the project. BLM would be responsible for enforcing any federal statutes or regulations that are associated with federal permits. State air statutes are administered by the IDEQ. However, enforcement of air statutes is not part of the impact assessment for this EIS.

Letter/Comment: 964/qq

Comment Count: ***1***

TOPIC: ***6. WATER RESOURCES***

Issue: **6a. The potential effects on the Blackfoot River by runoff from the mine.**

Response: As discussed in **Sections 4.3.1.1.5** and **5.3** of the FEIS, the agencies are aware of concerns about effects to the Blackfoot River by runoff from the mine and have addressed these potential impacts in the FEIS. Measures to control the release of selenium or other COPCs to the Blackfoot River are part of the Agency Preferred Alternative and will be required in the ROD. The installation of cover designs would reduce chemical loading of COPCs to the Blackfoot

River from the project area. Modeling results predict that the Agency Preferred Alternative would meet applicable water quality standards. Project design features, BMPs, the Water Management Plan (P4 2010c), and the proposed Mine and Reclamation Plan are elements designed to reduce environmental impacts to water resources.

Letter/Comment: 45/d, 47/a, 67/b

Comment Count: ***3***

Issue: **6b. The potential effects on groundwater and surface water quantity and quality.**

Response: As discussed in **Sections 3.3, 4.3,** and **5.3**, the agencies are aware of concerns about groundwater and surface water quantity and quality and have addressed these potential impacts in the FEIS. Project design features, BMPs, the Water Management Plan (P4 2010c), and the proposed Mine and Reclamation Plan are elements designed to reduce environmental impacts to water resources.

Letter/Comment: 45/f, 459/a, 464/a, 966/f, 966/m, 966/r

Comment Count: ***6***

Issue: **6c. The potential effects of backfill or overburden material leaching contaminants into the groundwater.**

Response: As discussed in **Sections 3.3.2, 4.3.1**, and **5.3**, the agencies are aware of concerns about backfill or overburden material leaching contaminants into the groundwater have addressed these potential impacts in the FEIS. Project design features, BMPs, the Water Management Plan (P4 2010c), and the proposed Mine and Reclamation Plan are elements designed to reduce environmental impacts to water resources.

Letter/Comment: 966/u, 968/g

Comment Count: ***2***

Issue: **6e. The potential effects on streams and surface water bodies and the compliance with water quality standards and regulations.**

Response: The potential effects on streams and surface water bodies and the compliance with water quality standards and regulations are discussed in the FEIS. The cover designs would reduce chemical loading of COPCs to surface water from the project area. Modeling results predict that the Agency Preferred Alternative would meet applicable water quality standards. Project design features, BMPs, the Water Management Plan (P4 2010c), and the proposed Mine and Reclamation Plan are elements designed to reduce environmental impacts to water resources.

Letter/Comment: 49/e

Comment Count: ***1***

Issue: **6g. The mineralogical and weathering characterization studies for the project are inadequate. Specifically:**

1. **Only four thin sections were prepared for mineralogical analysis;**
2. **Strong differences in mineralogy and contaminant associations between weathered and unweathered rocks in the Meade Peak make it critical that geochemical test units are separated based on the extent of weathering, in addition to other factors;**
3. **The Upper and Lower Center Waste units have numerous alternating layers of shale, siltstone, and mudstone, with some phosphatic seams and calcareous mudstones in the lower subunit. These layers in the subunits should be sampled separately to see if they have substantially different contaminant concentrations and leaching characteristics;**
4. **The geochemical sampling program conducted did the opposite of what was needed at the beginning of an environmental sampling: it "lumped" rather than "split" the mined materials for geochemical analysis. In fact, in addition to combining potentially inappropriate lithologies and alterations together in the Meade Peak Member, the Rex**

Shale and the Cherty Shale were combined in the material balance as Rex Chert;

5. **Compositing scheme was flawed and additional testing should be performed to provide finer definition of subunits for center waste and Rex Chert; and**
6. **Additional geochemical testing including whole rock elemental analyses, mineralogy and alteration analysis should be performed on uncomposited samples of center waste to determine if different parts of the unit need to be managed differently.**

Response: The geochemical characterization study was prepared in accordance with the Baseline Geochemical Characterization Study Plan (Whetstone 2006b) as modified by several memoranda (Whetstone 2006c, 2006d, 2007b, 2007c, and 2007d) with direction from BLM, IDEQ, and P4. The purpose of the study was to provide data that could be used to evaluate the geochemical characteristics and leaching behavior of the proposed overburden and ore. The testing methodologies used for the study were based on previous NEPA investigations for phosphate mines in the region (Maxim 2000, 2002a, and 2005) and included an extensive sampling and laboratory testing program that involved collecting more than 3,000 individual samples.

In response to bullet item 1, the mineralogical analysis for the Blackfoot Bridge Project is well supported by numerous data sources and is appropriate for the intended purpose of evaluating the geochemical characteristics and leaching behavior of the proposed overburden and ore. Although the comments correctly state that only four thin sections were prepared for the study, it is noted that this is the first geochemical characterization study for a phosphate mine in the region to incorporate thin section mineralogy as part of the baseline investigation. The thin sections were supplemented by 231 pages of drill logs containing site-specific mineralogical and lithologic information. Detailed mineralogical studies including polarized light microscopy, SEN/EDS, electron microprobe/EDS/WDS, XRF, and reflected light microscopy undertaken by the USGS and others including were also used to support the baseline analysis. In particular, studies compiled by Hein in Lifecycle of the Phosphoria Formation (Hein 2004) provide a comprehensive overview of the mineralogy and distribution of COPCs in Phosphoria Formation rocks. Hein's compilation was used extensively in the Blackfoot Bridge baseline study and represents the culmination of a 5-year cooperative research effort by the USGS, BLM, and USFS to support land management decisions by the agencies. The baseline study provides a broad overview of the mineral assemblages present in the proposed overburden and ore and forms a solid foundation for the evaluation of the geochemical characteristics and leaching behavior of the material.

The concerns expressed in bullet items 2 through 5 are similar to each other in that they are related to how the geologic testing units for the baseline geochemical characterization study were defined and composited. It is EPA's opinion that the center waste and the Rex Chert should have been subdivided into smaller groups for geochemical testing based on weathering, bedding, and small-scale lithologic variation. The purpose of subdividing the units would be to provide more detail about the residences of selenium and other COPCs for the evaluation of potential selective handling practices. The distribution of selenium and other COPCs in the Meade Peak and Rex Chert has been extensively studied by Herring and Grauch (2004), Herring (2004), Hein et al. (2004b), and Maxim (2000, 2002a, and 2005). The results of these studies indicate that selenium and other metals are widely distributed throughout the center waste, and regardless of weathering, individual beds and sub units are generally reactive and not amenable to selective handling based on relative environmental hazard. Regionally, the Rex Chert is more variable, with light colored sparry chert beds having lower selenium concentrations than darker shaley intervals. However, the character of the Rex Chert at Blackfoot Bridge is predominantly dark and shaley, and lithologic indicators that could be used to segregate high and low selenium content material were not apparent in the samples used for the baseline study. Although the authors of the FEIS do not agree with the comment that the center waste and Rex Chert should have been subdivided into smaller testing units and that compositing of the samples was potentially inappropriate, a supplemental study of weathering alteration and the elemental distribution in the rocks has been performed to address the concern (Whetstone 2010a).

The supplemental study is presented in Addendum A of the Revised Final Baseline Geochemical Characterization Study (Whetstone 2010a) and was performed on 1,467 splits of

samples that were used to prepare the original A-Composites (603 samples of Rex Chert and 864 samples of center waste). The study included logging the samples for lithology, mineralogy, and weathering intensity, followed by determination of elemental content for nine COPCs by X-ray fluorescence spectroscopy. The evaluated COPCs included selenium, cadmium, iron, manganese, nickel, phosphorous, sulfur, uranium, and zinc. The results of the study indicate that selenium and other COPCs are widely distributed in the center waste at levels of regulatory concern. In general, selenium concentrations were higher in unweathered center waste (geomean = 52 ppm) than in weathered center waste (geomean = 19 ppm). However, both weathered and unweathered center waste contain elevated selenium concentrations that make them unsuitable for selective handling based on environmental risk. No stratigraphic or lithologic criteria were identified for the center waste that could be used to reliably segregate high selenium content material from low selenium content material. Selenium concentrations in the Rex Chert were slightly higher in weathered material (geomean = 8 ppm) than in unweathered material (geomean = 5 ppm). Weathering in the Rex Chert was largely a function of lithology, with clastic rocks (siltstone, mudstone, and breccia) being more weathered than cherty rocks. Given the interbedded nature of the chert and clastic rocks and similar selenium content, selective handling of the Rex Chert based on lithologic/weathering differences is not supported, and the geochemical testing unit defined for the Baseline Characterization Program is considered to be appropriate.

The compositing methodology for the column studies used length-weighted samples of drill cuttings and cores from 43 boreholes that were spatially distributed along the length of the deposit. This sampling/compositing method provided for a broad and representative sampling of waste rock and backfill that will be produced from the pits. Because the sampling/compositing method provided representative samples that could be evaluated in terms of spatial and lithologic variability under the expected mining conditions, it is considered a scientifically valid approach to meet the goals of the Baseline Geochemical Characterization Study.

Letter/Comment: 959/c, 959/d, 959/e, 959/f, 959/g, 959/j, 959/k, 959/w

Comment Count: ***8***

Issue: **6i. Noted that the column composites were not representative of the current mine plan and underrepresented the center waste. The concern is that the validity of the model may be in question because of its reliance on inappropriate samples.**

Response: The mine plan that is presented in the FEIS specifies material balances for the proposed facilities that are different than those specified in the mine plan that was used to design the columns (P4 2005). The differences are documented in the Revised Final Baseline Geochemical Characterization Study (Whetstone 2010a) and the Revised Source Term Development Report (Whetstone 2010b). The column tests indicate that center waste is the unit of highest environmental concern and that the origin of the material (e.g., from the North Pit, Mid Pit, or South Pit) affects the leachability selenium and other COPCS. An important conclusion of the column study was that selenium and other COPCs are released at higher concentrations as the source of the center waste moves south (Whetstone 2010a).

The proposed facilities that are underrepresented in the column studies with respect to center waste include the backfills for the North Pit, Mid Pit, and South Pit. All other facilities would either contain no center waste or would contain only segregated Meade Peak waste rock. The proposed material balance for the North Pit backfill contains 7.3 percent more center waste than modeled in the column. About 17.3 percent of the center waste would be derived from the South Pit. The corresponding column contained only center waste derived from the North Pit and Mid Pit. The proposed material balance for the Mid Pit backfill contains 13.0 percent more center waste than modeled in the column. About 61.5 percent of the center waste would be derived from the South Pit. Only 2.3 percent of the center waste in the corresponding column for the Mid Pit was derived from South Pit. The proposed material balance for the South Pit backfill contains 5.0 percent more center waste than the column. All of the center waste would be derived from the South Pit. The corresponding column for the South Pit contained only center waste derived from South Pit.

Differences between the center waste content of the proposed backfills and their corresponding columns were accommodated in the contaminant transport model using the arithmetic average of the pore volume concentrations for the North Pit, Mid Pit, and South Pit columns to represent the North Pit and Mid Pit backfills. The source term for the South Pit backfill was simulated using pore volume concentrations from the column for the South Pit. The results of the adjustments for the modeled unsaturated source terms are summarize in the following tables.

As shown in the second table, the averaging method that was used to correct the 7.4 percent material balance discrepancy between the proposed North Pit backfill and the corresponding column resulted in a 100.9 percent increase in the modeled selenium concentration. In the Mid Pit, the adjustment resulted in a 39.2 percent increase in selenium concentration to compensate for a 13.0 percent discrepancy in the material balance. These adjustments are conservative in that they result in large modeled increases in selenium concentration compared to the relatively small changes in the center waste material balance. Although the source term concentration of the South Pit backfill was not adjusted, the modeled infiltration area includes the footprint of the low selenium limestone and chert partial backfill that will be placed to cover the outcrop of the Meade Peak in the pit bottom. This source term implementation increases modeled loading of COPCs from the South Pit backfill by about 70 percent over what would occur if the infiltration area was simulated as being equal to the proposed footprint of the seleniferous backfill. Even though some uncertainty exists in both the projected material balances for the backfills and in the application of column leachate concentrations to represent field-scale mine facilities, the source terms used in the contaminant transport model are considered to be reasonably conservative estimates of seepage concentrations for the proposed mine facilities.

Comparison of Material Balances for Proposed Mine Facilities, Columns, and Unsaturated Source Terms

Facility	Waste Rock Source Area	Mine Plan Percentages		Columns Percentages		Adjusted Source Term Percentages	
		Center Waste	Other Waste	Center Waste	Other Waste	Center Waste	Other Waste
North Pit Backfill	North Pit	5.7	18.1	9.2	25.8	4.0	8.7
	Mid Pit	13.1	49.1	6.1	58.9	5.3	43.7
	South Pit	3.9	10.1	0.0	0.0	7.7	30.6
	Total	**22.7**	**77.3**	**15.3**	**84.7**	**17.0**	**83.0**
Mid Pit Backfill	North Pit	10.0	32.0	2.8	0.3	4.0	8.7
	Mid Pit	0.0	0.0	9.9	72.1	5.3	43.7
	South Pit	16.0	42.0	0.3	14.6	7.7	30.6
	Total	**26.0**	**74.0**	**13.0**	**87.0**	**17.0**	**83.0**
South Pit Backfill	North Pit	0.0	0.0	0.0	0.0	0.0	0.0
	Mid Pit	0.0	0.0	0.0	0.0	0.0	0.0
	South Pit	27.7	72.3	22.7	77.3	22.7	77.3
	Total	**27.7**	**72.3**	**22.7**	**77.3**	**22.7**	**77.3**

Unsaturated Source Term Selenium Concentrations Compared to Column Leachate Concentrations

Facility	Center Waste Percentage Discrepancy Between Mine Plan and Columns	Pore Vol. 1 Selenium Concentrations (Column Leachates)	Pore Vol. 1 Selenium Concentrations (Modeled)	Modeled Increase in Selenium Concentration Compared to Columns Leachates
North Pit Backfill	7.4 %	0.357 mg/L	0.753 mg/L	110.9 %
Mid Pit Backfill	13.0 %	0.541 mg/L	0.753 mg/L	39.2 %
South Pit Backfill	5.0 %	1.361 mg/L	1.361 mg/L	0.0 %

Letter/Comment: 959/h, 963/w

Comment Count: *2*

Issue: **6j. Commented that phosphate and uranium should be considered COPCs because of their elevated concentrations in mined materials and associated leachate. Nitrate, nitrite, and ammonia should also be added to the list of COPCs because they will likely occur in mine runoff and infiltration as a result of blasting activities.**

Response: Although whole rock elemental analyses indicate that the proposed waste rock has elevated phosphorous and uranium content, it is a partial mischaracterization to state that the concentrations of the two elements were elevated in the associated leachates. Average phosphate concentrations in column and SPLP leachates were relatively low: 0.06 and 0.26 mg/L respectively. No numerical standards for groundwater or surface water are applicable for phosphorous or the related ion phosphate. It is noted that surface water and groundwater monitoring at phosphate mines in southeast Idaho does not indicate significant mobility of phosphate in the environment. The maximum concentrations of uranium in leachates from column and SPLP tests were 0.06 and <0.03 mg/L, respectively. The federal drinking water standard is 0.03 mg/L. Uranium was undetected in all SPLP leachates. Approximately 6 percent (5 out of 85) of the uranium analyses for the columns were at or above the federal standard. The FEIS and supporting technical documents erroneously did not note the elevated uranium analyses. This is corrected in the FEIS where uranium is listed as a COPC. It is noted, however, that water quality monitoring at phosphate mines in southeast Idaho does not indicate significant mobility of uranium at levels of regulatory concern.

In response to EPA's concerns, phosphorous, uranium, nitrate, nitrite, and ammonia were added to list of COPCs discussed in the FEIS. Source terms for phosphorous and uranium are included in numerical groundwater model. Nitrate, nitrite, and ammonia are discussed qualitatively because they are related to blasting, and samples of blasted rock from the proposed project are not available.

Letter/Comment: 959/i, 959/y

Comment Count: ***2***

Issue: **6k. Expressed concern about the use of EPA Method 1312, (Synthetic Precipitation Leaching Procedure [SPLP] tests) in the Baseline Geochemical Characterization Study and commented that the Meteoric Water Mobility Procedure (MWMP) would have been a preferable testing methodology. Specifically the comment stated "The liquid: solid ratio in the [SPLP] test is 10:1 and the standards are generally set at 100 times the Safe Drinking Water Act Maximum Contaminant Levels, assuming that contaminants will be diluted between the source materials and groundwater. However, for wastes in the arid western United States, this much dilution may not occur, and the test may underestimate leaching concentrations. Nevada instead uses the meteoric water mobility test (MWMP), which has a liquid: solid ratio of 1:1 (Maest et al. 2005). It would be preferable to use the MWMP leach test for materials at the Blackfoot Bridge Project to conservatively estimate short-term leachate concentrations."**

Response: The correct liquid to solid ratio for SPLP testing is 20:1 rather than the 10:1 ratio cited by the commenter. SPLP tests were used for the Blackfoot Bridge study to provide continuity with previous testing in the Southeast Idaho Phosphate District. SPLP tests have been extensively used in phosphate mine baseline characterization studies over the last decade, and were used in the Blackfoot Bridge study to provide analyses that were comparable to previous testing programs. The SPLP tests were used as a screening level analysis to help evaluate relative differences in leaching characteristics between different lithologic types and source areas at Blackfoot Bridge. They were not used, nor were they intended to be used, to estimate "short-term leachate concentrations" for comparison to regulatory standards. Instead, column leaching tests were used to quantitatively model the expected seepage concentrations from the proposed mine facilities. The liquid to solid ratio for each cycle of the columns was 0.25:1 which is more environmentally conservative than the 1:1 ratio specified for the MWMP tests.

Letter/Comment: 959/l

Comment Count: ***1***

Issue: **6l. Commented that the column testing approach used for the baseline geochemical characterization study was markedly different than column testing used in hard-rock mining applications and was not well described in the Baseline Geochemical Characterization Study. Specific Comments included:**

1. **The column testing method is not well described in Whetstone (2009a), and the timing of sample collection in the method is not described;**

2. **The approach used is markedly different than column testing normally used in hard rock mining applications. For example, the leaching period is much longer (14 days vs. 1 day for humidity cell testing), and this longer flushing period for the column test would likely dilute concentrations relative to results from the humidity cell test;**
3. **The column tests were conducted for a total of ~32 weeks, which may not be long enough to develop leaching of selenium from sulfides; and**
4. **Concentrations of sulfate, TDS, cadmium, manganese, nickel, and selenium were often elevated in the first leach cycle of saturated and unsaturated columns compared to later leach cycles, indicating that contaminants were leaching from salts quickly. If longer drying periods or shorter flushing periods were used in the testing - which would be more representative of weather conditions in southeastern Idaho - the salts might have had a chance to form again and produce elevated concentrations when flushed with solution.**

Response: The setup and operation of the columns is described on pages 51 through 60 of the Revised Final Baseline Geochemical Characterization Study (Whetstone 2010a). The discussion provides an overview of the column testing procedure including details about column construction, operation, sample collection, and quality control. The timing for the collection of samples is discussed on page 58, where it is stated that "the columns were allowed to drain freely and the leachates were collected at the bottom." The drainage period is cited as ending 48 hours after the 14-day solution application period. Appendix J of the Revised Final Baseline Geochemical Characterization Study (Whetstone 2010a) provides supporting detail regarding the exact dates and times for the solution application periods the drain down periods and sample collection.

The column testing methodology for Blackfoot Bridge was based on established procedures for the evaluation of phosphate mine waste rock in southeast Idaho (Maxim 2000, 2002a, 2005, 2006). The testing methodology has been modified several times with input from the agencies (IDEQ, BLM, and USFS) to address agency concerns about aeration, water to rock ratios, solution application rates, bacterial inoculation, water saturation, and composition (monolithologic composition versus mixed lithologic composition). Specific concerns that were addressed by the design of the column testing protocol for Blackfoot Bridge included:

- Previous column tests for phosphate mine waste rock were based on monolithologic compositions, and predictions of seepage concentrations for proposed backfills and overburden piles were calculated by "mixing" the leachate analyses in a spreadsheet to represent mine facilities with mixed lithologic composition. For Blackfoot Bridge, the agencies expressed a preference for using columns with mixed lithologic composition to more accurately represent the proposed composition of the waste rock disposal facilities. The mixed lithology columns are an improvement over the monolithologic testing method because they better simulate the complex reactions that may occur in a heterogeneous geochemical environment.
- The agencies expressed a preference that the solution application rate should be as slow as practicable to prevent the formation of partially saturated conditions in the columns. Slower application rates also provide a better match for infiltration rates observed in field-scale facilities. The lowest application rate that could be accurately calibrated with the column metering pumps was 15 m/L per hour. Each leaching cycle used a volume of water that was approximately equal to the pore volume of the sample material (5000 ml) which resulted in a 14-day solution application period.

The agencies requested that the unsaturated columns should be aerated between cycles to accelerate the natural weathering rate of the sample and mobilize constituents that are released by oxidative processes. The 3-day aeration period was partially based on methodology used for humidity cell tests.

Although humidity cell tests are often used for hardrock mines in Nevada, the column testing procedure has precedence in the Southeast Idaho Phosphate District. Experience has shown that the column tests generate first cycle leachates with compositions similar to observed seepage from phosphate mine overburden disposal facilities.

The hypothesis that "longer flushing period for the column test[s] would likely dilute

concentrations relative to results from the humidity cell test[s]" is not supported by theoretical considerations or experimental data. It is predicated on the assumption that longer aeration periods followed by rapid flushing would increase oxidative reaction rates and the release of COPCs. A study of the effects of aeration on the on the Blackfoot Bridge columns indicated no difference in selenium and COPC release rates between aerated and unaerated columns (Whetstone 2010a). Additionally, two other factors in the testing methodology increase the conservativeness of the column leaching tests over humidity cell leaching tests:

1. The humidity cell method specifies water to rock ratio of either 1:1 or 0.5:1. The column leaching tests used water to rock ratio of 0.25:1. All other considerations being equal, the lower water to rock ratio of the column tests should generate leachates with higher concentrations than humidity cell tests (the same amount of chemical mass in a smaller volume of water).

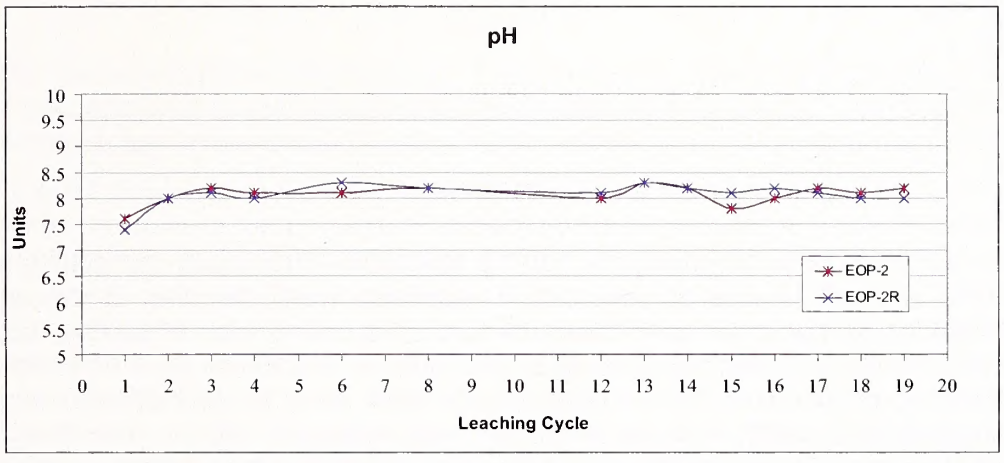
2. Given that aeration is demonstrated not to effect reaction rates in the columns (Whetstone 2010a), the longer duration of column cycles (19 days) compared to humidity cell cycles (7 days) should release more material per cycle if the releases are rate-controlled.

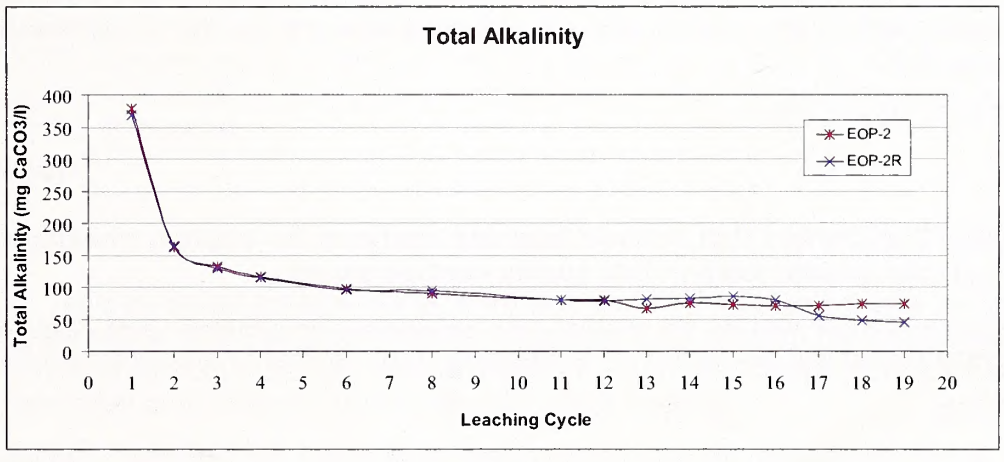
EPA also expressed concern that the duration of the column tests (32 weeks) may not have been long enough to develop leaching of selenium from sulfides. It is noted that the standard duration kinetic tests (e.g., humidity cell and column leaching tests) are designed to promote accelerated oxidation of sulfide minerals and the subsequent release of other constituents. Pyrite (FeS_2) and sphalerite (ZnS_2) are the primary sulfide minerals in the proposed waste rock from Blackfoot Bridge. The oxidation of pyrite releases iron, sulfate, and acidity into solution. Sphalerite oxidation releases zinc, sulfate, and acidity. The strength and rate of sulfide mineral oxidation reactions in kinetic tests are evaluated by monitoring pH, alkalinity, acidity, and the concentrations of reaction products in leachates (e.g., iron, zinc, and sulfate). Results from the column test indicate an initial flush of stored sulfate during the first three cycles followed by lower sulfate releases with stable to decreasing concentrations. Iron, zinc, selenium, and cadmium concentrations in the leachates followed similar trends. Solution pH increased initially and then stabilized above 7.5. Alkalinity decreased rapidly during the first three cycles and then was stable to slightly decreasing at about 90 mg $CaCO_3$/L. These results indicate that sulfide mineral oxidation rates were stable to decreasing at the end of the 32-week testing period. The data provided no indication that redox conditions in the columns were likely to change, or that sulfide mineral oxidation rates and selenium releases were likely to increase.

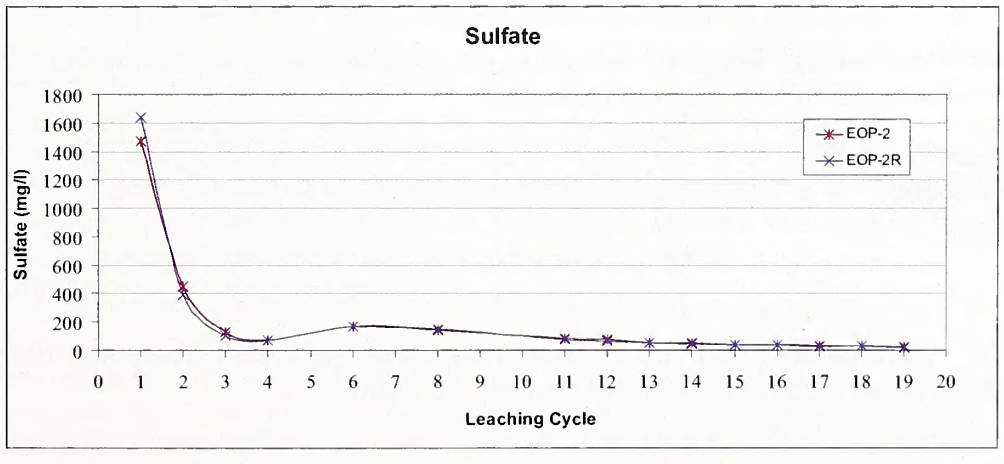
The conclusion that sulfide mineral oxidation rates were stable or decreasing in the columns at the end of the 32-week testing period was confirmed by additional testing of columns EOP-2 and EOP-2R. The additional tests were external to the scope of work defined in the Baseline Geochemical Characterization Study Plan (Whetstone 2006b) and are documented in an addendum to the Revised Final Baseline Geochemical Characterization Study (Whetstone 2010a). Columns EOP-2 and EOP-2 R are replicates of each other and contain only Meade Peak waste rock. The columns were operated for eight additional cycles after the end of the 32-week baseline testing period (19 cycles total). The total testing time was approximately 1 year (361 days). The purpose of the additional cycles was to evaluate the effect that aeration of the columns had on sulfide mineral oxidation rates and the release of selenium.

