Action Memorandum

for

WATER MANAGEMENT
at the
ZORTMAN AND LANDUSKY MINES

NON TIME-CRITICAL REMOVAL ACTIONS

Malta Field Office, Bureau of Land Management
Phillips County, Montana

September 2006

Cover, clockwise from top left: Landusky Mine in 1996; Bioreactor built near the L87 leach pad that treats residual heap leaching solutions; Landusky Mine in 2005 after reclamation; and Landusky Mine ARD Water Treatment Plant.

ACTION MEMORANDUM

To: Howard Lemm, Acting State Director

Through: Mark K. Albers, Field Manager, Malta Field Office MKA 9/7

From: Scott Haight, On-Scene Coordinator SH 9/6

Subject: Request to Commence Non Time-Critical Removal Actions at the Zortman and Landusky Mines, Phillips County, Malta Field Office

This Action Memorandum documents the Bureau of Land Management's (BLM) determination on the need to continue removal actions at the site of the Zortman and Landusky mines under the agency's delegated CERCLA authority.

Because the removal actions are to be implemented for longer than six months, an Engineering Evaluation/Cost Analysis (EE/CA) has been prepared. The EE/CA evaluates alternative removal technologies and costs to determine the removal actions (treatment methods or source control actions) that would most efficiently prevent the release of hazardous substances, which could threaten public health or welfare or the environment.

SUMMARY

The recommended action is to continue the removal actions implemented in the June 2004 Action Memorandum using Operable Unit 1 (OU1), the mine drainage capture and treatment systems, and OU2 the leach pad solution bioreactor and land application system, in order to prevent the release of contaminants that could threaten public health, welfare, or the environment. It is also recommended that the King Creek Passive Treatment System (Alternative KC-200) be installed and designated as OU4. This system would assist in meeting water quality objectives for nitrates and selenium in King Creek, which are contaminants of concern. In Swift Gulch, Alternative SG-300 is recommended to further characterize the conditions in the drainage while limiting movement of potential contaminants of concerns. Settling basins constructed as part of this removal action are to be designated as OU5.

In order to further control the generation of mine drainage and prevent the release of substances that could threaten public health or welfare or the environment, it is recommended that OU3 (mine reclamation) be modified and that Alternative AG-200 be implemented on the Alder Gulch Waste Rock Dump at the Zortman Mine. Installation of the synthetic liner on the dump top, with retention of the waste rock in its present location, will result in better source control of contaminants than either Alternative AG-100, the current reclamation cover; or Alternative AG-300 (aka Zortman Mine Reclamation Alternative Z6), which increases the potential for release by placing acid-generating waste rock in two different locations.

As the removal actions are conducted, cost saving measures such as the installation of wind generators, optimizing the use of ferric sulfate in the water treatment plant, and streamlining the monitoring plan are also recommended.

The estimated cost to implement the removal actions is:

- $ 1.5 million annually to operate OU1 and OU2, including all Site maintenance activity.
- $ 300,000 to recap the Alder Gulch Rock Dump, which is part of OU3.
- $ 130,000 to install OU4, the semi-passive treatment system in King Creek.
- $ 200,000 to 600,000 for the characterization study and to install OU5 basins in Swift Gulch.

Actual implementation is dependent upon funding. OU1 and OU2 collectively receive $731,321 annually in funding from water treatment bonds held by the Montana Department of Environmental Quality (DEQ). This leaves OU1 and OU2 collectively underfunded by approximately $770,000 per year.

Recapping the Alder Gulch Rock Dump top will be paid for by a grant awarded to the Montana DEQ in 2005. A construction bond posted by the mine operator with DEQ will be used to pay for construction of the semi-passive treatment system in King Creek; however, annual operating costs estimated at some $5,000 are not covered by the bond indefinitely, and would add to the overall site costs once the bond was depleted.

Agency funding and state grants will be used to pay for the characterization study and sediment control ponds in Swift Gulch. Depending on the results of the study, additional removal actions may be considered in the Swift Gulch watershed.

All removal actions at the Site will be done in cooperation with the Montana DEQ. The August 2, 2004 memorandum of understanding between the BLM and DEQ (Attachment 1) remains in effect and describes the interagency coordination for implementing the removal actions.

I. PURPOSE

The purpose of this Action Memorandum is to select the removal action from the final Engineering Evaluation/Cost Analysis (EE/CA) and to document approval of the Non Time-Critical Removal[1], as authorized by section 104 (42 U.S.C. 9604) of the Comprehensive, Environmental, Response, Compensation, and Liability Act (CERCLA), at the Zortman and Landusky Mine sites (the mines, or the Site) [2].

The owner and operator of the mines, Zortman Mining, Inc. (ZMI) and Pegasus Gold Corporation (PGC), declared bankruptcy in 1998. Since then the BLM and DEQ have worked together with the bankruptcy trustee (serving in the role of mine operator) to implement closure of the mine in a competent manner using the reclamation and water treatment bonds along with other funding sources. With completion of the bankruptcy proceedings in 2003, an operator of record no longer exists. However, conditions at the Site continue to pose a potential threat to public health or welfare or the environment; on, from, or to lands under the jurisdiction, custody, or control of the BLM (See Part II, Tables 1-3). These conditions meet the criteria for a Removal Action under 40 CFR § 300.415 (b)(2) of the National Contingency Plan (NCP).

Executive Orders 12580 and 13016 delegate removal action authority to the Department of the Interior. Secretarial Order 3201 further delegates the authority to the BLM when the release or potential release of hazardous substances is on or from BLM-managed lands. The BLM will use its delegated CERCLA authority to conduct response actions at the Zortman and Landusky Mines. All response actions will be consistent with the National Contingency Plan (40 CFR Part 300). Due to the intermingled nature of many mine waste units with private and BLM-managed land, the BLM removal actions may occur in whole or in part on private lands in order to protect public health, welfare, or the environment, as well as to protect public lands.

The removal actions will be conducted in conjunction with the Montana DEQ reclamation and water treatment activities at the Site. It is intended that the DEQ continue to use funds from the reclamation bonds, water treatment trust fund, grants, or with supplemental funding provided by the BLM to maintain year-round function of the operable units. DEQ's water treatment activities meet BLM's removal action objectives.

All CERCLA actions at the Site will continue to be consistent with the preferred reclamation plans from the 2001 Supplemental EIS on Reclamation of the Zortman and Landusky Mines, and the BLM's associated 2002 Record of Decision (ROD).

Copies of the Administrative Record for this project are available for viewing at the Lewistown Field Office, Lewistown, Montana. Public review of the record can be conducted during regular business hours.

1- An Action Memo completed in June 2004 determined that water treatment activity at OU1 and OU2 needed to be immediately implemented as a Time-Critical removal action. Because the removal actions described in the EE/CA will take longer than six-months to implement, they are considered Non Time-Critical.

2- The "Site" is defined as the combined facilities and infrastructure that exists for the Zortman and Landusky mines (See EE/CA Figure 2).

A. Identification of Operable Units

The BLM initially identified three Operable Units within the Site in its June 2004 Action Memorandum for a Time-Critical Removal. Operable Unit 1 (OU1) is the capture and treatment systems used to recover and treat mine drainage, also known as acid rock drainage (ARD), from the waste rock dumps, leach pad dikes, areas beneath the mine pits, or from historic underground mine workings. OU1 facilities include the seepage capture systems in Ruby Gulch, Alder Spur, Carter Gulch, Montana Gulch, Mill Gulch, and Sullivan Gulch; the Zortman and Landusky ARD water treatment plants, areas where treated water leaves the plants, and the associated infrastructure serving these facilities including roads, powerlines, pipelines, monitoring wells, sludge disposal pits, and current or future backup or supplemental power generation equipment.

Operable Unit 2 (OU2) includes the leach pad containment areas, or ponds, with residual process solutions; the biological treatment system used to treat leach pad solutions; associated treatment ponds, pipelines, pumps and pre- or post-treatment apparatus, sludge disposal areas; and the land application disposal (LAD) system.

Operable Unit 3 (OU3) consists of the area of mine disturbance at the Site where reclamation has occurred or is maintained. It includes all reclaimed surfaces, mine pit highwalls, stormwater conveyances, and associated support infrastructure such as buildings, gates and roadways.

Based on the final EE/CA, the BLM has identified two additional operable units for construction. Operable Unit 4 (OU4) is the passive water treatment system to be built in upper King Creek as described in the EE/CA under Alternative KC-200. Operable Unit 5 (OU5) is the settling basins or ponds to be built in Swift Gulch as described in the EE/CA under Alternative SG-300.

II. SITE CONDITIONS AND BACKGROUND

A. Site Description

1. Removal Site Evaluation

The Zortman and Landusky mines were open pit, cyanide heap leach, gold mines located in the Little Rocky Mountains of north central Montana. Ore was mined from pits, located mostly on private lands, and stacked in valley-fill leach pads, constructed mostly on BLM-administered lands (BLM lands), where standard cyanide heap leach technology was used to extract the precious metals (gold and silver) from the ore. Cyanide solution was applied to the heaps by spray or drip irrigation where gold was dissolved from the ore as the solution percolated through the heaps to sumps at the base of the leach pads. The “pregnant” solution was then pumped to a gold/silver recovery plant. During mining, nonmineralized rock (waste rock) was placed in waste rock dumps, as mine pit backfill, or used in the construction of retaining dikes for the leach pads.

The mines operated from 1979 until 2003 under State-approved Operating Permits, and from 1981 until 2003 under BLM-approved Plans of Operations, although active mining ceased in

1997. In 1998, PGC and ZMI declared bankruptcy and a Federal bankruptcy court appointed a Trustee. Also in 1998, the surety companies (USF&G and National Union Fire Insurance) reached an agreement with the DEQ to fund reclamation and water treatment to the limits of the surety bonds.

In 2002, the BLM and DEQ issued modifications to the operator's (Trustee's) reclamation plans as part of the reclamation plan modification process begun in 1993. These reclamation plans were developed over several years in a collaborative effort between BLM, DEQ, EPA, and the Fort Belknap Tribes. The reclamation plans selected by the 2002 ROD were estimated to cost $22.5 million more than the amount of the surety bonds. Through removal actions sponsored by the BLM's Abandoned Mine Land (AML) program, DEQ grants, and cost savings under the competitive bidding process, the estimated reclamation earthwork shortfall was reduced from $22.5 million to $1.7 million.

The annual treatment costs for OU1 (ARD capture and treatment) have been greater than the funds available under the near-term water treatment surety bond. Since 1999, the BLM has provided funds to keep these facilities operating because the surety bond has not been adequate to pay for operation of the OU1 water treatment plants for the entire year.[3] This situation will continue until 2018 when the long-term water treatment trust fund becomes available.

Operable Unit 1 was initially constructed as part of a 1996 Consent Decree between the mine operator, State of Montana, EPA, the Fort Belknap Tribes, and Island Mountain Protectors in order to resolve a complaint filed under the federal Clean Water Act and Montana Water Quality Act over discharges from the mines. Since 1999, OU1 has captured and treated over two billion gallons of mine drainage.

While the OU1 water treatment plants have been generally successful in meeting the effluent limits in the Consent Decree and have removed a large amount of metals and acidity from the mine drainage, they are not always able to meet ambient water quality standards. Nor are they suitable for treating cyanides, which are sometimes detected in the treated water at low levels (<1 mg/L total), usually in the spring, or nitrates and selenium. However, it is imperative that OU1 continue to operate to protect the public health, welfare, and the environment.

Operable Unit 2 is a biological treatment system that was constructed in 2001 to remove selenium, nitrates, and cyanide from the process solution remaining in the leach pads. The leach pad process circuits have a combined maximum capacity of approximately 350 million gallons. Prior to surface reclamation the leach pads were accumulating about 100 million gallons per year due to rainfall and snowmelt. In order to prevent overtopping of the process circuit, the solution was treated with hydrogen peroxide, to reduce the cyanide levels, and land applied at the Goslin Flats land application disposal (LAD) site. The elevated nitrate and selenium levels limited the amount of leachate that could be land applied without severely impacting area vegetation and groundwater quality. The biological treatment system was designed to remove the selenium,

3- The surety company distributes funds at the beginning of the calendar year in the amount of $731,321. For years 2000 through 2005, OU1 operating costs have been $843,387; $879,727; $905,899; $758,267; $804,973; and $847,403, respectively. Annual costs for OU1 alone are projected to increase to $972,100 (EE/CA, Figure 18) in 2006, because sharing of fixed costs with reclamation personnel will cease.

nitrate, and cyanide so that peroxide pre-treatment and land application disposal would not be necessary; or in the alternative to reduce nitrate and selenium to the point where these constituents would not be limiting factors in LAD.

