

# Explanation of Significant Differences

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Draft

Explanation of Significant Differences  
for the Record of Decision for the Blackbird Mine  
Lemhi County, Idaho  
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# Explanation of Significant Differences for the Record of Decision for Blackbird Mine Lemhi County, Idaho

## 1. Introduction and Statement of Purpose

The U.S. Environmental Protection Agency is issuing this Explanation of Significant Differences (ESD) to document three changes to the Record of Decision for remedial actions at the Blackbird Mine site, signed on March 3, 2003 (2003 ROD). This is the second ESD for this site. The first ESD was issued on July 27, 2007 to modify the cobalt water quality cleanup level at the site from 0.038 mg/L to 0.086 milligrams/liter (mg/L) based on site-specific toxicity testing. The cobalt water quality cleanup level remains at 0.086 mg/L and is not modified by this ESD.

This ESD was prepared in accordance with Section 117(c) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA/Superfund) and Section 300.435(c)(2)(i) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This ESD documents three significant changes of the remedy selected in the 2003 ROD for the Blackbird Mine site. The remedy changes and the basis for them are summarized below:

- The remedy selected in the 2003 ROD for Blackbird Creek included removal of contaminated overbank deposits (those materials above the normal stream high water mark) and removal of in-stream sediments (those materials within the normal stream high water mark), with stabilization of selected overbank deposits to reduce the risk of transport of these materials to off-mine properties along Panther Creek. The remedy also included three small settling basins along Blackbird Creek that were constructed as part of Early Removal Action to further reduce the risk of transport of these materials to off-mine properties. High flow events in Blackbird Creek subsequent to the remedial actions have resulted in remobilization of contaminated overbank and in-stream materials along Blackbird Creek with deposition downstream along Panther Creek at concentrations above the cleanup levels. To reduce the risk of recontamination, additional removals and stabilization of contaminated overbank and in-stream materials along Blackbird Creek were conducted in 2009 and 2010. There is a large degree of uncertainty regarding the effectiveness of the additional actions taken in 2009 and 2010. Therefore, this ESD provides for diversion of Blackbird Creek waters into much larger settling basins at the former Panther Creek Inn (PCI) property, now owned by an entity formed by one or more of the BMSG companies. These larger settling basins (referred to as the Blackbird Creek diversion and settling basins) will further reduce the risk of downstream deposition of contaminated sediments along the banks of Panther Creek as well as to the in-stream sediments in Panther Creek.
- The 2003 ROD did not establish cleanup levels for cobalt in mine site soils (surface soils in the former mine area that site maintenance workers may be exposed to) and overbank deposits (deposits adjacent to streams downstream from the mine site that residents and recreational users may be exposed to) because the soils did not present a risk to human health. This is because cobalt concentrations in these site media were significantly lower than risk-based levels calculated and established at the time of the 2003 ROD. A groundwater cleanup level, based on protection of human health for cobalt and was

established at 1,530 micro grams/liter ( $\mu\text{g/L}$ ) or parts per billion (ppb) in the 2003 ROD based on a worker exposure scenario at the mine site. In 2008, EPA published new toxicity values for human exposures to cobalt. Revised risk calculations based on the new toxicity values indicate that cobalt concentrations in some of the overbank deposits and groundwater at the site are greater than the revised risk-based levels. Therefore, this ESD establishes cobalt cleanup levels for overbank deposits and revises the cobalt cleanup level for groundwater to address human health risks. The concentrations of cobalt in mine site soils are less than the revised risk-based levels, therefore a cobalt cleanup level for mine site soils is not required (see Table 1 for a summary of cleanup levels for all contaminants of concern for all site media).

- The 2003 ROD listed the arsenic soil cleanup level for a day-use recreational scenario for U.S. Forest Service (USFS) lands along Panther Creek at 590 mg/kg. This cleanup level did not consider the differences in accessibility to the USFS lands depending upon which side of Panther Creek the lands are located. In 2010, the USFS requested that EPA review the recreational use assumptions for USFS lands since recreational users must cross Panther Creek in order to access these lands. Based on this review, EPA concurred with the USFS that the use assumptions should be changed to reflect a revised recreational-use scenario and this ESD therefore revises the arsenic cleanup level for the USFS lands that require fording Panther Creek from 590 mg/kg to 1180 mg.kg.

The human health cleanup levels for the various media that are established or changed by this ESD are to assure that potential carcinogenic risks do not exceed  $1.0 \times 10^{-4}$  and that non-carcinogenic risks do not exceed hazard quotients (HQs) of 1.0. The remedial action objectives (RAOs) included in the 2003 ROD are not changed by this ESD. This ESD will become part of the Blackbird Mine administrative record. The Blackbird Mine administrative record is available to the public at the following locations:

Salmon Public Library  
204 Main Street  
Salmon, ID

Hours: Monday through Wednesday 10:00 am – 6:00 pm, Thursday 10:00 am – 7:00 pm, Friday and Saturday 10:00 am to 5:00 pm

U.S. EPA, Idaho Operations Office  
1435 North Orchard Street  
Boise, ID

Hours: Monday through Friday 8:00 am – 5:30 pm

U.S. EPA, Region 10  
1200 Sixth Avenue  
Records Center – 7<sup>th</sup> Floor  
Seattle, WA

Hours: Monday through Friday 8:30 am – 4:30 pm

## 2. Site Location, History, Contamination, and Selected Remedy

### 2.1 Summary of Site Location and History

The Blackbird Mine is an inactive mine located in Lemhi County, Idaho, approximately 13 miles south of the Salmon River and 21 miles west of Salmon, Idaho, within the Salmon-Challis National Forest (Figure 1). Mining of gold, cobalt, and copper resulted in about 12 acres of an open pit, 14 miles of underground workings, 4.8 million tons of waste rock in multiple waste rock piles, and two million tons of tailings located within the West Fork Tailings Impoundment. The mine facilities were located on both sides of a topographical divide, with facilities on the north side of the divide within the Bucktail Creek drainage and facilities on the south side of the divide within the Blackbird Creek drainage. This ESD focuses on modifications to the 2003 ROD remedy within the Blackbird Creek drainage and downstream within the Panther Creek drainage.