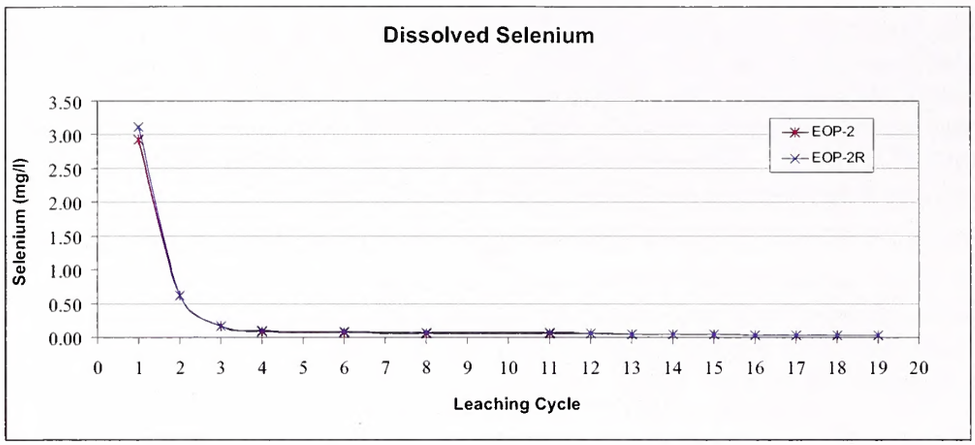
Operation of columns EOP-2 and EOP-2R during cycles 1 through 11 is described in the Revised Final Baseline Geochemical Characterization Study (Whetstone 2010a). Each leaching cycle required 19 days to complete and included a 14-day solution application period, 2-day drain-down period, and 3-day aeration period. The head solution (distilled water) was applied to the tops of the columns at a rate of about 15 ml/hr. Aeration of the columns was accomplished by circulating dry air (up-flow) through the columns at a flow rate of approximately 1 liter per minute (lpm). During cycles 12 through 15, circulation of dry air through column EOP-2 R was discontinued, and the column was allowed to sit idle during the aeration period. The column was otherwise operated as it had been previously. No changes were made to the operating procedure for EOP-2. In cycles 16 through 19, column EOP-2R was swept with nitrogen gas during the aeration period to remove residual oxygen from the pore spaces. Again, no changes were made to the operating procedure for column EOP-2. The results of the study indicated that sulfate production (and hence sulfide weathering) tracked together in both columns and decreased with subsequent leaching cycles. The pH of

the leachates was stable near 8, and the alkalinity for EOP-2 (the non-modified column) stabilized at about 70 mg $CaCO_3$/L. Alkalinity in EOP-2R decreased to 45 mg/L after it was swept with nitrogen gas. Dissolved selenium concentrations tracked together in both columns decreasing to 0.028 and 0.03 mg/L in leachates from EOP-2 and EOP-2R respectively at the end of cycle 19. Time-concentration plots for pH, alkalinity, sulfate, and dissolved selenium in column leachates are presented in the following diagrams.









In summary, data from columns EOP 2 and EOP-2R indicate that sulfide mineral weathering rates and the release of selenium in leachates were declining at the end of the 32-week baseline testing period, and that after approximately 1 year of testing, sulfate and selenium concentrations in leachates were still declining. The columns gave no indication that increased leaching of selenium from sulfide mineral was likely to develop with time. The data also suggest that sulfide mineral oxidation and selenium release from the columns were not significantly affected by the aeration cycle. The implication of this observation is that longer drying periods with rapid flushing would not likely have resulted in increased releases from the columns.

Letter/Comment: 959/m, 959/n, 959/o

Comment Count: ***3***

Issue: **6m. Commented that column leachate analyses for copper, phosphorous, manganese, and total organic carbon had quality control issues.**

Response: Quality control issues for copper, phosphorous, manganese, and total organic carbon are documented and discussed in the Baseline Geochemical Characterization Study.

Letter/Comment: 959/p

Comment Count: ***1***

Issue: **6n. Commented that total selenium concentrations in the column leachates were biased low because of loss during digestion.**

Response: Quality control issues for total selenium analyses in column leachates are documented and discussed in the Baseline Geochemical Characterization Study.

Letter/Comment: 959/q

Comment Count: ***1***

Issue: **6o. Commented that there were many problems with analytical data from the batch adsorption tests and the tests results are equivocal.**

Response: Adsorption data from the batch test were unreliable, as discussed in the Baseline Geochemical Characterization Study. The report recommends that the data not be used for quantitative modeling of sorption in groundwater flow and contaminant transport models. Consistent with the recommendation, the data were not used in any portion of the EIS analysis.

Letter/Comment: 959/r, 959/x

Comment Count: ***2***

Issue: **6p. The discussion of modeling results in the DEIS should be revised for the FEIS to reflect the inherent uncertainty associated with the results. (i.e. described as being likely to have impacts near levels of regulatory concern rather than as absolute values).**

Response: The discussion of model uncertainty presented in **Section 4.3.1.1.4** of the FEIS is consistent with the EPA's recommendation. Many sections of the document, however, discussed model results as deterministic values. The narrative in the FEIS has been modified to emphasize the degree of uncertainty that is associated with predicted values.

Letter/Comment: 959/s

Comment Count: *1*

Issue: **6q. Concentrations of selenium in groundwater discharging to the drainage above Fish Pond are predicted to exceed surface water standards, but concentrations in the smaller streams and other surface water bodies on the mine site were not predicted in the DEIS.**

Response: Results from the numerical groundwater model presented in the FEIS indicate that selenium concentrations in groundwater discharging to the drainage above Fish Pond would exceed applicable surface water standards for the Proposed Action, but would be below the lowest applicable standard for Alternatives 1A and 1B. Both the DEIS and FEIS contain discussions and predictions of water quality impacts for drainages in the project area that have perennial, intermittent, or ephemeral surface flow, including Blackfoot River, Fish Pond Drainage, State Land Creek, Beaver Pond Drainage, Woodall Spring, North Woodall Spring, and Wetland A. Discussions of the potential water quality impacts to Wetland X were also added to the FEIS. Surface water quality impacts and COPC concentrations are not predicted for other small drainages in the project area because the drainages are dry. Maps showing selenium and COPC concentrations in groundwater are presented in both the DEIS and FEIS and provide detailed information about the predicted aerial extent of ground water impacts at levels of regulatory concern.

Letter/Comment: 959/t

Comment Count: *1*

Issue: **6r. The modeled source terms were too low for important waste sources based on the observation that the pore volume concentrations used in the model were lower than the concentrations observed in the column leachates. Input concentrations for the first saturated pore volume are too low for initial wetting.**

Response: Previous contaminant fate and transport models for the phosphate mines in southeast Idaho have used pore volume approaches for the specification of source terms. The approach has precedent and is well established in the phosphate district (JBR 2007, Whetstone 2003). The pore volume approach assumes that observed concentrations of COPCs in sequential leachates from column tests can be applied with some modification to simulate concentrations in sequential pore volumes of seepage moving through backfill and overburden. Because the time required to infiltrate one pore volume of seepage through an overburden pile or pit backfill is generally on the order of 100 to 500 years, only the first one or two pore volumes from column tests are generally used as model source terms.

Column leaching data were normalized for application in the contaminant transport model using a mass balance approach to adjust concentrations to represent the chemical mass that would be released into one full pore volume of seepage. This step was required because the leachate recoveries from the first column cycle varied from about 24 percent to 51 percent of a full pore with the rest of the applied solution being retained in the columns to satisfy the field capacity of the dry material. Recoveries for subsequent leaching cycles were approximately equal to a full pore volume of solution. The normalized source term concentrations are consistent with data from the column tests and the pore volume modeling approach.

Model input concentration for the first saturated pore volume is based on concentrations observed in leachates from the saturated columns (Whetstone 2010a). The column tests did not indicate releases of COPCs during the initial wetting of the material that are not accounted for in the model. The concern that this input concentration is too low is not supported by baseline geochemical characterization work that was performed to specifically address this issue.

Letter/Comment: 959/u, 959/z, 961/dd, 961/m

Comment Count: *4*

Issue: **6s. Results from the field demonstrate that concentrations of contaminants in seeps vary seasonally rather than decreasing consistently over time. The model should evaluate seasonal variations in source concentrations, and the impact on groundwater and surface water concentrations should be determined.**

Response: The ground water model is based on the expected average annual condition. In reality, variations in precipitation, recharge, groundwater levels, and stream flow and water quality occur both seasonally and between years. The water resources technical report presents detailed analyses of the variation associated with these parameters. Seepage concentrations and discharges from phosphate mine wastes also vary seasonally and between years. Data presented in the source term development report indicate that the variation in concentration may span several orders of magnitude. Discharges from overburden associated seeps often vary by a factor of 10 or more.

The model is intended to evaluate the probable long-term impacts to water resources that could occur from the proposed mine facilities. For this purpose, the use of average values for the source terms is appropriate because they provide the best available engineering estimate of the expected total release from the proposed facilities over the simulated time period. Although seasonal and yearly variations in the source term are likely to occur, they are difficult to predict and quantify for input into the model. Instead, potential variability in hydrologic parameters and the source term concentrations was evaluated in sensitivity analyses presented in the groundwater modeling report. The results of the sensitivity analyses indicate that cyclic changes in source term concentration and seepage rates would have the strongest effect in groundwater directly below the modeled source terms. At distances of several hundred feet away from the sources, the effect of cyclic pulses would be similar to the average modeled concentrations presented in the FEIS.

The modeling approach used for the Blackfoot Bridge provides a defensible analysis of the long-term impacts to water resources from the proposed project. Although seasonal variability in the source term and other hydrologic factors is not explicitly modeled, it is considered in the modeling approach and has been evaluated in the sensitivity analyses for input parameters. For example, seasonal variability (e.g., spring melt) has been incorporated into the modeled infiltration rates for the cover designs that were used in the groundwater model (O'Kane 2009a and 2009b, O'Kane and Benson 2009). The groundwater flow model was calibrated to seasonal water level fluctuations due to seasonal variability of recharge from precipitation measured between fall 2005 and 2006. Discussions about the probable effects of seasonality on the predicted impacts to water are provided in the Final Groundwater Modeling Report (ARCADIS 2010).

Letter/Comment: 959/v

Comment Count: *1*

Issue: **6t. Rejection of the selective pit backfill alternative appears to be based on a worst-case scenario. The evaluation of this alternative needs to consider options of segregating materials, including placement of material with highest COPCs below the water table.**

Response: Under the Preferred Alternative 1A, mitigation steps are being provided to ensure that selenium-containing overburden would be managed properly. This includes installation of GCLL covers over backfilled pits and an 86-acre area of the EOP. Seepage collection systems would also be installed below the external overburden piles.

The volume of space below the water table in the North Pit would be approximately 3.1 mcy. About 0.3 mcy would also be available below the water table in the Mid Pit. No space would be available in the South Pit because the excavation would not intersect the regional water table. The Revised Final Baseline Geochemical Characterization Study (Whetstone 2010a) indicates the center waste has the highest selenium content of the various material types that would be produced as overburden. The volume of center waste that would be produced by the mining

operation is about 25.1 loose cubic yards (lcy), which is 7.4 times greater than the available saturated backfill space. Under the current mine plan, center waste would comprise about 22 percent of the backfill placed below the water table in the North Pit and about 26 percent of the backfill placed below the water table in the Mid Pit. Additional segregation of backfill to place only center waste below the water table would allow for an additional 2.6 mcy of center waste to be placed in the saturated environment. About 22 mcy of storage space for center waste would still be required above the water table. Given the relatively small volume of space that would be available below the water table compared to volume of center waste that would be produced, selective handling of center waste to preferentially place the material below the water table would have only minor potential to reduce selenium and COPC leaching from backfill. Additionally, the proposed mitigation measure would result in concentration of material with the highest potential to release selenium and other COPCs in a location near Blackfoot River. Given the limited area within the pits that would be available and the proximity of the North Pit Location to Blackfoot River, a sub-alternative that considered placing segregated material below the water table was not carried forward for analysis.

Letter/Comment: 959/aa

Comment Count: ***1***

Issue: **6u. Construction of the EOP Toe Interception Ditch should be given further consideration. Many mines in the U.S. use this technology as an initial interception measure and it is considered a standard BMP. Application of various groundwater capture systems to collect leachate should be considered, whether that leachate originates from features such as overburden piles or from open pits containing in-place or backfilled materials. Leachate collection systems to be evaluated should include French drains, toe trench drains, or interceptor ponds installed to intercept groundwater contaminated with COPCs. In the event that the site-specific features make groundwater capture problematic, liner systems installed underneath the EOP or relocation of the EOP and/or NWOP should be given further consideration in terms of an alternative.**

Response: For purposes of clarification, an interceptor trench and toe trench are considered very similar in terms of location and function. A roadside ditch is smaller than a toe trench and is designed to intercept overland flow similar to a toe trench, but its primary purpose is to protect the road surface from overland flow.

In response to comments received on the DEIS, P4 designed an OSMS to be installed in the NWOP and EOP overburden piles. The system is designed to direct seepage that infiltrates to the base of the NWOP or the EOP and forms saturated conditions above compacted clay layer prior to the placement of the final cover or in the unlikely event of a failure of the final cover system.

Two locations within the EOP and one location within the NWOP exhibit shallow groundwater zones. As part of the design of the OSMS, perforated pipe would be installed at these locations prior to construction of the compacted subgrade layer to drain existing groundwater from the footprint of the facilities. These groundwater underdrains would keep natural groundwater from potentially contacting overburden and would ensure stability of each overburden pile.

The EOP site topography poses limitations to the ability to install an open topped toe ditch of sufficient size to accommodate the runoff and sediment load that would be generated seasonally from the EOP facility and coincidentally provide for access for maintenance equipment without filling wetlands associated with the unnamed tributary. With installation of the OSMS, a bermed maintenance/access road would be constructed which would provide a limited barrier to sediment movement into the unnamed tributary. Employment of BMPs on the toe and slope of the EOP as it is constructed would also control sediment movement from the EOP.

As indicated above, a toe ditch of the size needed to capture all sediment and runoff from the EOP has been extensively evaluated and has been determined to be impracticable. In the Supplemental Alternatives Analysis, P4 designed additional variations to the toe ditch. For Supplemental Alternatives 1 and 2, the amount of physical space between the toe of the EOP, the access road, and the unnamed tributary to Fish Pond does not allow sufficient space to

construct a toe ditch of the size needed to manage the volume of annual runoff calculated to occur over the life of the project, manage the 100-year/24-hour storm event, and avoid release of sediment to the unnamed tributary.

Numerous water runoff and water control BMPs are already included in the Mine and Reclamation Plan to collect and divert water and trap sediment (**Section 2.3.9.1**). In response to public comments, these BMPs would include a small roadside ditch to be installed between the road fill and the toe of the EOP and NWOP which would, in combination with other BMPs (silt fences, straw wattles) trap sediment. However, the roadside ditch would not be of sufficient capacity to trap all of the sediment and runoff nor would it provide a barrier to seepage movement into the unnamed tributary.

The area currently containing the unnamed tributary drainage is included in the overall water management system to assure that potentially impacted surface water, groundwater, and sediment do not move beyond control features. A primary goal of the water management system is to prevent water quality impacts to the Blackfoot River, which will be protected using the design systems described.

If the water management system is not constructed, there may be potentially significant effects on water quality. For example, the loss of 9.8 acre-feet of storage capacity associated with EP2-4 would substantially affect the project by increasing the amount of water that may report to the CP2 and WMP1/2 systems. The predicted water balance for the 17-year life of the project based on the Proposed Action is shown in **Table 2.3-6**. The predicted water balance based on the water management system to be employed for Alternatives 1A and 1B is discussed in **Section 2.4.1.1.10**. Any loss of storage capacity as a consequence of eliminating water control ponds would have a substantial impact on the ability of P4 to protect offsite water quality, especially during pit dewatering phases of the project. Accordingly, the size and design of the water control ponds are necessary for the project's water management system.

Letter/Comment: 958/i, 958/k, 958/l, 959/bb, 961/q, 961/r

Comment Count: ***6***

Issue: **6v. Impacts of Alternative 1A to water quality are not adequately evaluated. Additional information and analysis are needed to understand whether and to what extent Alternative 1A would cause or contribute to violations of surface water and groundwater quality standards in the project area. Other alternatives should be considered to minimize impacts to jurisdictional waters.**

Response: Additional discussion of mitigation has been provided in the **Section 2.4.1.2**, including the implementation of an Adaptive Management Plan (**Appendix B** of FEIS) to the Water Management Plan (P4 2010c) to minimize impacts to jurisdictional waters. Potential impacts of implementation of Agency Preferred Alternative 1A on off-site water quality have been evaluated through extensive modeling (of both groundwater and capping systems). As described in the FEIS, the predicted impacts do not violate water quality standards.

Letter/Comment: 959/a

Comment Count: ***1***

Issue: **6w. Modeling indicates that selenium from the EOP would exceed surface water quality standards. While this flow could be intercepted and diverted to the water management ponds for treatment, modeling shows that elevated levels would still persist in 200 years. Additional information concerning the period of time this exceedance would persist and how long water treatment would be required needs to included in the FEIS. If this flow is not captured and treated, this action would violate the Clean Water Act and water quality standards.**

Response: Numerical modeling for Alternative 1A (and 1B) indicates that surface water in the drainage above Fish Pond and the Blackfoot River is expected to meet applicable water quality standards. Because the Proposed Action is not projected to meet the requirements of the Clean Water Act and is not being considered as the agency preferred action, additional

modeling of the contaminant plume for longer time periods is not warranted for the impact analysis.

Letter/Comment: 961/aa, 961/bb, 961/z, 964/c

Comment Count: *4*

Issue: **6x. Alternatives 1A and 1B both use a GCLL but in order to be more conservative, modeling efforts were conducted for an unlaminated version of the GCL. Since GCLL is estimated to have a percolation rate ten times less than the GCL, the assumption is that the applied layers will be more protective. The assumption made in the DEIS is that this difference would allow Alternative 1A to meet water quality standards. However, the field tests and modeling do not appear to have been conducted for GCLL. The FEIS needs to include a thorough evaluation and modeling results of the GCLL and potential for degradation over time.**

Response: The analysis for the FEIS includes updated two-dimensional numerical modeling of infiltration for the proposed GCLL cover system, as requested by the commenter, which has been incorporated into the groundwater contaminant fate and transport model. The GCLL cover design is being evaluated for Alternatives 1A and 1B. Field-scale testing of the GCLL cover system is beyond the scope of the EIS analysis. A thorough evaluation and discussion of the expected cover performance is presented in the FEIS in **Sections 2.4.1** and **4.3.1.2**, including the discussion and analysis of the potential for degradation of the GCLL covers with time. The inspection and monitoring schedule for the cover systems is provided in the Environmental Monitoring Plan (**Appendix A** of FEIS).

The cover system for Blackfoot Bridge Mine employs materials with the greatest resistance to failure while also providing the needed level of performance. The laminated GCL (GCLL) proposed for the barrier system minimizes potential problems related to dehydration and cracking of the bentonite. Field performance of GCLLs deployed in covers have performed adequately, even in conditions where the amount of water to be managed is much larger than that at Blackfoot Bridge Mine and under conditions that severely damage conventional GCLs (Benson et al. 2007a, Meer and Benson 2007). There are no reported cases of root penetration causing a GCL or GCLL to fail. Reinforcement in the interior of the GCL component and the bond between the GCL component and the geomembrane laminate greatly reduce the potential for stability issues due to internal shear failure or sliding at the interface between the GCL and the geomembrane. No internal shear failures have been reported for reinforced GCLs deployed in waste containment systems.

Potential degradation of the GCLL has been considered in the analysis conducted to date. This analysis included the effect of potential construction defects in the GCLL and the assumed presence of burrow holes penetrating the GCLL. The burrow analyses conservatively assumed that the burrow was a direct conduit for water flow through the barrier, whereas actual field studies of animal burrows have demonstrated that passive air flow through burrows actually enhances performance of a cover (Landeen 1994).

The comments also reference biological degradation of the bentonite in the GCLs. This is not a logical degradation mechanism, as the inorganic materials comprising bentonite cannot be used as an energy source for the microbes responsible for biodegradation (biodegradation will occur only if the material can be used to support microbial activity). Additionally, the long-chain polymers used for the geosynthetic elements in GCLs are not prone to degradation (Gulec et al. 2004). Breakdown of geosynthetics due to abiotic degradation mechanisms is accepted as the predominant degradation mode, and these mechanisms are the primary focus of fundamental studies on the lifetime of geosynthetic materials (Koerner et al. 2005, Rowe et al. 2009). Best estimates of the lifetime of geosynthetics report in these studies generally are on the order of several hundred years.

The National Academy of Science's (NAS) report cited in the EPA comments recommends designs that allow for recovery, repair, and/or replacement are encouraged. The EPA comments also recommend that monitoring systems be included that can validate performance and detect failures in engineering features before significant environmental consequences occur. The cover at Blackfoot Bridge Mine is the primary engineering feature controlling long-

term performance. For this reason, the cover system at Blackfoot Bridge Mine, including the GCLL, will be inspected periodically. A monitoring system employing pan lysimeters developed by EPA's Alternative Cover Assessment Program (ACAP) will be deployed to confirm the performance of the cover system design, as set forth in the Environmental Monitoring Plan (**Appendix A** of FEIS).

Letter/Comment: 961/kk, 961/x, 961/y, 963/dd, 963/j, 964/e, 965/a

Comment Count: ***7***

Issue: **6y. A slight vertical displacement may cause gaps to form between sheets of the GCLL. The fact that this overlap must be maintained for perpetuity highlights the need for maximum longevity of this barrier. As such, the FEIS should re-evaluate the need to increase the overlapping amount by an appropriate safety margin.**

Response Exhumations have shown that GCLs overlain with a polymeric barrier remain in place if they are buried beneath cover soil soon after deployment. The overlaps are held in place securely by the overburden pressure applied by the overlying cover soil. For example, Benson et al. (2010a) exhumed an in-service GCL from the final cover over a solid waste landfill in service for 6 years and found that the overlaps were maintained precisely at the match points used for deployment during construction (**Figure 1**). This is particularly important because of the appreciable settlements that occur in solid waste landfills (up to 30 percent), which have the potential to displace GCL overlaps. In contrast, settlement of waste rock piles and similar fill materials such as those associated with overburden placement at the Blackfoot Bridge Mine Project tend to be very small.

Figure. 1. Photo of GCL exhumed from final cover over a solid waste landfill. Purple Xs are match points that are used to align the overlap during installation. Excellent agreement exists between the match points on the upper and lower GCLs despite being in service over settling solid waste.

The overlap specified for GCLs (typically 6 inches) also has a built-in factor of safety of at least 2.0, as illustrated by Estornell and Daniel (1991). They conducted leakage experiments where GCLs were deployed with the specified overlap and one-half the specified overlap. No change in leakage rate was observed by decreasing the overlap by a factor of 2. LaGatta et al. (1997)

also showed that overlaps displaced up to 4 inches showed no change in leakage rate when exposed to differential settlements of 10 percent, which are much larger than settlements expected for waste rock.

Field studies have shown that GCLLs installed properly using industry-accepted methods are nearly leak-free, even under high head conditions. For example, Benson et al. (2004) describe a case study in Missouri where a GCLL was used as a pond liner under a head of at least 5 ft of water, a much greater head than would ever be realized at Blackfoot Bridge Mine. They found no noticeable leakage when the GCLL was installed properly. Similarly, Benson et al. (2007) report very low percolation rates for a cover employing a properly installed GCLL in Wisconsin.

The GCLL covers would be installed according to manufacturer's recommendations with appropriate factors of safety to ensure the cover system meets design criteria for performance and longevity. Based on the favorable field observations of overlaps in exhumed GCLs, and the studies on the impacts of the size and displacement of GCL overlaps, there is no need to increase the size of the overlap for the Blackfoot Bridge Mine Project. The overlap specified by the manufacturer already includes an adequate factor of safety.

An important consideration is that the impact analysis presented in the FEIS does not rely solely on the assurances of the GCLL manufacturer. Construction defects, as well as animal burrows, were accounted for when selecting hydraulic properties of the GCLL used as input to the computer model used to predict percolation from the cover (O'Kane and Benson 2009). The predictive capacity of the computer model used to predict percolation has also been validated using data from an independent field study published in the peer-reviewed literature (Benson et al. 2010a) where a GCLL was deployed in a full-scale cover in Wisconsin. The Blackfoot Bridge model predicted more percolation than measured in the field in the Wisconsin study (O'Kane and Benson 2009). That is, the model predicts more percolation than actually occurs, even when defects incurred during construction or by intrusion of biota are accounted for in the model input. Thus, the final cover at Blackfoot Bridge Mine should function more effectively and perform better than the modeling is currently predicting at the Blackfoot Bridge site, where less precipitation needs to be managed than in Wisconsin. Additionally, performance monitoring of the covers is provided in the Environmental Monitoring Plan (**Appendix A** of FEIS).

The Environmental Monitoring Plan (**Appendix A** of FEIS) specifies that the field performance of the GCLL will be monitored using pan lysimeters, and that the condition of the laminate will be periodically inspected. A seepage management system would also be installed as a secondary system that can be used to monitor the performance of the cover for both overburden piles. If the GCLL is not functioning to expectations, risks associated with inadequate performance would be evaluated and corrective actions would be taken to ensure the cover functions adequately.

Letter/Comment: 964/f

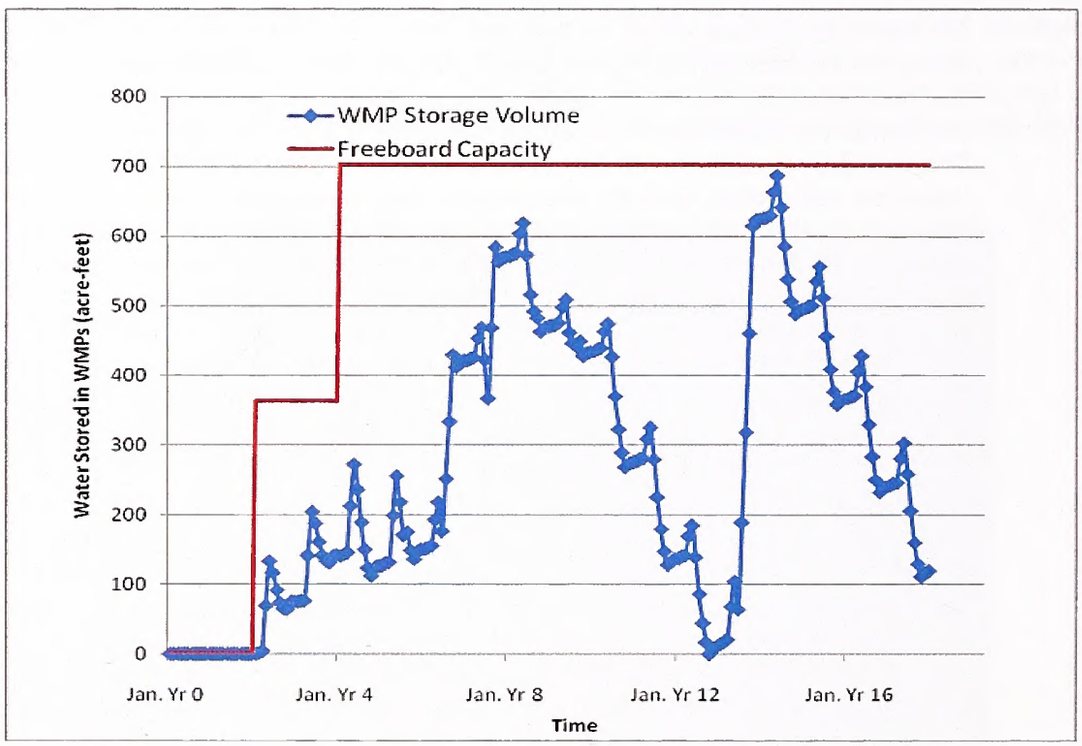
Comment Count: ***1***

Issue: **6z. The runoff flows used in modeling and for the design of the water management ponds appear to be estimated for 100-year, 24-hour storm events (DEIS p. 2-24). The water management ponds, however, may need to be operated in perpetuity. As such, the FEIS should reconfigure this facility to accommodate more infrequent events.**

Response: Diversion channels and culverts in the water management system were designed based on storm water runoff volumes and peak flows associated with a 100-year, 24-hour storm event, with the exception of a diversion ditch (haul road ditch) along the east side of the Mid Pit. The haul road ditch, was designed to convey runoff associated with a 25-year, 24-hour storm event. The water management ponds (WMP1 and WMP2) are designed to contain pit water and storm water runoff based on the average expected precipitation and runoff on the project area watershed. The water balance for the ponds considers the release of non-contact storm water from undisturbed and reclaimed areas within the project area, consumptive losses for dust suppression, and evaporative losses from sprayers and the free water surface. The predicted

storage capacity requirements for the ponds during mining under Alternatives 1A and 1B are shown on the following figure.