The biological treatment system has an optimal treatment rate of 125 gpm and has been successful at removing selenium and nitrates to levels where treated process water meets water quality objectives, after mixing with other treated water, and can be directed into area streams. Cyanide reduction has not achieved the same level of success, but natural degradation and dilution within the leaching circuit has reduced total cyanide levels to less than 1 ppm. The remaining cyanide complexes are tightly bound metal-cyanides with relatively low toxicity.

Presently, approximately 130 million gallons of residual solution in the leaching circuit requires treatment, with additional accumulations anticipated in the future (Spectrum Engineering, July 2006 Progress Report). Leaching solution in the L87 and L91 leach pads has "matured" and become increasingly acidic and requires pretreatment to raise the pH before entering the bioreactor. While reclamation has slowed the rate in which precipitation recharges the leach pads, it is imperative that leach pad solutions continue to be treated and released in order to maintain adequate storage capacity. Failure to maintain adequate storage capacity in the leach pads could result in breaching of the containment system; either due to a gradual build-up in the solution inventory or from an extreme precipitation event, causing the release of untreated leachate. To maintain storage capacity the leach pad solution is pretreated to raise the pH, then routed through the bioreactor, and finally disposed of either by mixing the bioreactor-treated water with OU1 treated water, or by land application at Goslin Flats.

2. Physical Location

The mines are situated on the crest of the Little Rocky Mountains and straddle the divide between the drainages which flow north toward the Milk River and those that flow south toward the Missouri River (EE/CA, Figure 2). Elevations range from 3800 to 5600 feet with annual precipitation from 20 to 30 inches.

The Zortman Mine is located in Sections 7, 17, and 18, Township 25 North, Range 25 East, Montana Principal Meridian. The LAD area is south of Zortman in Sections 20, 21, and 28. Streams in the Zortman Mine area include Lodgepole Creek which drains to the north, Ruby Gulch which flows south through the town of Zortman, and Alder Gulch a tributary of Ruby Gulch. Flow in Lodgepole Creek is intermittent near the mine but perennial in its lower reaches and supports a limited brook trout population several miles from the Site. Flows in Ruby and Alder Gulch are intermittent but may run quite high after storm events or rapid snowmelt. The LAD area at Goslin Flats is adjacent to both Ruby Gulch Creek and Goslin Gulch.

The Landusky Mine is about 1½ miles west of the Zortman Mine and is located in Sections 14, 15, 22, and 23, Township 25 North, Range 24 East. Streams in the Landusky Mine area include King Creek and Swift Gulch (both tributaries of South Bighorn Creek), which flow northwest onto the Fort Belknap Indian Reservation. A Tribal cultural and recreation use area is located along South Bighorn Creek about a mile downstream of the northern portion of the Landusky Mine. Montana Gulch, Mill Gulch, and Sullivan Gulch are all tributaries of Rock Creek, which

flows to the south. All these streams are intermittent near the Site. Small brook trout populations exist in perennial segments of both Rock Creek and South Bighorn Creek/Little Peoples Creek, several miles downstream of the mine. A BLM campground is located adjacent Montana Gulch about half a mile downstream of where treated water from OU1 enters the stream.

3. Site Characteristics

The Zortman Mine disturbance covers approximately 406 acres, of which about 122 acres are on BLM land. Approximately 20 million tons of ore were mined during operations from 1979 through 1994. The mine pits are located on private lands and cover approximately 96 acres. The leach pads and waste rock dumps are located on a mixture of private and BLM-managed lands over the remainder of the site.

The Landusky Mine disturbance covers approximately 783 acres, of which about 452 acres are on BLM land. Approximately 117 million tons of ore were mined during operations from 1979 through 1996. The mine pits are located mostly on private lands and cover approximately 235 acres. Virtually all of the leach pads and much of the waste rock are located on BLM lands.

Detailed site characterization of both mines and the surrounding environment can be found in Sections 3.1 through 3.4 of the final EE/CA. Two other recently completed documents, *Final Environmental Impact Statement, Zortman and Landusky Mines, Reclamation Plan Modifications and Mine Life Extensions* (BLM, DEQ, 1996); and *Final Supplemental Environmental Impact Statement for Reclamation of the Zortman and Landusky Mines* (BLM, DEQ, 2001); contain detailed discussions of the environmental conditions at the site along with an evaluation of the mine reclamation alternatives.

4. Release or Threatened Release into the Environment of a Hazardous Substance, Pollutant, or Contaminant

a. Hazardous Substances

Site characterization, including extensive sampling and monitoring, has revealed that hazardous substances, as defined in section 101 (14) of CERCLA, 42 U.S.C. 9601(14), have been released into the environment. If OU1 or OU2 ceases operation, the release of hazardous substances would increase greatly without the benefit of treatment, creating environmental damage. This includes the release of solutions containing metals such as arsenic, cadmium, copper, selenium and zinc; plus cyanide complexes, nitrates, and solutions having low pH (acidic) levels. Construction of OU4 and OU5 would prevent or limit future exceedances of Applicable or Relevant and Appropriate Requirements at the Site boundary. Modification of the Alder Gulch Waste Rock Dump's reclamation cap would reduce the load of hazardous substances that needs to be captured and treated.

b. Sampling and Analysis Data

Detailed monitoring of surface and ground water quality at the Site has been conducted since before open pit mining operations began in the late 1970s and continues to date. There is presently an extensive database containing thousands of monitoring results from hundreds of Site monitoring stations (e.g., Annual Water Resources Monitoring Report for 2005).

Water quality monitoring programs are in place to evaluate reclamation performance as well as the performance of the water treatment and disposal systems associated with OU1 and OU2. An updated Groundwater and Surface Water Monitoring Plan (April 2002) was developed by the Hydrology Technical Work Group whose members included technical specialists from BLM, DEQ, EPA, and Fort Belknap. This monitoring plan was designed in anticipation of the State issuing MPDES permits, which never occurred. The monitoring plan has recently been modified and updated by specialists from DEQ, BLM, and Fort Belknap (April 2006) to focus on assessing releases or potential releases of contaminates of concern.

Water quality data collected through the spring of 2006 shows that treated water from OU1 and OU2, while greatly improved, does not necessarily meet water quality standards upon exiting the treatment plants (Tables 1, 2, and 3). More importantly, the "red" columns in Tables 1 through 3 show the quantity and quality of water that would be released to the environment if not removed by operation of OU1 or OU2. The "captured," "pad water," and "treated" water values are typical values. Actual readings can vary considerably depending on a variety of factors including capture system efficiency, weather, mixing rates, and treatment system performance.

Table 1. Operating Unit 1 - Zortman Water Treatment Plant.

Parameter	Captured Water (120 gpm)	Treated Water	Standard (human health)	Standard (chronic aquatic)
pH	3.7 su	7.0 su	+6.5 - 8.5 su	na
Aluminum	254 mg/l	0.3 mg/l	+.05–0.2 mg/l	0.087 mg/l
Arsenic	0.227 mg/l	0.002 mg/l	0.010 mg/l	0.150 mg/l
Cadmium	0.22 mg/l	0.01 ppm	0.005 mg/l	0.001 mg/l
Cyanide (T)	<0.005 mg/l	<0.005 mg/l	0.2 mg/l (F)	0.022 mg/l
Copper	6.95 mg/l	0.014 mg/l	1.3 mg/l	0.030 mg/l
Nitrate	5.0 mg/l	4.9 mg/l	10 mg/l	na
Selenium	0.012 mg/l	0.009 mg/l	0.05 mg/l	0.005 mg/l
Zinc	7.02 mg/l	0.02 mg/l	2.0 mg/l	0.39 mg/l

Data source: EE/CA tables 21-22 and discharge monitoring data
+Secondary Standard

Table 2. Operating Unit 1 – Landusky Water Treatment Plant.

Parameter	Captured Water (380 gpm)	Treated Water	Standard (human health)	Standard (chronic aquatic)
pH	5.0 su	7.7 su	+6.5 - 8.5 su	na
Aluminum	33.5 mg/l	0.2 mg/l	+.05–0.2 mg/l	0.087 mg/l
Arsenic	0.15 mg/l	0.008 mg/l	0.010 mg/l	0.150 mg/l
Cadmium	0.04 mg/l	0.002 mg/l	0.005 mg/l	0.001 mg/l
Cyanide (T)	<0.005 mg/l	<0.005 mg/l	0.2 mg/l (F)	0.022 mg/l
Copper	0.11 mg/l	0.004 mg/l	1.3 mg/l	0.030 mg/l
Nitrate	1.0 mg/l	1.5 mg/l	10 mg/l	na
Selenium	0.004 mg/l	0.004 mg/l	0.05 mg/l	0.005 mg/l
Zinc	1.72 mg/l	0.07 mg/l	2.0 mg/l	0.39 mg/l

Data source: EE/CA tables 21-22 and discharge monitoring data
+Secondary Standard

Table 3. Operating Unit 2 – Bioreactor for Leach Pad Process Solution.

Parameter	Zortman Pad Water (50 gpm)	Landusky Pad Water (130 gpm)	*Treated Water from BR-3	Standard (human health)	Standard (chronic aquatic)
pH	3.0 su	4.2 su	6.8 su	+6.5 - 8.5 su	na
Aluminum	600 mg/l	385 mg/l	4.0 mg/l	+.05–0.2 mg/l	0.087 mg/l
Arsenic	1.2 mg/l	0.015 mg/l	0 mg/l	0.010 mg/l	0.150 mg/l
Cadmium	0.5 mg/l	0.5 ppm	0.012 ppm	0.005 mg/l	0.001 mg/l
Cyanide(T)	0.13 mg/l	0.25 mg/l	0.23 mg/l	0.2 mg/l (F)	0.022 mg/l
Copper	8.6 mg/l	6.5 mg/l	0.115 mg/l	1.3 mg/l	0.030 mg/l
Nitrate	85 mg/l	200 mg/l	0.3 mg/l	10 mg/l	na
Selenium	0.06 mg/l	0.67 mg/l	0.08 mg/l	0.05 mg/l	0.005 mg/l
Zinc	50.9 mg/l	34.9 mg/l	1.0 mg/l	2.0 mg/l	0.39 mg/l

Data source: EE/CA tables 21-22, figure 14; and discharge monitoring data.
*Water from BR-3 is either land applied or mixed with other treated water
+Secondary standard

c. Mechanism for Past, Present, or Future Release

Past releases of hazardous substances occurred from the water treatment plants and capture systems associated with OU1, and from the LAD component of OU2. Treated water from OU1 has contained elevated total cyanide and metals such as arsenic. Treatment rates average some 450 gpm for the Landusky treatment plant, which runs continuously, and substantially less for the Zortman plant as it only operates about 1 week per month. Previous irrigation at the LAD area contained selenium and nitrates greater than Montana water quality standards. Use of the bioreactor in OU2 has reduced the nitrate and selenium levels that will be present in future applications to the LAD area.

Data on leach pad chemistry shows changing conditions in the leach pad solutions as the alkaline solutions present during leaching give way to the acidity released by the oxidation of sulfide minerals in the spent ore. Pre-treatment of leach pad waters prior to entering the bioreactor has prevented this from becoming a significant impediment to OU2 operations. If leach pad chemistry changes sufficiently the process solution may be treated in OU1 in addition to, or instead of, the OU2 biological treatment system.

The capture systems could potentially fail to recover all the seepage from upgradient mine facilities, resulting in a release of hazardous substances. Monitoring is in place to detect failure or inadequate performance of the capture systems. Removal actions could include upgrading the capture systems or placement of additional capture structures.

The potential also exists for minor upsets or incomplete treatment in the OU1 or OU2 systems, with a resulting increase in contaminants of concern above the water quality standards leaving the Site boundaries. While this has happened in the past, and can be anticipated to occur in the future, monitoring has shown that attenuation processes have reduces contaminants to safe levels a short distance downgradient of the Site and pose little risk to public health or welfare.

d. Events or Features that Could Spread or Accelerate Releases

High volume precipitation events and spring runoff could overwhelm the treatment capacity and cause the release of untreated mine drainage and/or leaching solutions. While the OU1 seepage capture systems are designed to accommodate runoff from a 6.33-inch storm event, three storm events of 6-inches or more have occurred since 1986. Precipitation could also accelerate the migration of applied water from the LAD area into shallow groundwater and adjacent streams instead of allowing for the uptake of constituents such as nitrates and selenium by the vegetation, or attenuation of metals in the soil profile.

Similarly, storm events could overwhelm treatment capacity of the proposed OU4 and OU5 systems in King Creek and Swift Gulch, respectively. To prevent damage or failure, these systems are designed to pass runoff from high flow events, which typically contain a lower concentration of contaminants of concern anyway then the normal base flow that is treated.