Cleanup actions have been conducted at the site since 1993 as both removal and remedial actions. From 1993 to 2002, early actions were performed under EPA's removal authority, and included collection and treatment of contaminated waters, stabilization and/or relocation of waste rock piles, stabilization of the West Fork Tailings Impoundment, removal of contaminated soils along Blackbird Creek and Panther Creek with disposal at the West Fork Tailings Impoundment, and construction of three small settling basins along Blackbird Creek. EPA selected a remedy in the 2003 ROD to address the releases from the mine site that remained following the early actions. The 2003 ROD addressed surface water, sediments, groundwater and contaminated soils. Remedial actions selected in the 2003 ROD include incorporation of an ongoing operation and maintenance of the early actions, additional collection and treatment of contaminated waters, additional removals/stabilization of contaminated overbank and in-stream deposits along Blackbird Creek, removals of overbank deposits along Panther Creek, and establishment of institutional controls. All cleanup actions at the site have been conducted by the Blackbird Mine Site Group (BMSG) under oversight by EPA. EPA is the lead agency at the site and the U.S. Forest Service (USFS) and Idaho Department of Environmental Quality (IDEQ) are support agencies. The remedial action has been coordinated and supported by the Natural Resource Trustees, which include the State of Idaho, USFS, and the National Oceanic and Atmospheric Administration (NOAA).

### 2.2 Summary of Site Contamination

Historic mining activities resulted in waste rock, tailings, and underground workings, which are the largest sources of contamination to soils, surface water, and groundwater at the Blackbird Mine site (Figure 2). Acid rock drainage from waste rock piles, the underground workings, the Blacktail Pit, the West Fork Tailings Impoundment, and deposits along Blackbird Creek resulted in elevated levels of arsenic, cobalt, and copper in surface water and groundwater. Erosion from waste rock piles and tailings deposits during high flow events resulted in transport of materials elevated in arsenic and cobalt with subsequent deposition at overbank and in-stream areas along Blackbird Creek and Panther Creek. The fisheries and aquatic resources downstream from the Blackbird Mine site were impacted by arsenic, cobalt, and copper in the water column and in-stream sediments. Waste materials elevated in arsenic and cobalt were deposited at overbank areas along Panther Creek at concentrations that exceed human health risk-based concentrations. The site contamination was addressed through the remedial actions specified in the 2003 ROD (see Section 2.3 below for a discussion of the remedial actions).

Subsequent to the issuance of the ROD, it was discovered that oxyhydroxide flocs (very fine-grained particles), which are generated from groundwater seepage at the West Fork Tailings

Impoundment, are elevated in arsenic and copper. These oxyhydroxide flocs are deposited along Blackbird Creek downstream from the tailings impoundment, where they are subject to remobilization and downstream transport during high flow events. It has been estimated that the oxyhydroxide flocs constitute approximately 10% of the load in Blackbird Creek that could become remobilized. Also subsequent to the ROD, high flow events in Blackbird Creek in 2003, 2008 and 2009 remobilized overbank and in-stream materials elevated in arsenic and cobalt and deposited them along Panther Creek at concentrations above the cleanup levels. The recontamination risks from Blackbird Creek materials deposited along Panther Creek were partially addressed through additional removals and stabilization in Blackbird Creek in 2004, 2005, 2009 and 2010.

## **2.3 Selected Remedy in the 2003 Record of Decision**

The remedy selected in the 2003 ROD included remedial action objectives (RAOs) for surface soils, groundwater, surface water, and sediments and are listed in Section 8.2 of the ROD. To achieve the RAOs, the 2003 ROD selected remedial actions to address contaminated overbank deposits, groundwater, surface water, and in-stream sediments. The 2003 ROD required maintenance of the early removal actions and set forth additional actions required to attain the RAOs. The selected remedy requires long-term operation and maintenance and includes the following in each drainage basin.

### **2.3.1 Blackbird Creek Drainage Basin**

- Collection and treatment of upper Meadow Creek seeps
- Continued operation of the water treatment plant
- Construction of a soil cover over the West Fork Tailings Impoundment
- Collection and treatment of seepage from the West Fork Tailings Impoundment
- Removal of overbank deposits with armoring of selected deposits along Blackbird Creek
- Removal of in-stream sediments and overbank deposits in the vicinity of the Panther Creek Inn (PCI)
- Establishing institutional controls and physical restrictions
- Natural recovery of Blackbird Creek sediments
- Operation and maintenance of all facilities
- Five year reviews

### **2.3.2 Bucktail Creek Drainage Basin**

- Collection and treatment of Bucktail Creek groundwater seeps
- Continued operation of the Water Treatment Plant
- Diversion of Bucktail Creek waters to bypass South Fork Big Deer Creek
- Establishing institutional controls and access restrictions
- Natural recovery of Bucktail Creek, South Fork of Big Deer Creek and Big Deer Creek sediments
- Operation and maintenance of all facilities
- Five year reviews

### 2.3.3 Panther Creek Drainage Area

- Selective removal of overbank deposits
- Establishing institutional controls
- Natural recovery of Panther Creek sediments
- Operation and maintenance of all facilities
- Five year reviews

### 2.4 2007 ESD

The first ESD to the 2003 ROD was issued by EPA on July 27, 2007 to modify the cobalt surface water quality cleanup level specified in the 2003 ROD. This modification was based on site-specific toxicity testing and changed the cobalt water quality cleanup level from 0.038 mg/L to 0.086 mg/L. The revised cobalt water quality cleanup level included in the 2007 ESD is not modified by this ESD.

## 3. Basis for the Significant Differences

### 3.1 Recontamination from High Flow Events in Blackbird Creek

To reduce the potential for transport of contamination to Panther Creek, the 2003 ROD remedy included removal of overbank deposits and in-stream sediments containing elevated concentrations of arsenic along Blackbird Creek with selected armoring of some of the overbank deposits. The ROD remedy also included three small settling basins that had been constructed along Blackbird Creek as part of the early actions. The 2003 ROD recognized that there was a risk of high flow events that could result in remobilization of portions of the remaining contaminated overbank deposits and in-stream sediments along Blackbird Creek with deposition downstream along Panther Creek. Therefore, the 2003 ROD indicated that additional actions could be taken in the event of significant remobilization and deposition along Panther Creek at arsenic concentrations above the cleanup levels. These additional actions included removals of contaminated materials along Blackbird Creek and Panther Creek.