As shown below, the WMPs are anticipated to have sufficient capacity to contain water throughout the life of the mine. The greatest storage volume requirement is predicted to occur in mining year 14. This spike is the result of the high pit dewatering rates in year 13, followed by anticipated inflows during spring snowmelt in year 14. During May of year 14, it is predicted that the volume of water requiring storage will peak at approximately 687 acre-feet. The capacity of the WMPs at their freeboard limit is approximately 704 acre-feet. A contingency plan has been developed to pump water from the ponds to an infiltration gallery in the Mid Pit if wetter than average years occur during periods with peak storage requirements. During the post-mining phase, surface disturbances associated with mine facilities would be reclaimed, and it is expected that storm water would be suitable for discharge at the outfall for water control pond CP1. The storage requirements for the water management ponds during the post-mining phase would be less than during operation. Evaporative sprayers would be used to dispose of water from the ponds during the post-mining phase if required.



Letter/Comment: 964/l

Comment Count: ***1***

Issue: **6a1. The Fish Pond will serve as part of the stormwater capture system. As part of the upgrade, the pond's capacity will be increased and clay or other liner system will be added to reduce permeability. Because water contaminated with selenium may be part of this system, recommend using a synthetic double liner system to prevent infiltration. In addition, a groundwater testing well should be located underneath the pond. Note that the water management ponds will have both a liner and testing wells.**

Response: Alternatives 1A and 1B would comply with the CWA without these suggested additional mitigation measures. Monitoring would be implemented to ensure that the project is compliant with the CWA as predicted by the modeling. If monitoring indicates any unexpected issues, appropriate actions would be taken.

Letter/Comment: 964/m

Comment Count: ***1***

Issue: **6b1. The FEIS should describe the turnover rate of material at the top, middle and bottom of the stockpile and the effects of precipitation percolating through the stockpile.**

Response: **Section 4.3.1.1.1** describes turnover of the material in the stockpile and the effects of infiltrating precipitation. The stock pile would be a dynamic feature and the rate of turnover would be affected by the rates of mining and processing. The rate of turnover is not discussed.

Letter/Comment: 964/p

Comment Count: ***1***

Issue: **6c1. As an example of insufficient modeling, infiltration and seepage modeling was conducted for only a 100-year period (DEIS p. 4-22), whereas groundwater will continue to flow in perpetuity. Likewise, simulated durations for COPCs ranged up to 350 years (DEIS p. 4-30), but longer models do not appear to have been run. Recommend that the FEIS perform additional tests at much longer time spans so that the proposal can be designed to avoid long term contamination or better mitigate it.**

Response: Simulation of a longer time period is not required for the infiltration model because the modeled seepage rate achieved steady-state conditions (was not changing) at the end of the 100-year simulation. In other words, modeled seepage rates at 100 years, 200 years, 500 years, and 1,000 years would be the same because infiltration is simulated to have achieved an equilibrium condition. Likewise, the durations of the simulations for the groundwater contaminant fate and transport model are of sufficient length to evaluate steady state conditions at the expected peak chemical loading rates. Increasing the length of the modeled time periods for the groundwater model would show declining concentrations as subsequent pore volumes for the source term declined in strength. Extending the length of the modeled time periods would not provided additional information that could be used to design better mitigation strategies to avoid long-term impacts.

Letter/Comment: 964/r

Comment Count: ***1***

Issue: **6d1. NEPA requires reasonably accurate predictions of surface and groundwater flows both during mining operations and following reclamation. The modeling for surface and ground water studies is based on current climate patterns. The FEIS should examine current climate change models and assess how predicted changes will affect the environmental effects of each alternative. In particular, timing of spring runoff, snowfall amounts, rainfall amounts, stream flows and groundwater patterns may shift.**

Response: **Sections 4.2** and **5.2.2** discuss various climate change models and potential trends in climatic patterns. Additional consideration of climate change and how it may or may not affect each alternative is beyond the scope of this analysis. There is currently not a generally accepted model of climate change that could be used to identify likely scenarios for the surface and groundwater models. Sensitivity analyses for the numerical model indicate that model predictions are not sensitive to a wide range of variation in precipitation and recharge.

Letter/Comment: 963/k, 963/ww, 963/xx, 964/v

Comment Count: ***4***

Issue: **6e1. Dewatering will be required in the North Pit and Mid Pit. The FEIS should detail and account for the groundwater to be pumped. Specifically, the FEIS should describe what amount will be utilized for mining operations such as dust abatement and what amount may be diverted and released. If water is to be released into the environment as surface water or groundwater, the water quality needs to be assessed. This water should be treated at the water management ponds if it fails to meet standards. If water is to be diverted and released, the FEIS should consider mitigating for the altered hydrological systems (i.e. reduced flows to springs).**

There will be a one-year lag time between the two dewatering periods in the North Pit. The DEIS indicates that a pit lake would form in the interim period between pumping.

The model does not account for the volume of pit lake water that would need to be removed before onset of mining and continued dewatering during the second period.

Response: **Section 2.3.6.2** of the FEIS includes an expanded discussion of mine dewatering and the planned water handling practices. Potential impacts related to mine dewatering, including potential accumulation of pit lake water, are evaluated and discussed in **Section 4.3** of the FEIS. Any water that does not meet discharge criteria would be managed on site. Once the water table has recovered, flow to surface water features that may have been affected by dewatering would be restored. Dewatering discharge from the pits would not be released into the environment as surface water but could be re-infiltrated to groundwater in the area of the Mid Pit if sufficient storage capacity is not available in the water management ponds. The water management ponds are designed to store the expected dewatering discharge, but under upset conditions, the water could be pumped to the Mid Pit for re-infiltration.

Letter/Comment: 961/cc, 961/s, 963/c, 963/s, 964/w

Comment Count: 5

Issue: **6f1. The DEIS describes development of a short-term contingency plan to pump excess water into the Mid Pit infiltration gallery. The FEIS needs to provide details on approximately how long this "short-term" activity can be maintained. The FEIS should also illustrate the subsequent groundwater migration pathway for this pumped water and describe potential environmental effects. Note that the addition of contaminated water to the Mid Pit will contribute water and contaminates to groundwater. These additional inputs (both as short term and long term) need to be modeled and their impact on predicted contaminate plumes needs to be described.**

Response: Pumping from the water management ponds to the Mid Pit infiltration gallery would occur on an emergency basis if the volume of water in the ponds exceeds the design capacity. The water balance analysis in the Water Management Plan (P4 2010c) for the ponds under Alternatives 1A and 1B indicates that during years 13 and 14, peak dewatering discharge from the North Pit would occur and the ponds would be filled to near capacity. This 2-year period has the greatest potential to require implementation of the contingency pumping plan.

The emergency pump-back system would have the capacity to pump the entire volume of runoff associated with the design storm events for Catchments A and B (about 40.8 acre-feet) over a 24-hour period. In the event that contingency pumping is implemented, the duration of pumping would be related to the length of the storm event or upset condition, and would be limited to several days per occurrence. Storm water runoff from the site would be managed to minimize the potential for contact with materials that could leach COPCs. However, water reporting to the ponds may or may not meet water quality standards depending on the source. Given the uncertainty associated with the probable composition of the water, quantitative modeling of potential impacts associated with contingency pumping is not supported. Because the duration of pumping is expected to be short (if it occurs) and contingency pumping would occur much earlier than when model predicted peak concentrations would occur for most COPCs, it would result in negligible changes to the predicted long-term impacts. Contaminant migration pathways would be identical to the path currently modeled from the north end of the proposed Mid Pit. Contingency pumping from the water management ponds could result in either temporary increases in solute loading to groundwater near the Mid Pit or dilution. The effect, if detectable, would be transient and of short duration. See also response to 6f2.

Letter/Comment: 964/x

Comment Count: 1

Issue: **6g1. The DEIS suggests that selenium discharges into the Blackfoot River are only a mere possibility.**

Response: The FEIS contains detailed discussions about the potential for increased selenium loading to Blackfoot River from the Proposed Action and Alternatives. The discussions present quantitative predictions of the water quality impacts from the proposed project. The FEIS also includes discussions about the uncertainty associated with predictions of water quality impacts.

It is an incorrect characterization to state that the impact analysis in the EIS "suggests that selenium discharges into the Blackfoot River are only a mere possibility". The predicted impacts are presented as the best engineering estimate of the likely consequences associated with the Proposed Action and Alternatives.

Letter/Comment: 961/a, 963/kkk

Comment Count: *2*

Issue: **6h1. DEIS makes unsupported assertions regarding the seasonality of selenium contamination in the Blackfoot River that are irrelevant and misleading. In particular, the discussion minimizes the extent of selenium contamination in the Blackfoot River by emphasizing seasonal fluctuations.**

Response: The EIS and supporting water resource technical report present a compilation of documented and validated data that describe the observed seasonality selenium concentrations in the Blackfoot River. The authors of the EIS consider a thorough understanding of the hydrologic and chemical cycles that affect selenium concentrations in the river to be relevant to the impact analysis. The discussion about the durations of the periods where selenium concentrations have exceeded applicable standards (**Section 3.3.1.3.1**) has been modified to "for 1 to 3 weeks each spring" rather than "for a few days every year."

Letter/Comment: 961/b

Comment Count: *1*

Issue: **6i1. The DEIS cites the incorrect 303(d) list.**

Response: The 303(d) list has been corrected in the FEIS to reflect the current list.

Letter/Comment: 961/c

Comment Count: *1*

Issue: **6j1. Fluctuations of the water table within the pits will leach more Se than predicted by the model.**

Response: Monitoring data presented in the Water Resources Baseline Characterization Report (Whetstone 2009a) indicate that the regional water table in the North Pit and Mid Pit is expected to fluctuate 1 to 3 feet annually. The zone of fluctuation will have leaching characteristics similar to backfill in the unsaturated zone and is included as part of the unsaturated source term. Because the zone of fluctuation is included in the unsaturated source term, the model correctly simulates the amount of selenium that will be released into groundwater.

Letter/Comment: 961/l, 961/n, 963/i, 963/v

Comment Count: *4*

Issue: **6l1. Simulation of excavation below the water table is incorrect. The model does not simulate the effects of temporary pit lakes.**

Response: North Pits 1 and 2 would be mined in two phases over a 2-year period. During the first phase of mining, temporary pit lakes would develop. After mining is complete during the second phase, these two pits would be backfilled. Additional dewatering would be required to remove water stored within these temporary pit lakes prior to commencing the second phase of mining of North Pits 1 and 2. North Pits 3 and 4 would be mined in a single phase and then backfilled without temporary pit lakes occurring. The groundwater flow model accounts for the additional volume of water stored within temporary pit lakes and backfill by extending the pumping periods to remove the additional volume of water stored within the temporary lakes or the pore space within the backfill.

Letter/Comment: 961/t, 963/d, 963/ll

Comment Count: *3*

Issue: **6m1. The water balance in the model is not constrained by a priori estimates. In addition, water balance is poorly estimated and recharge is incorrectly distributed in the model.**

Response: Several components of the water balance are constrained by a priori estimates whenever data are available including flow measurements at springs (Woodall Springs, Gardner Spring, Wetland Springs C, G, and N) and streams (State Land Creek Upper and Lower, and gains and losses on Blackfoot River between stations GLS-1 to GLS-5). The regional flow in the Wells Formation was estimated based on measured hydraulic gradients and calibrated hydraulic conductivity values required to match the measured flows described above which are part of the overall water balance.

The model water balance is based on multiple flow measurements across the model domain. One of the primary components of the water balance, which is most significant regarding potential future impacts to the Blackfoot River, is the gains and losses survey conducted for the Blackfoot River Reach 2. Blackfoot River Reach 2 is located closest to the North Pit and is where the majority of the groundwater flowing underneath the proposed mine areas discharges into the river. The model simulated flows along Blackfoot River Reach 2 indicate a good agreement with measured flows which demonstrates the model's predictive capabilities.

Groundwater recharge as a function of annual precipitation was estimated following a methodology developed by the USGS that was adjusted for local conditions observed at Smoky Canyon (Buck and Mayo 2004). Recharge was then estimated over the model domain using the PRISM derived annual precipitation values for the project area. This best engineering estimate of groundwater recharge results in an average annual recharge applied over the model that is approximately 1.5 inches/year. The reviewer suggests that a more appropriate method to estimate recharge would be to calculate recharge as equal to discharge for different portions of the model, which may yield a much greater recharge value than currently used in the model.

The State Land Creek watershed is one area of the model where flow records are available to perform this analysis. This watershed has an area of 4.4 square miles, which is approximately 18 percent of the total area of 24 square miles covered by the model domain. There are two surface water stations in this watershed: State Land Creek Upstream (SW08-ST), with a drainage area of 1 square mile, and State Land Creek Downstream (SW09-ST), which is located near the confluence with the Blackfoot River. The average baseflows measured at State Land Creek Upstream and Downstream are 0.24 and 0.09 cfs, respectively. Assuming that recharge is equal to discharge for this watershed, results in an average annual recharge of 0.62 inches/year for the upstream station and 0.74 inches/year for the downstream station. These values are much lower and not greater than the recharge values used in the model, which range between 1.3 and 2.3 inches/year, because they assume that all recharge from precipitation reports to surface water features in the form of baseflow. This assumption may be appropriate for other types of hydrogeologic settings, but is not for this area where portions of recharge from precipitation may contribute to deeper groundwater flow systems and do not result in baseflow within the same surface water drainage as is the case in the State Land Creek Watershed. The groundwater flow model calibration shows an excellent match between model-simulated and measured flows along State Land Creek using current recharge estimates, which indicate that a portion of the recharge applied within this watershed deep infiltrates and results in recharge to deeper groundwater flow systems.

Letter/Comment: 961/u, 963/e, 963/lll, 963/m, 963/mmm, 963/n, 963/p

Comment Count: ***7***

Issue: **6n1. Modeled heads are incorrectly simulated as being either above ground surface or below layer bottoms.**

Response: Model simulated heads are below layer bottoms throughout many areas of the model domain but do not affect the model's ability to accurately simulate groundwater flow. Dry cells do not necessarily reflect a model's ability to accurately simulate groundwater flow whether using MODFLOW-SURFACT or standard MODLFOW. The groundwater flow model allows for dry cells to remain active by using the pseudo-soil functions option in MODLFOW-SURFACT.

Similarly, cells in model layer 1 with computed heads above the cell top elevation (flooded cells) are not necessarily an indication of poorly simulated groundwater flow. The majority of the areas of the model where flooded cells are observed are along the trace of the Aspen Range fault, which matches areas where wetlands and springs actually do exist.

Letter/Comment: 961/v, 963/f, 963/jjj

Comment Count: *3*

Issue: **6o1. Source terms should be based on fractional pore volumes and the column tests should be rerun to simulate fractional pore volumes.**

Response: The issue and response are similar to Issue 6r. Previous contaminant fate and transport models for the phosphate mines in southeast Idaho have used pore volume approaches for the specification of source terms. The approach has precedent and is well established in the phosphate district (JBR 2007, Whetstone 2003). The pore volume approach assumes that observed concentrations of COPCs in sequential leachates from column tests can be applied with some modification to simulate concentrations in sequential pore volumes of seepage moving through backfill and overburden.

Column leaching data were normalized for application in the contaminant transport model using a mass balance approach to adjust concentrations to represent the chemical mass that would be released into one full pore volume of seepage. This step was required because the leachate recoveries from the first column cycle varied from about 24 percent to 51 percent of a full pore with the rest of the applied solution being retained in the columns to satisfy the field capacity of the dry material. Recoveries for subsequent leaching cycles were approximately equal to a full pore volume of solution. The normalized source term concentrations are consistent with data from the column tests and the pore volume modeling approach.

Letter/Comment: 961/w, 963/bb, 963/g

Comment Count: *3*

Issue: **6p1. The groundwater model is poorly conceptualized.**

Response: Comment lacks details explaining why the commenter believes this to be true. Specific issues related to the groundwater model are addressed in other responses to comments. The conceptualization of the model and the subsequent calibration is adequate to allow the agencies to reasonably predict the effects of the proposed mine pits on the groundwater and satisfy the requirements of NEPA.

Letter/Comment: 963/a

Comment Count: *1*

Issue: **6q1. Calibration of the groundwater model is biased.**

Response: The steady-state groundwater model calibration was conducted using 30 head targets from average water levels measured between fall 2005 and fall 2007, flux targets at five springs, and stream flow data at six surface water stations located within the model domain. The calibration statistics show that the model calibration is reasonable and there is no significant bias. The model calibration also shows an excellent match to flow targets along the Blackfoot River Reaches 1 and 2, which is of critical importance to the model's predictive capabilities. The reviewer states: "The over predictions of the steady-state water level, as shown by the positive residuals, could cause several problems." This is not correct. Residuals are the difference between the measured heads and the model simulated heads. A residual is positive if the measured level is greater than the simulated head predicted by the model. Positive residuals indicate that the model is underpredicting heads and negative residuals indicate model is overpredicting heads. The reviewer's conclusions are based largely on this misunderstanding.

Letter/Comment: 963/b

Comment Count: *1*

Issue: **6r1. The transport portion of the model is inappropriately parameterized. ARCADIS (2009) estimated longitudinal dispersivity using an equation determined by Xu and Eckstein (1995), but they misapplied the equation. The equation relates the dispersivity to a scale length. The concept is that the dispersivity estimate becomes larger with larger length scale (Neuman, 1990). This is because small features control the flow at small scales but at larger scales fractures and other larger scale preferential flow features control. The equation is a scaling equation, not a predictive equation which means it explains an observed trend. ARCADIS ignored the assumptions that control the equation by inputting distance between the North Pit and river as the scale. ARCADIS should either use observed data from the site to calibrate the dispersivity coefficient into the model or perform a tracer test to determine dispersivity. Either would provide a much better, and theoretically correct, estimate of the dispersivity.**

Response: Site dispersivity values were estimated based on a standard practice procedure. The calculated dispersivity value falls within the lower range of values presented in Xu and Eckstein (1995), which is considered to be conservative because it results in higher predicted concentrations in groundwater. The reviewer suggests either using observed site data to calibrate the dispersivity coefficient or performing a tracer test to measure it. While these may be valid approaches, there are no data available to calibrate the dispersivity coefficient, and performance of a tracer test would be unwarranted and unproductive.

Letter/Comment: 963/h, 963/q, 963/t

Comment Count: ***3***

Issue: **6s1. The FEIS should define what is meant by the terminology local, intermediate scale aquifers.**

Response: **Section 3.3.1.4.3** of the FEIS defines local to intermediate scale aquifers as being groundwater flow systems with short to intermediate length flow paths. Local aquifers typically discharge in or near the drainages that contain their recharge areas. Intermediate scale aquifers may include multiple drainages within a larger surface water basin but they do not participate directly in inter-basin transfers of water.

Letter/Comment: 963/l

Comment Count: ***1***

Issue: **6t1. Simulated ETs overestimate discharge because it does not account for precipitation or the contribution from nearby surface water.**

Response: In the study referenced by the reviewer (Welch et al. 2007) annual groundwater discharge is computed as the difference between annual ET and precipitation. In this study, it was assumed that most precipitation falling directly on areas of groundwater discharge ultimately is lost by ET. This assumption is reasonable for the semi-arid valleys in Nevada where the study was conducted and the average precipitation ranges between 6 and 13 inches per year. This is not the case in the Blackfoot Bridge Project area, where annual average precipitation is approximately 17 inches (Whetstone 2008). Additionally, most precipitation occurs in the form of snow during the winter and spring months, when ET is lowest.

Letter/Comment: 963/o

Comment Count: ***1***

Issue: **6u1. The results and analysis of pumping test are flawed and therefore not valid. The pumping test should be evaluated by a new, more detailed model that includes smaller scale lithologic changes.**

Specifically:

"The pump test pumping well and monitoring well construction does not correspond properly to the lithology being tested and could cause inaccurate results."

"The pump test design and analysis violates many test assumptions which cause results

which are inaccurate."

Some useful data could be salvaged from the pump test results by writing and calibrating a detailed groundwater model for just the area affected by the pump test.

Response: Currently the aquifer test was designed, performed, and evaluated according to well-accepted standard practices and provided reliable data for use in the numerical groundwater flow model. The analytical solutions that were used to evaluate the aquifer test data were based on groundwater flow in theoretically ideal aquifers. As a rule, ideal aquifers do not exist in nature, and experience and professional judgment are required to apply analytical solutions to real world situations. However, the analytical solutions are robust, and given knowledge of the stratigraphy and structural characteristics of the aquifer, they can be used to make accurate estimates of aquifer transmissivity, hydraulic conductivity, and storage. The commenter's assertion that the results of the pumping test are not valid because the well design and analysis of the test do not perfectly match theoretically ideal conditions is not credible. Given this criteria, very few, if any, of the aquifer tests that are routinely performed world-wide would provide valid data.

The pumping test was evaluated on a scale that is relevant to the EIS impact analysis using analytical methods and the numerical groundwater model. Construction of a smaller-scale model to evaluate the pumping test is not warranted and would not provide results that are significantly different or more accurate that the current analysis.

Letter/Comment: 963/nnn, 963/ooo, 963/ppp, 963/r

Comment Count: 4

Issue: **6v1. The conservative groundwater modeling overstates the potential for loading of constituents of potential concern (COPCs) to groundwater through the overburden.**

Response: The groundwater model provides the best engineering estimate of potential loading of COPCs to groundwater from overburden.

Letter/Comment: 965/b

Comment Count: 1

Issue: **6w1. The conservative groundwater model predicts that Alternative 1A using the non-laminated GCL would result in reduced potential loading of COPCs including selenium.**

Response: The commenter correctly states that the groundwater model predicts that Alternative 1A would result in reduced loading of COPCs to groundwater and surface water compared to the Proposed Action.

Letter/Comment: 965/c

Comment Count: 1

Issue: **6x1. The DEIS suggests that unsaturated soils below the facilities may attenuate some contaminants. This is wrong because the unsaturated zone consists of the similar [sic - same] material that was excavated from the pits and will yield contaminants when placed [in] the piles.**

Response: Soil and rock below the proposed external overburden piles and backfills may include alluvium, Dinwoody Formation, Grandeur Tongue, or Wells Formation. These materials are not lithologically, or chemically similar to rocks from the Phosphoria Formation, which leach selenium and other COPCs into groundwater. Studies that document attenuation mechanisms in substrate materials are cited and referenced in the Baseline Geochemical Characterization Study. It is noted that, although attenuation of some COPCs is probable in the unsaturated zone below mine facilities, the EIS analysis uses the conservative assumption that no attenuation will occur in all quantitative modeling.

Letter/Comment: 963/u

Comment Count: 1

Issue: **6y1. The flow rates in the columns were different than the expected seepage rates in field scale facilities. Operation of the columns at conditions of near field capacity prevented the leachate from adequately sampling the entire mass of rock in the column. The columns should be rerun using dye to stain the flow paths.**

Response: Because of practical operational considerations, the columns were operated at higher seepage rates than would occur in the field. It is incorrect, however, to state that the columns were operated at "conditions of near field capacity." Field capacity is defined as the maximum amount of water that the unsaturated zone of a soil can hold against the pull of gravity. The average amount of solution that was required to satisfy field capacity of the columns during the first cycle was about 3,100 mL. The average excess solution (above field capacity) that was applied to the columns during the first cycle was 1,900 mL. In subsequent cycles, the volume of excess solution applied to the columns was 5,000 mL. Clearly, the columns were not operated at conditions of near field capacity.

Wetting of the material in the columns was closely observed during testing. During the first cycle, the wetting front advanced evenly with no evidence of preferential flow. Also, no evidence of channeling or preferential flow was observed during the duration of the column tests. Dye staining of the column materials would not yield usable information about the flow paths. Visual inspection of the material in the columns after testing indicates that all of the material in the columns appeared to be uniformly wet. This observation leads to the conclusion that all of the material in the column would be stained by a dye test. A second and probably more important consideration is that dye could affect the chemistry of the leachates.

Letter/Comment: 963/aa, 963/x, 963/y, 963/z

Comment Count: 4

Issue: **6z1. The kinetic leaching analysis in the source term report is not the correct way to evaluate leaching characteristics for the source term.**

Response: The commenter agrees with the conclusions presented in the source term report regarding this subject. The source term for the model uses a mass based approach rather than a kinetic approach.

Letter/Comment: 963/cc

Comment Count: 1

Issue: **6a2. The cover model simulates the surface of the covers as a flat plane. Even in the two-d simulation, the model does not account for ponding in depressions which will exist on the reclaimed surface. Vegetation growth and construction imperfections cause surface depressions. These will capture water and allow it to seep into the topsoil.**

Response: The infiltration model for the cap/cover system accounts for many variables including flaws in the cover, transpiration by vegetation, and seasonal storage and runoff snow. Modeling of the covers included simulations for various slope aspects including side slopes and flat areas. Minor imperfections in the surfaces of side slopes would not cause ponding. Small, isolated depression on flat slopes could capture some water; however, with adequate quality control during construction, this volume of water is not expected to be significant to the water balance of the cover. Flat areas of the covers also have limited extent compared to slope areas, which further minimizes the volume of water that could be stored and infiltrated by imperfections in the cover surface. With regard to the formation of surface depressions by vegetative growth, the Environmental Monitoring Plan (**Appendix A** of FEIS) includes provision for long-term monitoring of the covers to detect and correct issues that may decrease cover performance.

Letter/Comment: 963/ee

Comment Count: 1

Issue: **6b2. The cover model does not adequately simulate interflow, the downslope flow through the soils above the liner. Adequately considering interflow would maintain saturation in the soils above the liner for a longer period and maintain a vertical gradient driving seepage through the liner. It may also increase the gradient by increasing the**

saturated thickness on top of the liner.

Response: A two-dimensional (2D) model was completed by O'Kane Consultants to evaluate the performance of the GCLL cover system (O'Kane 2009a). The 2D model was completed for all five potential slope orientations (north, south, east, west, and flat). This model adequately considers the effect of interflow in the soil cover above the liner.

Letter/Comment: 963/ff, 963/jj

Comment Count: *2*

Issue: **6c2. The cover model assumes that the hydrologic properties of the soils above the liner are constant, forever. This ignores that root growth may change both conductivity and moisture-holding capabilities. Freeze/thaw, which is certainly possible at this site, could cause preferential flow pathways which may partially expose the liner.**

Response: The Environmental Monitoring Plan (**Appendix A** of FEIS) includes provisions for long-term monitoring of the covers to detect and correct issues that may decrease cover performance. The inspection program would include monitoring vegetative succession for deep rooted plants that could damage the cover, monitoring of surface depressions, monitoring of pedogenic (soil) changes, monitoring of head-cutting or rilling ("preferential flow pathways") that could expose the liner, and monitoring of water quality for indications of increased seepage.

Letter/Comment: 963/gg

Comment Count: *1*

Issue: **6d2. The cover infiltration model treats the vertical flow as a one-dimensional process, with homogeneous properties. Simulated flow paths across the liner system would be vertical vectors from the surface to and through the liner. The reality is that preferential flow would cause portions of the liner system to receive (much) more infiltration than other systems. Different hydraulic properties (inhomogeneities) across the liner system may also cause flow paths to change.**

Response: A 2D model was completed by O'Kane Consultants to evaluate the performance of the GCLL cover system (O'Kane 2009a). The model accounts for increased hydraulic conductivity associated with defects that may develop during installation, overlap of panels, and the effect of animal burrows. Field studies have shown that conventional GCLs exposed to wet-dry cycling have undergone large increases in hydraulic conductivity due to development of structure within the GCL. These same studies have also shown that GCLs that are properly hydrated and then maintained in a moist state will retain low hydraulic conductivity, even if cation exchange occurs (Lin and Benson 2000, Meer and Benson 2007, Scalia and Benson 2010). An effective method to ensure that a GCL remains properly hydrated after installation is to cover the GCL with a geomembrane immediately after deployment. The geomembrane lamination on a GCLL serves this function. See also Response 6y.