Power outages could cause a shutdown in the mine drainage capture and treatment system and in the biological treatment system. However, the site is equipped with two backup generators to

maintain power to the seepage capture systems and treatment plants. If backup power generation failed, the seven seepage capture systems that are part of OU1, located in six area drainages, would likely overflow within a few hours, releasing untreated mine drainage. Process solution in the OU2 systems could drain back into the leach pads if a power failure occurs. OU4 and OU5 do not rely on electrical power to operate.

e. Properties that Influence the Rate of Releases

The biological treatment plant was initially designed to treat heap solution at 300 gpm. However, field testing has shown that optimal treatment is dependent upon water quality, so OU2 is operated between 75 and 300 gpm. Because it is a biological treatment system, the flow-through rates cannot be varied easily without upsetting the biological activity and treatment efficiency. Therefore, release rates are not expected to fluctuate much, although treated heap solution could be routed back into the heap containment if the LAD system or OU1 was not online. When nitrate and cyanide levels in the heap solution decline to the extent feasible, LAD of treated water will cease and the biological plant will be dismantled. Long-term bio-treatment of seepage from the leach pads in OU2 is not expected to be necessary, as there are finite amounts of nitrates and cyanide left over in the leach pads from mineral processing. As the long-term character of the residual leach pad solution changes (acidifies), and the nitrates and selenium loads decrease, it may be more appropriate to treat it in OU1 as mine drainage.

As surface reclamation is completed and revegetation matures, the volume of precipitation entering waste rock piles, mine pits floors and leach pads will decrease. This will result in a decrease in the volume of water requiring capture, treatment, and disposal by OU1 and OU2. However, the concentration of some contaminants may also increase because there will be less dilution.

5. National Priority List (NPL Status)

The Zortman and Landusky Mines are not now on the NPL list and are not expected to be placed on the list in the future. If OU1 or OU2 were to cease functioning the situation would be reevaluated because contaminant levels are likely to increase considerably.

6. Maps and Graphic Representation

Location maps showing topography, land status and mine site facilities are presented in the EE/CA. Water treatment flowcharts for OU1 and OU2 are provided in EE/CA Figures 6, 8, 12, 13, and 14. A diagram for recapping the top of the Alder Gulch Rock Dump is provided in EE/CA Figure 5. The schematic for design of the King Creek passive treatment system (OU4) is provided in EE/CA section 7.2.2.12. A map showing the conceptual placement of the ponds in Swift Gulch is provided at the end of EE/CA section 8.

B. Other Action to Date

1. Previous Actions

Previous CERCLA-based removal actions have been conducted at and adjacent to the Site, either by the EPA or by the BLM.

Beginning in 1999, the BLM provided funding to keep OU1 running in order to remove acidity and metals from mine drainage that was either impacting, or derived from, BLM lands. This action supplemented the monies provided annually by the surety bond and has allowed for year-round treatment of mine drainage through 2006.

During 2000, the EPA conducted a non time-critical removal of the historic mine tailings in King Creek. Approximately 60,000 cubic yards of tailings were excavated from the King Creek drainage on the Fort Belknap Reservation along about a 2-mile stream reach from just upstream of the Pow Wow grounds to the Cumberland Dam, immediately downstream of the Landusky Mine. The tailings were hauled to the Landusky Mine and placed on the regraded L80 through L84 leach pads for use as subsoil in the mine reclamation. The EPA prepared an Engineering Evaluation/Cost Analysis for the project (IT Corp., 1999).

Beginning in 2001, the BLM and DEQ removed the historic mine tailings from Ruby Gulch and restored the streambed as an abandoned mine land reclamation project. Approximately 650,000 cubic yards of tailings were removed from the Ruby Gulch drainage beginning just below the town of Zortman where the county road crosses the stream and continuing upstream some two miles to the Ruby Gulch capture system at the edge of the Zortman Mine. A portion of the tailings was used as subsoil in the reclamation cover placed over the backfilled OK/Ruby Pit.

2. Current Actions

BLM recently completed conducting a removal action at the Landusky Mine as part of its abandoned mine reclamation program through an assistance agreement with the DEQ. BLM excavated the L85/86 leach pad and dike from the Montana Gulch drainage in order to remove a potential source of contaminants that within the drainage. This action was consistent with mine reclamation Alternative L4 in the SEIS, but could not be implemented with the mine reclamation bond monies available. This removal action was completed in 2005.

BLM is currently running OU1 and OU2 to collect and treat mine drainage and leach pad solutions as described in the EE/CA. These actions are part of the Time-Critical Removal Action implemented in the June 2004 Action Memorandum and are conducted in cooperation with the DEQ. Because solution recovery and treatment would need to continue to be implemented for longer than six-months, the activity is now considered as a Non Time-Critical Removal Action and is the main subject of the current EE/CA.

C. State and Local Authorities' Role

1. State and Local Actions to Date

Over the past twenty years, the State of Montana and BLM have worked together first as co-regulators under each agency's respective mining regulations, then during the bankruptcy process, and most recently to develop and implement the mine reclamation and water management plans. From early 1999 to date, the DEQ's Environmental Management Bureau has been using the mine reclamation surety bonds and water treatment funds to manage the Site and maintain water treatment activities consistent with this removal action.

During 2002, the DEQ prepared MPDES permits for the Site as anticipated by the 1996 Consent Decree that were to be issued to the mine operator and permit applicant, ZMI. However, due to the bankruptcy process, no operator-applicant was available to receive the permits.

2. Potential for Continued State/Local Response

In 2005, the Montana State Legislature established a long-term trust fund for water treatment at the Site. The State's trust fund is a supplement the long-term trust fund posted by the mine operator with DEQ and is available to pay for water treatment beginning in 2018. Between the two trust funds, adequate funding for long-term water treatment costs beyond year 2018 most likely exists. It is only from the present through 2017 that there is a significant funding shortfall.

Contracting for Site management activities is expected to continue to be conducted using the State's contracting process through the DEQ, with BLM participation in contractor selection and oversight. DEQ only has access to approximately half the funds needed to manage the Site through 2017. BLM as lead federal agency for the removal action intends to supplement the DEQ activities and funding as necessary in order to maintain year-round operations that meet ARARs. BLM will provide supplemental funding to the DEQ for the removal actions. The BLM and DEQ have entered a memorandum of understanding (MOU) formalizing this working arrangement (Attachment 1).

In implementing this CERCLA action, the BLM will continue to perform community relations activities; including those described in the National Contingency Plan (NCP) and 40 CFR 300.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

Concentrations of total cyanide, selenium, nitrate, and metals in the mine drainage and residual heap leaching solutions at the Site present a threat to public health or welfare and the environment. These conditions meet the criteria for a Removal Action under 40 CFR § 300.415(b)(2) of the NCP. The identified contaminants of concern are: arsenic, aluminum, cadmium, copper, cyanide, nitrates, selenium, and zinc. While other contaminants, both metal and nonmetal are at the Site, they do not play a determinate role in the selection of treatment technology, although they are also removed during the treatment processes. BLM will continue

to monitor for additional contaminants of concern and may add to this list should additional contaminants be identified at levels of concern requiring a removal action.

The toxicity profile summaries from the Risk Assessment Information System website for the Site contaminants of concern are in Appendix 5 of the EE/CA. The formal toxicity profiles are also available at the following link: http://rais.ornl.gov/tox/rap_toxp.shtml

A. Threats to Public Health or Welfare

Without removal actions the threat of direct exposure exists through the ingestion of cyanide, selenium, and heavy metal compounds that may expose the human and animal population to the toxic effects. The following factors from § 300.415 (b)(2) of the NCP form the basis for our determination of the threat presented, and the appropriate action to be taken:

> (i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants;
>
> (ii) Actual or potential contamination of drinking water supplies or sensitive ecosystems;
>
> (iv) High levels of hazardous substances, pollutants, or contaminants in soils largely at or near the surface, that may migrate;
>
> (v) Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released; and,
>
> (vii) The unavailability of other appropriate federal or state response mechanisms to respond to the release.

B. Threats to the Environment

Cyanide, selenium, and metals are found on the Site in elevated levels, are hazardous substances as defined in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended, Section 101(14), and are listed in 40 CFR Section 302.4 "List of Hazardous Substances and Reportable Quantities".

Mine drainage derived from Site waste rock piles, heap dikes, and mine pits, if not captured and treated potentially affects several groups of ecological receptors. The first group includes aquatic life in the local streams emanating from the mining area. The second group of receptors includes wildlife that may ingest water in area streams with elevated metal content that could bio-accumulate, potentially reaching toxic levels. The third group includes plant life growing near waterways subject to mine drainage.

Because the communities of Zortman, Landusky, and the Montana Gulch Campground are all located within a mile of the potential releases, residents or visitors could be exposed to water containing elevated metal content. Streams on the north side of the mountains have fewer mine facilities, receive less mine drainage or runoff, and experience greater dilution or attenuation prior to reaching recreation areas or communities.

Several ecological receptors are potentially affected by residual contaminants in treated heap water associated with the LAD. The first group includes aquatic life associated with local streams located downgradient of the LAD areas in the Ruby and Goslin drainages. The second group of receptors is native terrestrial plants whose ability to grow in LAD area soils may be limited by the relatively high concentrations of nitrates, selenium, metals and salts in the land-applied water. Some plants that grow on the land application area, or near waterways subject to untreated mine drainage, may concentrate metals. These may include plants of importance to Native Americans for purposes of traditional use. Depending on the plant species and use, exposure to high metals could occur through ingestion or inhalation of plant material. The third group of receptors are cattle or wildlife that forage in the LAD area and may be exposed to on-site contamination either through direct contact with contaminated soil, plant forage, standing water, and sediments, or indirectly through consumption of organisms (algae, aquatic insects, or animals) feeding in the area.

IV. ENDANGERMENT DETERMINATION

Actual or threatened releases of hazardous substances from the Zortman and Landusky mines, if not addressed by implementing the response actions selected in this Action Memorandum, may present an imminent and substantial endangerment to public health or welfare, or the environment.

V. PROPOSED ACTIONS AND ESTIMATED COSTS

A. Proposed Actions

1. Proposed Action Description

The proposed actions are designed to mitigate the potential threat at the Zortman and Landusky mines. The proposed actions for this Removal Action are continued operation of OU1 and OU2 in order to capture, treat, and dispose of mine drainage and leach pad solutions. The proposed action also includes construction of a passive treatment system in King Creek (OU4), construction of settling ponds in Swift Gulch (OU5), and re-covering the top of the Alder Gulch Waste Rock Dump (an OU3 component).

a. Site Assessment

The BLM and DEQ have conducted extensive water quality, soils, and vegetation monitoring. Operational water quality monitoring will be done in accordance with the revised Water Management Plan (EE/CA Tables 17 and 18). Water quality monitoring may be adjusted when conditions warrant in response to undesirable events or changing conditions, or for research or characterization purposes—especially in the Swift Gulch area. Sampling and analysis results will continue to be provided monthly to the Fort Belknap Environmental Department, and available for review at the BLM office in Lewistown and the DEQ office in Helena.

Various configurations for the LAD irrigation system have been tested in an effort to maximize attenuation of contaminants in the soil. These include changing the sprinkler heads for a more even distribution, rotating the areas under irrigation, and limiting land application to the summer growing season. The present LAD configuration is considered adequate. The LAD is shutdown in the winter to eliminate impacts to surface water. Year-round operation of the LAD was considered as a means to get rid of all the leaching solutions as quickly as possible, but was eliminated due to the potential for increased impacts to surface water adjacent the LAD area, operational difficulties in winter months, and the present availability of in-heap storage for winter precipitation.

As noted, ZMI and Pegasus Gold constructed the seepage capture systems and water treatment plants as part of the 1996 Consent Decree. Since then the systems have undergone several evaluations in order to optimize treatment efficiency. Initial difficulty with arsenic removal at the Landusky Mine water treatment plant appears to have been resolved. Automation of treatment plant systems may be used to lower labor costs but would not alter their performance.

b. Removal and Disposal

The seepage capture systems located on BLM lands in Ruby Gulch, Alder Gulch, Carter Gulch, Montana Gulch, Mill Gulch, and Sullivan Gulch will continue to capture mine drainage derived from upgradient BLM lands, and from private lands that could affect BLM lands. Captured mine drainage will be routed to one of two lime precipitation water treatment plants where it will be treated to remove metals and reduce acidity; and then routed to BLM land in the Montana Gulch and Ruby Gulch drainages. Although the Zortman Mine water treatment plant is located on private lands, it will continue to be used to treat mine drainage derived from BLM lands, or mine drainage that would have affected BLM lands. The outfall from the Zortman Mine water treatment plant is on BLM land and is within the Site boundary.