During spring snow melt in May 2003 (subsequent to the issuance of the ROD in March 2003), high flows in Blackbird Creek caused significant erosion of in-stream and overbank materials (including oxyhydroxide flocs) along Blackbird Creek. These materials were elevated in arsenic and cobalt and were transported downstream into Panther Creek, where a portion of the materials were deposited at in-stream and overbank areas. Sampling later in 2003 indicated that some of the redeposited materials in the overbank areas exceeded the arsenic cleanup levels established for those areas. These areas had been previously cleaned up as part of the early actions between 1998 and 2002. In accordance with provisions in the 2003 ROD, the areas were cleaned up again where redeposition exceeded the arsenic cleanup levels. This cleanup entailed excavation of the contaminated materials with transport to the West Fork Tailings Impoundment for disposal. A summary of properties along Panther Creek recontaminated by the 2003 high flow event in Blackbird Creek is included in Table 2. High spring runoff flows in May 2008 and again in May 2009 resulted in additional erosion of in-stream and overbank materials along Blackbird Creek with downstream deposition at in-stream and overbank areas along Panther Creek at concentrations above the cleanup levels. A summary of the properties along Panther Creek recontaminated by the 2008 and 2009 high flow events is also included in Table 2. The 2008 and 2009 events also resulted in exceedances of the copper water quality cleanup levels in

Panther Creek. The frequency of significant erosional events along Blackbird Creek had not been anticipated at the time that the ROD was issued.

EPA determined that additional actions were required along Blackbird Creek to achieve RAOs and to address the continuing remobilization of Blackbird Creek materials that result in recontamination of in-stream sediments and overbank areas along Panther Creek and exceedances of copper water quality cleanup levels in Panther Creek waters. In 2009, a detailed alternatives analysis of additional actions was begun. Some of the additional actions determined necessary included removals and stabilization of contaminated materials along Blackbird Creek. These additional actions were conducted in 2009 and 2010 to partially address the recontamination issues while the evaluation of alternatives was finalized to determine the best method for completely addressing the recontamination issues. The additional actions are more fully described in Section 4 below and the evaluation of alternatives is described in Section 5 below.

### 3.2 Additions/Changes to Cobalt Cleanup Levels

EPA selected cobalt cleanup levels for surface water and in-stream sediments in the 2003 ROD to protect aquatic receptors. The cobalt cleanup level for surface water was modified in the 2007 ESD from 0.038 mg/L to 0.086 mg/L. The cobalt cleanup levels for in-stream sediments specified in the 2003 ROD have not changed (cleanup levels for all media and contaminants of concern are summarized in Table 1). Cleanup levels for cobalt in groundwater were established in the 2003 ROD to protect human receptors. Cleanup levels for cobalt in mine site soils (surface soils within the former mine site) and overbank deposits (adjacent to streams downstream from the mine site) were not established in the 2003 ROD. Cleanup levels for these media were not established because concentrations of cobalt in these media did not result in potential cancer risks that exceed the EPA risk management range (1E-06 to 1E-04) or hazard quotients (HQs) greater than 1, the threshold level that EPA considers acceptable for potential noncancer effects. In August 2008, EPA published revised toxicity values for cobalt. Revised risk calculations based on the revised toxicity values indicate that some overbank deposits and groundwater at the site have cobalt concentrations that exceed the HQ of 1 for non-cancer risks for ingestion of groundwater under worker and residential use scenarios as well as ingestion of soils under recreational use and residential use scenarios. Concentrations of cobalt in mine site soils still do not exceed the revised risk-based levels, therefore cobalt cleanup levels for mine site soils are not necessary. Section 4 below describes the new cobalt cleanup levels for overbank deposits and the revised cobalt cleanup levels for groundwater.

### 3.3 Change in Recreational Soil Cleanup Levels

Prior to the 2003 ROD, contaminated overbank deposits along Panther Creek were removed on USFS lands as part of the early actions using the same cleanup level as established in the 2003 ROD. The 2003 ROD listed the arsenic soil cleanup level for a day-use recreational scenario along Panther Creek at 590 mg/kg. This cleanup level was based on use assumptions for recreational users of USFS lands along Panther Creek. The USFS lands are located on both sides of Panther Creek and the accessibility for public use depends upon which side of the creek the lands are located. The USFS lands located on the same side of Panther Creek as the road along Panther Creek have convenient access. However, the USFS lands located on the opposite side of Panther Creek from the road are less accessible and require wading across Panther Creek. Regardless, the use assumptions for establishing the arsenic recreational cleanup level in the 2003 ROD did not differentiate in terms of which side of the creek the USFS lands are located on.

Some of the overbank areas on USFS lands along Panther Creek became re-contaminated with Blackbird Creek sediments that were being mobilized and re-deposited during the 2008 and 2009 high runoff events. In June 2010, the USFS sent a letter to EPA regarding the need for additional cleanups and the recreational use assumptions at USFS lands along Panther Creek (*Letter from Russ Bjorklund/USFS to Fran Allans/EPA dated June 9, 2010*). The USFS letter indicated that USFS lands across Panther Creek from the Panther Creek Road are rarely accessed by recreational users. Based on this more recent information EPA determined that the exposure assumptions in our initial risk evaluation were over estimated. EPA re-calculated the cleanup levels for the recreational scenario for USFS lands across Panther Creek from the road. Details of the revised recreational cleanup level are provided in Section 4 below. The revised cleanup level for arsenic is still adequately conservative and protective of human health. Figure 4 shows the four areas recontaminated by the 2008 and 2009 high spring runoff events on USFS lands across Panther Creek where additional cleanup actions to address arsenic contamination is not required based on the revised arsenic cleanup level.

## 4. Description of Significant Differences

### 4.1 Measures to Address Recontamination from High Flow Events in Blackbird Creek

To address the frequent recontamination of downstream properties and the adverse impacts to surface water and in-stream sediment quality in Panther Creek, EPA directed the BMSG to prepare an evaluation of alternative actions. The BMSG, in consultation with EPA, IDEQ, and the USFS developed a number of alternatives and evaluated those alternatives in the *Blackbird Creek Evaluation Report to Address Migration of Blackbird Creek Sediments*, dated July 22, 2010 (BCER). A summary of the evaluation of alternatives in the BCER is included in Section 5. The recommended alternative in the BCER was Alternative C, which includes additional removal/stabilization of overbank and in-stream deposits along Blackbird Creek, and diversion and settling basins at the former PCI property (Blackbird Creek diversion and settling basins).