Letter/Comment: 963/hh

Comment Count: *1*

Issue: **6e2. The modeling ignores construction defects in the GCLL liner which could affect the flow patterns through the system. These defects could be puncture holes (that do not self-heal through expanding clay) or inappropriate overlap or sealing at the seams. They could cause substantial flow through a section of liner. The increased seepage would leach more contaminants from the backfill than the model assumes.**

Response: Construction and other defects in the cover were considered in the infiltration model using the following assumptions:

An areally weighted average was used to account for the effect of the overlap on the overall ksat of the GCLL. The area of the overlap was computed assuming a standard roll size (15 ft x 150 ft), 6-inch overlaps along the sides of panels, and 3-foot overlaps at each end of the panel. The overlap area was assigned a hydraulic conductivity of 1×10^{-8} cm/s, which is 20 times higher than the hydraulic conductivity of the panel.

A similar weighted average was used to account for the effect of defects on the overall ksat of the GCLL. The area associated with defects was assigned a ksat equal to that of the underlying center waste shale ($5x10^{-4}$ cm/s). Eight holes were assumed per acre, with each hole having a diameter of 0.5 inch. This is a conservative approach (results in an over-estimate of the hydraulic conductivity) because the GCLL is assumed to be completely ineffective in the area of a defect. In reality, bentonite in the GCLL will seal a portion, or all of the area in the vicinity of a defect (Shan and Daniel 1991). In addition, the assumed frequency of defects is greater than the frequency normally assumed in engineering computations (five holes per acre) (Benson 2000). The effect of animal burrows was also included when computing the average ksat of the GCLL for the 2D modeling. The American badger was selected as the design animal because it is known to occur in the area and has the potential to create the largest burrow diameter at the depth of GCLL. The American badger in southern Idaho has an average population density of one badger per square mile (approximately 640 acres). One Idaho study reported a home range of less than 1.6 square miles, while another in-state study found that adult home range averaged 0.9 square mile. Home ranges of badgers can overlap, but individual badgers are solitary. Badger burrows are elliptical in shape with a diameter of 12 to 18 inches wide (IMNH 2009). For this analysis, one badger burrow was assumed per 50 acres. The burrow was assumed to be 15 inches in diameter and to completely penetrate the GCLL. Based on these assumptions, the holes, overlaps, and panels constitute the following percentage of the total area:

- Percent area of holes: 3x10-5 percent
- Percent area of badger burrows: 6x10-5 percent
- Percent area of GCLL overlap: 5.2 percent
- Percent area of GCLL panel: 94.8 percent

The weighted average calculation using these areas yielded a ksat of $1x10^{-9}$ cm/s for the GCLL.

Letter/Comment: 963/ii

Comment Count: 1

Issue: **6f2. Water management may cause another somewhat temporary source of seepage in the Mid-pit. In emergency situations, meaning that dewatering or runoff threatens to overflow the water management ponds, excess water will be discharged to the Mid-pit backfill (DEIS, Section 2.3.6.3). Just a few acre-feet of water would cause the water level to rise substantially and promote oxidation. It is not protective of water quality for the discharge to be to an area of non-segregated overburden with volcanics and limestone for two reasons:**

1. Non-segregated backfill in the Mid-Pit will generate contaminants; and

2. Discharge to the backfill will spread until it reaches the pit bottom. At this point the horizontal spread will increase and the chances of impinging on segregated backfill will increase.

Response: Pumping from the water management ponds to the Mid Pit infiltration gallery under Alternative 1A or 1B would occur on an emergency basis if the volume of water in the ponds exceeds the design capacity. The water balance analysis for the ponds under Alternatives 1A and 1B (P4 2010c) indicates that, except for mining years 13 and 14, the ponds have adequate capacity to store runoff and dewatering discharge with a safety factor of 1.5 or greater. During years 13 and 14, peak dewatering discharge from the North Pit would occur and the ponds would be filled to near capacity. This 2-year period has the greatest potential to require implementation of the contingency pumping plan. In the event that contingency pumping is implemented, the duration of pumping would be related to the length of the storm event or upset condition.

The infiltration area of the Mid Pit would be constructed of selectively handled volcanic tuff or limestone. Geochemical testing indicates that these materials have low potential to leach constituents of concern in infiltrating water. Additionally, the operational geochemical monitoring program that is described in the Environmental Monitoring Plan (**Appendix A** of FEIS) is designed to ensure that material placed in the infiltration area would not leach COPCs.

Increased water levels in the infiltration area would not promote oxidation of the fill material.

Partially saturated environments with adequate airflow/oxygen in the pore spaces favor oxidative reactions. Keeping material saturated is a common strategy for limiting oxidation in mine waste rock. Infiltration of water in the Mid Pit could cause temporary increase in water levels; however, it is unlikely to result in long-term changes in pore water volumes or oxygen content. Depending on the initial chemistry of the water that is infiltrated, temporary discharge to the Mid Pit could result in temporary increases in groundwater concentrations or dilution of groundwater concentrations. The effects, however, would be short-lived.

The rapid discharge of water to the Mid Pit infiltration area could result in temporary increases in water levels in the backfill that could contact ROM material located on the periphery of the infiltration area. Loading of COPCs from the temporary contact of infiltration water with backfill is not expected to be significant compared to the total mass that is predicted to be released from the backfill. Contingency pumping would only occur under emergency conditions to prevent surface discharge from the water management ponds. Potential impacts to groundwater associated with the temporary discharge of runoff water to the Mid Pit infiltration area would be minimal and temporary. Also see response 6f1.

Letter/Comment: 963/kk

Comment Count: ***1***

Issue: **6g2. The implementation of drain cells with a lag period between dewatering, with faults through the middle of the pit, and without drains in the upper layers decreases the amount of groundwater removed due to dewatering and the extent of predicted drawdown.**

Response: Drain cells to simulate mine dewatering were placed within model layers 4 and 5, where the majority of the North Pit bottom is located within the model grid. The low flow from the model layers above the drain cells is primarily due to most of these cells within the Wells Formation being dry. There are some cells within the Wells Formation in layer 3 that remain saturated because their bottom is below the bottom of the North Pit 1, which has an elevation of 6,140 ft in Year 5. The effect of faults within the North Pit would continue to occur because faults are only removed by mining above the bottom of the pit, where these faults are unsaturated due to previous dewatering. The remaining portions of the faults below the pit bottoms would also be below the water table and would continue to act as barriers to flow during mine dewatering.

Letter/Comment: 963/mm

Comment Count: ***1***

Issue: **6h2. The conductivity value for backfill in the pits is given as the same that of in-situ bedrock. This [rock] will be removed by excavation and filled with backfill or left open – the model does not consider this.**

Response: The portions of the pits below the water table will be backfilled primarily with waste rock from the Phosphoria Formation, which has a hydraulic conductivity that is two to three orders of magnitude lower than the rocks in the Wells Formation. The increased hydraulic conductivity of the saturated backfill was taken into account as part of the simulation of saturated source areas by estimating the groundwater flux through the backfill as the cross sectional area of the saturated backfill multiplied by the unit flux calculated under pre-mining steady-state conditions. This assumption implies that the hydraulic conductivity of the saturated backfill was increased by up to three orders of magnitude from its original value.

Letter/Comment: 963/nn

Comment Count: ***1***

Issue: **6i2. The transient model behaves strangely in places and in ways that decrease confidence in the predictive results.**

Response: The drawdown observed by the reviewer occurs in cells that are dry and which have no detrimental effect on the model's ability to properly simulate groundwater flow. When simulating groundwater flow with MODLFOW-SURFACT dry cells are active and have calculated heads;

however, when using the pseudo-soil functions option the amount of water stored in the unsaturated zone is negligible and does not have a significant effect on groundwater flow.

Letter/Comment: 963/oo

Comment Count: *1*

Issue: **6j2. The seepage rates for different aspect of each mine feature are inappropriately averaged.**

Response: The model predictive simulations were updated to account for different slope aspects and cover types for the EOP. Seepage from the EOP has a short flow path before it discharges as spring flow in the unnamed tributary above Fish Pond and modeling infiltration from the different slope aspects separately rather than as lumped value is conservative in that it increases the predicted concentrations at the springs. This increase is mostly related to the north slope aspect of the EOP, which has the highest infiltration rate and is located close to the spring discharge points at Wetland H. For all other source areas, averaging of net percolation rates by slope aspects does not affect the average load of COPCs to groundwater and so it is not likely to significantly change model predicted peak concentrations along the Blackfoot River. Even though the NWOP and the North Pit are located relatively close to the groundwater discharge area for the Blackfoot River, the facilities do not have significant north facing slopes that have infiltration rates several times higher than the other slope aspects. This approach is supported by the modeled contaminant transport times from NWOP and North Pit to the Blackfoot River, which require decades to reach peak concentrations (**Figures 4.3-14** and **4.3-14**). The times required to reach peak concentrations would not be significantly affected by applying net percolation rates based on slope orientation for these facilities or the other backfills.

Letter/Comment: 963/pp

Comment Count: *1*

Issue: **6k2. The water balance analysis underestimates the amount of water to be handled.**

Response: In response to this comment, an updated water balance analysis was prepared for the project (P4 2010c). Runoff calculations for the project have been revised upward to account for seasonal snow storage and runoff. Previous calculations were based on average monthly precipitation and did not account for increased runoff during spring snowmelt. The Water Management Plan (P4 2010c) has been revised accordingly to accommodate the increased runoff volume. The revised runoff calculations and Water Management Plan (P4 2010c) are discussed in **Section 2.4.1.1**.

Letter/Comment: 963/rr

Comment Count: *1*

Issue: **6l2. It is also important to obtain baseline samples on these near-river springs (SW10-St and SW11-St) to compare with the Woodall and North Woodall Springs. Whetstone claims these springs are "deeply circulating groundwater discharging along the Aspen Range Fault" (Whetstone, 2009a [reissued as 2010a], page 78). However, they seem to base this statement on a 1983 report, Ralston et al, and state that based on radiocarbon dating the water is very old. If this is correct, the water would likely circulate deeply and have a geothermal signature – the water should be warmer than other springs in the area. Table C1-1 in Whetstone (2009a [2010a]) does not support this idea. The differences among near-river springs and those discharging from the Wells formation need to be addressed.**

Response: The temperature of the water sampled from the ponds at Woodall and North Woodall Springs is affected by ambient air temperature and should not be interpreted to provide meaningful information about the origin of the water. Definitive data that document the long flow path (deep circulation) of the water include radio carbon dates presented in Ralston 1983, the high dissolved solids content of the water compared to other water in the area, spatial location of the spring discharge areas along an aerially extensive fault with major displacement, and the water

balance for the Blackfoot Lava Field that indicates at least 52 cfs of the groundwater in the basin originates from extra-basinal sources. Sampling of the springs along the banks of the Blackfoot River is addressed in the revised Environmental Monitoring Plan (**Appendix A** of FEIS).

Letter/Comment: 963/tt, 963/uu

Comment Count: *2*

Issue: **6m2. Any given model cell consists of just one hydrostratigraphic unit, but adjacent cells may have different units. The mathematics of the model simulation will cause the flow to be among adjacent cells, which may be between different units, rather than along the dip of a unit. This is an error in the implementation of the conceptual flow model. The only way to model flow properly along a dipping formation is for a model layer to represent a single formation including its synclines and anticlines.**

Response: The geology of the mine area is highly complex, with steeply dipping beds disrupted by faulting which cannot be simply simulated in the numerical model by dipping layers that represent a single hydrogeologic unit. Variable direction anisotropy would be required to properly simulate groundwater flow along dipping beds, which is not simulated by most finite-difference models. The Wells Formation strikes north 20° west and dips 30° to 35° east, and faulting disrupts the bedding north and east of the location of the pump test well PW-1W. Results of this pumping test show that the aquifer is anisotropic with drawdown parallel to strike being greater than perpendicular to strike. Conceptually, this is expected, as the lithology of most sedimentary formations tends to vary both horizontally and vertically. The groundwater model simulates this anisotropy by using the Horizontal Flow Barrier (HFB) package. HFB elements which simulate low-permeability features that impede groundwater flow were assigned parallel to strike in the Wells Formation near the pump test area to account for the reduced flow that is expected to occur in the direction perpendicular to the steeply dipping beds. The model calibration to the aquifer test results shows a good agreement between model-simulated and measured drawdown, which is an indication of the model's ability to properly account for the aquifer anisotropy within the steeply dipping beds of the Wells Formation.

Letter/Comment: 963/yy, 963/zz

Comment Count: *2*

Issue: **6n2. ARCADIS' groundwater model domain is surrounded by specified head boundaries. These boundaries may allow too much flux in or out of the domain. Their implementation is "grossly" incorrect.**

Response: The model domain within the deep groundwater flow system is surrounded by constant head boundaries that specify a regional hydraulic gradient of approximately 0.006 observed in the Wells Formation. There are several discharge areas, such as Woodall Springs and the Blackfoot River, where it flows across the Wells Formation and the trace of the Aspen Range, where high flows are observed (25 cfs at Woodall Springs and 3.7 cfs at the river) which are primarily fed by groundwater from the Wells Formation and the Aspen Range Fault. These flows far exceed the total recharge across the model domain of 3.0 cfs and are primarily fed by the constant heads along the model southern boundary. Calibration of the model discharge at Woodall Springs provides independent verification that flows from the constant heads are within the correct range.

Letter/Comment: 963/aaa, 963/bbb, 963/ccc, 963/ddd, 963/eee, 963/fff, 963/ggg

Comment Count: *7*

Issue: **6o2. River cells are incorrectly simulated - The reach in the incised canyon should be redone so that the river is only in one layer.**

Response: River cells along this incised portion of the Blackfoot River were set in model layers 1 through 3 because most of the cells adjacent to the river in model layers 1 and 2 are dry, which limits the interaction between groundwater and surface water in these layers. Placing river cells in model layer 3 is necessary to allow for this interaction to occur and does not diminish the ability of the

groundwater model to accurately simulate groundwater flow.

Letter/Comment: 963/hhh, 963/iii

Comment Count: **2**

Issue: **6p2. Regarding the conclusion that "Column leaching tests suggest limited selenium release under saturated conditions," a great leap of scale has been made, over mounds of uncertainties, to conclude that if selenium can be captured in a saturated zone, e.g., in ground water, it will not be a problem.**

Response: Neither the FEIS nor supporting baseline documents conclude that selenium will be captured in the unsaturated zone and will not be a problem. Column leaching tests do, however, demonstrate that the selenium releases are limited under saturated conditions, most likely by bacterially mediated reactions that reduce mobile selenate and bi-selenate to relatively immobile selenite or selenide. The impact analysis uses the saturated column release rates for backfill sources that will be located below the water table, but does not consider any attenuation of selenium in the saturated zone.

Letter/Comment: 960/f, 962/d

Comment Count: **2**

Issue: **6q2. In reference to the following statement from the baseline geochemistry study "The column leachates were moderately buffered to well-buffered solutions with calcium-sulfate to calcium-bicarbonate compositions and near neutral pH. The pH of the leachates from saturated columns was lower than leachates from their unsaturated counterparts. This difference may have been caused by increased partial pressure of CO_2 gas (PCO2) in the saturated columns which were closed to the atmosphere and could not separate the CO_2 released by anaerobic bacteria." E. Imhoff commented: We can thank the scientists for their objective comments. Indeed, during the mining of the North Pit the selenium bearing material will not be closed to the atmosphere, as in a column test. What will happen in the field is that exposure to air will allow venting of CO_2, higher pH, and greater mobility of selenium.**

Response: The author of the geochemical study and quote cited by the commenter states that there is no geochemical basis to conclude that the difference in selenium mobility between the saturated and unsaturated columns which varied between (6.8 and 8.4) was related to pH. The observed difference in selenium mobility is attributed to microbial reduction of selenium in the saturated columns. The oxidation state of selenium is the dominant factor controlling its solubility at circum neutral to moderately alkaline pH (Hem 1989, Masscheleyn et al. 1990). Venting (or not venting) of CO_2 under field conditions is not likely to increase (or decrease) selenium mobility in water.

Letter/Comment: 962/e

Comment Count: **1**

Issue: **6r2. The FEIS should include a discussion about how 303(d) listed water would not be further degraded by the proposal. There should also be discussion about how the project would meet the targets in the existing total maximum daily load (TMDL).**

Response: The Blackfoot River in the area of the proposed project is on the Idaho 303(d) list for temperature, selenium, and dissolved oxygen. In addition, a sediment TMDL exists for this reach.

TMDLs must be developed for waters on the state's 303(d) list. As required by state and federal law, IDEQ has prioritized waters for the development of TMDLs (IDAPA 58.01.02.054.03). The Blackfoot River is a medium or low priority water body for TMDL development. As such, IDAPA 58.01.02.054.05 applies. This section requires that, until a TMDL is developed, there must be changes in permitted discharges from point sources and BMPs for nonpoint sources deemed necessary to prohibit further impairment of designated or existing beneficial uses.

The modeling results used in developing the FEIS predict that discharges from the Blackfoot Bridge Mine will not cause a measurable increase in the concentration of selenium in the Blackfoot River during the time when selenium levels already exceed the criteria for selenium set forth in section 210. While not measurably increasing the selenium concentration, the mine will contribute an additional load of selenium to the River. There is no information to suggest, however, that this small load will cause or contribute to any further impairment of the beneficial uses of the River. In addition, P4 will be conducting activities in the watershed that will reduce the selenium load and offset any load contributed by the proposed project. Therefore, the Blackfoot River will not be further degraded by selenium discharges from the proposed project pending the development of a TMDL for selenium.

A TMDL for sediment was developed by IDEQ and approved by EPA in 2002. Once a TMDL is completed, new or increased discharges must be consistent with the approved TMDL (Idaho Code § 39-3612; IDAPA 58.01.02.054.04). The TMDL sets a target of 80 percent stream bank stability to reduce sediment impacting the Blackfoot River. In addition, the 2006 Implementation Plan for the Blackfoot River Sediment TMDL provides that mining activities implement appropriate and approved BMPs to minimize erosion and sediment delivery to adjacent waterbodies. An "Assessment of Potential Mitigation Sites and Preliminary Design - Blackfoot Bridge Project, Caribou County, Idaho" and a Compensatory Mitigation Plan for Waters of the U.S. (P4 2010b) were prepared by AMEC Geomatrix for P4 to identify areas and methods where wetland habitat would be restored to offset the loss of 9.43 acres associated with the proposed Blackfoot Bridge Mine. This plan proposes streambank and wetland restoration on the mainstem Blackfoot River within the Fox Hills Ranch (owned by P4 close to the Blackfoot Bridge Project. Approximately 7 miles of the Blackfoot River meander through the Fox Hills Ranch. Preliminary data would suggest that of the approximately 74,000 feet of streambank in this reach, roughly 5,500 feet (or about 7 to 8 percent) are in a degraded condition and would lend themselves to restoration. Given this information and the observations of DEQ field staff, it would appear that streambank conditions within the Fox Hills Ranch are likely meeting the 80 percent streambank target and will improve to near reference if the restoration activities proposed by P4 are successful. Moreover, it is IDEQ's opinion that BMPs identified in the FEIS and to be detailed in the Storm Water Pollution Prevention Plan, including the monitoring that will be required by the Environmental Monitoring Plan (**Appendix A** of FEIS), provide appropriate BMPs to minimize erosion and sediment delivery to adjacent waterbodies. Therefore, the project will be consistent with the approved sediment TMDL and its implementation plan.

In addition, the Blackfoot River was listed on the 2008 Integrated Report as not meeting water quality standards for temperature and dissolved oxygen. The information in the FEIS shows that the project will not adversely affect temperature or dissolved oxygen in the Blackfoot River. In addition, as set forth below, the measures outlined in the report prepared by AMEC are likely to result in improvement of temperature and related dissolved oxygen conditions.

IDEQ has not developed TMDLs for temperature and dissolved oxygen at this date but has begun data collection in anticipation of TMDL development in the near future. IDEQ's technical approach for developing TMDLs for temperature involves looking at the potential for natural vegetation to provide cooling shade and assessing the shade provided by existing vegetative structure. IDEQ has developed regional shade curves that set targets for stream shading based on the potential for reference (or expected) levels of vegetation that would occur in the riparian zone of streams. In short, the shade provided by the expected natural vegetation becomes the TMDL target and the difference in the observed shading from the expected is the management goal to achieve in implementing the temperature TMDL. Further, low levels of dissolved oxygen in the Blackfoot River are more than likely coupled to high summertime temperatures (see **Figure 1**). Implementation of a dissolved oxygen TMDL will likely propose improving temperature conditions through riparian corridor restoration thus increasing effective shade.

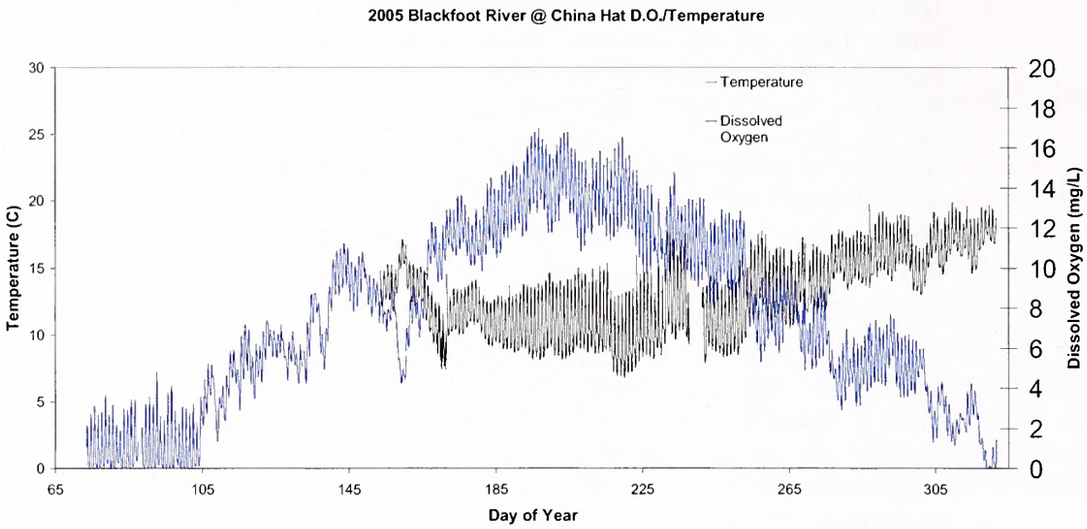


Figure 1. Diel temperature and dissolved oxygen at China Hat, Blackfoot River, Caribou County, Idaho in 2005.

Preliminary analysis of the shade data collected by DEQ staff in summer 2009 along the mainstem Blackfoot River through the Fox Hills Ranch indicates existing vegetation is providing roughly 6 to 8 percent effective shade to the stream. Based on the stream type, valley bottom type, and other variables, IDEQ anticipates the potential natural vegetation shade target to be in the realm of 20 percent +/- 5 percent. Once the restoration strategy for the Fox Hills Ranch reach described in the AMEC plan is successfully implemented, IDEQ would likely consider that this reach of the Blackfoot River meets the goals of a future potential natural vegetation TMDL while concurrently improving dissolved oxygen regimes in the river.

Also note that Section 401 of the CWA provides that any applicant for a federal license or permit to conduct any activity which may result in any discharge into navigable waters must obtain a water quality certification from the state in which the discharge originates. While this response addresses certain water quality issues based upon information contained in the FEIS and other related documents, the IDEQ will make a 401 certification decision with respect to any permits or licenses to which Section 401 applies, and that certification decision may include conclusions different from those set forth in this response.

Letter/Comment: 959/ii

Comment Count: 1

Issue: **6s2. Revise the FEIS to reflect EPA's determination that an individual NPDES will be required for discharges that require NPDES permitting and that are not eligible for coverage under the MSGP. For example, discharge of wastewater that contains contaminated seepage from the EOP will require an individual permit. Also revise the FEIS to explain that storm water runoff associated with industrial activity and contaminated seepage from the EOP are regulated as point sources under the CWA.**

Response: The FEIS reflects P4's intent to apply for an NPDES permit or permits for the project, including an individual NPDES permit if required by EPA. For example, **Section 1.3.2** acknowledges the potential need for an individual NPDES permit for discharge of water from the project. Implementation of the Water Management Plan (P4 2010c) would result in collection of seepage and storm water runoff in a series of water control ponds and the OSMS. Water that does not meet the criteria for discharge would be maintained within the water management system.

Letter/Comment: 959/jj, 959/ll, 961/mm

Comment Count: 3

Issue: **6t2. It appears that the applicant did not include the discharge diversion to wetland X in the 404 permit application. If that is the case, the applicant should correct these**

omissions in the permit application and the USACE should include the discharge diversion as permit conditions to provide a reasonable assurance of compliance with water quality standards for the pollutants of concern.

Response: Identification of a discharge outfall is not part of the 404 Permit process. Rather, it is part of the NPDES permit application process. As discussed in **Section 4.3.1.1.1**, discharge of water from CP1 and other water control ponds (NWP1-4) to Wetland X would require that the water meet discharge criteria.

Letter/Comment: 958/t

Comment Count: *1*

Issue: **6u2. The DEIS states that the water management system will be maintained until vegetation has fully established on reclaimed areas. The FEIS needs to describe if this requirement is met by establishment of annual grasses, shrubs, or succession by conifers and aspen.**

Response: Establishment of a self-sustaining vegetation cover that stabilizes growth media on all reclaimed areas, including the water management system, would be evaluated by BLM and IDL representatives to determine adequacy of vegetation. As described in **Section 2.3.8** and in the Mine and Reclamation Plan, agency evaluation of vegetation cover on reclaimed areas would be based on federal and state vegetation and cover requirements. Removal of any components of the water management system would be subject to the agency assessment and approval of the reclamation.

Letter/Comment: 964/oo

Comment Count: *1*

Issue: **6v2. The DEIS predicts that sediment increases in the local streams and in the Blackfoot River will not be an issue because of BMPs, and sediment loadings from mining activities were quantified. BLM should include estimated sediment loadings, not only during mining but also after mine operation.**

Response: The water management system, as discussed in **Section 2.3.6**, would control any runoff associated with the mining activities. Only water that meets surface water quality standards would be allowed to discharge consistent with the requirements of the CWA. All mining areas would be reclaimed as discussed in **Section 2.3.8**. **Section 2.3.6.12** further states that the water management system would operate until the reclamation areas have fully stabilized and monitoring demonstrates that runoff from the reclaimed project area meets surface water quality standards, including total suspended solids. As any runoff associated with this project would meet surface water quality standards before and after mining, no further analysis of sediment loading was conducted.

Letter/Comment: 966/pp

Comment Count: *1*

Issue: **6w2. BLM needs to analyze the effect of applying dry-year stream flows on the stated results in the FEIS. Years 2005- through 2007 (and in particular, 2007) represented relatively dry conditions in the upper Blackfoot River Basin, and sampling the mine site creeks during relatively dry years might influence the resulting impacts from the modeling and analysis.**

Response: The years 2005 through 2007 were relatively dry compared to long-term records of precipitation and stream flow in the Blackfoot River Basin. The dry years resulted in generally lower than average stream flows in Blackfoot River and presumably in the tributary drainages. It is also possible that the dry conditions may have exerted some influence (either slightly increased or decreased concentrations) over the chemical characteristics of groundwater and surface water during the baseline monitoring period. In general, the impact analysis was based on the calculated chemical load to the receiving water. Chemical loading considers infiltration rates based on long-tem estimates of precipitation and infiltration and is not adversely affected by

dryer than average years during the baseline monitoring period. Likewise, streamflow estimates for Blackfoot River were evaluated in terms of the available long-term data rather than just the data collected between 2005 and 2007. To the extent that long-term data for other drainages within the project area were not available, loading calculations based on data collected during relatively dry years tends to predict higher concentrations than would be expected for relatively wet years. This results because a smaller volume of receiving water is available to dilute seepage from mine facilities.