Virtually all of the heap leach pads are on BLM lands. Heap process solution will continue to be treated in the bioreactor on the L87 leach pad to remove nitrates, selenium, and cyanide, to the extent feasible. Treated heap solution will then be routed either to the LAD area on private lands at Goslin Flats, where the State has land application rights, or mixed with pre-treatment or post-treatment mine drainage and routed to Montana Gulch on BLM lands. Direct discharge is preferred to land application when the quality of mixed OU1 and OU2 water is acceptable.

2. Contribution to Remedial Performance

The proposed actions will not adversely affect any future removal or remedial actions but will support and complement any future removal or remedial actions. The proposed actions are consistent with the selected alternatives in the 2001 Supplemental EIS on Reclamation of the Zortman and Landusky Mines.

3. Description of Alternative Technologies

The parties (DEQ, EPA, Fort Belknap, Island Mountain Protectors, and ZMI) who negotiated the 1996 Consent Decree established the lime-precipitation treatment technology as the preferred

method to treat mine drainage in OU1. While other treatment technologies for mine drainage exist, such as semi-passive wetland systems, reverse osmosis, anoxic drains, etc., the EE/CA did not identify any other technology that was feasible, reliable, or affordable enough to handle the volume of water requiring treatment at the Site with the degree of success presently achieved. Should either the amount of mine drainage, or level of contaminants, significantly decrease in the future, alternate treatment technologies may become practical. Table 1 in the EE/CA contains a summary of the removal action (treatment) alternatives considered, the estimated cost, and their ability to satisfy ARARs.

During 2000 and 2001, the interagency technical working group (BLM, EPA, Fort Belknap, and DEQ) evaluated a series of different proposals for treatment of residual heap process solution. The technology ultimately decided upon was the present biological treatment system (OU2). The purpose of this treatment was the targeted reduction in cyanide, selenium and nitrate contaminants reporting to the LAD area, which were the constituents limiting application of heap process solutions at that time. Other treatment technologies were considered to supplement the existing bio-treatment plant. In particular, reverse osmosis was considered to reduce the salinity of land-applied solutions, and to remove selenium and nitrates. However, the added expense of such a system, plus the difficulty in disposing of the produced waste brine, does not support the use of reverse osmosis technology.

Various configurations for irrigation application and sprinkler head types have been tested since 1999 in order to arrive at a LAD management plan that maximizes the attenuation of contaminants in the soil while limiting effects on LAD area vegetation. The current configuration is considered the most advantageous.

4. Engineering Evaluation/Cost Analysis (EE/CA)

Spectrum Engineering prepared the EE/CA on these removal actions for the BLM. The resulting recommendation is to optimize the current mine drainage and heap solution treatment systems in order to reduce costs and improve efficiency. No alternative treatment technology was identified by the EE/CA that would substantially improve protection of public health, welfare or the environment; or treatment performance, in a cost effective manner. Several relatively minor additional removal actions were recommended for King Creek, Swift Gulch, and on the Alder Gulch Waste Rock Dump, as previously explained, in order to improve overall removal performance.

5. Applicable or Relevant and Appropriate Requirements (ARARs)

The removal actions will attain, to the extent practicable considering the exigencies of the situation, Applicable or Relevant and Appropriate Requirements of federal and state laws. The identified ARARs are in EE/CA Appendix 4. Because the Removal Action is a variety of treatment plants designed to remove contaminants of concern from area streams, the main ARARs of interest are the Montana water quality standards as published in DEQ-7.

Section 300.415(i) of the National Contingency Plan requires that removal actions attain ARARs under federal or state environmental laws or facility siting laws, to the extent practicable

considering the urgency of the situation and the scope of the removal. In addition to ARARs, the lead agency may identify other federal or state advisories, criteria, or guidance to be considered for a particular release.

ARARs are either *applicable* or *relevant and appropriate*. *Applicable* requirements are those standards, requirements, criteria, or limitations promulgated under federal or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, or contaminant found at a site and would apply in the absence of a CERCLA cleanup (the Montana Water Quality Standards constitute an "applicable" ARAR). *Relevant and appropriate* requirements are those standards, requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that are not applicable to a particular situation but apply to similar problems or situations, and therefore may be well-suited requirements for a response action.

ARARs are divided into contaminant-specific, location-specific, and action-specific requirements. Contaminant-specific ARARs are listed according to specific media and govern the release to the environment of specific chemical compounds or materials possessing certain chemical or physical characteristics. Contaminant-specific ARARs generally set health or risk based numerical values or methodologies which, when applied to site-specific conditions, result in the establishment of numerical values. These values establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the ambient environment.

Location-specific ARARs are restrictions placed on the concentration of hazardous substances or the conduct of cleanup activities because they are in specific locations. Location-specific ARARs generally relate to the geographic location or physical characteristics or setting of the site, rather than to the nature of the site contaminants.

Action-specific ARARs are usually technology or activity based requirements or limitations on actions taken with respect to hazardous substances.

Only the substantive portions of the requirements are ARARs. Administrative requirements are not ARARs and do not apply to removal actions conducted on the Site. Provisions of statutes or regulations that contain general goals expressing legislative intent, but are non-binding, are not ARARs. In addition, in instances like the present case where the cleanup is proceeding in stages, a particular phase of the remedy may not comply with all ARARs, so long as the overall remedy does meet ARARs to the extent practicable.

Under Section 121 of CERCLA, 42 U.S.C. §9621, only those state standards that are more stringent than any federal standard are considered to be an ARAR provided that these standards are identified by the state in a timely manner. To be an ARAR, a state standard must be "promulgated," which means that the standards are of general applicability and are legally enforceable. The assessment of ARARs for the Site has been done with the cooperation and assistance of the Montana DEQ in 2004, and is listed in Appendix 4 of the EE/CA.

a. Non-Compliance with ARARs

The preferred removal action selected for cleanup of mining-related impacts at the Site will comply with ARARs to the extent practicable. Surface water and groundwater quality is expected to temporarily degrade to some extent by implementation of the preferred alternative, although not to the extent it would degrade if no response action were taken. This action includes continued monitoring for evaluating any further actions at the Site. Implementing the preferred removal actions will not hinder future response actions that may be required at the Site.

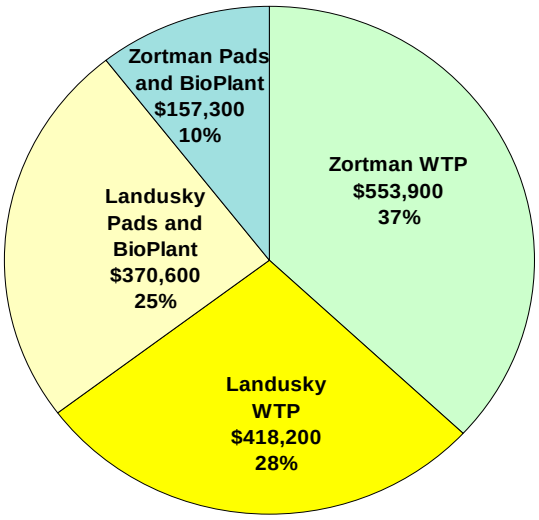
6. Project Schedule

Capture and treatment of mine drainage will continue as designed until mine drainage ceases or changes character such that treatment is not warranted. Treatment will be conducted year round and is anticipated to continue for at least five years at present rates.

Treatment and disposal of heap solutions is also underway. LAD of treated heap solution will continue until the fall of each year when inclement weather reduces land application efficiency. In lieu of land application, treated heap solution from the bioreactor may be mixed with treated or untreated mine drainage throughout the year. Treatment of heap solutions is not expected to be required in the long-term. As leach pad solution levels are drawn down over the next decade and surface reclamation limits infiltration, only periodic treatment of heap solutions will be necessary.

B. Estimated Costs

The costs to run OU1 and OU2 are presented in EE/CA Section 3.7.1. The overall annual cost estimate is $1.5 million, with $972,100 (65%) of the cost going to treat mine drainage in OU1; and $527,900 (35%) of the cost going to treat leach pad solution in OU2, as shown below.



A breakdown of the expenditures by category is presented in EE/CA Section 3.6 and Table 4 below.

Table 4. Estimated Costs for Operable Unit 1 and Operable Unit 2, Combined Operations.

Major Work Category	Costs	Percent Total
Labor Costs	$ 632,462	42 %
Chemicals & Reagents	329,516	22 %
Power, Heat, and Fuel	269,112	18 %
Other: tools, parts, lab fees	268,970	18 %
Annual Total Costs (2006)	**~ $ 1.5 million**	**100%**

Of the $1.5 million annual cost, the DEQ surety bond will pay for $731,321 per year through year 2017. After 2017, two trust funds are available to DEQ that will offset costs. Absent the development of cost-saving measures or significant changes in the character of the mine drainage, the net cost of the removal action is estimated at approximately $770,000 per year for OU1 and OU2 operations through 2017 (in 2006 dollars).

For the other removal actions in King Creek, Swift Gulch, and on the Alder Gulch Rock Dump top the estimated costs and funding sources are shown in Table 5.

Table 5. Estimated Costs for Operable Units 3, 4, and 5.

Removal Action Description	Initial Cost	Est. Annual Cost	Funding Source
Install passive treatment system in King Creek near L-5 monitor station (OU4)	$130,000	$5,000	Construction bond posted by ZMI under the Consent Decree
Install settling basins and conduct groundwater characterization study in Swift Gulch (OU5)	$ 200,000 to 600,000	unknown	BLM and State Grants
Place synthetic barrier on the top of the Alder Gulch Rock Dump (OU3 component)	$300,000	none	RIT grant awarded to DEQ in 2005

VI. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

Delayed or no action will increase the public health risks and threats to the environment because the on-site hazardous substances pose a health risk to children or adults who recreate near the Site, as well as to aquatic resources and area wildlife.

During calendar year 2005, the OU1 capture and treatment systems treated over 250 million gallons of mine drainage with elevated metals and acidity that would have entered area streams. Failure to take the removal action would place OU1 in a nonoperational status resulting in the untreated discharge of mine drainage in similar amounts and quality to that shown above in Tables 1 and 2.

Also during 2005, there were 45 million gallons of heap process solution treated in the OU2 biological treatment plant. Failure to continue the removal action would place OU2 in a nonoperational status, with several undesirable consequences. Shutting down the bioreactor would adversely affect the biological organisms used to remove nitrate, selenium and cyanide. Restarting the system would be more difficult and costly. Should the shutdown continue, failing to treat and remove the leach pad solutions would leave the present heap solution inventory at some 130 million gallons, and increasing with each precipitation event. Because the system can store about 350 million gallons, overtopping would not occur immediately; however, storage capacity would gradually decrease until the solution levels could no longer be contained. Either the solution would have to be treated or the system would overtop releasing process solution with contaminant levels similar to those shown above in Table 3. A lengthy shutdown in the treatment system may make the bioreactor ineffective due to changes in the chemistry of leach pad solutions.

Failure to install OU4, the passive treatment system in King Creek would result in continued levels of selenium and nitrate above background levels at the Site boundary, which is also the boundary with the Fort Belknap Reservation. The present levels of nitrate and selenium at the Site boundary do not presently pose a risk to public health or welfare (i.e., they generally meet chronic aquatic standards). However, the nitrate and selenium levels just upstream of the Site boundary, at monitoring station L-5, exceed water quality standards (values of 22.9 and 0.042 mg/l, respectively, detected on 06/30/2006). The removal action will reduce these levels and provide continued assurance that water leaving the Site meets ARARs where it entered the Fort Belknap Reservation.

Failure to install the OU5 settling ponds in Swift Gulch would most likely result in the continued migration of iron-rich sediments downstream. The ponds will be designed and constructed as semi-passive treatment systems that would remove iron oxide sediments along with some other metals, including zinc. Zinc levels at the Site boundary adjacent to the Fort Belknap Reservation have been increasing steadily. While the levels of zinc at the Site boundary do not presently pose a risk to public health or welfare, the metal levels upstream are continuing to increase and migrate downstream. The removal action will provide an added safeguard so that water leaving the Site meets ARARs in the future. The second component of OU5 is to conduct further characterization studies in order to identify the source areas from which the iron-rich seeps enter the Swift Gulch drainage. Without such study, it would be difficult to identify any specific source area(s) responsible for the elevated metals and low pH in upper Swift Gulch, nor would it be possible to distinguish its influence from natural background levels that are believed to be a contributing factor.