The removal of additional contaminated sediments and in-stream stabilization of the remaining sediments along Blackbird Creek were not changes from the ROD. The in-stream stabilization measures include riprap grade control structures and bendway weirs to prevent horizontal movement of the Blackbird Creek channel and reduce the risk of down cutting and head cutting during high flow events. These stabilization measures are anticipated to be effective in the long term. However, it is anticipated that for several years following construction (estimated to be about six years), some contaminants could be winnowed out (flushed out) of the shallow surface of the stabilized channel of Blackbird Creek and transported downstream. There is a large degree of uncertainty regarding the time until the stabilization measures become fully effective. Therefore, additional measures are needed to capture the winnowed out sediments and reduce the risk of recontamination along Panther Creek until it is proven that the in-stream stabilization measures along Blackbird Creek are fully effective. The additional measures include a diversion structure in Blackbird Creek and settling basins at the former PCI property. Stabilization actions implemented as part of early actions and post-ROD remedial actions, including three small settling basins along Blackbird Creek, have not proven effective in achieving RAOs and reducing migration of contamination. Therefore, the BCER demonstrates that much larger settling basins are required. The diversion structure and larger settling basins are a change to a component of the ROD (i.e. the small settling basins) and are therefore included in this ESD. The Blackbird Creek diversion structure and settling basins are shown on Figure 3 and include:

- An earth and rock-fill diversion dam about 20 feet high located on Blackbird Creek approximately 570 feet upstream from the confluence with Panther Creek. This dam will divert Blackbird Creek flows up to about 200 cfs (approximately a 25-year high flow event), and pass flows greater than 200 cfs over a spillway. Blackbird Creek flows will be diverted continuously, which will dewater the stretch of Blackbird Creek between the diversion dam and Panther Creek.
- A 54-inch high density polyethylene (HDPE) diversion pipeline to transport Blackbird Creek flows from the diversion dam to the settling basins. The total length of the diversion pipeline is about 1,700 feet.
- Two settling basins with a total surface area of about 2.6 acres located along Panther Creek downstream from Blackbird Creek at the former PCI campground area. These settling basins will settle out most of the oxyhydroxide flocs and fine-grained contaminated sediments carried in Blackbird Creek flows. The settling basins will be about three feet deep and will be formed by earth fill dikes varying from about three to ten feet high. The discharge from the settling basins to Panther Creek will be through 10 outlet pipes located along the dikes. The multiple outlet pipes are needed to maximize the settling efficiency of the ponds.

In October 2009, EPA authorized the BMSG to implement the removal and in-stream stabilization measures in the erosion-prone areas along Blackbird Creek to lower the risk of remobilization. The construction of these additional removals and in-stream stabilization measures was completed in November 2010. It is anticipated that construction of the diversion dam and settling basins will begin in mid-summer 2011, and be completed by November 2011.

The evaluations included in the BCER indicated that the additional removal and in-stream stabilization measures, in conjunction with the Blackbird Creek Diversion and Settling Basins, will significantly reduce the risk of future erosion of Blackbird Creek sediments with deposition downstream along Panther Creek. These actions will also reduce the risk of future exceedances of water quality cleanup levels in Panther Creek during high flow events in Blackbird Creek, and will speed the natural recovery of in-stream sediments in Panther Creek.

## 4.2 Additions/Changes to Cobalt Cleanup Levels

### 4.2.1 Overbank Deposits and Mine Site Soils

Cobalt cleanup levels to protect human health at overbank deposits at properties along Panther Creek were calculated based upon the cobalt toxicity values revised in 2008 by EPA and based on the exposure frequencies used to calculate arsenic cleanup levels in the 2003 ROD. The cobalt cleanup levels for overbank deposits and sediments within the high water mark (sediments on the stream banks that are exposed during low flows) are included in a memorandum titled *Preliminary Remediation Goals for Cobalt at the Blackbird Mine Site*, prepared for EPA by CH2M HILL, May 19, 2011 (2011 PRG memo). The cobalt cleanup levels for overbank areas along Panther Creek include:

- Full-time residential scenario (exposure frequency = 350 days per year) – 97 mg/kg
- Recreational day-user scenario (exposure frequency = 14 days per year) – 390 mg/kg
- Recreational day-user scenario on Forest Service lands across Panther Creek (exposure frequency = 7 days per year) – 780 mg/kg

- Camping scenario (exposure frequency = 21 days per year) – 260 mg/kg
- Camping scenario (exposure frequency = 30 days per year) – 180 mg/kg

Cleanup levels for cobalt for lower Blackbird Creek downstream from the mine gate (14 days/year and 2 hours/day) and upper Blackbird Creek upstream from the mine gate (7 days/year and 2 hours/day) were developed based on lower exposure frequencies because these areas are used much less frequently by recreationists than the areas along Panther Creek. The cleanup levels for cobalt for overbank deposits and in-stream sediments for these areas are: 2,700 mg/kg downstream from the mine gate and 5,500 mg/kg for upstream from the mine gate (2011 PRG memo). All cleanup levels at the site for all media are summarized in Table 1.

Risk calculations for mine site soils based on the revised cobalt toxicity values indicate that the concentrations of cobalt in mine site soils are lower than the revised risk-based levels. Therefore, action for cobalt mine soil is not warranted and therefore a cleanup level for cobalt in mine site soils is not required.

#### 4.2.2 Surface Water and In-Stream Sediments

The surface water cobalt cleanup level for the site was established at 0.038 mg/L in the 2003 ROD but was changed to 0.086 mg/L in the 2007 ESD based on site-specific toxicity testing of aquatic organisms. This ESD does not change the surface water cobalt cleanup level set in the 2007 ESD. The cobalt cleanup level for Panther Creek in-stream sediments was established in the 2003 ROD based on background concentrations. Therefore, this ESD does not change the Panther Creek in-stream sediment cleanup level for cobalt.