Letter/Comment: 966/oo

Comment Count: 1

Issue: **6x2. A Failure Modes and Effects Analysis should be conducted for the Blackfoot Bridge Project to evaluate the risk that proposed reclamation and mitigation measures pose for the surrounding environment, workers and the public including impacts to water resources and wetlands.**

Response: Failure modes and effects analysis (FMEA) is a procedure applied in product development and operations management for analysis of potential failure modes within a system for classification by the severity and likelihood of the failures. A full evaluation of potential impacts of the project on the environment has been conducted as part of the FEIS. Impacts that could result from implementation of the Mine and Reclamation Plan for the project and from implementation of mitigation measures to reduce identified impacts have also been described. Project design has incorporated factors of safety and safeguards as set forth in the FEIS and Environmental Monitoring Plan (**Appendix A** of FEIS). An FMEA would be redundant in the FEIS.

Letter/Comment: 959/kk

Comment Count: 1

TOPIC: 8. VEGETATION, RIPARIAN AREAS, AND WETLANDS

Issue: **8a. The DEIS does not adequately evaluate potential effects of elevated selenium concentrations on wetlands and riparian habitat and on migratory birds that may use those habitats.**

Response: As indicated in **Section 4.5** of the FEIS, P4 submitted a Section 404 permit application to the USACE for disturbance of 9.43 acres of wetlands and other waters of the U.S. As part of the application, and in compliance with the Final Rule, Compensatory Mitigation for Losses of Aquatic Resources, P4 submitted a Compensatory Mitigation Plan (P4 2010b) that identified potential compensatory mitigation for the USACE to consider in replacement of wetlands and lost functions and values. The primary goal of the proposed compensatory wetland mitigation for the project is to replace or enhance wetland functions to maintain no net loss. The amount of wetland mitigation required was determined based on the functional assessment conducted for projected levels of ecological functions. Under either the Proposed Action or Alternative 1A or 1B, 3.21 functional units would be lost. The compensatory mitigation options are presented in **Section 2.3.9.5**.

Letter/Comment: 665/b, 968/a

Comment Count: 2

TOPIC: 9. TERRESTRIAL WILDLIFE

Issue: **9a. The FEIS needs to address the potential for the project to result in fragmentation of habitat and loss of biodiversity. In addition to the direct effects of the mining activities, improvements to access to the general project area (new or reconstructed roads and increased OHV access) could impact habitat effectiveness and increase the mortality of big game. New or reconstructed roads need to be included as disturbed areas.**

Response: As indicated in **Sections 4.6** and **5.6**, habitat fragmentation and mortality have occurred as a result of road-building and other construction projects, grazing, mining, vegetation management, conversion of land to agriculture, and wildfire. Project design features, BMPs, Water Management Plan (P4 2010c), Bald Eagle Management Plan (P4 2009b), Environmental

Monitoring Plan (**Appendix A** of FEIS), and the Mine and Reclamation Plan are elements designed to reduce fragmentation of habitat and loss of biodiversity. The increase in road density through the construction or reconstruction of roads will be directly associated with mining activity and will not increase public access. Access to the mining areas would be restricted during mining operations. As shown in **Table 2.3-1**, the project includes disturbance of 1.1 acres of "road & service" on the federal property and 85.7 acres on private land.

Letter/Comment: 610/d, 612/d, 621/d, 626/d, 630/d, 631/d, 635/d, 966/cc, 968/b, 968/c, 968/d, 968/e, 968/f

Comment Count: 13

Issue: **9b. The potential for fragmentation of habitat and loss of biodiversity.**

Response: As indicated in **Sections 4.6** and **5.6** of the DEIS, habitat fragmentation and mortality have occurred as a result of road-building and other construction projects, grazing, mining, vegetation management, conversion of land to agriculture, and wildfire. Project design features such as, BMPs, Water Management Plan, Bald Eagle Management Plan, and the Environmental Monitoring Plan are elements designed to reduce fragmentation of habitat and loss of biodiversity.

Letter/Comment: 966/y

Comment Count: 1

Issue: **9c. The FEIS should disclose the potential direct and indirect effects to wildlife from selenium or other contaminants of potential concern (COPCs).**

Response: As indicated in **Section 4.6.1.1** of the FEIS, wildlife may experience acute or chronic selenium toxicity (depending on exposure) from the uptake of plant forage, which may have accumulated selenium. Specific examples of acute and chronic selenium toxicity were added to the discussion.

Letter/Comment: 357/a

Comment Count: 1

Issue: **9d. Because COPC's will have to be isolated in perpetuity, managing for a 200-year time span is insufficient. The DEIS does not adequately discuss the potential effects of deeper rooted plants and trees on the GCLL. Will deep rooted forbs such as alfalfa be able to access and concentrate selenium, exposing wildlife and livestock?**

Response: As described in the Mine and Reclamation Plan, the first priority of revegetation is establishing ground cover to stabilize the soil surface. The approved seed mix consists of grasses and forbs that would quickly stabilize the surface and establish a healthy long-term plant cover. The seed mix also is designed to include plant species that are shallow-rooting types to avoid issues with the GCLL cover system.

Some non-native taxa in the seed mix are colonizers that would aid in establishing an initial cover, but would be replaced by native taxa in subsequent seasons. The Environmental Monitoring Plan (**Appendix A** of FEIS) includes monitoring of revegetation and would include controls if there is any unanticipated succession of deep-rooted species in areas where there may be a potential to penetrate the GCLL and access selenium.

Vegetation responds to the surrounding environment in an opportunistic manner, particularly in the semi-arid west where water deficits often exist during portions of the year. Roots proliferate in regions where water is available, and avoid regions deficient in water. That is why roots are normally found above barrier systems with polymeric layers (e.g., geomembranes or the laminate in a GCL) and not within or below the polymeric layer (the roots proliferate in the moist soil above the barrier). As a result, roots are not expected to penetrate the GCLL cover planned for the Blackfoot Bridge Mine Project.

The GCLL would also provide natural controls on the species that would develop on the cover. Because the GCLL functions as a hydraulic barrier, water that would normally flow to greater depths would be maintained closer to the surface, or would drain off in the drainage layer

above the GCLL. This water would also be more readily available for evapotranspiration, and thus drier soil conditions would likely exist. Consequently, the plant species population should be dominated by shallow rooted species (within the depth of the cover soil above the GCLL) that can tolerate drier soil conditions. Deeper-rooted species would be less successful because water would not be available at depth for their root systems (root systems associate themselves with available water.

Letter/Comment: 964/g, 968/k

Comment Count: ***2***

Issue: **9e. The DEIS attributes the low numbers of bats found on the site to the amount of roosting habitat. Mitigation should include requirements for adding bat roosting habitat or raptor perching and nesting opportunities in the 99 acres of pit highwalls.**

Response: The discussion in **Section 4.6.1.1** that some species of animals may find habitat in the highwall, such as bats and crevice nesting bird species was removed because the unconsolidated nature of the geology of the unreclaimed highwalls tends to ravel upon abandonment and is not likely to provide suitable habitat for bats or raptors.

Letter/Comment: 964/t

Comment Count: ***1***

Issue: **9f. The FEIS should address mitigation in coordination with IF&G for construction osprey platforms as an alternative to birds nesting on power line poles.**

Response: A new power line would not be required; however a portion of the existing main power line would need to be modified around project facilities. As discussed in **Section 2.3.7.1** BMPs would be implemented to protect raptors and migratory birds. Ospreys were not recorded in the project area during baseline studies. Consequently, it is not anticipated that such a mitigation measure for osprey would be needed.

Letter/Comment: 964/u

Comment Count: ***1***

Issue: **9g. Rock may be placed in the Fish Pond drainage to prevent direct exposure of wildlife to the contaminated water source. This selenium-contaminated water would be intercepted by the diversion ditch and redirected to the water management ponds. Wildlife would still have access to this contaminated water while it is in the diversion ditch, Fish Pond, CP1 or water management ponds. The FEIS needs to discuss the level of access and exposure that wildlife would have to this contaminated water and what the environmental effects would be.**

Response: Potential exists for wildlife to have access to contaminated water. P4 would be required to implement management practices to discourage and prevent wildlife access to water containing COPCs. These measures are also discussed in the Response to issues 20b1 and 20c1. For example, the water management ponds would be designed with steep slopes and short ground cover such as sheep fescue would be established and maintained in an effort to create low quality habitat. Water birds may temporarily land on ponds during migration, but the ponds would not have habitat features that would make it suitable for long-term foraging or nesting. Therefore, should water birds have contact with water containing COPCs, it is anticipated that the contact time would be minimal and not at levels expected to cause adverse effects. Monitoring is provided in the Environmental Monitoring Plan (**Appendix A** of FEIS) and provides annual surveys at water management ponds to ensure no nesting/habitat is being developed. Additionally, the facility would be fenced off to prevent wildlife accessing the area. This discussion was incorporated into **Section 4.6.1.1**.

Letter/Comment: 964/cc

Comment Count: ***1***

Issue: **9h. The DEIS points out that springs and wetlands may reestablish in the Fish Pond drainage over time. The FEIS needs to discuss the potential effects to wildlife from the**

reestablishment of springs and wetlands that may expose wildlife to contaminated surface water.

Response: The GCLL cover and the OSMS are designed to prevent toe seeps at the overburden piles. Therefore, the establishment of springs and wetlands is not anticipated. However, P4 would monitor development of springs and wetlands. If such development occurs, a solution would be implemented promptly to intercept the source of flow to these features and prevent the establishment of springs and wetlands on a site-specific basis. For example, as discussed in **Section 4.6.1.1**, P4 may place rock materials as needed to preclude access to seeps and springs by wildlife or excavate a sump at the new spring location to collect flow and convey the flow to the water management system.

Letter/Comment: 964/dd

Comment Count: *1*

Issue: **9i. The DEIS may be underestimating the amphibian diversity and abundance in the project area.**

Response: Scouting for potential amphibian habitat in the project area was done prior to amphibian surveys. The amphibian surveys were completed in identified suitable amphibian habitat. As discussed in **Section 3.6.3**, amphibian surveys were performed at Fish Pond, State Land Creek, and Blackfoot River (during fish surveys). In addition to these prescribed searches of suitable amphibian habitats, biologists also recorded any other amphibian observations that occurred during other biological surveys conducted in May, June, and August 2005. One post-reclamation monitoring event is also proposed.

Letter/Comment: 964/ee

Comment Count: *1*

Issue: **9j. P4 should provide mitigation for wildlife habitat loss associated with the project. As part of the assessment of wildlife habitat loss, the FEIS should describe the ability of sage grouse to exist under the proposed mining actions and the impact their demise would have on Tribal culture and traditions.**

Response: As discussed in **Section 4.6.1.1.6**, during the baseline wildlife survey, thirteen survey stations were established within or adjacent to the project site to evaluate the potential for on-site vegetation to support sage grouse. Sage grouse were not observed in the project area during baseline studies and it was concluded that the habitat in the project area is marginal for sage grouse leks and is not optimal sage grouse habitat (Greystone 2006c). However, sage grouse habitat has been identified near the Ballard Mine, about a mile from the proposed project area boundary (**Figure 3.6-2**). The mixed shrub communities that dominate the project area contain a mixture of mountain big sagebrush, snowberry, bitterbrush, chokecherry, and serviceberry that differs substantially from the sagebrush steppe habitat mapped as sage grouse habitat near the Ballard Mine where sage grouse were observed. Therefore, it was concluded that the proposed project would not be likely to affect sage grouse or their habitat.

P4 is developing a site management plan for their nearby Fox Hills Ranch. This site management plan includes water quality protection and improvement, fishery improvement; and habitat restoration and maintenance.

P4 would mitigate impacts to wildlife values from the Project by entering into an agreement with the BLM for a conservation easement on 120 acres of its Soda Hills undeveloped natural property in the general area of the mine and Soda Springs. The Monsanto Soda Hills property lies contiguous to BLM managed lands and is considered to have a "conservation value" of benefit to the public. The property will contribute to mule deer winter range acreage which is a benefit to the people of the county, state, USA, and Shoshone-Bannock Tribes. The conservation easement would preclude use of the land for any purpose other than buffer zone and require it be maintained in its current natural state.

The purpose of the conservation easement is to assure that the property would be retained forever in its relatively natural and scenic condition, to preserve opportunities to continue

traditional agriculture and to prevent any use of the property that would significantly impair or interfere with the maintenance and protection of the conservation values of the property. A specific purpose of this conservation easement is to conserve the important Soda Springs Hills big game winter range. Grantor (P4) and Grantee (BLM) intend that this conservation easement would limit the use of the property to activities that are consistent with the purposes of this conservation easement, which include but are not limited to livestock grazing, enjoyment of nature and wildlife, and public access and recreation. P4 would fund a management reserve with a third party, if necessary, to monitor compliance and take actions necessary to ensure compliance. The easement would conserve the conservation values of the property in perpetuity.

For a conservation easement to do this it must prohibit actions such as:

- subdividing the property;
- mining;
- topographical alteration;
- wholesale vegetation removal/alteration;
- on-site hydrologic alteration;
- residential development;
- commercial development except for limited livestock grazing (if desired);
- storage of hazardous materials and other trash;
- new roads;
- landing strips and helipads; and
- deliberate introduction of exotic plant and animal species.

A conservation easement can allow activities that are not detrimental to the conservation values of the property such as:

- biological and chemical weed treatment in accordance with state/county rules;
- limited predator control;
- limited low impact recreational activities;
- low impact agricultural use such as limited livestock grazing (if desired);
- habitat enhancement projects;;
- low impact educational activities;
- public access (if desired);
- some structures - usually strive to cluster structures and minimize their visibility and size and structure maintenance; and
- maintenance of existing roads and trails.

Letter/Comment: 966/bb

Comment Count: ***1***

Issue: **9k. The numbers in the text and table referring to the number of eaglets fledged should be reconciled (Section 3.6.2.1).**

Response: The text in **Section 3.6.2.1** was corrected to accurately reflect the number of eaglets fledged and is consistent with the table. **Table 3.6-1** has been updated.

Letter/Comment: 967/m

Comment Count: *1*

Issue: **9l. The legend on Figure 3.6-2 should include a description of the dark blue areas on the map.**

Response: The legend on **Figure 3.6-2** was revised to include the dark blue areas (wetlands).

Letter/Comment: 967/n

Comment Count: *1*

Issue: **9m. Wetlands and ponds where nesting occurred should be identified if available (Table 3.6-3).**

Response: The names of wetlands and ponds, if known have been included in **Table 3.6-3** (e.g. Fish Pond).

Letter/Comment: 967/o

Comment Count: *1*

Issue: **9o. The 2002 BLM special status species list includes wolverine, yet they are not listed in the table (Table 3.8.1; Table 4.8.1; Table 5.8.1).**

Response: The wolverine is a special status species for other BLM field offices, but not for the Pocatello field office area. This is true for the 2002 BLM Special Status Species list and the most current, 2003 list. Therefore, the wolverine is not listed as a special status species in **Table 3.8.1, Table 4.8.1**, and **Table 5.8.1**.

Letter/Comment: 967/aa, 967/q, 967/x

Comment Count: *3*

Issue: **9p. Section 4.6.1.1.5 of the DEIS discusses a population-level assessment of selenium impacts to robins and blackbirds (Ratti et al. 2002). The conclusion that this demonstrates no substantial negative impact from selenium contamination is misleading. Either all information needs to be disclosed to the reader, or statements such as those made in the DEIS need to be removed.**

Response: The sections describing the Ratti et al. paper in **Chapters 4** and **5** have been re-written to more clearly present and interpret the data in the study.

Letter/Comment: 967/v

Comment Count: *1*

Issue: **9q. An additional issue that should be added to the bullet list of issues and evaluated in Section 4.6 is the potential for contamination of habitat by elevated concentrations of COPCs, thereby degrading habitat and resulting in adverse effects.**

Response: Contamination of habitat by elevated concentrations of COPCs was added as an issue under **Section 4.6**. A discussion on the potential of COPC loading to water resources was also added to **Section 4.6.1**.

Letter/Comment: 967/r

Comment Count: *1*

Issue: **9r. The estimated number of tiger salamanders (10) that are likely to occur in the disturbed area seems low.**

Response: The FEIS accurately reflects the number of tiger salamanders documented in the baseline study.

Letter/Comment: 967/s

Comment Count: *1*

Issue: **9s. The FEIS should clarify what is meant by "eagle safe" (Section 4.6.4).**

Response: The terminology "eagle safe" has been clarified in **Section 4.6.4**.

Letter/Comment: 967/w, 967/y

Comment Count: *2*

Issue: **9t. In Section 4.8.4, the DEIS states that if nests of threatened, endangered, or sensitive raptors were identified, the BLM biologist would be contacted. The FEIS needs to identify what the follow-up action would be.**

Response: **Section 4.8.4** was revised to state that if a threatened, endangered, or sensitive raptor were identified, the BLM would oversee the conservation strategies for the particular species.

Letter/Comment: 967/z

Comment Count: *1*

Issue: **9v. The FEIS should provide examples of other mine sites where nesting birds or bats have used unreclaimed highwalls.**

Response: After further review in response to this comment, BLM determined that, because of their nature and composition, the rock formations that would be exposed in the unreclaimed highwalls in the project would tend to ravel over time and would not likely provide suitable habitat for bats or raptors. This discussion was revised in **Section 4.6.1.1** of the FEIS. Because this is no longer discussed as suitable habitat, examples from other mines were not included.

Letter/Comment: 967/f

Comment Count: *1*

Issue: **9w. The FEIS should discuss how the concentrations of selenium discussed in Section 4.6.1.1 compare to those observed during the late summer of 2009 when cattle died at the Lanes Creek Mine.**

Response: The threshold at which toxic symptoms of selenium poisoning first appear in grazing mammals is 5 mg/kg of food (**Section 4.6.1.1**). With the proposed cover system design and seed mix for reclamation of the proposed Blackfoot Bridge Mine, accumulation of selenium in plants grown on reclaimed areas would be limited. The discussion in **Section 4.5.1.1** references vegetation samples taken from P4's current mine operation at South Rasmussen which found all samples to have concentrations less than 5 mg/kg milligrams selenium per dry weight kilogram of vegetation. Given the increased level of preventative measures to be implemented at the Blackfoot Bridge Mine relative to the South Rasmussen Mine, it is expected that the concentration of selenium in vegetation on reclaimed areas at Blackfoot Bridge Mine would also be less than 5 mg/kg. The Environmental Monitoring Plan (**Appendix A** of FEIS) provides for periodic sampling and testing of vegetation.

Letter/Comment: 967/u

Comment Count: *1*

Issue: **9x. A songbird nesting survey should be completed in the spring so that disturbance can be relocated to avoid active nests.**

Response: Mitigation measures are discussed in **Section 4.6.1.1.5** of the FEIS. These include ground clearing activities only during non-nesting season to avoid direct impacts to nesting songbirds and other migratory birds.

Letter/Comment: 964/gg

Comment Count: *1*

Issue: **9y. The DEIS cites and misrepresents research on the effects of selenium on migratory birds (e.g., Section 5.6.3.6). The FEIS should present a balanced discussion of the effects of selenium on migratory birds from various reputable sources.**

Response: The sections describing the Ratti et al. 2002 paper in **Chapters 4 and 5** have been re-written to more clearly present and interpret the data in the study. The discussion of selenium impacts on migratory birds has been expanded in **Sections 4.6.1.1.5** and **5.6.3.6**, to incorporate the Skorupa et al. 2002 study results.

Mitigation measures are also discussed in **Section 4.6.1.1.5** and other appropriate sections of the FEIS. These include: ground clearing activities only during non-nesting season, steep-sided water management ponds with little vegetation to avoid attracting water birds, monitoring use of the ponds by water birds, and creating "islands of diversity" in reclaimed areas. Language was also added to address the potential for raptors to nest on power lines following the start of mining, appropriate mitigation measures would be implemented. The Environmental Monitoring Plan (**Appendix A** of FEIS) has also been updated to include monitoring pond use by water birds.

Letter/Comment: 961/e, 962/c

Comment Count: ***2***

Issue: **9z. The DEIS does not discuss compliance with the Migratory Bird Treaty Act (MBTA). The FEIS should address compliance with the MBTA including mitigation and management measures that will be put in place to reduce mortality of migratory birds.**

Response: **Sections 3.6.2** and **4.6.1.1** have been revised to include a more detailed discussion of the MBTA regulatory background and potential impacts to migratory birds. The FEIS includes a discussion of agreed upon measures to minimize possible incidental impacts.

Section 4.6.1.1.4 was updated to reflect USFWS new regulations related to the incidental take of eagles under the Bald and Golden Eagle Protection Act and that P4 has submitted an incidental take permit application to the USFWS.

Mitigation measures to protect migratory birds are discussed in **Section 4.6.1.1.5** and other appropriate sections of the FEIS. These include: ground clearing activities only during non-nesting season, steep-sided water management ponds with little vegetation to avoid attracting water birds, monitoring use of the ponds by water birds, and creating "islands of diversity" in reclaimed areas.

Letter/Comment: 961/ee, 962/f

Comment Count: ***2***

TOPIC: 10. FISHERIES AND AQUATIC RESOURCES

Issue: **10a. The FEIS needs to disclose the potential effect on fish populations and their habitat, and the potential habitat degradation of the Blackfoot River.**

Response: As indicated in **Sections 4.7 and 5.7,** the negligible amount of selenium and other COPCs that would be released with this project would not be expected to alter aquatic habitat, nor to cause or accelerate a decline in aquatic populations. A number of BMPs are included in the Water Management Plan (P4 2010c) that would mitigate the potential impacts to fisheries and aquatic habitats. Flows to the mainstem of Blackfoot River from the project are not anticipated. Where applicable, other BMPs would be implemented as part of the SWPPP including the use of erosion matting, silt fencing, and straw bales/wattles. During active mining, runoff from the open pit and roads that exceeds surface water quality standards would be contained and would not be allowed to discharge offsite. Concurrent reclamation would also be used to restore areas that were no longer required for mining operations. Disturbed areas, such as roadsides and topsoil stockpiles, would also be revegetated during operations to further limit the potential for erosion and sedimentation. Implementation of BMPs is expected to limit the potential for impacts from sedimentation and erosion and consequent impacts to aquatic wildlife.

Letter/Comment: 966/v

Comment Count: ***1***

Issue: **10b. The DEIS states that selenium concentrations exceed the chronic aquatic life standard for a few days each spring, but does not describe what the effects are on aquatic life for having this standard exceeded (DEIS p. 4-108). The FEIS needs to address this topic in greater detail.**

Response: The effects of selenium concentrations exceeding the chronic aquatic life standard are discussed in more detail in **Section 4.7**.

Letter/Comment: 964/b

Comment Count: ***1***

Issue: **10c. The FEIS needs to address the long term impacts of the proposed action on fish resources along the entire stretch of the watercourse from the headwaters of the Blackfoot River to its confluence with Snake River.**

Response: The additional input of selenium to Blackfoot River is not predicted to adversely alter the existing cyclic concentrations of selenium in the Blackfoot River. As discussed in **Section 4.7**, increases in selenium concentrations to aquatic resources are far lower than the Criteria Continuous Concentration (CCC) aquatic life standard of 0.005 mg/L and are below the detection limit of 0.001 mg/L for selenium. Therefore, long term effects to the entire watercourse are not anticipated.

Letter/Comment: 966/w

Comment Count: ***1***

Issue: **10d. The FEIS should provide additional information to the public regarding potential impacts to aquatic populations and if there is conflicting evidence from the scientific community; the FEIS should disclose those conflicts in an objective analysis.**

Response: Additional information on impacts to aquatic resources was added to the FEIS **Section 4.7**. No evidence of conflicting evidence or scientific controversy was identified and no analysis of those potential conflicts was added.

Letter/Comment: 966/x

Comment Count: ***1***

Issue: **10e. The statement that pelicans are "a likely limiting factor of Yellowstone cutthroat trout in the Blackfoot River" (Sections 3.7.1 and 5.7.3) needs to be supported with data and references or be removed from the FEIS.**

Response: The sentence in **Section 3.7.1** was edited and reference to pelicans as a limiting factor was removed. **Section 5.7.3** does not reference pelicans as a limiting factor. Discussion regarding pelican's predation impact on Yellowstone cutthroat trout remains in the document. IDF&G documents (e.g. Pelican Management Plan) acknowledge that IDF&G fishery management staff is concerned about pelicans preying on native cutthroat trout subspecies and hatchery trout, including the Yellowstone cutthroat trout.

Letter/Comment: 967/p

Comment Count: ***1***

Issue: **10f. Northern leatherside chub also should be listed as a fishery that inhabits the Blackfoot River (Section ES 4.1.9).**

Response: Northern leatherside chub were added to the list of fish inhabiting the Blackfoot River in **Section 3.7.1**.

Letter/Comment: 967/h

Comment Count: ***1***

Issue: **10g. The DEIS relies too heavily on non peer-reviewed research concerning the extent and intensity of selenium contamination to Yellowstone cutthroat trout. The FEIS should present a more balanced discussion including additional relevant studies of selenium effects on fish populations.**

Response: **Section 4.7.1.1** describing results of the Hardy, Rudolph, and Kennedy studies has been re-examined and re-worded and a discussion of several other relevant studies has been added.

Letter/Comment: 961/f

Comment Count: ***1***

Issue: **10h. The DEIS fails to present all relevant information from a pertinent study (Parametrix 2009).**

Response: **Section 3.7.2** has been revised and includes additional data from the Parametrix 2009 study.

Letter/Comment: 961/g

Comment Count: ***1***

Issue: **10i. The DEIS should include relevant research data on the effects of selenium to fish as a result of phosphate mining in southeast Idaho, specifically research by Van Kirk and Hill (2007) and the Brown Trout Study (NewFields 2009).**

Response: **Sections 4.7.1.1** and **5.7.3** of the FEIS have been revised to include discussions of the Van Kirk and Hill (2007) and Brown Trout (NewField 2009b) studies.

Letter/Comment: 961/h

Comment Count: ***1***

Issue: **10j. The DEIS fails to fully analyze potential impacts from selenium contained in the planting mediums planned for use in reclamation of the mine.**

Response: The Lemly procedure for hazard assessment was re-visited and discussed in **Section 4.7.1.1** and other relevant sections of **Chapter 4**, including a discussion of the potential for aquatic life and birds to be impacted by leachates from plant growth media. However, the BLM's position is that the Lemly procedure for hazard assessment has not been approved by the agencies and is not considered guidance for this phosphate mine proposal or any other at the current time. The analysis in the FEIS follows a defensible scientific process to determine the environmental consequences of the mining operation.

As discussed in **Section 4.3**, potential impacts to water resources were evaluated using numerical models to simulate the transport of COPCs in groundwater and surface water. Leachates from planting mediums planned for reclamation of the mine was considered in the analysis.

A discussion on the potential for selenium to enter the Blackfoot River via runoff including leachates from the growth media planned for reclamation of the mine, was added to **Section 4.7.1.1**. Therefore, no change was made to the discussion on potential selenium impacts to aquatic life in **Section 4.7.1.1** since there would be no change to the average increase in selenium concentration as result of leachates from growth media.

Letter/Comment: 961/i, 962/a

Comment Count: ***2***

Issue: **10k. The results of analysis of selenium impacts on fisheries should be provided in the FEIS, or that analysis referenced in Chapter 7 of the DEIS and made available to the Public.**

Response: Further description and detail was added to **Section 4.7.1.1** on how the relationships presented by Lemly (1997) were applied to the Blackfoot Bridge project to predict increases in deformity-related fish mortality associated with the proposed action. The text suggesting that the potential impact would be "negligible" was removed, in favor of presenting quantitative data.

Letter/Comment: 962/b

Comment Count: ***1***

TOPIC: ***11. THREATENED, ENDANGERED, AND SPECIAL STATUS SPECIES***

Issue: **11a. The team watching the bald eagles should have a schedule of that day's mining activities and radio contact.**

Response: The Bald Eagle Management Plan (P4 2009b) includes coordination between biologists and mining personnel to ensure that certain behavioral responses to blasting are recorded during the breeding season when bald eagles are occupying the nest. Note that P4 has applied for an incidental take permit which, if granted, will also contain monitoring measures.

Letter/Comment: 964/ff

Comment Count: ***1***

Issue: **11b. The FEIS should include special provisions for goshawk according to guidelines presented by Reynolds et al (1992).**

Response: As discussed in **Section 3.6.2.1**, Northern Goshawk surveys were performed within the project area; surveys did not detect any goshawks, nor was any suitable goshawk nesting habitat identified in the project area. Therefore, it is not anticipated that any goshawks would be encountered during construction. Should goshawk be encountered, BLM would be notified and would take appropriate action.