Delay or failure to install the synthetic reclamation barrier cover on top of the Alder Gulch Waste Rock Dump (an OU3 component) would result in no change to the volume of mine

drainage presently recovered in the Carter Gulch capture system at the base of the Alder Gulch Rock Dump. During 2005, approximately 11.3 million gallons of mine drainage was captured at the Carter Gulch capture system, treated, and released. Installation of the synthetic liner on 6.3 acres of the dump top will reduce the amount of precipitation that enters the waste rock and generates acid drainage. This removal action will reduce the amount of mine drainage that reports to the capture system by an estimated 21% (EE/CA, Section 3.1.6); saving an estimated $2,000 a year in treatment costs. More importantly, it will have the effect of increasing the ability of the Carter Gulch capture system to handle seepage from an extreme storm event without overtopping.

VII. PUBLIC INVOLVEMENT

A Community Relations Plan was prepared in February 2006 to facilitate communication and public involvement during preparation of the EE/CA. The draft EE/CA was released for public comment on May 24, 2006. A press release was issued to all the statewide news outlets. The document was posted to BLM's website on May 31, 2006. The release of the draft EE/CA and its findings received front-page coverage in the Great Falls Tribune on May 31, 2006 and general coverage in other newspapers and radio stations statewide.

In addition to the news coverage, BLM published Notices of Availability of the draft EE/CA and of the administrative record in the legal sections of three community newspapers. The legal notices were published in the Lewistown News Argus, the Phillips County News of Malta, and the Journal News-Opinion in Chinook. The legal notice was published in four separate issues of each newspaper.

Copies of the draft EE/CA were available at the BLM offices in Lewistown and Malta; and could be downloaded from the BLM website.

Comments on the draft EE/CA were received from only three entities. The comments and the BLM responses to those comments are in Attachment 2 of this Action Memorandum.

VIII. CONSULTATION WITH THE FORT BELKNAP GOVERNMENT

During development of the removal actions and preparation of the EE/CA, the BLM consulted at length with the Fort Belknap government. Key consultation events are listed below:

February 3, 2006. The Acting BLM State Director, Howard Lemm, sends a letter to Fort Belknap Council President Julia Doney. The letter seeks to consult with Fort Belknap in, ". . . the selection of cost-effective water management removal actions at the mines that are protective of human health and the environment." The letter says the BLM is "initiating government to government consultation on the content of the EE/CA and the selection of the non time-critical removal action." And, that to begin the consultation process, BLM will be sending Fort Belknap the preliminary draft EE/CA and is available to meet with Fort Belknap's staff to discuss the

removal action and solicit input on the document. The letter also confirms a meeting with the Fort Belknap Community Council to discuss the removal action.

February 3, 2006. Two copies of a "consultation draft" EE/CA are sent to President Doney from Scott Haight, BLM Project Coordinator. The cover letter states that BLM is requesting Fort Belknap's input on the content of the EE/CA and the selection of the removal action. Copies of the consultation draft EE/CA are emailed to Dean Stiffarm with the Fort Belknap Environmental Department and to Mr. David Chambers, technical consultant for Fort Belknap.

February 21, 2006. Comments on the preliminary consultation draft EE/CA are received from David Chambers.

February 24, 2006. BLM and EE/CA contractor Spectrum Engineering meet with David Chambers and Dean Stiffarm. Wayne Jepson with DEQ is also present. The group reviews David Chambers letter and additional comments provided by Dean Stiffarm's on the consultation draft EE/CA.

February 28, 2006. The planned March 2nd meeting to discuss the removal action with the Fort Belknap Community Council is delayed due to the basketball playoffs. The meeting is rescheduled for March 22.

March 22, 2006. A consultation meeting held with the Fort Belknap Community Council in their chambers at Fort Belknap. In attendance are Fort Belknap Council members, Council President Doney, Consultant David Chambers, Dean Stiffarm of the Fort Belknap Environmental Department, BLM Malta Field Manager, BLM Deputy State Director, BLM State Abandoned Mine Land Coordinator, BLM On Scene Coordinator, Bill Maehl with Spectrum Engineering, and Wayne Jepson with DEQ. Presentations and discussions covered the site conditions and the potential removal actions contained in the consultation draft EE/CA. BLM requests Fort Belknap's input on the adequacy of the various treatment measures or removal technology. The local radio station broadcasts the meeting to the area public. After the meeting, the technical specialists from Fort Belknap, BLM, and DEQ meet at the Fort Belknap Environmental Department office. The group discusses work that could be done in Swift Gulch this year, and the development of a revised site wide water resources monitoring plan in lieu of the monitoring plan prepared in April 2002 to support the MPDES permits.

April 7, 2006. Scott Haight emails Dean Stiffarm with a proposal for testing depth to bedrock and building a settling berm in Swift Gulch a part of data collection needed to develop plans for the removal action in Swift Gulch.

April 12, 2006. Jim Mitchell, BLM, and David Chambers, Dean Stiffarm, Bill Maehl, and Wayne Jepson meet in Bozeman and develop a new water resources monitoring plan. This monitoring plan is contained in EE/CA Section 3.5.

May 1, 2006. Phone conversation between Scott Haight and Dean Stiffarm. Dean says that the Fort Belknap Council does not have any additional comments on the preliminary draft EE/CA other than what we heard at the March 22nd meeting, and what Dean and Dave Chambers

provided in February. Dean concurs that it is okay for BLM to put a draft EE/CA out for general public comment.

May 31, 2006. The BLM On Scene Coordinator, Scott Haight, sends Fort Belknap President Julia Doney two copies of the draft EE/CA along with a request for the Fort Belknap government's input on the content of the EE/CA and the selection of appropriate removal actions. The letter offers to meet again with the Fort Belknap Council to discuss the draft EE/CA.

June 15, 2006. BLM holds a tour of the Zortman-Landusky Site with the Fort Belknap Community Council and interested Fort Belknap residents. About 20 people attend. The BLM On Scene Coordinator confers with President Doney and verifies that she received the draft EE/CA and offers for BLM to come visit again with the Council. President Doney advises that she will let BLM know if further discussion with the Council is necessary.

July 5, 2006. An emailed letter is received by Scott Haight, BLM, from Fort Belknap President Doney. Fort Belknap requests a 30-day comment period extension in order for the Tribal government's legal counsel to evaluate the draft EE/CA. The extension is requested due to an IBLA decision that dismissed as moot Fort Belknap's appeal of the BLM's 2002 Record of Decision on mine reclamation.

July 11, 2006. Scott Haight, BLM emails Dean Stiffarm and President Doney in response to Fort Belknap's request for extending the comment period. Fort Belknap is provided extra time until August 4, 2006 to evaluate the draft EE/CA and provide the BLM with comments.

August 4, 2006. A letter is received from Fort Belknap President Doney regarding the draft EE/CA. In addition to providing technical comments on the draft EE/CA, the letter disavows previous consultation efforts and requests that BLM "initiate" government to government consultation with the Fort Belknap government regarding the selection of a preferred alternative.

IX. CONSULATION WITH THE STATE OF MONTANA

During preparation of the June 2004 Action Memorandum, the BLM receives input from the Montana DEQ regarding what it considers to be ARARs for the Site.

From November 2005 to present, the BLM participates in the State's technical working group meetings and discussions. The group consists of representatives from the DEQ, and plaintiffs Fort Belknap, National Wildlife Federation, Montana Environmental Information Center, and Mineral Policy Center, who are the involved in the state litigation over reclamation at the mines. BLM's role is to provide information on the progress of the EE/CA and to ensure incorporation of the technical working group's input into the EE/CA preparation.

On February 6, 2006, the BLM sends copies of the preliminary "consultation" draft EE/CA to Montana DEQ Director Richard Opper and DEQ Project Manager Wayne Jepson. The cover letter says that BLM would like to consult with DEQ on the preparation of the EE/CA and the

selection of the removal actions. The letter confirms input is also being solicited from Fort Belknap and that arrangements for a technical specialist meeting have been made.

Wayne Jepson sends an email on May 1, 2006 stating that the Montana water quality standard for cyanide is based on the "total" cyanide analytical method, not the "weak acid dissociable" method, and requests that total cyanide be listed as the ARAR in the EE/CA.

On July 5, 2006, Wayne Jepson sends comments on the draft EE/CA regarding status of the State Operating Permits for the mines. This comment is followed up with DEQ-suggested wording.

X. OUTSTANDING POLICY ISSUES

None.

XI. RECOMMENDATION

Conditions at the Zortman and Landusky mine Site meet the NCP Section 300.415(b)(2) criteria for a Removal, and I recommend your approval of the proposed removal actions:

Scott Haight
On Scene Coordinator

9/6/2006
Date

I concur with the recommendation to implement the proposed action as described in this Action Memo for the Zortman and Landusky mine Site removal actions:

Mark K. Albers
Field Manager

9/7/2006
Date

I approve the recommended proposed action as described in this Action Memo for the Zortman and Landusky mine Site removal actions:

Howard Lemm
Acting State Director

9/11/06
Date

ATTACHMENTS:

1 – BLM-DEQ Memorandum of Understanding, 2 pages.
2 – Comments and Responses on the Draft EE/CA, 13 pages.

SUPPLEMENTAL REFERENCE DOCUMENTS:

Support/reference documents that may be helpful to the reader and/or have been cited in this report may be found in the Administrative Record at the Lewistown Field Office, Airport Road, Lewistown, Montana, phone number (406) 538-1900. The following reference documents may be particularly useful:

Agency for Toxic Substances and Disease Registry, 1998. Petitioned Public Health Assessment for Kings Creek (a/k/a Fort Belknap Indian Reservation/Zortman Mining, Incorporated). CERCLIS No. MTD986069920, Lodgepole, Blaine County, Montana. May 14, 1998.

BLM, 2004, June. Action Memorandum for Zortman and Landusky Mines Time-Critical Removal, Operable Unit 1 & Operable Unit 2. Malta Field Office, Bureau of Land Management. 44 pages.

BLM, 2006, February. Preliminary Draft Engineering Evaluation/Cost Analysis (EE/CA) For Water Management at the Zortman and Landusky Mines, Phillips County, Montana. Prepared by Spectrum Engineering for BLM. Document is a labeled as "Consultation Draft" submitted to the Fort Belknap government as part of BLM's consultation process.

BLM, 2006, June. Draft Engineering Evaluation/Cost Analysis (EE/CA) For Water Management at the Zortman and Landusky Mines, Phillips County, Montana. Prepared by Spectrum Engineering for BLM.

BLM, 2006, September. Final Engineering Evaluation/Cost Analysis (EE/CA) For Water Management at the Zortman and Landusky Mines, Phillips County, Montana. Prepared by Spectrum Engineering for BLM.

BLM/DEQ, 1996. Final Environmental Impact Statement, Zortman and Landusky Mines Reclamation Plan Modifications and Mine Life Extensions.

BLM/DEQ, 2001. Final Supplemental Environmental Impact Statement for Reclamation of the Zortman and Landusky Mines, Phillips County, Montana.

BLM/DEQ, 2002. Record of Decision for Reclamation of the Zortman and Landusky Mines, Phillips County, Montana. 77 p.

Consent Decree, September 27, 1996. United States and the State of Montana, Plaintiffs vs. Pegasus Gold Corporation and Zortman Mining Inc. CV 95-95-BLG-JDS; and Gros

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IT Corporation, September 1999. Engineering Evaluation/Cost Analysis Report, King Creek, Phillips and Blaine Counties, Montana. Prepared for U.S. EPA and U.S. Army Corps of Engineers.

Spectrum Engineering, August 2006. Zortman/Landusky Reclamation Site – 2006 Second Quarter Discharge and Water Monitoring Report.

Zortman and Landusky Mines Ground Water and Surface Water Monitoring Plan, April 2002, Interagency Technical Working Group.

Zortman and Landusky Mines Ground Water and Surface Water Monitoring Plan, Revised April 2006, Interagency Technical Working Group.

- ATTACHMENT 1 -

Zortman and Landusky Mines
Memorandum of Understanding between the
Bureau of Land Management
and the
Montana Department of Environmental Quality

Introduction:

The Zortman and Landusky mines operated from 1979 through 1998 when the mine operator, Zortman Mining, Inc. (ZMI) filed for bankruptcy protection. Since 1998, the Bureau of Land Management (BLM) and the Montana Department of Environmental Quality (DEQ) have worked together with the bankruptcy trustee, in the role of mine operator, to complete reclamation and closure of the mines. With the discharge of the ZMI bankruptcy proceedings, an operator of record no longer exists.

The BLM surface management regulations at 43 CFR 3809 for mining activities on public lands presume the presence of a mine operator. With the discharge of the bankruptcy, the BLM regards the Zortman and Landusky mines as abandoned mines.

Current conditions at the mines require the ongoing capture and treatment of mine drainage, and the removal and treatment of heap leach processing solution. Since 1999, the DEQ has been operating the mine drainage and heap solution water treatment plants. Funding for this effort has been provided, in part, by the ZMI surety bonds posted with the State of Montana. The present capture and treatment systems remove mine drainage or leach pad solution that is either from BLM lands or would impact BLM lands.