A cleanup level for arsenic for residential exposure to in-stream sediments in Blackbird Creek adjacent to the Panther Creek Inn was included in the 2003 ROD. A human health-based cleanup level for arsenic for in-stream sediments was only relevant to the Panther Creek Inn property because this is the only property along Panther Creek with significant use of the areas within and immediately adjacent to the creek. However, in 2009 the Panther Creek Inn property was purchased by the BMSG and, according to the BMSG, will no longer be used for residential and commercial uses. Therefore, a corresponding cobalt cleanup level was not developed for residential exposure to in-stream sediments in Blackbird Creek adjacent to the Panther Creek Inn. Institutional controls for the Blackbird Mine site will include measures to assure that the former Panther Creek Inn property is not used for residential or commercial purposes in the future.

#### 4.2.3 Groundwater

Revised cobalt cleanup levels based on the revised cobalt toxicity values were calculated for groundwater for the residential and mine site worker scenarios. The revised residential cobalt cleanup level is based on an age-adjusted exposure scenario (i.e., six years of exposure as a child drinking one liter of water per day and 24 years of exposure as an adult drinking two liters of water per day). The revised residential cobalt cleanup level using the age-adjusted residential scenario is 9 µg/L (2011 PRG memo). Currently, there are no wells on residential properties that exceed the residential cleanup level for cobalt.

The revised mine site worker cobalt cleanup level is based on the same worker exposure assumptions that were used in the ROD (i.e. adult, drinking 2 liters of water per day, 167 days/year for 25 years). The revised cleanup level for cobalt in groundwater for the mine site worker is 23 µg/L (2011 PRG memo).

Institutional controls for the Blackbird Mine site, including the PCI property recently purchased by an entity comprised of BMSG members, will include measures to assure that groundwater with cobalt concentrations exceeding these revised cleanup levels is not used for human consumption.

#### 4.3 Revisions to Recreational Soil Cleanup Levels

As discussed in Section 3.3 (prior to issuing the 2003 ROD), contaminated overbank deposits along Panther Creek were removed on USFS lands as part of the early actions. The arsenic cleanup level for a day-use recreational scenario in overbank areas along Panther Creek included in the 2003 ROD is 590 mg/kg. This cleanup level was adopted from the early removal action cleanup levels and is based on an exposure frequency of 14 days per year for recreational users of USFS lands along Panther Creek. In June 2010, the USFS sent a letter to EPA regarding the need for cleanups and the recreational use assumptions at USFS lands along Panther Creek (*Letter from Russ Bjorklund/USFS to Fran Allans/EPA dated June 9, 2010*). This letter indicated that USFS lands across Panther Creek from the Panther Creek Road are rarely accessed by recreational users. The letter also indicated that the USFS did not believe that the disturbances associated with cleanups at these isolated areas are warranted given the infrequent recreational use. Based on the USFS letter, EPA re-evaluated the exposure use assumptions and developed the cleanup levels for a day-use recreational scenario for USFS lands located on the opposite side of Panther Creek from the road. Based on the accessibility to the USFS land this re-evaluation used an exposure frequency for lands on the opposite side of Panther Creek from the road (i.e. that require fording of Panther Creek) of half of that for the lands on the same side of the road as Panther Creek (2011 PRG memo). The corresponding cleanup levels for overbank deposits for the reduced exposure frequency of 7 days per year are 1,180 mg/kg arsenic and 780 mg/kg cobalt (based on non-cancer risk of a HQ of 1). Four areas on Forest Service lands along Panther Creek would be affected by the change in cleanup levels (see Figure 4). The current levels of contamination at these areas do not exceed the revised arsenic cleanup level for non-cancer risks (i.e. the Hazard quotient is less than 1) and therefore no cleanup actions are required. Additional sampling needs to be performed to determine if cobalt levels are above 780 mg/kg in these four areas. Table 1 summarizes the cleanup levels for this and all other media at the site.

### 5. Evaluation of Alternatives

To address the frequent recontamination of downstream properties and the adverse impacts to surface water and in-stream sediment quality in Panther Creek, EPA directed the BMSG to prepare an evaluation of alternative remedial actions. The BMSG developed five alternatives and evaluated those alternatives in the *Blackbird Creek Evaluation Report to Address Migration of Blackbird Creek Sediments*, dated July 22, 2010 (BCER). The alternatives evaluated in the BCER included:

Alternative A—No Action (required by the NCP)

Alternative B—Removal and in-stream stabilization (with no additional measures)

Alternative C—Removal and in-stream stabilization with settling basins at the PCI property

Alternative D—Large dam (150 feet high) near the mouth of Blackbird Creek (removal and in-stream stabilization not required with this alternative)

Alternative E—Removal and in-stream stabilization with a moderately sized dam (36 feet high) near the mouth of Blackbird Creek

The alternatives were evaluated according to EPA guidance (*Interim Final, Guidance for Preparing Remedial Investigations and Feasibility Studies under CERCLA*, October 1988). The criteria used for evaluation included: overall protection of human health and the environment; compliance with applicable or relevant and appropriate requirements (ARARs); long-term effectiveness and permanence; reduction of toxicity, mobility and volume; short-term effectiveness; implementability; and cost. The details of the evaluations are included in the BCER.

The BCER recommended Alternative C and the BCER was approved by EPA on July 28, 2010. Alternative C was the recommended alternative because:

- Alternative C would be the alternative most protective of human health and the environment because it would be best at controlling exposures to contaminants in the long term. Contaminated fine-grained sediments within the Blackbird Creek channel would be stabilized in place or removed through in-stream stabilization of sediments, coupled with aggressive supplemental capture in the settling basins. Some migration of contaminated sediments would continue to occur during the first several years (on the order of approximately six years) as the fine-grained sediments are winnowed from the channel surface and an armor layer develops.
- Alternative C would provide additional capture of the winnowed sediments and floc through construction of the diversion dam and settling basins. The basins would be operated so that nearly all of the flow of Blackbird Creek would pass through them. The sediments released during the winnowing process would flow into the settling basins thus allowing control of contaminants included with those sediments. Most of the oxyhydroxide floc from West Fork Tailings Impoundment seepage would also be captured by the settling basins. Alternative C would significantly reduce the risk of water quality exceedances and deposition of contaminated in-stream sediments in Panther Creek.
- Alternative C would be the most effective alternative, and is predicted to be fully protective for small and medium-sized runoff events (up to about the 25-year event), During large runoff events (greater than about the 25-year event), there would be a slight risk of transport of contaminants with deposition along Panther Creek; however, Alternative C is the most effective alternative at reducing the risks of downstream transport during large events. Alternatives D and E are less protective and effective than Alternative C for runoff events greater than the 5-year event. Alternative B is the least protective and effective alternative because of the continued risk of re-deposition of contaminants on downstream properties and in-stream sediments for several years and for larger runoff events.
- Alternative C would be more easily implemented than the alternatives that include dams (Alternatives D and E).