Letter/Comment: 964/hh

Comment Count: ***1***

Issue: **11c. The FEIS should be amended to reflect issuance of the new final rule regarding the incidental take of eagles under the Bald and Golden Eagle Protection Act and to reflect P4's intention to proceed with an incidental take permit application.**

Response: **Section 4.6.1.1.4** has been updated to reflect USFWS new regulations regarding the incidental take of eagles under the Bald and Golden Eagle Protection Act and that P4 has submitted an incidental take permit application to the USFWS.

Letter/Comment: 965/e

Comment Count: ***1***

TOPIC: ***12. VISUAL RESOURCES***

Issue: **12b. The FEIS needs to examine the visual impacts at night from key observation points and develop alternatives that reduce light pollution.**

Response: **Section 4.9.1.1.1** discloses the greater visibility of night-lighting of proposed facilities at longer distances than would be seen during the daytime, as well as visibility of night-lighting from sensitive viewpoints. The FEIS discusses that night-lighting would be visible in background distances zones of views from the Blackfoot Reservoir and country roads and rural residences to the west of State Highway 34, in addition to viewers at key viewing areas. Directing mounted facility lights downward is proposed to minimize impacts for every alternative. Visual simulations were not prepared for the visibility of night-lighting. The location and number of safety and security lights required for mine operations has not been designed for the mine plan. It is anticipated that the final lighting design will consider the effects of night-lighting.

Letter/Comment: 964/mm

Comment Count: ***1***

TOPIC:13. LAND USE

Issue: **13a. The FEIS should address potential effects to and from livestock grazing, including**

the potential degradation of riparian vegetation and water quality, and the possibility of moving existing livestock grazing allotments to other allotments or eliminating grazing in the project area during the project life.

Response: Grazing would be eliminated on approximately 640 acres for the life of the mine. As described in **Section 4.10.1.1.1**, all disturbed areas amenable to reclamation would be reclaimed and revegetated using a seed mixture primarily made up of grasses. After reclamation is successful, forage production and carrying capacity may be improved compared to existing conditions. After reclamation, impacts to riparian vegetation and water quality from grazing would likely be similar to baseline conditions. However, as indicated in **Section 4.10.1.1.1,** during mining activities BLM may reduce stocking rates or arrange for alternate allotments which may result in less impacts to riparian vegetation and water quality from livestock grazing. The Compensatory Mitigation Plan (P4 2010b) discussed in **Section 2.3.9.5.1** would restore 8.82 acres of riparian vegetation along the Blackfoot River that has been degraded by livestock. Approximately 10 percent (76 acres) of the Blackfoot Bridge Project area that would be disturbed by mining is public land administered by the BLM. This is less than 10 percent of the Woodall Mountain and Woodall Spring Grazing Allotments. As discussed in **Section 4.10.1.1.1**, any adjustment in stocking rates to other allotments as a consequence of the project would be conducted within the criteria for the carrying capacity of the selected allotment.

Letter/Comment: 968/h

Comment Count: *1*

Issue: **13d. The FEIS should disclose the potential effects on wilderness values, ecologically critical areas, Wild and Scenic Rivers, or other unique natural resources.**

Response: There are no Wild and Scenic Rivers, wilderness values (e.g., designated wilderness areas), or other ecologically critical areas within the project area. The proposed project would not affect wilderness characteristics, wild and scenic values of rivers, or other designated special management areas or unique natural resources located outside of the project area.

Letter/Comment: 188/b, 603/a, 603/b

Comment Count: *3*

Issue: **13e. Commenters observed that hunting opportunities have increased in the vicinity of mine sites due to past reclamation activities.**

Response: **Sections 4.5 - 4.8, 5.5 - 5.8** of the FEIS include mitigation to reduce impacts to hunting and fishing to the extent feasible.

Letter/Comment: 38/a, 81/a, 139/b

Comment Count: *3*

TOPIC: ***14. CULTURAL RESOURCES***

Issue: **14a. Discussions in all EIS sections concerning the potential effects on historic properties (important scientific, archeological, and other cultural resources listed in or eligible for the National Register of Historic Places) must be consistent.**

Response: As indicated in **Sections 4.11** and **5.11**, no known historic properties have been affected by past or present ground disturbances in the study area. One historic property has been identified in the mine permit area and has received SHPO concurrence. This site would be avoided by all mine-related disturbances. Three other sites that may be disturbed have been investigated in more detail and have been recommended as not eligible (not historic properties) and SHPO has concurred. No effects to historic properties are anticipated to result from the proposed project.

Letter/Comment: 218/a, 218/b, 218/c, 218/d

Comment Count: *4*

TOPIC: 15. TRIBAL TREATY RIGHTS AND INTERESTS

Issue: **15a. The FEIS needs to disclose potential effects on access relevant to Tribes exercising Treaty Rights and Interests.**

Response: As discussed in **Sections 4.12** and **5.12**, no long-term changes in land status or access associated would result from the project, and those portions of the project area that are currently unoccupied public land would retain that status. Within the project area, approximately 76 acres of federal land would be disturbed (**Table 2.3-1**). Although, there would be an interruption during mining activities to the Shoshone and Bannock Tribes' access to public land to exercise treaty rights and traditional uses, access would be restored at the completion of mining. The project would result in adverse impacts to some of the natural resources that the Tribes may require in the exercise of their treaty rights. Potential short-term impacts would be associated with the disturbance or displacement of plant and wildlife species used for traditional purposes and subsistence.

Letter/Comment: 382/a, 966/b, 966/h

Comment Count: 3

Issue: **15b. A regional ethnographic study should be completed to augment baseline information for making informed, long-term regional land management decisions on tribal interests and concerns.**

Response: No sacred sites have been identified within the project area that would be affected by the proposed project. BLM will continue to consult with the Shoshone and Bannock Tribes to ensure that no previously unknown sacred sites are adversely affected. A regional ethnographic study would be out of scope for this project.

Letter/Comment: 966/ee, 966/k, 966/o

Comment Count: 3

Issue: **15c. The FEIS should address degradation of unoccupied federal lands resulting in displacement and loss of Tribal Treaty Rights and Interests including the Tribes' ability to continue exercising traditional cultural and ceremonial practices and should recognize the Shoshone-Bannock Tribes Policy for Management of Snake River Basin Resources. The BLM should require that federal lands be reclaimed to pre-mining conditions and that appropriate mitigation be implemented for any impacts to Tribal Treaty Rights and Interests.**

Response: As discussed in **Sections 4.12** and **5.12**, approximately 76 acres of public land would be disturbed by the Proposed Action, and approximately 98 acres of public land would be disturbed by Alternative 1A or 1B. The project would result in adverse effects to the natural resources on public land that the Tribes may require to exercise their treaty rights. The disturbance and potential displacement of plant and animal species is considered short-term and the land would be reclaimed after mining. Over the long-term, the quantity and diversity of plant and animal species would be enhanced. Impacts to water resources, vegetation, terrestrial wildlife, fisheries and aquatic resources are discussed in their respective **Sections (4.3, 5.3, 4.5, 5.5, 4.6, 5.6, 4.7** and **5.7)**. **Sections 3.12** and **4.12** discuss BLM recognition of the Tribes' treaty rights and potential impacts to treaty rights. The BLM recognizes the Shoshone Bannock Tribes' Policy for Management of Snake River Basin Resources and is requiring the project proponent to reclaim the small area of unoccupied public land to the extent feasible.

Letter/Comment: 966/e, 966/mm

Comment Count: 2

Issue: **15d. The Proposed Action describes a long-term drawdown of water and a dewatering of a tributary of the Blackfoot River. The FEIS should disclose the source of these water rights and what is the contingency plan if all available water is appropriated by senior holders.**

Response: The FEIS indicates in **Table 1.3-1** that P4 would need to acquire the necessary approval from IDWR to transfer existing P4 water rights to the site or acquire a new water right permit to authorize use of water at the site pursuant to the Water Management Plan (P4 2010c). P4 would demonstrate that it has sufficient water rights for the amount of water that may be removed from the Blackfoot River drainage during operations. Wording has been modified in **Section 1.3.2** to clarify this. **Figure 4.3-10** shows the predicted impact to flow for both the Blackfoot River and for Woodall Springs. These predictions and future monitoring to determine actual impacts during operation of the Water Management Plan (P4 2010c) would be used to determine what amount of water will be required.

As part of the P4 water right transfer and permit process, IDWR will consider the possible impacts to other water right holders. In the upper Blackfoot River, any impacts of the proposed project are expected to only affect surface water rights. If an impact to surface water rights is shown, IDWR may impose appropriate conditions upon approval of the transfer or permit to ensure other water right holders are not injured. This would likely require that P4 develop a mitigation plan to offset the impacts to other water rights. The water requirements of any mitigation plan could be supplied by transfer of existing P4 water rights, drying up irrigated acres under existing rights, leasing water rights from other right holders of the State Water Supply Bank or purchasing other water rights.

Letter/Comment: 966/s, 966/t

Comment Count: ***2***

Issue: **15e. The Tribes request information regarding any consultation with the FWS, ongoing or proposed.**

Response: The FEIS, ROD, and subsequent monitoring plans will be made available to the Tribes as soon as they are finalized. Any consultation and correspondence with the USFWS that occurs during the process of finalizing these various documents will be recorded and will be made available to the Tribes.

Letter/Comment: 966/dd

Comment Count: ***1***

TOPIC: 16. SOCIAL AND ECONOMIC RESOURCES

Issue: **16a. Socioeconomic reasons for supporting the proposed project include: personal employment, local/regional employment/economy, the Idaho economy, Southeastern Idaho and western Wyoming economies, community benefits, financial benefits, good pay and benefits, high salaries, possible displacement of families and businesses, the fertilizer industry, the P4 processing plant, vendors of the mine, local farmers, cost effective agriculture, U.S. competition in global marketplace, U.S. jobs, foreign dependency, property values, and P4's support of events, projects, organizations, and local communities, local farmers.**

Response: See Response 1a. As discussed in the Purpose and Need (**Section 1.2**), the agencies are required to review the submitted mine plans and analyze the environmental impacts. The goal is to ensure that the Mine and Reclamation Plan is in compliance with all state and federal laws and regulations. Socioeconomic information is provided in **Sections 3.13, 4.13,** and **5.13** of the FEIS. Issues identified by the commenters are addressed in those sections.

Letter/Comment: 1/a, 2/b, 3/b, 4/b, 5/a, 6/a, 7/a, 8/b, 9/b, 9/c, 11/a, 12/a, 12/b, 12/c, 12/d, 13/a, 14/b, 15/a, 16/b, 17/b, 18/b, 19/c, 19/d, 20/a, 20/b, 20/c, 20/d, 22/c, 22/d, 23/b, 24/a, 24/b, 24/f, 25/a, 26/a, 27/a, 28/b, 29/a, 31/b, 32/b, 33/b, 34/b, 35/b, 36/a, 36/b, 37/a, 39/b, 41/c, 44/b, 45/b, 45/g, 46/a, 47/b, 47/e, 48/b, 49/a, 49/c, 49/d, 50/a, 51/a, 51/c, 52/a, 52/d, 54/d, 54/e, 55/a, 56/b, 56/c, 58/a, 59/a, 60/a, 62/a, 63/b, 63/c, 63/d, 64/b, 65/b, 66/a, 66/d, 66/e, 67/d, 67/e, 67/g, 67/h, 68/a, 69/b, 69/c, 69/e, 70/a, 70/b, 72/b, 73/b, 74/b, 75/a, 76/b, 78/a, 83/a, 84/a, 85/a, 87/a, 88/a, 89/a, 91/a, 91/c, 98/a, 99/a, 100/a, 102/b, 103/a, 105/a, 108/c, 109/c, 114/c, 118/c, 121/a, 124/c, 125/a, 125/c, 126/a, 127/c, 128/a, 129/a, 129/c, 130/c, 131/b, 132/b, 133/b, 135/b, 136/b, 137/b, 138/a, 139/c, 140/d, 140/f, 143/c, 147/b, 149/a, 152/d, 153/a, 153/b, 154/b, 159/a, 159/d, 160/a, 162/a, 163/a, 165/d, 166/b, 169/a, 170/a, 171/c, 172/b, 175/a, 177/b, 179/a, 181/a, 185/a, 185/d,

186/b, 187/b, 189/b, 190/c, 193/a, 194/c, 195/a, 197/a, 198/a, 199/a, 200/a, 201/a, 202/b, 206/a, 207/c, 207/e, 210/b, 210/d, 211/b, 212/b, 214/a, 215/c, 216/c, 217/a, 217/d, 220/a, 221/b, 221/c, 223/b, 223/e, 224/a, 226/c, 227/a, 228/b, 229/a, 231/c, 235/b, 237/b, 239/b, 240/a, 241/c, 244/b, 244/c, 253/b, 255/c, 256/a, 257/b, 258/b, 259/a, 260/b, 260/c, 264/b, 272/a, 272/b, 273/b, 275/b, 276/c, 277/a, 278/b, 283/a, 283/c, 287/c, 289/b, 290/a, 291/b, 292/a, 297/a, 298/a, 300/b, 301/b, 302/a, 303/a, 304/c, 306/b, 308/b, 311/a, 312/a, 313/a, 314/a, 315/b, 315/d, 317/b, 318/b, 319/a, 320/a, 321/b, 324/b, 328/c, 329/d, 329/e, 330/b, 331/a, 332/a, 333/a, 335/a, 335/c, 337/b, 339/b, 340/a, 344/b, 346/b, 347/b, 348/b, 350/a, 351/b, 351/c, 358/a, 358/d, 360/a, 363/a, 367/b, 369/a, 371/b, 374/d, 377/a, 380/b, 381/d, 389/b, 394/a, 399/a, 404/a, 406/a, 407/a, 408/b, 409/b, 413/a, 414/b, 415/a, 418/c, 419/a, 420/b, 421/a, 422/a, 424/e, 426/b, 427/a, 428/a, 429/a, 432/b, 434/a, 436/a, 437/c, 439/b, 442/a, 445/b, 445/c, 447/a, 452/b, 454/b, 457/a, 459/b, 464/c, 465/b, 465/c, 465/d, 466/a, 466/b, 467/b, 468/a, 468/c, 468/d, 469/c, 472/a, 473/b, 474/b, 475/a, 477/b, 478/a, 479/d, 480/b, 482/a, 483/b, 486/b, 487/a, 489/b, 491/a, 492/a, 495/b, 499/a, 500/c, 500/d, 501/a, 501/b, 503/a, 504/b, 505/b, 506/b, 509/a, 510/a, 511/b, 512/b, 514/a, 514/C, 515/a, 516/a, 517/b, 518/a, 519/b, 520/b, 521/b, 522/a, 524/c, 524/d, 525/a, 525/c, 528/b, 530/b, 533/b, 534/b, 537/b, 538/a, 538/b, 540/a, 541/a, 542/b, 547/c, 551/c, 552/a, 552/b, 554/b, 554/d, 556/a, 558/a, 558/d, 559/b, 559/d, 561/b, 562/b, 564/a, 565/a, 566/a, 568/a, 569/c, 574/a, 575/a, 576/a, 577/a, 577/b, 581/c, 583/a, 586/a, 587/b, 587/d, 588/b, 589/b, 590/b, 591/a, 592/a, 594/a, 594/c, 595/b, 596/b, 599/b, 602/a, 602/b, 604/a, 606/a, 607/a, 607/d, 608/a, 608/b, 610/b, 612/b, 614/a, 615/b, 617/a, 619/a, 620/a, 621/b, 622/b, 623/a, 624/a, 625/a, 626/b, 627/a, 630/b, 631/b, 633/a, 634/a, 635/b, 636/c, 637/b, 638/b, 639/b, 640/a, 641/b, 642/c, 651/a, 653/b, 657/a, 657/b, 660/b, 662/a, 670/a, 675/a, 676/a, 677/a, 678/a, 682/c, 683/a, 684/c, 686/b, 687/b, 689/a, 689/c, 691/b, 693/a, 696/a, 700/a, 703/a, 704/a, 704/b, 705/a, 705/d, 706/b, 707/a, 708/a, 710/a, 712/b, 712/d, 716/b, 716/d, 717/a, 720/a, 720/c, 721/a, 723/b, 724/b, 725/b, 725/d, 726/a, 728/a, 730/b, 735/b, 736/a, 736/d, 738/a, 738/e, 741/a, 742/a, 743/c, 744/a, 745/a, 746/a, 749/c, 752/a, 754/a, 757/a, 758/c, 760/b, 761/a, 763/b, 764/a, 765/b, 767/b, 771/b, 772/b, 776/b, 777/a, 777/b, 781/b, 783/a, 786/b, 788/a, 790/c, 791/b, 793/b, 795/b, 797/a, 799/b, 801/a, 806/a, 807/a, 809/a, 812/a, 812/c, 813/b, 814/a, 814/c, 816/a, 817/b, 819/b, 820/b, 820/d, 821/b, 822/a, 823/c, 824/a, 824/b, 825/b, 826/b, 827/b, 829/b, 832/a, 834/b, 835/c, 840/a, 840/c, 842/b, 843/b, 844/b, 846/a, 849/b, 850/a, 851/a, 852/b, 852/c, 853/a, 853/d, 854/a, 858/b, 859/a, 859/d, 860/a, 860/f, 861/d, 862/a, 863/b, 866/a, 866/c, 867/c, 869/c, 871/a, 872/b, 873/b, 879/a, 880/c, 881/b, 883/a, 884/a, 884/b, 885/b, 888/a, 890/b, 890/d, 892/a, 894/b, 896/a, 897/a, 900/a, 902/a, 904/b, 906/b, 908/b, 909/b, 912/b, 915/a, 916/a, 917/a, 917/c, 918/b, 918/c, 919/a, 920/a, 921/a, 923/b, 925/b, 926/a, 929/a, 930/a, 931/b, 932/a, 933/b, 934/a, 936/a, 937/a, 940/c, 941/b, 942/b, 944/a, 945/a, 947/a, 949/a, 950/a, 952/a, 953/b, 953/e, 954/a, 954/c, 955/a, 956/a, 957/a, 957/b, 969/b, 970/b, 973/b, 974/a, 977/b, 978/a, 980/b, 981/c, 983/b, 985/a, 987/b, 988/b, 989/b, 990/a

Comment Count: 655

Issue: **16b. The FEIS needs to evaluate the potential effects on the short- and long-term regional economy.**

Response: The socio-economic benefits and impacts related to this project are described in **Sections 4.13** and **5.13** of the FEIS. The contribution of past and present phosphate mining to local economies has been significant in terms of employment and revenues earned from tax collections. The four active phosphate mines, as well as historic mines, are part of the economic base that stimulates the growth of other economic sectors through a multiplier effect. Contributions to local economies from increased employment and addition of workforce payroll to local economies have benefited Bannock and Lincoln Counties; however, no phosphate mines are located in these counties. Revenues earned from tax collections and equipment purchases have occurred primarily in Caribou and Bear Lake Counties. Social dislocations and economic changes in the county and local revenues would occur when mining at South Rasmussen ceases if the Blackfoot Bridge Mine is not approved.

Letter/Comment: 71/a, 494/c

Comment Count: 2

Issue: **16c. The potential effects on local economy including recreation, values associated with the ecosystem, and biodiversity.**

Response: The socio-economic benefits and impacts related to this project are described in **Sections 4.13** and **5.13**. There would be short-term impacts to the economy including recreation, values associated with the ecosystem, biodiversity. In comparison, past and present projects on federal lands, such as vegetation management or recreation activities, individually or collectively, produce few noticeable or measurable effects on the economic or social structure of the area. Hunting is the major recreation use in the study area. Recreational opportunities would be largely reestablished after completion of mining and reclamation. Temporary restrictions of recreational uses may cause some recreationists to abandon the area in search of more remote recreation opportunities. After reclamation, the area would be expected to provide the same types of recreation use as is currently available.

Letter/Comment: 527/b, 529/c, 531/c

Comment Count: ***3***

Issue: **16d. The FEIS should include an evaluation of the potential effects of the project on the rural/urban status of the local communities.**

Response: The socio-economic benefits and impacts related to this project are described in **Sections 4.13** and **5.13** of the FEIS. The types of effects that could occur to social and economic conditions would primarily be from population growth and economic development stimulated by the exploration and development of phosphate. The local economy (Caribou and Bear Lake Counties) has increased and diversified in recent years. It is likely that diversification would continue into the future so that the overall cumulative effects of the Blackfoot Bridge Mine, as well as other phosphate development, would be a smaller component of the complex social and economic characteristics of the cumulative effects area.

Letter/Comment: 145/b, 590/c

Comment Count: ***2***

Issue: **16e. Additional studies and research should be conducted to document the positive and negative impacts to businesses in the surrounding area.**

Response: The socio-economic benefits and impacts related to this project are described in **Sections 4.13** and **5.13** of the FEIS.

Letter/Comment: 45/c, 81/b

Comment Count: ***2***

TOPIC: ***18. HAZARDOUS AND SOLID WASTES***

Issue: **18e. The FEIS needs to detail the level of production and protection for hazardous materials, and how they will be managed.**

Response: **Section 2.3.9.7** (Hazardous Materials and Wastes) discusses the types of potential hazardous materials that would be handled at the Blackfoot Bridge mine including diesel fuel, gasoline, oil, solvent and waste oil. This section also discusses how these materials would be stored and the need for a SPCC Plan for the oil storage. The approved SPCC Plan incorporating appropriate BMPS for the Blackfoot Bridge Mine would be implemented by P4.

Letter/Comment: 964/rr

Comment Count: ***1***

TOPIC: ***19. CUMULATIVE EFFECTS***

Issue: **19a. The FEIS should include a discussion of the potential cumulative effects of phosphate mining and other land use activities on the area environment including logging, grazing, recreation, and road use. A specific issue is the role of reclamation in long-term and cumulative effects. The duration of loss of important shrub and forest**

habitats and the adequacy of baseline information for monitoring and evaluating reclamation should be addressed.

Response: P4 would conduct additional vegetation community surveys and would monitor and evaluate reclamation with respect to shrub and forest habitats pursuant to its Environmental Monitoring Plan (**Appendix A** of FEIS). As indicated in **Section 5.10** of the FEIS, existing land uses in the study area include commercial mining, timber harvesting, livestock grazing, and dispersed recreation. The principal use of public land in the project area is livestock grazing and recreation. The area that would be affected by mining as part of the Blackfoot Mine Project is primarily private surface land and federal mineral rights. The proposed project is consistent with past land uses in the study area. The Mine and Reclamation Plan (summarized in **Section 2.3.8**) is consistent with standards set by the BLM, USACE and IDL. The goal of reclamation is to prevent post-mining degradation and to restore a reasonable approximation of pre-mining habitats to meet multiple land use goals, not to precisely duplicate existing conditions.

Previous disturbances in the project area include extensive exploration activities from as early as 1956. Exploration activities included drilling and trenching. The recent exploration was conducted in forested areas in and around the project area. At the inactive Conda Mine south of the project area, land disturbance includes the mine pit, overburden piles, roads, and other facilities and surface disturbance. The Conda Phosphate Plant is located along the haul road southwest of the project area and receives ore by rail along the railroad line that passes through the project area. Evident clear-cut patches south and west of the project area are indicated by uncultivated areas clear of trees and brush with sharp or straight boundaries. This pattern typically reflects clearing of timber which can be directly or incidentally associated with small-scale timber harvesting. The principal effect of past, present, and foreseeable actions, including the proposed project, on land use would be the removal of portions of the project area from other land uses during the operation of the mine. Minable minerals would be removed. Over the long term, reclamation would return the land to a condition suitable for other land uses. Seral succession to shrub and forest habitats is a more prolonged process than initial revegetation and stabilization of the soil surface. Long-term, but not permanent loss of forest habitat is discussed in **Sections 4.5, 5.5, 4.6**, and **5.6**. This long-term loss of habitat types would be minor in proportion to the habitat available in the general region and the cumulative effect would be comparable to the effects of timber harvest clear cuts.

The BLM Pocatello Resource Area Office administers the public land and mineral leases in the study area. The BLM would apply conditions for approval, stipulations, and mitigation measures to the mineral leases in the mine area. Reclamation of the project site must also meet State of Idaho requirements. Upon completion of successful reclamation, long-term impacts to land use would be minimal.

Baseline studies that characterized vegetation, soil, wildlife, water resources, and land uses are adequate to monitor and gauge reclamation of the site; however, reclamation regulations do not require restoration of land to the existing condition.

Letter/Comment: 877/d, 966/j, 966/n, 966/p, 968/i, 968/l, 968/n

Comment Count: ***7***

Issue: **19c. The FEIS should include a broader cumulative effects analysis area for wildlife to include the entire phosphate deposit region.**

Response: As discussed in **Section 5.6.1**, the boundary for the wildlife cumulative effects analysis was chosen to include a 15-mile radius around the project area. This boundary is large enough to encompass the home ranges of the most mobile wildlife individuals in the project area, such as large predatory mammals and is therefore deemed sufficient for a thorough analysis.

Letter/Comment: 966/l

Comment Count: ***1***

Issue: **19d. The cumulative effects analysis area should include and disclose long-term population status monitoring efforts by the State and federal agencies to quantify adverse impacts to mule deer at the population level from the proposed mine.**

Response: As noted in **Section 4.6.1.1.1**, impacts to mule deer are not expected to be major when analyzed in context of the whole winter range. As mentioned in **Section 3.6.1**, per Idaho Fish and Game, other than winter range, no additional data have been collected on mule deer use of the project area. Therefore, adverse impacts at the population level cannot be quantified.

Letter/Comment: 966/aa

Comment Count: *1*

Issue: **19e. Any new mining proposals that are submitted to BLM during preparation of the FEIS should be included in the cumulative impacts analysis, for example, Agrium's new Rasmussen Valley Mine and Husky/North Dry Ridge exploration activities.**

Response: The Husky 1-North Dry Ridge exploration drilling program has been added to reasonably foreseeable actions in **Section 5.1.4**. BLM has received a mine plan from Agrium for the Rasmussen Valley Mine and has added this project to the FEIS cumulative impact analysis in **Section 5.1.4**.

Letter/Comment: 965/f

Comment Count: *1*

TOPIC: 20. MITIGATION

Issue: **20a. The FEIS should include an analysis of the effectiveness of the reclamation plan, the lifespan of the liner and the length of time the liner would be monitored. Mitigation measures and monitoring plans described in the DEIS may be inadequate to respond to unanticipated effects. Installation of the GCLL should include an electric defect detection survey. In addition, the reclamation plan does not adequately address the restoration of shrub and forest communities and how shrub and forest vegetation will affect the lifespan of the liner. In addition, the FEIS should address potential adjustments to the seed mix for different alternatives.**

Response: Also see Response 20b. **Sections 2.3.8, 4.5, 4.6, 5.5** and **5.6** address the rationale and goals of reclamation. The approved seed mix for reclamation consists of native species including antelope bitterbrush. The seed mix does not include sagebrush, a naturally aggressive colonizer, or forest species that would colonize by slower processes of succession. The strategies and processes discussed in the Mine and Reclamation Plan is consistent with the standards and goals of the BLM, USACE, and IDL and is designed to meet the goals of multiple land use.

P4 would work with IDFG and other experts to develop the appropriate seed mix after the ROD is issued. If the Proposed Action were selected, then the proposed reclamation seed mix as set forth in the Mine and Reclamation Plan would not be adjusted. If Alternative 1A or 1B were selected (both of which employ the GCLL cover), the seed mix would be adjusted in order to ensure that shallow-rooting species are used on the areas of the cover where the GCLL has been employed, and deep-rooting species would be eliminated from those areas. For example, alfalfa and antelope bitterbrush may potentially be eliminated from the seed mix due to their minimum root depth (24 and 20 inches, respectively) in areas utilizing the GCLL cover. All other proposed species in the reclamation seed mix are shallow rooting, are not expected to reach the proposed GCLL cover system, and would be used in the seed mix in connection with Alternatives 1A and 1B.

A construction quality assurance (CQA) program appropriate for installation of the GCLL cover system would be developed for agency review and implemented during installation. The cover system would also employ approved monitoring systems to detect potential percolation, and annual surveys of the cover would be conducted to detect potential defects. Please see the Environmental Monitoring Plan (**Appendix A** of FEIS) for additional information.