BLM has reviewed conditions at the Site and determined that, concurrent with the DEQ actions, the capture and treatment activities should continue as time-critical removal actions through the agency's delegated authority (Executive Order 12580) under the Comprehensive, Environmental, Response, Compensation, and Liability Act (CERCLA) in order to protect public lands and resources. An Action Memorandum has been prepared to document the BLM's removal action determination (Attached).

Purpose

The purpose of this memorandum of understanding (MOU) is to coordinate the current DEQ water treatment activities with the BLM's removal actions in order to avoid duplication of effort and maintain efficient operation of the capture systems and treatment plants.

Authority

The Federal Land Policy and Management Act of 1976, Section 307(b), 43 U.S.C. 1737; and Montana Code Annotated (MCA) at 75-10-603 and 82-4-323.

Points of Agreement

The BLM and DEQ agree as follows:

1. DEQ will continue to operate the two mine drainage capture and treatment systems (designated OU1) and the heap solution treatment and disposal system (designated OU2) for BLM, as removal actions under BLM's CERCLA authority, in addition to operating these systems as part of DEQ's mine reclamation effort under the Montana Metal Mine Reclamation Act (82-4-301 et. Seq. MCA).

2. Day to day operation of OU1 and OU2 will continue to be done by contractor under contract with the DEQ, using funds provided by the surety companies. Contracted activities will be conducted in accordance with Montana statute and authority, and with BLM's CERCLA procedures.

3. BLM will provide supplemental funding to DEQ, to the extent allowed in BLM's budgeting process; in order to maintain operation of the water treatment plants after the annual surety payment has been expended.

4. DEQ will not charge the BLM for the use of any DEQ equipment, supplies, facilities, land, infrastructure or personnel at the site used to conduct or support the removal actions.

5. BLM will not charge DEQ any rent or lease fees for the buildings, treatment plants, facilities or support structures that are located on BLM lands and used to conduct or support the mine reclamation or removal actions.

6. The areas of mine reclamation (pits, pads, waste rock piles, etc.) are designated by BLM as Operating Unit 3 (OU3). Presently, these areas are being reclaimed in accordance with the agencies' mine reclamation requirements. Additional CERCLA removal actions may be necessary to protect BLM lands. BLM and DEQ agree to cooperate in any future removal actions taken on or adjacent OU3 components.

Funding

Nothing in this MOU shall obligate the BLM to expend appropriations or to enter into any contract or other obligation. Specific work projects or activities that involve the transfer of funds, services, or property between the MOU parties will require the execution of separate agreements or contracts, contingent upon the availability of funds as appropriated by Congress. Each subsequent agreement or arrangement involving the transfer of funds, services, or property shall be made in writing and shall be independently authorized by appropriate statutory authority and regulations, including those applicable to procurement activities.

Termination of Agreement

This agreement shall terminate 60 days after written notice by either party, with or without cause.

Effective Date

This agreement is effective upon signing by both the BLM State Director and the Director of the Montana Department of Environmental Quality.

/S/ Jan P. Sensibaugh — *August 2, 2004*

Jan P. Sensibaugh, Director — Date
Montana Department of Environmental Quality

/S/ Martin C. Ott — *June 25, 2004*

Martin C. Ott, State Director — Date
Bureau of Land Management

Attachment – 1

Action Memorandum for the Zortman and Landusky Mines Time-Critical Removal, Operable Unit 1 & Operable Unit 2, 44 pages. [See administrative record to view *June 2004 Action Memorandum*]

- ATTACHMENT 2 -

Comments and Responses on the Draft EE/CA

Montana Department of Environmental Quality, Wayne Jepson

1. Comment: On page ES-1, end of the first paragraph of the Executive Summary, it states that DEQ continues to oversee mine reclamation and closure under the MMRA. This is not correct, as the sites are no longer covered by Operating Permits. You should check with John North or Claudia Massman concerning DEQ's continuing authority over Zortman and Landusky.

Response: The text on page ES-1 has been edited to clarify that the DEQ is assisting with water treatment activities according to the terms of the Memorandum of Understanding entered into between DEQ and BLM in 2004.

Kirsten Moran, University of Calgary

2. Comment: There are many innovative, efficient and apparently effective measures being taken. For instance, the use of the sludge pits to raise pH and reduce arsenic in leach pad water. On page 8-2 it mentions that the long term use of this method is questionable since the alkalinity may be consumed in the future. Isn't still sludge being produced?

Response: Yes, sludge will continue to be produced and alkalinity will be added to the sludge ponds from this source. The concern is that the alkalinity may be consumed faster than it is replaced unless additional alkalinity is added.

3. Comment: As I am not a chemist nor an ARD specialist, there is probably a good reason why the following won't work. But just for fun: is there a way to increase the oxidation rate of the sulphide ore (add a strong oxidant for instance) remaining such that capture and treatment is required for a shorter amount of time?

Response: So far as the heap leach pads are concerned, they are already in a very oxidizing condition and are not oxygen limited, so it is doubtful that adding an oxidizing agent would speed up the reaction. Even if an oxidizing agent could speed up the reaction, as a practical matter there is no way to get the oxidizing agent into contact with all the acid forming material. It would be necessary to set up some type of a chemical distribution system similar to that used during the heap leach operation, and there is no way to control the flow paths deep inside the leach pads. For the mine drainage/ARD, much of the water treated comes from old underground workings. There is no way to effectively introduce oxidizers into these sources. Even if we were able to rapidly oxidize a portion of the source material, it would still be necessary to collect and treat water for a long time.

4. Comment: Is it prudent to have the same company who has designed much of the remediation and is managing the sites conduct and analysis? Might a new set of eyes bring more issues/options to light?

Response: Shortly before the EE/CA was prepared, a new Site management contract was put out for bid. Only two other companies besides Spectrum were interested; i.e., thought they had something new to offer. Even then, their proposals did not contain any new technological approaches to site problems. During the process of preparing the EE/CA, Spectrum Engineering reviewed all the recent literature and discussed the issues and problems with other experts in this field in order to incorporate a wide array of expertise and input. Over the past decade, several outside consultants and experts from the EPA have reviewed the Site and made recommendations that have already been incorporated to improve Site operations and practices. The BLM believes, with the outside consultation that has occurred, that the intimate detailed knowledge Spectrum possess from working on the site for the past seven years provides a greater advantage to developing feasible removal action alternatives, than an entity with no experience at this particular site.

5. Comment: Section 4.2.3 isn't complete (Page 4-18 the last sentence isn't complete). Section 8.1.3 may not be complete.

Response: The last sentence of 4.2.3 is complete. "The flow was 120gpm in April 2006." The last sentence of 8.1.3 should end with a period rather than a comma.

6. Comment: A couple of times in the report visual examination is mentioned as a method to separate rock by sulphide content. How accurate is this? Is this practice still used in the industry?

Response: The visual examination was conducted by the mine operator as a way to classify the rock types. The visual examination records, rather than actual assays, are all that is available. The concept is based on the fact that the oxidized rock is a different color than the un-oxidized rock. The practice, although somewhat subjective, can be reasonably reliable if it is regularly crosschecked with chemical analysis. The other risk is that visual examination only addresses the surface character and not that of the entire rock mass.

7. Comment: Again, I'm not a chemist or ARD specialist so please excuse my lack of technical expertise. Lime has been added to some of the pits. I understand that the amount of lime required is determined by acid base accounting. Does ABA take into account rates of reaction and availability of acids and bases? Does the particle size or surface area of the lime added matter? Is it possible that it will dissolve at a different rate than acid is being produced?

Response: ABA tests do not consider the reaction rates but simply looks at the balance of acid-generating and acid-neutralizing rock present in the sample. Particle sizes do affect reaction rates, and it is theoretically possible for the lime to dissolve and leave the system faster than the

acid generating material. In this particular case, the lime addition was used to prevent or limit acidification of the cover soil in order to help with vegetation establishment. It was not intended to permanently neutralize the entire rock mass.

8. Comment: Clay liners have been noted not to perform well in arid environments over the long term. If the clay caps/liners begin to crack/degrade, what anticipated effects will this have on the water balance of the site and the level of environmental protection provided?

Response: All of the areas with clay liners report to the water capture systems, so if the liners leak, the effect will be for more water to report to the water treatment plants. Adverse impacts would be limited while the water is being collected and treated. Once vegetation is fully established, the consequences of desiccated clay in the reclamation cover will be minimal.

9. Comment: Section 6.1.2.3 discusses the addition of manure to the piles. Could this create a new set of water quality concerns?

Response: Manure is regularly used in passive and semi passive bioreactors. We are not proposing to use manure, but there is always the possibility of contaminating the water with harmful bacteria if it were done on a large scale. We are not aware that this has ever been reported as a problem.

10. Comment: I had some trouble following the discussion of wind power in the executive summary, so please excuse me if I misunderstood something. Since the site has good generation potential, it seems like a viable way to reduce costs considerably. Is it possible, rather than attempt to generate the exact amount required by the site, to sell excess power back to the grid in order to help earn back some of the capital costs incurred?

Response: The site has excellent potential for commercial wind generation. If wind generators were installed, the intent would be to sell generated power back into the power grid to offset capital costs for the wind plants and water treatment operating costs.

11. Comment: I understand that the waste from the crystal clarifiers is buried (pg 3-39). What is the nature of the waste?

Response: The filter medium is diatomaceous earth, which is mostly silica. The clarifiers filter out any of the iron and aluminum hydroxide precipitates that do not settle out in the pH Pond. The waste will be similar in character to the sludge from the water treatment plants.

Fort Belknap Indian Community, Julia Doney - President

12. Comment: The Fort Belknap Indian Community (FBIC) appreciates the opportunity to comment on the draft Engineering Evaluation/Cost Analysis (EE/CA) on water treatment at the Zortman-Landusky mine sites. However, the FBIC maintains that the opportunity to comment on the draft EE/CA does not fulfill the Bureau of Land Management's responsibility to engage in full "government to government" consultations with the FBIC regarding the actual selection of a preferred alternative. See, Executive Order 13175, 65 FR 67249, Consultation and Coordination with Indian Tribal Governments; BLM Manual 8160, General Procedural Guidance for Native American Consultation.

Response: BLM agrees that consultation can involve more than the opportunity to comment. That is why in addition to having the opportunity to comment on the draft EE/CA the BLM specifically engaged in government-to-government consultation with the Fort Belknap government. The consultation process was initiated on February 3, 2006 when the BLM State Director contacted the Fort Belknap President to begin consultation on the ". . . *content of the EE/CA and the selection of the non time-critical removal action.*" The consultation process continued with technical meetings, the presentation of a "consultation draft" EE/CA specifically to help elicit Fort Belknap's input on the removal actions, a consultation session between the BLM decision makers and the Fort Belknap Council, a site tour for the Council and other Fort Belknap residents, and an extension of the comment period just for Fort Belknap. More detail on the consultation process is presented above in part VIII of the Action Memorandum. The BLM believes it has fully consulted with the Fort Belknap government and is not aware of any unaddressed issues Fort Belknap has with the removal actions. The BLM anticipates that, as the removal actions progress, there will be continued involvement and ongoing consultation with Fort Belknap in monitoring site conditions and removal action performance.

13. Comment: Executive Summary (page ES-l). *"In June 2004, the BLM issued an Action Memorandum for Time-Critical removal actions".* The FBIC received a letter from the BLM, Lewistown Field Office, dated May 31, 2006, requesting the FBIC to select appropriate non-time critical removal actions. The BLM's implementation of CERCLA for time-critical removal actions and the later request for selection of non-time critical removal actions is confusing. The FBIC requests that the BLM fully explain the scope of time-critical removal actions and the scope of non-time critical removal actions relating to the contamination and clean-up at and surrounding the Zortman-Landusky mine sites.

Response: The difference in scope between "time-critical" and "non time-critical" removal actions is mainly with the implementation timeframe. The time-critical removal actions are implemented within six months and do not require the preparation of an EE/CA, only an Action Memorandum. The non time-critical removal actions are those that have a projected implementation timeframe of at least six months, allowing for the preparation of an EE/CA. In the case of the Zortman and Landusky Site, since the removal actions have at least six months of advanced planning available they can be considered non time-critical and require the preparation of an EE/CA.

14. Comment: Executive Summary (page ES-2). *Current Site Conditions. "With natural attenuation, the treated water does satisfy all DEQ-7 standards before leaving the site boundary shown in Figure* 2, *located in Section* 2." The BLM has arbitrarily extended the site boundaries in an effort to meet ARARs, including water quality standards. By extending the site boundaries, the BLM has been able to increase the size of the mixing zones in order to lessen the overall contaminant levels, particularly at the King Creek and Swift Gulch drainages. The FBIC strongly objects to BLM moving the site boundaries to meet ARARs.