## 6. Costs

The costs associated with this ESD include the following:

- Measures to Address Recontamination from High Flow Events in Blackbird Creek. The costs for the additional removals and stabilization along Blackbird Creek are covered under the 2003 ROD and are therefore not included in this ESD. The costs for the diversion dam and settling basins are estimated to be \$3.6 million on a present worth basis (capital cost is \$ 2.6 million and operation and maintenance costs are \$ 970,000 using a present worth discount rate of 7.0 % for 30 years<sup>1</sup>).
- Additions/Changes to Cobalt Cleanup Levels. The only cost associated with the change in cobalt cleanup levels resulting from the revised cobalt toxicity values is for additional cleanups of certain overbank areas at private properties along Panther Creek. The cleanups at overbank areas along Panther Creek re-contaminated by high flow events in Blackbird Creek are generally driven by arsenic concentrations. This is because arsenic and cobalt tend to be co-located at most overbank areas where cleanup is required and the arsenic concentrations are typically greater than the cleanup levels, regardless of the cobalt concentrations. Only in isolated overbank areas are the cobalt concentrations greater than the cleanup levels while the arsenic concentrations are lower than the cleanup levels. The costs for cleanups in overbank areas driven by the cobalt concentrations (and therefore addressed by this ESD) are estimated at \$25,000 which includes excavation, disposal, and replacement of approximately 370 cubic yards of soil. There are no other costs associated with the changes in the cobalt cleanup levels for other media.
- Revisions to Recreational Soil Cleanup Levels. The change in the recreational cleanup levels for USFS lands across Panther Creek from the road results in a decrease in costs because most of these areas will not be required to be cleaned up under the revised cleanup levels. The amount of the cost reduction is estimated at \$68,000, which would include excavation, disposal, and replacement of approximately 600 cubic yards of soils.

## 7. Support Agency Comments

The Idaho Department of Environmental Quality and the Salmon-Challis National Forest have been involved in the changes presented in this ESD and concur with the ESD.

## 8. Statutory Determinations

EPA believes that the remedy for the Blackbird Mine Site, as modified by this ESD, satisfies CERCLA §121 and remains protective of human health and the environment, complies with federal and state requirements identified in the 2003 ROD as applicable or relevant and appropriate to the remedial action at the time of the final 2003 ROD, is cost-effective, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

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<sup>1</sup> The discount rate and term for the present worth cost estimates in the BCER were based on *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*, EPA, July 2000.

## 9. Public Participation Compliance

EPA will publish a notice in the Salmon Recorder-Herald regarding this ESD in accordance with the requirements set out in NCP §300.435(c)(2)(i). In addition EPA will send out a fact sheet and provide a 30-day public comment period to seek public comment on the ESD. A responsiveness summary which responds to comments received during the comment period will be attached to the ESD.

### Authorizing Signature

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Daniel D. Opalski, Director  
Environmental Cleanup Office, Region 10  
U.S. Environmental Protection Agency

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Date

**Table 1**  
**Summary of Cleanup Levels for Blackbird Mine Site**  
(Shaded Values are Changes from 2003 ROD)

Drainage/Area of Drainage	Media	Cleanup Levels Established by 2003 ROD			Cleanup Levels Established by this ESD			Risk Driver
		Arsenic	Cobalt	Copper	Arsenic	Cobalt	Copper	
Blackbird Creek/above mine gate	Overbank deposits and in-stream sediments	8,500 mg/kg	None <sup>a</sup>	None <sup>a</sup>	8,500 mg/kg	5,500 mg/kg	None <sup>a</sup>	Human health
Blackbird Creek/below mine gate	Overbank deposits and in-stream sediments	4,300 mg/kg	None <sup>a</sup>	None <sup>a</sup>	4,300 mg/kg	2,700 mg/kg	None <sup>a</sup>	Human health
Blackbird Creek	Surface Water	Narrative goal <sup>b</sup>	Narrative goal <sup>b</sup>	Narrative goal <sup>b</sup>	Narrative goal <sup>b</sup>	Narrative goal <sup>b</sup>	Narrative goal <sup>b</sup>	Aquatics
Panther Creek/ residential areas	Overbank deposits <sup>c</sup>	100 mg/kg	None <sup>a</sup>	None <sup>a</sup>	100 mg/kg	97 mg/kg	None <sup>a</sup>	Human health
Panther Creek/ USFS campgrounds	Overbank deposits <sup>c</sup>	280 mg/kg	None <sup>a</sup>	None <sup>a</sup>	280 mg/kg	180 mg/kg	None <sup>a</sup>	Human health
Panther Creek/ undeveloped campgrounds	Overbank deposits <sup>c</sup>	400 mg/kg	None <sup>a</sup>	None <sup>a</sup>	400 mg/kg	260 mg/kg	None <sup>a</sup>	Human health
Panther Creek/ recreational areas on road side of Panther Creek	Overbank deposits <sup>c</sup>	590mg/kg	None <sup>a</sup>	None <sup>a</sup>	590mg/kg	390 mg/kg	None <sup>a</sup>	Human health
Panther Creek/ recreational areas on opposite side of Panther Creek from road	Overbank deposits <sup>c</sup>	590mg/kg	None <sup>a</sup>	None <sup>a</sup>	1,180 mg/kg	780 mg/kg	None <sup>a</sup>	Human health
Panther Creek	In-stream sediments	35 mg/kg	80 mg/kg	149 mg/kg	35 mg/kg	80 mg/kg	149 mg/kg	Aquatics
	Surface waters	0.014 mg/L <sup>d</sup>	0.038 mg/L <sup>e</sup>	IWQS <sup>f</sup>	0.014 mg/L <sup>d</sup>	0.086 mg/L <sup>e</sup>	IWQS <sup>f</sup>	Aquatics
Residential	Groundwater	0.010 mg/L	None <sup>a</sup>	1.30 mg/L	0.010 mg/L	0.009 mg/L	1.30 mg/L	Human health