Letter/Comment: 355/a, 386/a, 877/b, 877/c, 883/c, 904/c, 905/a, 907/a, 966/c, 966/gg, 966/ii, 966/tt, 968/j, 968/m, 990c

Comment Count: *15*

Issue: **20b. According to the DEIS, the Blackfoot Bridge Project GCLL cover system will**

answer all potential criticisms, many of which run contradictory to the National Academy of Sciences (NAS 2007) findings or lack factual data. The FEIS should address the uncertainty present with a GCLL cover system by considering potential contingencies in the event of cover failure.

Response: As noted in the NAS report, observational data over a 20-year period indicate that properly designed, constructed, and maintained GCL cap and liner systems have provided environmental protection at or above specified levels. However, the report only addresses conventional GCLs and not the laminated GCLs that are proposed for the Blackfoot Bridge Mine Project. The NAS report indicates that shrink-swell due to wetting and drying is the primary concern for degradation of GCL covers. This is an important issue for conventional GCLs, as they can dry as water is removed from the overlying soil layers in response to surface evaporation and plant transpiration. However, the laminate used in a GCLL reduces or prevents wetting and drying, and minimizes potential for deterioration due to shrink-swell. This is documented in the field study conducted by Benson et al. (2007a), which showed excellent performance of a GCLL deployed in a field setting that caused failure of a conventional GCL in response to wet-dry cycling.

The laminate on the GCLL will also minimize potential impacts associated with plant roots. Observations made during exhumation of barrier systems used in final covers evaluated by U.S. EPA's Alternative Cover Assessment Program showed no penetration of roots through geomembranes in barrier systems used in covers. As such, penetration through a geomembrane laminate is also unlikely. Plant roots generally do not penetrate geomembranes because the hydraulic resistance afforded by the geomembrane results in water being stored in the overlying soil. Because plants are biologically opportunistic, plant roots typically remain in soil overlying geomembranes where water is plentiful and can be extracted with minimal energy. As reported by Dr. Benson, plant roots typically do not penetrate into drier materials underlying a geomembrane, because there would be little water available to roots and water that would be present is difficult to extract.

The seed mix chosen for the cover mimics the species found in natural vegetative communities in the area surrounding the Blackfoot Bridge Mine Project for those species which are shallow rooting. The intent is to create a sustainable plant community that is in concert with its surroundings and requires minimal maintenance to thrive under ambient conditions and whose rooting depth would not jeopardize the GCLL system. By choosing a seed mix that mimics the natural community, long-term erosion from the cover will be minimized to the same degree as erosion in surrounding lands.

The GCLL cover system employs materials with the greatest resistance to failure while also providing the needed level of performance. The GCLL proposed for the barrier system reduces or eliminates problems related to dehydration and cracking of the bentonite. Field performance of GCLLs deployed in covers has been excellent, even in conditions where the amount of water to be managed is much larger than that at Blackfoot Bridge Mine and under conditions that severely damage conventional GCLs (Benson et al. 2007a). Moreover, in no cases has root penetration caused a GCL or laminated GCLL to fail. Reinforcement in the interior of the GCL component and the bond between the GCL component and the geomembrane laminate greatly reduce the potential for stability issues due to internal shear failure or sliding at the interface between the GCL and the geomembrane. No internal shear failures have been reported for reinforced GCLs deployed in waste containment systems.

Satisfactory performance of the GCLL is contingent on the existence of the geosynthetic materials (i.e., the geotextile component [to ensure physical stability on sloped portions of the cover] and the laminate [to block flow and prevent drying of the bentonite]). Recent research on the durability of geosynthetic polymers indicate that buried geosynthetics have a projected lifetime of 200 years or longer (e.g., Rowe et al. 2009). Thermal degradation of the GCLL covers at Blackfoot Bridge is not expected to be an issue. Overburden contains only trace amounts of sulfide mineral that could oxidize (weather) by exothermic reactions. Elevated temperatures due to sulfide mineral oxidation have not been observed in backfills or overburden dumps at phosphate mines in southeast Idaho. Thus, long-term durability of the GCLL is anticipated. At some point, however, the polymers may degrade and the percolation rate may increase. This is one of the primary reasons for the required monitoring plan that P4

is proposing. The plan includes use of pan lysimeters to directly measure percolation from the base of the cover, providing a direct check on performance. Periodic inspection of the geosynthetic materials in the cover would also be conducted where portions of the GCLL are exhumed and inspected. If deterioration is observed, or the pan lysimeters show higher than anticipated percolation rates, risks associated with these occurrences would be evaluated and corrective actions taken that would address the higher percolation rate.

In response to comments to the DEIS, an OSMS would also be installed beneath the EOP and the NWOP (**Section 2.4.1.1.6**). The OSMS would include a compacted subgrade layer at the bottom of each external overburden pile, installation of perforated seepage collection pipes, and seepage conveyance pipelines that link to CP2 and the WMP pond system. The OSMS system is designed to direct seepage to topographically low areas, where it would be collected in the drain pipes prior to the placement of the final cover or in the unlikely event of a failure of the final cover system.

Letter/Comment: 959/dd, 964/h

Comment Count: ***2***

Issue: **20c. The DEIS focuses "solely" on source control. The FEIS should consider additional "capture and treat" mitigation measures that may be necessary to adequately control COPCs, perhaps using an adaptive management scheme that would evaluate changes in groundwater and surface water every year.**

Response: As discussed in **Section 4.3**, in the Water Management Plan (P4 2010c), and in the Mine and Reclamation Plan, project design features, BMPs, and mitigation measures would be implemented to eliminate or minimize environmental impacts to water resources and other resources. Measures that have been added or refined include the OSMS to capture seepage that may contain COPCs in the EOP and NWOP. In addition, implementation of the Environmental Monitoring Plan (**Appendix A** of FEIS) would result in data associated with regular monitoring of water resources. As necessary, with agency approval, the management of site water and closure methods would be adjusted to respond to changes in environmental conditions. Any water not suitable for discharge would be sent to the water management ponds.

Letter/Comment: 959/cc

Comment Count: ***1***

Issue: **20d. An adaptive management plan should be included in post closure monitoring so that measures can be taken in response to potential changes in site conditions that could result in mass wasting and affects to COPC source control measures.**

Response: Adaptive management concepts have been incorporated into the Environmental Monitoring Plan (**Appendix A** of FEIS) for mining operations, reclamation, and post-closure. Environmental conditions would be periodically monitored and assessed with assigned triggers that would require additional site investigations in response to potential changes in site conditions that could result in mass wasting and effects to COPC source control measures. Among other things, the Environmental Monitoring Plan (**Appendix A** of FEIS) would include periodic sampling and testing of vegetation and both surface and groundwater. The resulting data would reveal any unexpected concentrations of selenium or other COPCs. Any unexpected results would be evaluated for environmental protectiveness and appropriate response taken. In addition, an Adaptive Management Plan (**Appendix B** of FEIS) has been developed to respond to any unexpected changes in conditions or monitoring results.

Letter/Comment: 959/ee, 959/gg

Comment Count: ***2***

Issue: **20e. The GCLL consists of 0-6" of drainage/protective layer (the actual thickness will depend on slope and aspect). Given this wide potential range of thickness, less than the needed amount may be employed in some locations. The FEIS should prescribe specifically how thick this layer should be at each aspect and slope.**

Response: In the conceptual design, a 6-inch drainage layer (which is above the GCLL) would be used on all GCLL cover areas. Design of the drainage layer would be finalized after the ROD is issued. **Section 2.4.2** of the FEIS specifies that the GCLL would have an approximately 6-inch protective subgrade layer underneath the GCLL. This subgrade layer would consist of weathered alluvium or other earthen materials, including overburden provided specifications necessary to protect the GCLL from puncture associated with underlying materials are met. This subgrade layer is not the same as the 1-foot thick compacted clay subgrade that would be placed beneath the underdrain seepage collection system as part of the Overburden Seepage Management System (**Section 2.4.1.1.6**). Design specifications for the protective layer beneath the GCLL require a relatively smooth surface be prepared with individual protruding particles limited to no larger than 0.5 inch diameter. This surface may be achieved by grid or smooth rolling various materials such as soft altered middle waste shales or by placement of other fine-grained materials as needed on specific areas.

Letter/Comment: 964/j

Comment Count: ***1***

Issue: **20f. The FEIS should also include an analysis of the long term effects of soil disturbance on the permeability of each of the layers from mechanical disturbance, chemical weathering and mass movement. Mechanical disturbances may be caused by burrowing animals such as gophers, ground squirrels and badgers as well soil turnover from tree tip ups. Other physical disturbance may be in the form of soil creep, solifluction, rock fall and fires consuming tree roots.**

Response: Analysis of the long-term effects of soil disturbance on the permeability of each of the layers of the GCLL and cover is discussed in **Sections 2.4.2** and **4.3.1.1.3** and addressed in both modeling and in the design of the cover system (ARCADIS 2010).

Each of the earthen layers used in the modeling was assigned a saturated hydraulic conductivity (permeability) of 10^{-4} cm/s. This saturated hydraulic conductivity is consistent with the range of saturated hydraulic conductivities reported for in-service cover profiles by EPA's Alternative Cover Assessment Program (ACAP) (Benson et al. 2007b, 2010b). The ACAP data are based on field and laboratory measurements conducted on full-scale covers included in the ACAP monitoring network.

Mechanical soil disturbance, chemical weathering, and mass movement are often referred to as pedogenic processes (i.e., physical, chemical, and biological processes) that affect the structure and properties of soil. ACAP showed that pedogenic processes result in cover soil having a long-term saturated hydraulic conductivity ranging between approximately 10^{-5} to 10^{-3} cm/s, with 10^{-4} cm/s being typical, regardless of the initial saturated hydraulic conductivity of the soil. Pedogenic processes typically resulted in more structure and larger changes in saturated hydraulic conductivity in cover soils that were more densely compacted and had lower as-built saturated hydraulic conductivity.

Long-term saturated hydraulic conductivity of GCLLs is controlled by the initial hydration of the bentonite, cation exchange with the subgrade soil, and persistence of moisture within the bentonite while the GCLL is in service. Recent studies have shown that GCLLs that are adequately hydrated and protected from wet-dry cycling using a polymeric barrier (e.g., separate geomembrane or laminate) retain saturated hydraulic conductivity on the order of 10^{-9} cm/s provided that the subgrade is placed at a water content of at least 10 percent (gravimetric) (Benson et al. 2010b). This saturated hydraulic conductivity is consistent with the saturated hydraulic conductivity assumed in the modeling for the GCLL proposed for the Blackfoot Bridge Mine cover ($1x10^{-9}$ cm/s).

The drainage layer was not included in the model used to predict percolation and, therefore, no hydraulic properties have been assigned to the drainage layer. The saturated hydraulic conductivity of the drainage layer may diminish over time in areas where fines or roots accumulate; however, these areas should be localized and, therefore, would not affect the overall capacity of the drainage layer. Nevertheless, even if the drainage layer became completely fouled, predicted percolation from the cover would not be affected because the drainage layer was not included in the model.

There is no direct means to design a GCLL, or other barrier system, that is resistant to all forms of distress. However, the cover design for Blackfoot Bridge Mine minimizes the possibility that damage to the GCLL would occur due to root intrusion or tree toppling.

Root penetration of the GCLL is unlikely, as vegetation responds to the surrounding environment in an opportunistic manner, particularly in the semi-arid west where water deficits often exist during portions of the year. Roots proliferate in regions where water is available, and avoid regions deficient in water. That is why roots are normally found above barrier systems with polymeric layers (e.g., geomembranes or the laminate in a GCL) and not within or below the polymeric layer (the roots proliferate in the moist soil above the barrier). As a result, roots are not expected to penetrate the GCLL planned for the Blackfoot Bridge Mine Project.

Toppling of trees due to wind is known to displace soil within the root zone. Trees that are toppled during windstorms tend to have weaker root systems and shallower roots, resulting in relatively shallow throws of soil. Provided the overlying cover soil is maintained, tree toppling should not disrupt the GCLL at Blackfoot Bridge Mine. Moreover, soil throw is associated with rotation of the root mass. If roots do not penetrate the GCLL, then the GCLL would not be distorted by tree toppling.

While considered unlikely, if a soil throw were to occur, such an event would be evident during inspections conducted as part of the monitoring program for the cover. When a throw is observed, depth of the throw would be determined and the potential for damage of the GCLL assessed. If damage is possible or likely, the GCLL would be exposed, inspected, and repaired as necessary.

The Environmental Monitoring Plan (**Appendix A** of FEIS) provides for long-term inspection and monitoring of the cover systems. Part of the monitoring and maintenance program would be to monitor the cover for tree colonization and prevent conditions that could result in degradation of the cover by root penetration and root tip ups.

Letter/Comment: 964/k

Comment Count: *1*

Issue: **20g. The general approach described in the DEIS to minimize selenium transport focuses on covering refilled pits and overburden piles. Such an approach will not work for ore storage because of the rapid turnover of the material. The FEIS should consider placing a double synthetic liner with a leak detection and removal system underneath the stockpile and directing the flow to the nearby water management pond. In addition, groundwater monitoring wells should be placed to monitor potential COPCs downgradient of the ore stockpile.**

Response: Geochemical testing and numerical modeling indicate that the ore stockpile would be a smaller source of selenium loading to groundwater than the other proposed mine facilities, and that under Alternative 1A, the stockpile area would meet all applicable water quality standards for COPCs. Runoff from the stockpile would not be allowed to discharge to surface water but would instead be captured by water control pond CP2 and pumped to the WMP1 and WMP2 for disposal. Because groundwater and surface water in the ore stockpile area are projected to meet all applicable water quality standards, a double synthetic liner is not required. The Environmental Monitoring Plan (**Appendix A** of FEIS) provides for monitoring of groundwater downgradient of the facility at wells MW-8A and MW-9W. Monitoring well MW-8A is completed in alluvium. Well MW-9W is completed in the Wells Formation.

Letter/Comment: 958/d, 964/n

Comment Count: *2*

Issue: **20h. The FEIS should provide additional information on lateral groundwater movement through refilled pits and overburden piles. In order to avoid or minimize potential lateral transport of COPCs, the BLM should consider expanding coverage of the GCLL, GCL or Simple 1 covers farther across critical collection points.**

Response: Discussions about the potential for lateral movement of groundwater and seepage have been

added to **Sections 4.3.1.1.1** and **4.3.1.1.4**. In response to this comment, revised Alternative 1A includes an expanded GCLL cover over additional portions of the EOP to address this issue. The previous GCLL cover design encompassed approximately 21 acres of the surface of the EOP above the Meade Peak cell; this has been expanded to approximately 90 acres of GCLL placement in the cover of the EOP to enhance the control of infiltration that could occur in the area of the Meade Peak overburden. To ensure that meteoric water would not infiltrate from above or laterally into this seleniferous material, the GCLL cover layer would be expanded to overlap the entire drainage area where the cell would be located.

Components of the OSMS include installation of a hydraulic break on the upgradient portion of the Meade Peak cell to intercept meteoric water that may infiltrate from adjacent areas upgradient from the cell. The Hydraulic Break would consist of a zone of coarse, free-draining, non-seleniferous overburden material placed around the uphill sides of the Meade Peak cell. This zone of coarse material would effectively conduct water away from these areas during high runoff (saturated) conditions and would act as a hydraulic break by interrupting unsaturated flow towards the seleniferous Meade Peak material during dryer periods. Any seepage from the bottom of the Hydraulic Break would report to the Compacted Clay Subgrade layer and Seepage Underdrain pipeline system.

Letter/Comment: 964/q

Comment Count: ***1***

Issue: **20i. The FEIS should detail a thorough testing and monitoring program. This program should not only include geological strata, as it is uncovered, but subsequent overburden, waste rock and ore piles, and road construction material. The testing should include areas not presumed to contain selenium as well as known seleniferous material. For example, exposures of Rex Chert may also contain seleniferous material.**

Response: The FEIS summarizes the thorough testing and monitoring program presented in P4's Environmental Monitoring Plan (**Appendix A** of FEIS). Baseline geochemical testing has been conducted at the project area. Based on the exploration samples at Blackfoot Bridge Mine, and the proposed waste handling practices, continuous geochemical testing and monitoring during the uncovering of geological strata would be unwarranted. Shale materials would be selectively handled and placed as core material in external overburden or backfill. These materials would then be further isolated by being placed beneath engineered GCLL cover systems. Other materials placed in external overburden areas not covered by the GCLL (such as chert, limestone, volcanic rock, and alluvial materials) would be covered utilizing engineered "store and release" cover systems. Methods and procedures to determine suitability for road and construction materials are outlined in the Environmental Monitoring Plan (**Appendix A** of FEIS).

Letter/Comment: 964/s

Comment Count: ***1***

Issue: **20j. The FEIS needs to assess the potential transportation pathways of selenium via the evaporative sprayers and design the water treatment system to keep the aerosolized selenium contained within a controlled area.**

Response: The proposed number of evaporative sprayers (12) was selected to allow a minimum 250-foot distance between the sprayers and the edges of WMP1 and WMP2 to prevent drift from the sprayers onto the surrounding land surface. In addition, the maximum spray radius of the sprayers is 180 feet. The ponds are approximately 1,760 feet long by 1,180 feet wide, and the evaporative spray locations would be positioned to prevent overspray from exiting the containment area of each pond, even in high wind conditions. Additionally, the water intake system for the evaporative sprayer can be adjusted to suction from the upper levels of the ponded water where less suspended solids would be located.

P4 completed an air dispersion modeling exercise to assess the deposition of selenium as a result of operation of evaporators in the WMP system (P4 2010c). Based on the model results, total deposition of potential airborne selenium would be 0.187 grams/square meter (g/m^2)

outside of the footprint of WMP1 and WMP2. Assuming that the selenium would be transported to the primary root depth of 18 inches in area soil, the concentration increase over the life of mine evaporator operation would be 0.255 ppm; which is below the USFS soil suitability guideline for selenium of 13 ppm.

Letter/Comment: 964/y

Comment Count: *1*

Issue: **20k. According to the DEIS, sediment from the water ponds will be removed and placed as backfill in the South Pit. However, no information is provided whether this material will be placed under the GCLL liner and isolated. It is recommended that this material be isolated. The FEIS needs to estimate how frequently seleniferous material will need to be removed and the removal technique such as initial evaporation and mucking with a vacuum system.**

Response: It is assumed that the commenter is discussing seleniferous sediment. **Section 2.3.6.12** discusses the post mine disposition of sediment from WMP1 and WMP2. Sediment that does not meet the suitability criteria for growth medium (e.g., seleniferous sediment) would be managed as seleniferous material and placed as backfill in the South Pit. This is described as a post mine activity, not a routine maintenance activity. Consequently, it is part of a one-time activity, and the question of frequency does not apply. The primary source of sediment that would report to WMP1 and WMP2 would be associated with pit sump water that would be pumped to the ponds for evaporation. Runoff water that may be pumped to the WMP1 and WMP2 ponds would have initially reported to several water control ponds. As such, the sediment load associated with runoff water would be substantially reduced through the multiple water control ponds.

Alternative 1A includes a GCLL cover over all backfilled areas of the South Pit, North Pit, and Middle Pit. Seleniferous sediment removed from the water management ponds and water control ponds would be isolated by placement as backfill in the South Pit, which would be covered with a GCLL, as described for Alternative 1A and 1B. Non-seleniferous sediment would be returned to growth media stockpiles or placed on reclaimed areas for use in reestablishment of vegetation. The determination of selenium content of the sediment will require sampling and analysis prior to placement as discussed in the Environmental Monitoring Plan (**Appendix A** of FEIS).

It is not currently possible to calculate an average or annual sediment volume that would be trapped in the water management ponds. Periodic removal of sediment from the water management ponds may be necessary. P4 would periodically monitor the volume of sediment in all water control ponds and the water management ponds in the Water Management Plan (P4 2010c) system. Should the volume of sediment in the ponds reach levels that interfere with the function of the evaporative spray systems or substantially reduce the capacity of the ponds for water storage, P4 would initiate removal and disposal of the sediment. As for removal techniques, various dredging technologies are available to remove sediment from the pond bottoms. Pond sediments could also be manually removed as part of isolating and decanting one of the ponds.

Letter/Comment: 964/z

Comment Count: *1*

Issue: **20l. Contaminated groundwater may flow into surface water in the Blackfoot River. While surface and groundwater monitoring stations will allow water quality testing, there is currently no ability to pump contaminated groundwater back to the water management ponds. The FEIS should add this tool as part of the water management plan for all alternatives.**

Response: The Environmental Monitoring Plan (**Appendix A** of FEIS) describes the proposed surface and groundwater monitoring stations that will be used to detect any changes in water quality prior to discharge to the Blackfoot River. Several groundwater monitoring locations would be located between the mine pit and the river. The monitoring plan includes triggers for additional

monitoring and reporting should routine monitoring detect COPCs at levels above background concentrations.

In accordance with Idaho's Groundwater Quality Rule, the IDEQ will determine appropriate points of compliance (POCs) at which groundwater quality standards must be met to ensure there will be no injury to current or projected future beneficial use of groundwater and no violation of water quality standards applicable to any interconnected surface water. Should monitoring detect issues that pose a threat to beneficial use of groundwater or interconnected surface water quality, the IDEQ and BLM will require appropriate actions to address the concern. Appropriate actions could include additional monitoring or cleanup/mitigation such as groundwater pumping.

Letter/Comment: 964/aa

Comment Count: ***1***

Issue: **20m. Regarding monitoring stations along the Blackfoot River, the DEIS proposed setting state groundwater points of compliance on the north side of the Blackfoot River. Understand that this is a "gaining" stretch of river and if this is so, the compliance point would not offer an accurate measure of contamination. Instead, both surface water and groundwater compliance points should be established on the same side of the river as the mine, both upstream and downstream of the mine.**

Response: The FEIS includes a revised Environmental Monitoring Plan (**Appendix A** of FEIS). The plan includes monitoring stations along the Blackfoot River and both surface and groundwater monitoring stations at the mine and between the mine and the river consistent with State of Idaho law. POCs are defined in the Idaho Ground Water Quality Rules (IDAPA 58.01.11.401.03). Groundwater quality standards must be met at the POC to ensure there will be no injury to current or projected future beneficial use of groundwater and no violation of water quality standards applicable to any interconnected surface water. These monitoring stations would be checked regularly, and any change in contaminant levels would be evaluated and addressed appropriately to ensure there will be no injury to current or projected future beneficial use of groundwater and no violation of water quality standards applicable to any surface water.

Letter/Comment: 964/kk

Comment Count: ***1***

Issue: **20n. The BLM has selected Alternative 1A as the Agency Preferred Alternative in the DEIS, however, we do not believe that Alternative 1A is sufficiently protective or consistent with the Clean Water Act. Both State Land Creek and the Blackfoot River are already listed on Idaho's 303d list for not meeting water quality standards, but other water bodies in the project area are at risk. The beneficial uses for the Blackfoot River include cold water aquatic life, salmonid spawning, primary recreation, and domestic water supply. The Blackfoot River is impaired by sediment, insufficient dissolved oxygen, and selenium. The DEIS states that selenium concentrations exceed the chronic aquatic live standard for a few days each spring, but does not describe what the effects are on aquatic life for having this standard exceeded (DEIS p. 4-108). The FEIS needs to address this topic in greater detail.**

Response: The potential impacts to water quality under the Proposed Action and Alternative 1A are discussed in **Sections 4.3.1.1.5** and **4.3.1.2** of the FEIS.

Section 303 of the CWA requires that states adopt water quality standards, develop lists of water bodies that do not meet applicable water quality standards, and for such water bodies, establish Total Daily Maximum Loads (TMDLs). IDEQ is responsible for meeting these CWA requirements in the State of Idaho. IDEQ has adopted water quality standards (WQS) at IDAPA 58.01.02, and identified those water bodies in the state that do not meet the WQS. IDEQ has prioritized the development of TMDLs for impaired water bodies consistent with federal and state law.

There are a number of provisions in the WQS that are applicable to the Blackfoot Bridge Mine. First, the Blackfoot River is an impaired water body, listed for selenium, temperature, and

dissolved oxygen, for which TMDLs have yet to be developed. IDEQ has ranked the Blackfoot River as a medium or low priority water body for TMDL development. Therefore, IDAPA 58.01.02.054.05 is applicable. This section of the WQS requires that, until a TMDL is developed, there must be changes in permitted discharges from point sources and BMPs for nonpoint sources deemed necessary to prohibit further impairment of designated or existing beneficial uses (IDAPA 58.01.02.054.05).

Second, IDAPA 58.01.02.080.01.a is applicable. This section provides that no pollutant shall be discharged (as that term is defined in the WQS) from a single source or in combination with pollutants discharged from other sources in concentrations or in a manner that will or can be expected to result in violation of the WQS applicable to the receiving water body or downstream waters.

Because the level of selenium in the Blackfoot River already exceeds the water quality criteria for selenium set forth in Section 210 of the WQS during certain flow conditions, a discharge which increases the concentration of selenium in the River is a discharge which, in combination with pollutants discharged from other sources, will result in a violation of the WQS applicable to the receiving water body. Thus, any discharges from the Blackfoot Bridge Mine that result in an increase in the concentration of selenium in the Blackfoot River, during that period of time when the existing levels already exceed the criteria for selenium in Section 210, would violate Section 080.01.a of the WQS. Similarly, increases in temperature and decreases in dissolved oxygen, for which the River is listed, will also violate Section 080.01.

Third, IDAPA 58.01.02.080.01.b is applicable. This section provides that no pollutant shall be discharged from a single source or in combination with pollutants discharged from other sources in concentrations or in a manner that will injure designated or existing beneficial uses. Thus, this section is similar to 054.05 because it prohibits discharges from the Blackfoot Bridge Mine that will further impair or injure the beneficial uses of the Blackfoot River.

To the extent that the Blackfoot Bridge Mine results in discharges from nonpoint sources, Sections 054.05 and 080.01 must be read in conjunction with Section 350 of the WQS that applies to nonpoint sources of pollution. This section directs nonpoint sources to implement approved BMPs, or if there are no approved BMPs, to use knowledgeable and reasonable efforts, in order to avoid a violation of applicable water quality criteria and to maintain and protect beneficial uses. The Rules Governing Exploration, Surface Mining, and Closure of Cyanidation Facilities are listed as approved BMPs in IDAPA 58.01.02.350.03. These rules provide that, with respect to nonpoint source controls, operators shall utilize BMPs designed to achieve state water quality standards and to protect existing beneficial uses of adjacent waters of the state (IDAPA 20.03.02.140.01). Therefore, under the WQS and the Surface Mining Rules, the operator of the Blackfoot Bridge Mine must employ BMPs designed to achieve compliance with 054.05, 080.01 and the applicable water quality criteria.

The modeling results used in developing the FEIS predict that discharges from the Blackfoot Bridge Mine will not cause a measurable increase in the concentration of selenium in the Blackfoot River during the time when selenium levels already exceed the criteria for selenium set forth in Section 210. In addition, the project will not likely adversely affect either temperature or dissolved oxygen (see more detailed response with respect to temperature and dissolved oxygen in response to comment 6r2). Therefore, based upon the modeling and other information presented, if appropriate BMPs for the Blackfoot Bridge Mine are implemented, discharges from the mine are not expected to violate criteria applicable to the receiving water body and, as a result, will not violate Section 080.01.a.

The WQS in Sections 080.01.b and 054.05 also prohibit discharges that will further impair an already impaired beneficial use of the Blackfoot River. There is no information at this point in time that establishes that discharges from the Blackfoot Bridge Mine will further impair beneficial uses in the Blackfoot River. Therefore, based upon the modeling and other information presented, if the appropriate BMPs for the Blackfoot Bridge Mine are implemented, discharges from the mine are not expected to violate these sections of the WQS.

Although the mine discharges will not increase the concentration of selenium in the Blackfoot River and are unlikely to violate WQS, the mine will contribute an additional load of selenium to the Blackfoot River. Although not otherwise required to do so pursuant to the WQS, P4 has

agreed to perform activities in the Blackfoot River watershed to mitigate this additional load. These activities will help reduce the risk of an impact to aquatic life in the River.

In addition, Section 401 of the CWA provides that any applicant for a federal license or permit to conduct any activity which may result in any discharge into navigable waters must obtain a water quality certification from the state in which the discharge originates. While this response to comment addresses certain water quality issues based upon information contained in the FEIS and other related documents, the IDEQ will make a 401 certification decision with respect to any permits or licenses to which Section 401 applies, and that certification decision may include conclusions different from those set forth in this response to comment.