Response: The Site boundaries are not for the purpose of establishing mixing zones but instead are used to describe the area within which the contaminates exist and where the removal actions will be conducted. If, for example, contaminants were to increase significantly downstream beyond the present site boundary, the site boundary would have to be expanded in order to conduct removal operations in that area. Conversely, as removal actions are implemented and contaminant levels decrease, the site boundaries could be contracted as the area of removal operations shrinks.

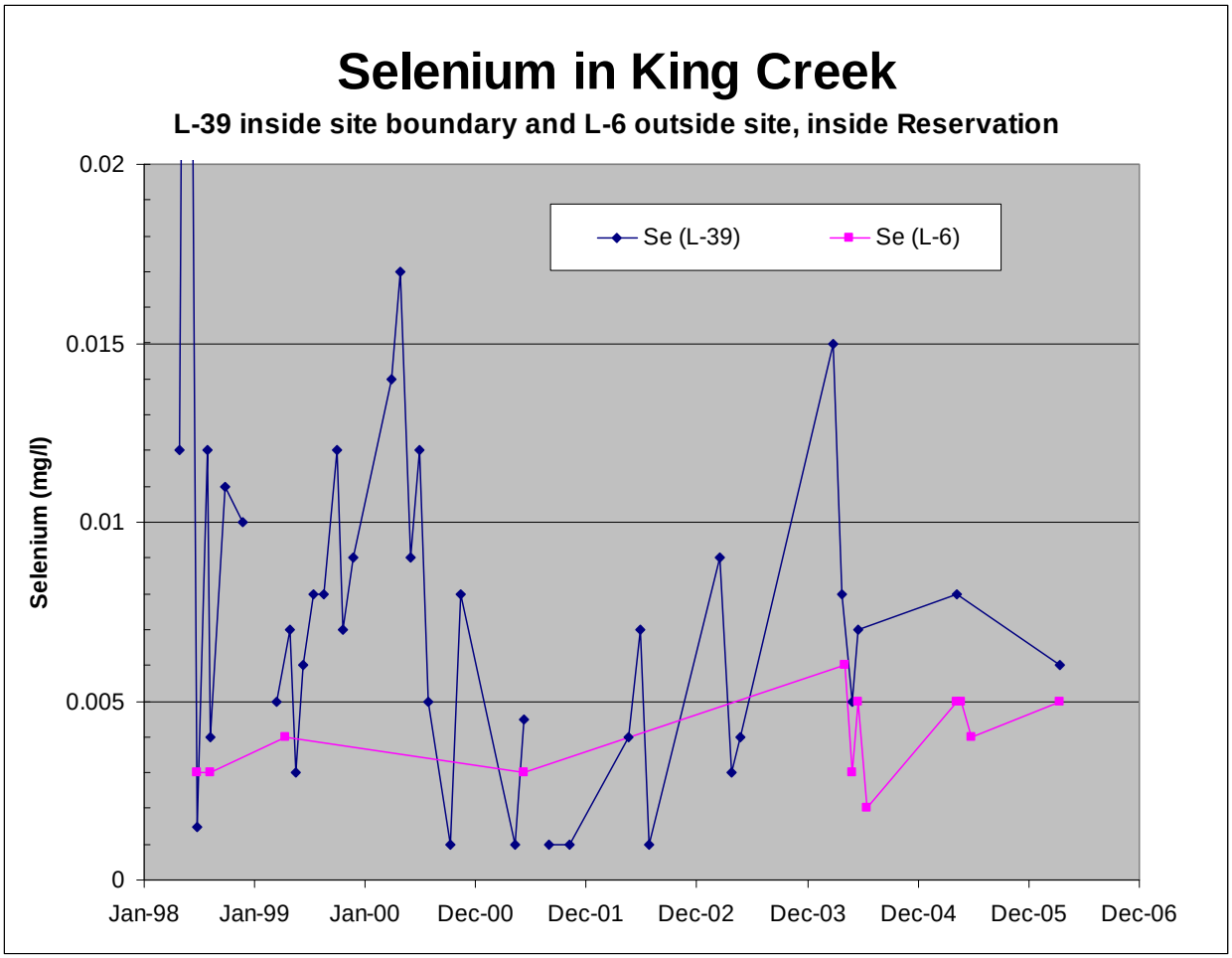
15. Comment: In a number of places in the EE/CA, it is noted that 'treated water meets WQB-7 before leaving the site boundary.' The FBIC notes that WQB-7 standards are not being met at the site boundary in King Creek, where the standard for selenium is regularly being violated.

Response: King Creek water is not treated water, as referenced in the EE/CA. Secondly, King Creek water does meet the DEQ-7 human health standards at the site boundary. Although the chronic aquatic life criterion for selenium in King Creek is not always met, the water does not pose a risk to human health. The Selenium inside and outside the site boundary in King Creek meets human health and safety standards and acute aquatic standards. Plus, the water quality at both sites hovers around the 0.005 mg/l, the aquatic chronic standard as shown in the attached graph and the following standards table.

Selenium Standards	mg/l
Aquatic Chronic	0.02
Aquatic Chronic	0.005
Human health (Surf & Gr) water	0.05

It should be noted that the accuracy of the laboratory analysis is ±0.001 ppm. This means that statistically, any value between 0.004 and 0.006 mg/l could represent the same concentration. The selenium concentration in King Creek at L-6 (just inside the Reservation boundary) therefore satisfies the both the human health and aquatic standards.

A passive treatment system to remove nitrates and selenium is the selected removal action for King Creek. This system will use the same selenium-reducing technology currently in use in the biological treatment plant. This system should be in place by the end of 2006 and is intended to keep selenium levels well below the DEQ-7 standards.



16. Comment: 1.0 Introduction and 1.2 Objective (page 1-4). *"Removal actions are to be conducted in conjunction and cooperation with the Montana DEQ actions at the site."* The FBIC draws attention to the BLM's ongoing responsibility to consult with the FBIC, pursuant to Executive Order 13175, 65 FR 67249, Consultation and Coordination with Indian Tribal Governments, and BLM Manual 8160, General Procedural Guidance for Native American Consultation. The FBIC recommends that the BLM acknowledge this responsibility in the EE/CA and include government to government consultation between the BLM and the FBIC as a required aspect of selecting and implementing any removal actions, whether or not included as an alternative in the draft EE/CA.

Response: The text in Section 1.2 has been modified to include maintaining consultation with the Fort Belknap government as the removal actions are implemented. Part VIII of this Action Memorandum describes the consultation process that occurred between the BLM and Fort Belknap on the selection of the removal actions.

17. Comment: 2.0 Site Location and Historic Timeline and 2.2 Site Description (page 2-3). *"The Little Rocky Mountains were determined eligible for listing on the National Register of*

Historic Places as a Traditional Cultural Property." The FBIC requests further information from the BLM regarding the status of listing on the National Register, including but not limited to a discussion of whether the BLM is currently working on getting the Little Rocky Mountains listed on the National Register of Historic Places as a Traditional Cultural Property, and if not, why not.

Response: The BLM is not currently working on a National Register nomination for the Little Rocky Mountains (LRM) as a Traditional Cultural Property (TCP). The working boundary of the LRM - TCP District includes a great deal of private land in addition to the BLM-public land, Tribal land, allotted land and state land. Listing a property on the National Register with multiple ownership requires the notification and consent of a majority of the property owners (36 CFR 60.6(g)).

When BLM made the determination that the LRM were eligible for the National Register as a TCP District, numerous private landowners objected. Properties determined eligible for the National Register are treated the same as properties actually listed on the National Register by federal agencies. Since the private landowners in the LRM-TCP object to listing and listing would not change BLM's treatment of the property, BLM has no plans to pursue actual listing of the LRM-TCP District on the National Register.

18. Comment: 2.0 Site Location and Historic Timeline and 2.3 Mining History (page 2-4). *"Gold was discovered in Alder Gulch on July* 3, 1884, *which triggered a gold rush."* The FBIC strongly suggests the draft EE/CA provide more historical information regarding the Little Rocky Mountains, including but not limited to Alder Gulch, in order to fully explain the FBIC's present interest in the effective clean-up of the Zortman and Landusky mine sites and surrounding areas. Such historical information should include but not be limited to the fact that the Little Rocky Mountains were once part of our reservation land base until trespassing miners located gold and our Tribal Ancestors were coerced through the Grinnell Agreement to sell the mountains.

Response: The purpose of the EE/CA is to address the cleanup of mining-related water quality contamination. Additional site history is included in Appendix 1, and has been modified to acknowledge Fort Belknap's assertion that it was coerced to sell the land. BLM records do not show that *all* the Little Rocky Mountains were within the Reservation prior to the Grinnell Agreement. The Grinnell Agreement included only the purchase of lands on the north side of the Little Rocky Mountains, and did not include Alder Gulch.

19. Comment: 2.0 Site Location and Historic Timeline and 2.3 Mining History (page 2-4). *"An environmental impact analysis was completed in* 1979." The FBIC requests that the draft EE/CA state that this was a draft report by DEQ. This report was never finalized, even though the DEQ continued to make amendments to it at later times.

Response: The 1979 EIS was finalized by the State. Our records show that on May 17, 1979 the Montana Department of State Lands (the precursor to the DEQ) issued the State's final EIS

documentation. The documentation consisted of a letter to the Governor, State Environmental Quality Council, and all commenting and consulting parties, advising that it was adopting the Draft EIS under State rules as final for purposes of making a permit decision; and included the State's responses to comments received on the Draft EIS. In the early days of EIS writing under NEPA, or in this case MEPA, it was fairly common practice to simply respond to comments and adopt a draft EIS as the final document.

20. Comment: 3.0 Site Characterization and Risk Assessment and 3.1.6 Zortman Mine Regrading and Backfilling Reclamation (OU3) (page 3-8). *Work Remaining-"The preferred reclamation alternative selected in the 2002 ROD for the Zortman Mine was Alternative Z6."* The FBIC continues to support the preferred reclamation alternatives identified in the 2002 ROD, and requests that BLM make all necessary efforts to comply with Alternatives Z6 and L4.

Response: Alternatives Z6 and L4 have been completed on BLM-managed lands. BLM believes that the modification selected for the reclamation on the top of the Alder Gulch Waste Rock Dump (under EE/CA Alternative AG-200) offers superior protection for area water resources and public lands than the reclamation originally planned for this facility by DEQ under Alternative Z6 in their 2002 ROD.

21. Comment: 3.0 Site Characterization and Risk Assessment and 3.1.7.2 Sludge Disposal Pits (page 3-12). *"Turbidity and precipitates that settle out of the treated water (sludge) are pumped in slurry to either of two disposal pits."* The FBIC requests that the BLM [add] a statement in the EE/CA that the Sludge Disposal Pit process will be closely monitored in the event that this process results in a high metal concentration in the future.

Response: A statement has been added to section 3.1.7.2. The sludge in the disposal areas will be periodically tested and monitored for the accumulation of high metal concentrations. Should metal concentrations in the sludge become mobile, corrective actions, including encapsulation, may be implemented.

22. Comment: 3.0 Site Characterization and Risk Assessment and 3.2.5.2.1 Swift Gulch (page 3-25). *"Because Swift Gulch drains toward reservation land, control measures have been implemented to minimize the amount of ground water and surface water moving from mine areas into this drainage."* The FBIC maintains that the BLM does not yet fully understand the hydrology of the Swift Gulch drainage, due to the BLM's continued insistence that the contamination at Swift Gulch is naturally occurring, despite the sudden rise in contamination there in 1998 and thereafter, and the results of the DEQ tracer flow test which shows that contaminants from the mine sites are ending up in Swift Gulch. In the IBLA case, Island Mountain Protectors, 144 IBLA 168 (1998), the IBLA noted that the BLM is obligated to understand groundwater flows in order to make reasoned choices. The FBIC requests that the BLM take further action to meet this duty in the present situation.

Response: The reclamation measures undertaken in the Landusky Mine pit area were based on the premise that restricting water flow from infiltrating through the mine pits and migrating toward Swift Gulch would protect the water quality in that drainage from mining-related impacts whether or not seepage through the mine pit was recharging groundwater that entered Swift Gulch. BLM still believes those reclamation measures to be a prudent course of action. However, the further study of Swift Gulch completed in 2005 identified natural outcrops of acid-generating rock adjacent the creek, similar to what is present in the Landusky Mine pit areas. The degree to which the natural bedrock geology, prehistoric ferricrete deposits, and associated fracture system is contributing to the elevated metals and acidy Swift Gulch is not clear. Whatever the cause, BLM agrees that additional study to characterize the hydrogeology of the drainage basin would be useful. That is why the selected EE/CA alternative is SG-300, which includes an expanded characterization study of Swift Gulch in addition to the construction of the settling ponds.