Drainage/Area of Drainage	Media	Cleanup Levels Established by 2003 ROD			Cleanup Levels Established by this ESD			Risk Driver
		Arsenic	Cobalt	Copper	Arsenic	Cobalt	Copper	
Mine Site	Groundwater	0.010 mg/L	1.53 mg/L	3.06 mg/L	0.010 mg/L	0.023 mg/L	3.06 mg/L	
Mine Site	Soils	None <sup>a</sup>	None <sup>a</sup>	None <sup>a</sup>	None <sup>a</sup>	None <sup>a</sup>	None <sup>a</sup>	Human health
Bucktail Creek, South Fork Big Deer Creek, and Big Deer Creek	Overbank Deposits	None <sup>a</sup>	None <sup>a</sup>	None <sup>a</sup>	None <sup>a</sup>	None <sup>a</sup>	None <sup>a</sup>	Human health
Bucktail Creek	In-stream sediments and surface waters	Narrative goal <sup>b</sup>	Narrative goal <sup>b</sup>	Narrative goal <sup>b</sup>	Narrative goal <sup>b</sup>	Narrative goal <sup>b</sup>	Narrative goal <sup>b</sup>	Aquatics
South Fork Big Deer Creek	In-stream sediments	35 mg/kg	436 mg/kg	637 mg/kg	35 mg/kg	436 mg/kg	637 mg/kg	Aquatics
	Surface waters	0.014 mg/L <sup>d</sup>	0.038 mg/L <sup>e</sup>	IWQS <sup>f</sup>	0.014 mg/L <sup>d</sup>	0.086 mg/L <sup>e</sup>	IWQS <sup>f</sup>	Aquatics
Big Deer Creek	In-stream sediments	35 mg/kg	80 mg/kg	149 mg/kg	35 mg/kg	80 mg/kg	149 mg/kg	Aquatics
	Surface waters	0.014 mg/L <sup>d</sup>	0.038 mg/L <sup>e</sup>	IWQS <sup>f</sup>	0.014 mg/L <sup>d</sup>	0.086 mg/L <sup>e</sup>	IWQS <sup>f</sup>	Aquatics

<sup>a</sup>Concentrations of this contaminant in this media do not exceed risk-based levels, therefore a cleanup level has not been established.

<sup>b</sup>See narrative goals in Section 8.3.3 of the 2003 ROD

<sup>c</sup>Includes sediments below the high water mark that are exposed during low flow periods.

<sup>d</sup>In March 2010, the State of Idaho changed its surface water quality cleanup level for dissolved arsenic from 0.050 mg/l to 0.010 mg/L. The surface water quality cleanup level established in the 2003 ROD was 0.014 mg/L total arsenic. There have been exceedances of the ROD's total arsenic cleanup level of 0.014 mg/L in Panther Creek during high flow events in Blackbird Creek. However, there have been no measured exceedances of Idaho's revised dissolved arsenic standard of 0.010 mg/L in South Fork Big Deer Creek, Big Deer Creek or Panther Creek. Therefore, the ROD's cleanup level of 0.014 mg/L total arsenic is the standard listed in this table.

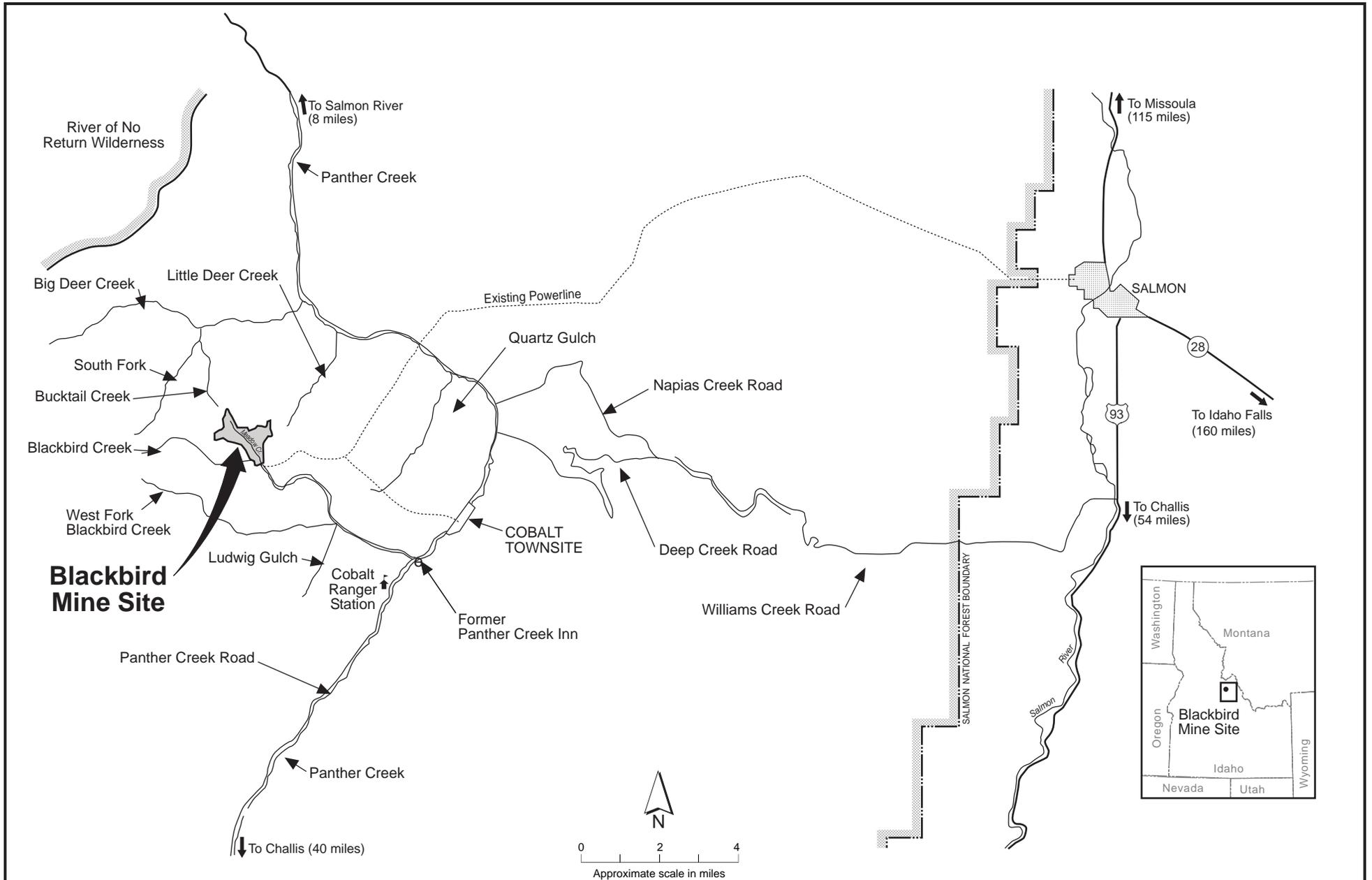
<sup>e</sup>This value was set at 0.038 mg/L in the 2003 ROD. The cleanup level for cobalt in surface waters was changed to 0.086 mg/L in the 2007 ESD, based on site-specific cobalt toxicity testing. The cobalt cleanup level for surface waters does not change for this ESD.