Letter/Comment: 964/a

Comment Count: ***1***

Issue: **20o. Design of the GCLL and other coverings to avoid mechanical damage should be adjusted to incorporate natural plant colonization as a long-term component to better isolate the seleniferous materials.**

Response: The Mine and Reclamation Plan and the Environmental Monitoring Plan (**Appendix A** of FEIS) incorporate expected natural plant colonization. The GCLL is designed to accommodate the expected changes in vegetation community over time. The Environmental Monitoring Plan (**Appendix A** of FEIS) would identify any variations in seral succession and the adaptive management strategy would incorporate any necessary adjustments to BMPs or mitigation measures for the water management system. These measures together would allow for natural plant colonization to be a long-term component of the cover system resulting in effective isolation of seleniferous material.

The Mine and Reclamation Plan provides for establishment of a self-sustaining vegetative community consistent with the project location. This may include eventual colonization of the cover by various species of trees. Vegetation responds to the surrounding environment in an opportunistic manner, particularly in the semi-arid west where water deficits often exist during portions of the year. Roots proliferate in regions where water is available, and avoid regions deficient in water. That is why roots are normally found above barrier systems with polymeric layers (e.g., geomembranes or the laminate in a GCLL) and not within or below the polymeric layer (the roots proliferate in the moist soil above the barrier). As a result, roots should not penetrate the GCLL planned for the Blackfoot Bridge Mine Project.

The GCLL would also provide natural controls on the species that would develop on the cover. Because the GCLL functions as a hydraulic barrier, water that would normally flow to greater depths would be maintained closer to the surface, or would drain off in the drainage layer above the GCLL. This water would also be more readily available for evapotranspiration, and thus drier soil conditions likely would exist. Consequently, the vegetation population should be dominated by shallow-rooted species (within the depth of the cover soil above the GCLL) that can tolerate drier soil conditions. Deeper-rooted species would be less successful because water would not be available at depth for their root systems (root systems associate themselves with available water).

Toppling of trees due to wind is known to displace soil within the root zone. Trees toppled during windstorms tend to have weaker root systems and shallower roots, resulting in relatively shallow throws of soil. Thus, provided the overlying cover soil is maintained, tree toppling is not expected to disrupt the GCLL at Blackfoot Bridge Mine. Moreover, soil throw is associated with rotation of the root mass. Thus, if roots do not penetrate the GCLL, then the GCLL would not be distorted by tree toppling.

While considered unlikely, BLM considered the possibility that deep soil throws could occur and expose the GCLL. Such events would be evident during annual inspections conducted as part of the cover monitoring program. When throws are observed, depth of the throw would be determined and the potential for damage of the GCLL assessed. If damage is possible or likely, the GCLL would be exposed, inspected, and repaired if necessary.

Letter/Comment: 964/i

Comment Count: *1*

Issue: **20p. Establish a larger dialogue with P4 on additional strategies to improve fisheries.**

Response: BLM encourages such discussion; however, no impairment of the fisheries in the Blackfoot River is expected with implementation of mitigation measures associated with this project, such as installation of GCLLs and other BMPs. The analysis in the FEIS has concluded that there would be no impacts to the fishery and that no further mitigation would be necessary.

Letter/Comment: 964/ii

Comment Count: *1*

Issue: **20r. A detailed discussion of the dam and channel fills in the Fish Pond drainage should be included in the FEIS.**

Response: The discussion of the dam and channel fills has been expanded in **Section 4.3.1.1.5** to clarify the function of the rock fill. Placement of dredged material and fill in the unnamed tributary to Fish Pond would occur as needed as described in the Adaptive Management Plan (**Appendix B** of FEIS) for the Blackfoot Bridge Project - Water Management Plan (P4 2010c). Fill would initially be placed in several reaches of the unnamed tributary as a result of installation of the EP water control ponds. Additional fill may be required as a result of water management conditions during the operational life of the water control ponds, and these are detailed in the Adaptive Management Plan (**Appendix B** of FEIS).

Components of the proposed water management system would be constructed in areas that include the Fish Pond, the unnamed tributary, and associated wetlands. The Adaptive Management Plan (**Appendix B** of FEIS) specifies that, should any on-site conditions be identified that would lead to placement of additional fill, notification must be provided to the USACE, IDEQ, and EPA. The water management systems in conjunction with the Adaptive Management Plan (**Appendix B** of FEIS) and appropriate BMPs would minimize the need for fills to waters of the U.S. The mine would be eligible for coverage under a Multi-sector Industrial Stormwater General NPDES Permit (MSGP), and P4 intends to seek coverage under the MSGP for the unnamed tributary and associated wetlands.

Construction, operation, closure, and reclamation of the EOP pond system and Fish Pond in the unnamed tributary would not result in permanent conversion of wetlands and non-wetland waters of the U.S. to uplands. P4 would remove the dams and fill material, as feasible, that may have been placed in the unnamed tributary during the project life. The reclamation goal is to reestablish wetland and non-wetland habitat in the unnamed tributary. Accordingly, the impacts are temporary.

If required as set forth under the Adaptive Management Plan (**Appendix B** of FEIS), a 5-foot lift may be placed on the Fish Pond dam to increase the capacity of Fish Pond, thus increasing the holding time of runoff water and allowing for settlement of suspended solids. P4 would review site hydraulics with BLM and IDEQ personnel at the time of closure/reclamation to determine the best course of action concerning the dam. None of the options would result in Fish Pond conversion to upland habitat.

Letter/Comment: 958/p

Comment Count: *1*

Issue: **20s. The FEIS should discuss a more detailed mitigation plan including project goals and objectives, site selection criteria, detailed baseline information on impact and compensation sites, ecological performance standards and other details.**

Response: The plan for mitigating loss of wetlands and non-wetland waters of the U.S. has been expanded through the development of a Compensatory Mitigation Plan (P4 2010b). In addition, the details of the mitigation have been expanded in the FEIS including discussion of impacts and compensation for wetlands in **Sections 2.3.9.5** and **4.5.1.1.2**.

Letter/Comment: 958/s

Comment Count: *1*

Issue: **20t. The discussion of proposed discharge of fill material to wetlands and waters of the US does not include all appropriate and practicable measures to minimize potential harm to the aquatic ecosystem.**

Response: Additional mitigation to reduce potential impacts to the wetlands has been added. As described in the Adaptive Management Plan (**Appendix B** of FEIS), placement of dredged material or fill into wetlands and non-wetland waters of the U.S. located within the unnamed tributary would not occur unless necessary to meet water management needs of the project. In addition, wetlands and non-wetland waters of the U.S. in the unnamed tributary would be restored to the extent practicable once water control ponds are no longer necessary during closure of the site.

Letter/Comment: 958/r

Comment Count: *1*

Issue: **20u. The channel and wetlands of the Fish Pond and unnamed tributary would be filled with rock. The DEIS does not explain the purpose of these fills.**

Response: As specified in the Adaptive Management Plan (**Appendix B** of FEIS), rock fill would be placed as needed in the non-wetland waters and wetlands to protect the unnamed tributary from the flow of water released from the water control ponds. Each water control pond (EP1 through EP4) would be constructed with a rock-lined stilling basin to dissipate energy from both the decant pipe outfall and the spillway. To control the velocity of water exiting the stilling basin, P4 would line the channel with coarse rock to armor the existing channel, thereby reducing erosion along the channel length. To the extent that flow velocity would also need to be reduced in wetland areas located between water control ponds, P4 would place coarse rock in the wetland for the purpose of armoring the wetland to reduce erosion that would result from flow associated with the water management system. The water management system, including the OSMS and in conjunction with appropriate BMPs and the Adaptive Management Plan (**Appendix B** of FEIS), would avoid or minimize the need for any fills to waters of the U.S. and would not convert the stream to a water treatment system.

As discussed in **Section 4.3.1.1.5**, rock fill would also be placed as needed in areas to prevent direct access of wildlife to standing water within wetland areas in the circumstance where water quality has been affected and could potentially affect wildlife.

Letter/Comment: 958/e

Comment Count: *1*

Issue: **20v. The DEIS has not provided a basis to justify the proposed actions which would destroy ecological values of the tributary system.**

Response: As specified in the Adaptive Management Plan (**Appendix B** of FEIS), the ecological values of the tributary system would be maintained to the extent possible, and would not be destroyed as suggested by the comment. Additionally, in areas that are affected, P4 would reclaim, and to the extent feasible, restore the ecological functions of wetlands and non-wetland waters of the U.S. located within the unnamed tributary and Fish Pond. Reclamation would be initiated once the water control pond system is no longer needed to manage runoff from the reclaimed mine site. P4, the USACE, BLM, and IDL representatives would evaluate the need for removal of rock fill placed as protection of the channel and wetland areas. Sediment that may have filled interstitial spaces in the rock fill areas may result in a condition that would support reestablishment of wetlands.

P4, in conjunction with the USACE, has also developed a Compensatory Mitigation Plan to replace wetlands and non-wetland waters of the U.S. as part of the 404 permit process and to account for ecological values that would be temporarily lost. Restoration of wetlands and wetland habitat within the unnamed tributary and Fish Pond would be in addition to the wetland

mitigation that will be completed to meet the 404 permit requirements.

Letter/Comment: 958/h

Comment Count: *1*

Issue: **20w. There is no adequate monitoring and data evaluation protocol to evaluate the effectiveness of BMPs and mitigation measures. There need to be specific "performance metrics" to be met and regular monitoring. Mitigation measures must be enforceable. The DEIS does not require regular measurement of potential impacts. Given the sensitivity of water resources, there should be frequent, probably weekly oversight.**

Response: The Environmental Monitoring Plan (**Appendix A** of FEIS) has been updated for the FEIS. It includes recommended inspection detail and frequency for various BMPs plus a general discussion of performance monitoring installations that would be incorporated to evaluate the actual performance of the project cover systems. This Environmental Monitoring Plan (**Appendix A** of FEIS) contains both surface and groundwater compliance points to be monitored on a frequency that would effectively measure potential project impacts and resulting performance of the multiple project BMPs.

The discussions of mitigation measures and monitoring in **Sections 4.6.1.1.5** through **Section 4.6.1.1.7** were revised to include more specific and measurable mitigation. In addition to surface and groundwater monitoring, these include: ground clearing activities only during non-nesting season for migratory birds, steep-sided water management ponds with little vegetation to avoid attracting water birds, monitoring use of the ponds by water birds, and creating "islands of diversity" in reclaimed areas. If raptors begin nesting on power poles following the start of mining, appropriate mitigation measures would be implemented. The Environmental Monitoring Plan (**Appendix A** of FEIS) was also updated to include monitoring pond use by water birds. Mitigation measures and monitoring would be adopted by BLM and detailed in the ROD and mine plan authorization as enforceable requirements.

Letter/Comment: 961/hh, 961/ii, 961/jj, 966/jj

Comment Count: *4*

Issue: **20x. The DEIS indicates that federal land will not be adequately recontoured and reclaimed and that unreclaimed high-walls will constitute a degraded habitat. Approval of this plan would result in severe and un-reclaimed damage to the federal lands on the southern portion of the lease. Allowing a proponent to utilize lower standards of reclamation on federal lands is not in the public interest. The plan of operations calls for reclamation of virtually every portion of the mine except the BLM parcel, which will remain disturbed indefinitely. If the proponent is unwilling to demonstrate a commitment to reclamation for each parcel of the mine the lease modification should be denied and operations should be restricted to private lands.**

Response: **Sections 4.1.3, 4.4.2, 4.5.2, 4.6.1.1, 4.10.2, 5.1.6,** and **5.4.6** disclose that the unreclaimed highwalls would constitute a degraded habitat. **Section 2.7.2** describes an alternative that would reduce the amount of the unreclaimed highwall acreage. While reduction of highwalls is of environmental benefit, the cost associated with rehandling overburden reduces the overall depth and therefore recovery of ore during the mining operation. The reduction in mineral recovery at Blackfoot Bridge Mine would result in having to open new open pits elsewhere sooner.

Lease modification standards of approval in the BLM regulations require that BLM consider applications for lease modifications when the expansion would assist in the recovery of the mineral deposit on the pre-existing lease. Public land administered by BLM would be reclaimed in accordance with an approved Mine and Reclamation Plan. Restricting mining to private surface areas only would reduce the recovery of phosphate ore from the lease areas.

Letter/Comment: 966/i, 966/qq, 966/rr

Comment Count: *3*

Issue: **20y. The FEIS should include a discussion of funding of off-site mitigation for impacts to elk and mule deer winter range by replacing lost winter habitat within the Cumulative Effects Area (CEA) and completely reclaiming the mine area (including the highwalls).**

Response: **Section 4.6.1.1.1** discloses that the direct and indirect long-term impacts to elk and mule deer winter range are not expected to be major when analyzed in context of available winter range.

Options for off-site mitigation are discussed in **Sections 2.3.9.4** and **4.6.4**. P4 is developing a site management plan for their nearby Fox Hills Ranch. This site management plan includes water quality protection and improvement, fishery improvement; and habitat restoration and maintenance. P4 would also mitigate impacts to wildlife values impacted by the project by placing a legal restriction, such as a restrictive covenant or conservation easement, on 120 acres of its undeveloped private property in the vicinity of Soda Hills near Soda Springs or other similar undeveloped, natural property in the general area of the mine and Soda Springs. P4's Soda Hills property is located in what BLM and IDFG have identified as mule deer winter range. The covenant would preclude use of the land for any purpose other than buffer zone and require it be maintained in its current natural state. P4 would fund a management reserve with a third party, if necessary, to monitor compliance and take actions necessary to ensure that compliance.

For the highwall reclamation portion of this comment, see previous response.

Letter/Comment: 966/z

Comment Count: ***1***

Issue: **20z. Recommend permanent monitoring for selenium and COPCs along the Blackfoot River.**

Response: The Environmental Monitoring Plan (**Appendix A** of FEIS) details the surface and groundwater monitoring strategies for the project. This plan was also updated to include additional discussions regarding compliance points for both surface and groundwater as well as long-term monitoring of the cover systems.

Letter/Comment: 964/jj

Comment Count: ***1***

Issue: **20a1. Highwalls with no soil or vegetation doesn't fit the definition of reclaim. The statement that steep slopes would be reclaimed as highwalls is misleading and should be revised.**

Response: Statement has been revised in **Table 2.8-1** and in Sections of **Chapter 4** discussing the highwalls including **Sections 4.1.3, 4.4.1.2** and **4.5.1.2**. These areas are now referred to as unreclaimed highwalls.

Letter/Comment: 967/d

Comment Count: ***1***

Issue: **20b1. Explain what measures will be put in place to reduce mortality or any mitigation and management strategies that will be applied as part of the proposed action (for migratory birds, including raptors) - Section 2.3.7.1 and Section 4.6.1.1.4.**

Response: Mitigation measures to protect migratory birds are discussed in **Section 4.6.1.1.5**, in the updated Environmental Monitoring Plan (**Appendix A** of FEIS), and other appropriate sections of the FEIS. These include: ground clearing activities only during non-nesting season, steep-sided water management ponds with little vegetation to avoid attracting water birds, monitoring use of the ponds by water birds, and creating "islands of diversity" in reclaimed areas.

A new power line would not be required for the project; however, a portion of the existing main power line would need to be modified around project facilities. As discussed in **Section 2.3.7.1,** BMPs would be implemented to protect raptors and migratory birds. If raptors begin nesting on power poles following the start of mining, appropriate mitigation measures would be implemented.

Letter/Comment: 961/ff, 962/g, 967/a, 967/i, 967/k, 967/t

Comment Count: *6*

Issue: **20c1. If water bodies with degraded habitat are created, the FEIS should discuss what BMPs will be implemented to preclude use of those areas by wildlife.**

Response: The water management ponds would be designed with steep slopes, and short ground cover, such as sheep fescue, would be established and maintained in an effort to create low quality habitat. Waterfowl may land on the ponds; however, it is anticipated that, due to the low quality habitat surrounding the ponds and lack of feed, the ponds would only provide resting habitat and the waterfowl would fly off relatively quickly. Therefore, should waterfowl have contact with water containing COPCs, it is anticipated that the contact time would be minimal and not at levels expected to cause adverse effects. Additionally, the facility would be fenced to prevent wildlife accessing the water management ponds. Small mammals, reptiles, and amphibians may be able to pass through the fence and access areas with potentially contaminated water; however, the steep slopes and low quality habitat would provide minimal cover and therefore, use of the area is expected to be low. Wildlife use would be monitored and, if needed, additional measures to prevent and discourage wildlife use of the area would be implemented. This discussion was incorporated into **Section 4.6.1.1**.

As discussed in **Section 4.3.1.1.5** and in the Adaptive Management Plan (**Appendix B** of FEIS), should water quality in wetland and non-wetland areas associated with the Water Management Plan (P4 2010c) exhibit concentrations of COPCs that may affect wildlife, P4 would place clean rock fill into these areas to eliminate direct access of animals to water.

Letter/Comment: 967/b

Comment Count: *1*

Issue: **20d1. The 99 acres of existing habitat that will be lost is not comparable to the minimal habitat that will be created by the highwall once it begins to erode and grow vegetation.**

Response: The statement in the executive summary and in **Chapter 4** of the DEIS that the eroding highwalls would create additional wildlife habitat was revised in the FEIS to explain that the highwalls would erode over time and would achieve a configuration that would support development of soil and establishment of vegetation. Current land use of the privately owned portion of the proposed disturbance area (90 percent) and the public land (10 percent) is livestock grazing. Habitat available within the project area supports various species including big game species, small game, birds, and predators. Ample habitat exists in adjacent areas to support viable populations during the life of the operation and the post-closure period so that the area can be recolonized after reclamation.

Letter/Comment: 967/g

Comment Count: *1*

Issue: **20e1. The FEIS should clarify what measures will be implemented to ensure that selenium does not accumulate to concentrations that may adversely affect wetlands.**

Response: Mitigation measures discussed in the Water Management Plan (P4 2010c), including the OSMS, and the Mine and Reclamation Plan focus on minimizing accumulation of selenium through source control and capture of potential selenium sources. These measures include segregation of seleniferous material and minimization of infiltration of meteoric water into selenium-bearing materials. These measures are designed to limit potentially contaminated surface water or groundwater from entering wetland areas. Downgradient areas from the mine and water control ponds to the Blackfoot River, including wetland areas, would be monitored regularly during operations, closure, and post-closure. In addition, an Adaptive Management Plan (**Appendix B** of FEIS) for the water management system has been developed so that measures can be taken in response to potential changes in site conditions to minimize impacts to the wetlands. The Environmental Monitoring Plan (**Appendix A** of FEIS) would include regular monitoring of water quality at the mine and at selected downstream locations. Any indications of selenium release would be responded to promptly.

Letter/Comment: 967/e, 967/j

Comment Count: *2*

Issue: **20f1. P4 has designed a complex water management system to collect and manage surface water on the site. The system will prevent the discharge of COPCs in storm water or seeps and will comply with all applicable permitting requirements.**

Response: The Water Management Plan (P4 2010c) has been revised to include an OSMS, and an Adaptive Management Plan (**Appendix B** of FEIS) for the water management system was developed to minimize impacts to the wetlands. In addition, the Environmental Monitoring Plan (**Appendix A** of FEIS) includes monitoring stations along the Blackfoot River and both surface and groundwater monitoring stations at the mine and between the mine and the river. Selected groundwater monitoring stations would be identified as points of compliance consistent with state law requirements. These monitoring stations would be checked regularly. Changes in contaminant levels would be evaluated, and appropriate actions would be taken to ensure environmental protection. The area currently containing the unnamed tributary drainage is included in the overall water management system to assure that potentially impacted surface water, groundwater, and sediment do not move beyond control features. A primary goal of the water management system is to prevent water quality impacts to the Blackfoot River, which would be protected using the proposed water management system.

Letter/Comment: 965/d

Comment Count: *1*

Issue: **20g1. Pond EP1 is above the Fish Pond. Runoff captured by that pond will "be allowed to discharge via its spillway to Fish Pond" (DEIS, Section 2.3.6.4) if it meets surface water standards. Usually, flow over a spillway is not controlled. Therefore, the FEIS should explain how P4 will be able to prevent the flow from going over the spillway and how they will sample and test the waters quick enough to prevent downstream water quality problems.**

Response: The design of the water control ponds (EP1 through EP4) has been revised to include a decant piping system with valves that would be opened to allow water to flow through the dam or closed to allow water to pond behind each dam. At EP1, a control valve would regulate water through the spillway. The water management system has been designed to enable storage of stormwater events prior to moving the water from the EP1 to either Fish Pond, if it meets surface water quality standards, or to ponds CP2/WMP1 or WMP2 if the stormwater exceeds surface water quality standards. As provided in the Environmental Monitoring Plan (**Appendix A** of FEIS), monitoring of the concentrations within the EP ponds, Fish Pond, and CP1 would provide the analytical basis to ensure any water discharged at CP1 meets discharge limits (water quality standards). Prior to any discharge from CP1, water quality measurements (selenium, manganese, total suspended solids, turbidity, and pH) would be obtained to determine if stored water meets Idaho surface water quality standards and applicable NPDES permit requirements and can be released from storage. Concurrent with the sampling at CP1, sampling at Fish Pond would be conducted to identify selenium concentration trends up gradient of CP1. Thereafter, water quality monitoring would occur at least weekly during discharge. Should upset conditions cause overflow issues at EP1 that impact P4's ability to ensure that water quality standards would be met at CP1, water would be pumped to CP2/WMP1 or WMP2 as necessary.

Letter/Comment: 963/qq

Comment Count: *1*

Issue: **20h1. Several of the springs discharging on the banks of the Blackfoot River between SW10-St and SW11-St should be monitored.**

Response: Monitoring between SW10-ST (located upstream of the Blackfoot River) and SW11-ST (located downstream of the Blackfoot River) will be considered. As discussed in the Environmental Monitoring Plan (**Appendix A** of FEIS), groundwater monitoring will continue each year in the spring and fall through the life-of-mine and post-closure at selected wells determined by the

IDEQ. IDEQ may identify these springs as monitoring points. If selenium concentrations that are statistically higher than predicted are detected at any of these locations, the well(s) would be re-sampled within 15 days of receipt of the results. If exceedance is confirmed, an investigation plan to address the possible causes and remedies would be submitted to BLM and IDEQ. The investigation plan may include, as appropriate, inspection and sampling of springs such as SW10 and SW11 and nearby surface water to assess any impacts.

Letter/Comment: 963/ss

Comment Count: *1*

Issue: **20i1. At least three wetland springs, X, P, and O, should be monitored as well as the source that supports Wetland X, which differs from the spring which is downhill from the wetland. Wetland X, at more than 54 acres, is the largest wetland near the site (Table 11, Whetstone, 2010a). The source of water to this wetland is not discussed, but it should be and the source should be monitored. If the source to the wetland is an undefined seep, the FEIS should include monitoring of any ponded or pooled water in the wetland. The FEIS should add monitoring of the spring or water source in Wetland X and either wetland P or O spring.**

Response: The majority of Wetlands X, P, and Os source water is believed to occur as upwelling springs associated with discharge from the Aspen Range Fault. The geologic setting of the Aspen Range Fault is described in **Section 3.1.4** and the upwelling springs are discussed in **Section 3.3.1.2.8**. The conceptual hydrologic model indicates that northwesterly flowing deep groundwater is forced upward along the fault, in part by the lower permeability of the Salt Lake Formation relative to the Wells Formation (**Section 3.3.1.4.3**). Wetlands P and O have been sampled for the past several years as part of the baseline surface water program including sampling stations SW07-SP North Spring Pond and SW04-SP Woodall Spring. These sampling locations would continue to be monitored in the future as indicated in the Environmental Monitoring Plan (**Appendix A** of FEIS).

In addition to the deep spring water sources for Wetland X discussed above, a potential surface water source would occur as the intermittent discharge from water control pond CP1. This drainage area exhibits intermittent runoff for approximately 2 to 3 weeks during the spring peak runoff period, and the drainage is dry for the majority of the year. P4 plans to sample potential discharges from CP1 as described in the Environmental Monitoring Plan (**Appendix A** of FEIS), which would ensure that only water meeting discharge criteria would be allowed to discharge from CP1 to Wetland X. Any water failing to meet limits would be maintained in CP1 or pumped to the CP2/WMP lined ponds.

Letter/Comment: 963/vv

Comment Count: *1*

Issue: **20j1. The DEIS is not clear if or how the unnamed tributary to Fish Pond will be reclaimed. If the rock fill remains, the functions and values of the drainage and wetlands would be lost.**

Response: The Adaptive Management Plan (**Appendix B** of FEIS) for the water management system specifies that the area currently containing the unnamed tributary that includes Fish Pond would be reclaimed once the water control ponds are no longer needed and the vegetation cover on the EOP has stabilized to a condition where sediment and growth media movement from the EOP surface is reduced to acceptable levels as determined by state and federal agencies. P4 would reestablish the drainage by removing the EP water control ponds. P4 would review conditions within this area at the time of reclamation with BLM and USACE to evaluate the condition of each wetland area and determine the appropriate course of action for restoration.

The Mine and Reclamation Plan provides that P4 would remove the EP water control ponds and reestablish the natural channel through the area that currently contains the unnamed tributary. P4 would review the condition of each water control pond area and individual former wetland area with the USACE and BLM to determine whether fill that had been placed should

be removed to enhance reestablishment of wetlands or whether sediment trapped in wetland areas is beneficial to reestablishment of wetland functions.

Sediment that collects in the water management system would be sampled and, based on sample results, would be removed periodically and hauled to growth media stockpiles or used as growth media on areas which have been prepared for reclamation. Seleniferous sediment would be placed as backfill in the South Pit and would eventually be covered as described for Alternative 1A.

Maintenance of the water control ponds and periodic removal of sediment from these ponds would limit the amount of sediment that would remain at the end of mining operations and during the closure and reclamation period. Once water control pond dams have been removed, the drainage would return to a function similar to the pre-mining period.

Letter/Comment: 958/f, 958/n

Comment Count: ***2***

TOPIC: ***21. OTHER***

Issue: **21a. Question the effects of P4's other products including genetically modified (GM) seeds and Monsanto's litigation against organic farmers.**

Response: This comment is outside of the scope of this EIS. The potential effects of product end use and other actions using unrelated industry products cannot be assessed meaningfully in this analysis. These end uses do not depend on whether or not this project goes forward or how it is implemented. These are not impacts that can be addressed by the planning of this mine.

Letter/Comment: 234/b, 398/a, 402/a, 609/a, 855/a, 856/a

Comment Count: ***6***

Issue: **21b. Commenters noted that mining is important since our country was built on utilizing natural resources. We need these natural resources to survive. All commodities and development come with some impact to people and the environment. There are ways to mine that are safe and clean. Common sense and stewardship are imperative.**

Response: This comment is outside of the scope of this EIS. The comment is a value judgment on the importance of the kind of product that would be produced by this mine. There are no measurable outcomes that can be associated with this mine in comparison to a similar mine in a different location.

Letter/Comment: 69/d, 105/b

Comment Count: ***2***

Issue: **21c. Commenters voiced concern that rules and regulations result in an economic burden to mining.**

Response: This comment is outside of the scope of this EIS. It is not the intent of an EIS to assess the general economic burden of regulations on the mining industry. This issue cannot be addressed by planning or regulation of this mine.

Letter/Comment: 173/b, 836/a, 838/a, 852/a

Comment Count: ***4***

Issue: **21d. Commenter expressed concern over the corruption of politicians and their influence on the BLM and that the BLM does not protect the environment, and also stated that the BLM is responsible for killing all the wild horses in the West.**

Response: This comment is outside of the scope of this EIS. Planning of this mine cannot address the issue of corrupt politicians or whether the politicians exert any influence over regulatory

agencies. There are no wild horse herds in this project area.

Letter/Comment: 42/a

Comment Count: ***1***

Issue: **21e. Commenters offered to assist the mine.**

Response: This comment is outside of the scope of this EIS. Offers of assistance to the mine do not alter any effects that the mine may have.

Letter/Comment: 232/a

Comment Count: ***1***

Issue: **21f. The DEIS uses outdated information to minimize human health risks posed by consuming elk from the phosphate mining area.**

Response: The FEIS **Section 3.1.6.1** discussion on the mobility of selenium in the environment has been revised to include current information on the potential health risks of eating elk.

Letter/Comment: 961/d, 967/l

Comment Count: ***2***

Issue: **21g. If P4 wants to make their employees and equipment available to fire fighting efforts, employees need to be trained and certified by local Fire District personnel. Post-closure management plan for the site should include a fire management plan.**

Response: A post-closure fire management plan is not required as part of Mine and Reclamation Plan and training and qualification of personnel is outside the scope of this NEPA analysis.

Letter/Comment: 964/ss

Comment Count: ***1***

Total Comment Count: ***2312***

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