The DEQ tracer test did not conclude that contaminants from the mine are ending up in Swift Gulch. The tracer was injected into well ZL-315, which is located north of the Landusky Mine pits, between the mine and Swift Gulch. For the test to show a clear connection between the mine and Swift Gulch, the tracer would have to have been injected into a well further south and actually traveled through the mine site and then into Swift Gulch. In this case, tracer injection occurred beyond the mine site, closer to Swift Gulch, and only clarified flow paths and travel times from this northernmost monitoring well to the creek.

23. Comment: 3.0 Site Characterization and Risk Assessment and 3.3.3 Biological Treatment Plant (page 3-37). *"It was designed to remove cyanide, selenium, and nitrates from leach pad water using three processing tanks containing carbon bedding."* The FBIC is concerned that this plant is aimed more at recovering gold and silver still present in the leach pad waters, rather than adequately cleaning up the contaminated waters. The FBIC requests that the BLM provide further information about this treatment plant and the justification for processing the used carbon offsite.

Response: The Fort Belknap concern with the bioreactor is confusing, considering that the technical review committee which selected this treatment system included a member of the Fort Belknap Environmental Department, a technical consultant working for the Fort Belknap Tribes, the EPA, the BLM, the DEQ, and Spectrum Engineering. The issue of gold recovery by the bioreactor was also discussed at the consultation meeting with the Fort Belknap Council on March 22, 2006. The bioreactor is not designed nor intended to recover gold or silver. Carbon leach systems originally used at the mine to recover gold in the mid-90s operated in high cyanide, high pH conditions; neither of which is present in the solution being treated today. The carbon substrate is used because it has a large surface area to volume ratio that improves the efficiency of the bacteria by providing more surface area for the biofilms to grow upon. No carbon will need to be processed for many years, and processing may or may not be done offsite depending on the technical difficulty involved at that time. The carbon that is presently stored onsite near the bioreactor is extra material that will be used in construction of the King Creek passive treatment system.

24. Comment: 3.0 Site Characterization and Risk Assessment and 3.5 Sampling and Analyses Plan (page 3-42). *"All King Creek and Swift Gulch surface water will be sampled quarterly."* The FBIC requests that King Creek, Swift Gulch, and Lodge Pole Creek drainages be sampled monthly, rather than quarterly, in order to obtain adequate and useful water quality information and to ensure that the BLM is meeting its trust responsibility to protect the Tribes from harmful water contamination and undue water quality degradation.

Response: The sampling and analysis plan described in this section is for the normal operational sampling events. It does not include sampling for research purposes, which will be the case in Swift Gulch. Numerous additional samples will be collected in Swift Gulch as part of removal alternative SG-300. Of course, sampling in Swift Gulch is seasonal with sample collection between November and April limited by weather conditions. There is no reason to sample Lodgepole Creek on a more frequent basis. The 28 years of monitoring conducted to date has not shown any significant contamination in this watershed. As with all sampling sites, if high levels of contaminants are detected during normal sampling events, BLM will take additional samples to identify the contaminant source and evaluate the need for additional removal actions.

25. Comment: 3.0 Site Characterization and Risk Assessment and 3.6 Site Costs (page 3-46). *"For 2006, labor costs are* 42 % *of the total operating cost of the entire operation."* The FBIC requests a detailed breakdown of the labor costs, totaling $632,462, according to Spectrum Engineering's Year Cost Projection (January 12, 2006).

Response: The $632,462 is the labor cost estimate for calendar year 2006. Detailed labor rates, hours, and labor burden for Site employees are available in the monthly invoice summaries on file at the BLM office in Lewistown and at the DEQ office in Helena.

26. Comment: 3.0 Site Characterization and Risk Assessment and 3.7.2 Leach Pad Water (page 3-50). *"Thallium appears to be fluctuating around 0.003 mgl/ and the chronic human health standard is 0.00024 mg/l."* The FBIC is very concerned with this information and requests that the BLM add thallium as one of the contaminants it test for through its sample sites analyses.

Response: At this time there appears to be only sporadic thallium readings at low levels. Additional tests will be conducted for thallium. If thallium is prevalent in the mine drainage or leach pad water at levels that constitute a threat to public health, welfare or the environment, it will be added as a contaminant of concern.

27. Comment: 3.0 Site Characterization and Risk Assessment and 3.7.4 Natural Acidic Water (page 3-51). *"The water chemistry in Swift Gulch, as measured at L-19, began to decline in* 1998." The FBIC is still questioning the BLM's understanding of the hydrology of the Swift Gulch drainage. See above comment regarding- 3.0 Site Characterization and Risk Assessment and 3.2.5.2.1 Swift Gulch (page 3-25).

Response: BLM recognizes that additional characterization work in the Swift Gulch area could be beneficial. That is the main reason selected removal action alternative SG-300 includes another characterization study.

28. Comment: 3.0 Site Characterization and Risk Assessment and 3.7.6.1 Waters Flowing North (page 3-52). *"Based on data reviewed, ASTDR concluded that the gold mining operations were no apparent public health hazard to the residents of Fort Belknap (ASTDR.* 1999)". The FBIC requests that the BLM, under its CERCLA authority, have ASTDR reevaluate the current water contamination and health risks, since a lot has changed since 1999.

Response: With the recent completion of reclamation at the mines, the installation of the Landusky Mine capture and treatment systems in 1997, and the EPA tailings removal action in King Creek during 2000, area water quality has greatly improved since the ATSDR public health assessment was conducted during the 1995-1996 period. The only decrease seen in water quality conditions is in the Swift Gulch area. While water quality at Swift Gulch monitoring station L-19 has declined since 1998, the water quality at monitoring stations downstream, near the Reservation boundary do not present a public health risk. Should there be a change in conditions that pose a health risk to the residents of Zortman, Landusky, or the Fort Belknap Reservation, the BLM will contact ATSDR about the need for another public health assessment.

29. Comment: 4.0 Sources, Nature and Extent of Contamination and 4.1.3 ARD Migration Overview (page 4-7). *"Flow toward Swift Gulch was further substantiated when the August Pit filled after artesian well WS-3 was Closed"* The FBIC states that this Migration Overview information shows that Tribal water rights' diversions are taking place at the mine site.

Response: An assessment of the effects on flow in both King Creek and Swift Gulch from having artesian well WS-3 open and closed is contained in Spectrum Engineering's (2001) *Final Report on the Landusky Mine's Hydrologic Impact to King Creek and Swift Gulch*. Site removal actions have reduced the amount of mine-impacted water flowing towards the Reservation.

30. Comment: 4.0 Sources, Nature and Extent of Contamination and 4.1.4 Domestic Well Contamination (page 4-8). *"No documented contamination has been shown to extend onto the reservation where it could affect these water supplies."* The FBIC states that this does not mean that contamination will not occur in the future -- without detailed flowpath studies, it is impossible to definitely conclude what and where contamination will or will not occur.

Response: The large-scale flowpaths and sources that have resulted in releases are reasonably well known. The intent of this section is to explain the situation regarding the nature and extent of contamination as it exists to date, and to extrapolate the future likelihood of problems based on these known structures and sources. Characterization studies conducted as part of the removal action in Swift Gulch will further refine this knowledge. However, even with detailed flowpath studies it is never possible to absolutely conclude exactly where contamination will or

will not occur. For that reason, monitoring of area streams and groundwater for changes in conditions or contaminates, will be done as part of the removal actions.

31. Comment: 5.0 Removal Action Objectives and 5.2 Justification For The Response Action (page 5-1). *"The Site contaminants of concern include*" The FBIC would like to see Thallium added to this list after reviewing page 3-50 of this report. See above comment regarding- 3.0 Site Characterization and Risk Assessment and 3.7.2 Leach Pad Water (page 3-50).

Response: If thallium is determined to be prevalent in the mine drainage or leach pad water at levels that constitute a threat to public health, welfare or the environment, it will be added as a contaminant of concern. If changes in treatment technology or methods are required beyond the scope of those considered in the EE/CA, the BLM will amend or modify the EE/CA and consult with Fort Belknap.

32. Comment: 5.0 Removal Action Objectives and 5.2.2 Threats to the Environment (page 5-2). *"The third group of potential receptors is individuals recreating at or near streams impacted by mine drainage"*. The FBIC requests that BLM take note that many of the "individuals recreating at or near streams impacted by mine drainage" are children. As the Swift Gulch drainage is right above our ceremonial powwow grounds, many of our children play in the water during the hot summer months. As such, the BLM should consider that the human health standard for children is generally lower than the health standard for adults. In addition, the FBIC requests that the BLM add a fourth group of receptors to its analysis -- Plants. Many of our tribal members use and ingest plants for medicinal and ceremonial purposes.

Response: The water flowing onto the reservation meets safe drinking water standards. The water is safe for children to drink or play in. The state water quality standards (DEQ-7) do not provide separate standards for children; rather it is assumed in all cases when setting standards that children will use the water and must be protected. For example, if only adult health were considered, the standard for cyanide in groundwater might be 0.7 mg/L, not 0.2 mg/L as specified in DEQ-7. Individuals using native plants for medicinal or ceremonial purposes have been added as potential receptors in Section 5.2.2. With regard to protection of plants, DEQ-7 and Montana Surface Water standards (e.g. ARM 17.30.623: B-1 Classification Standards) state that B-1 waters are suitable for: drinking (after conventional treatment), bathing, swimming, recreation... and agricultural water supply. That would imply that the same DEQ-7 standards cover the use of water for growing plants.

33. Comment: 6.0 Response Action Technology and Development of Alternatives and 6.1 Technology Identification and Screening (page 6-1). *"In general, these treatment plants do an excellent job eliminating the acidity and removing most of the heavy metals, selenium and nitrates."* The FBIC expresses concern that the Landusky mine site has not yet matured and that when it does mature, the metals in the water will increase. The FBIC requests that the BLM make all necessary efforts to upgrade these plants as the mine site matures, so that the plants will be able to meet the ARARs as listed in the future.

Response: The source water fed into the water treatment plants is continually monitored. If the water treatment plants need to be upgraded to treat lower pH or different metal loads then changes are made using actual data. Accurate predictions of what exact water chemistry might evolve in the future are not possible, so it is not feasible to develop plant modifications and upgrades for something that may not be needed. It is worth noting that the Landusky leach pads have "matured" considerably in the past few years (see Table 3), which is the reason a pH pre-treatment pond has been added to the bioreactor treatment system.

34. Comment: 7.0 Analysis of Alternatives and 7.2 Identification of Alternatives (page 7-1). *"The main issues of concern are the water quality and the lack of funding to implement the treatment of water to satisfy ARARs."* The FBIC requests that the BLM initiate government to government consultations with the FBIC regarding the selection of a preferred alternative that meets the above mentioned concerns of the BLM and the needs and concerns of the FBIC. The FBIC further reserves the right to raise additional issues of concern, not mentioned in these comments, regarding the selection of an alternative, including the BLM's recommended alternative and other alternatives analyzed in the draft *EE/CA.*

Response: The BLM believes it has fully consulted with Fort Belknap on selection of the preferred alternative and provided Fort Belknap with every opportunity to raise "additional issues of concern." As none appears to be forthcoming, the BLM must take action to prevent the release of contaminants that present a threat to public health, welfare, or the environment. If additional issues of concern come to Fort Belknap's attention, the BLM will continue to be available for consultation.

35. Comment: 8.0 Recommended Alternative Action; and 8.1 Zortman Mine Recommendations (page 8-1) and 8.2 Landusky Mine Recommendations (page 8-2). The FBIC requests that the BLM initiate government to government consultations with the FBIC regarding the selection of a preferred alternative that meets the concerns of the BLM and the needs and concerns of the FBIC. The FBIC further reserves the right to raise additional issues of concern, not mentioned in these comments, regarding the final selection of an alternative.

Response: The BLM consulted with Fort Belknap on selection of the mine reclamation alternatives in the three-year period from 1999 to 2002. The BLM then again consulted with Fort Belknap on preparation of the subject EE/CA and selection of the preferred alternatives, as described above in part VIII of this Action Memorandum. While government to government consultation may not always result in total agreement; in this case, after the extensive consultation that has occurred, we are not aware of any substantial disagreement or concerns Fort Belknap has with the removal actions. The BLM has provided Fort Belknap with every opportunity to raise "additional issues of concern." As none appears to be forthcoming, the BLM must take action and continue to prevent the release of contaminants that present a threat to public health, welfare, or the environment. The BLM will continue to be available for consultation if additional issues of concern come to Fort Belknap's attention.

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