<sup>f</sup>The equation for the dissolved copper water quality cleanup level is based on total hardness and is the Idaho Water Quality Standard.

**Table 2**  
**Summary of Recontamination Along Panther Creek**

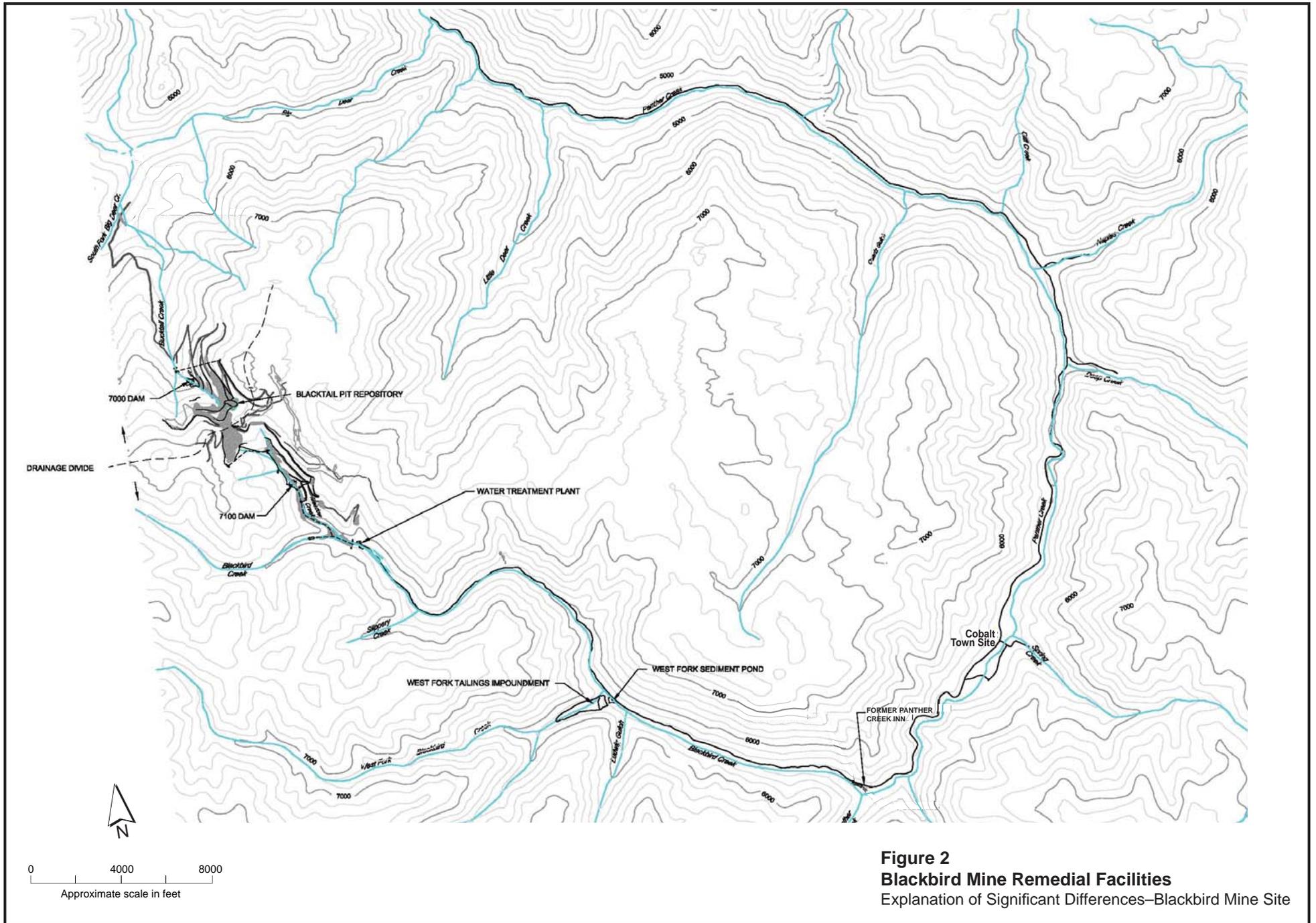
Area/Property	Owner	Recontaminated Above Cleanup Levels or PRGs?			Comments
		2003	2008	2009	
Panther Creek Inn	Private	Yes	Yes	Yes	Areas recontaminated in 2003 were cleaned up in 2004. Additional cleanups required
Cobalt TS & Noranda Pasture	Private	Yes	Yes	Yes	Areas recontaminated in 2003 were cleaned up in 2005. Additional cleanups required
Riprap Bar	USFS	Yes	Yes	No	Recontamination not yet cleaned up
Sillings Headgate	Private	Yes?	Yes	Yes	Cleaned up in 2004 and 2010
Sillings & C. Fernandez	Private	?	Yes	Yes	Recontamination not yet cleaned up
Lower Sillings and USFS area	Private & USFS	?	Yes	Yes	Partially cleaned up in 2010. Additional cleanups required
Deep Creek CG	USFS	?	Yes	No	Initial cleanup in 2000. Cleaned up again in 2009
Napias Creek Area	Private	?	Yes	Yes	Recontamination not yet cleaned up
Napias Creek Area	USFS	?	No	No	Cleanup not required
Rogers	Private	NS	NS	NS	Initial cleanup in 2004 under ROD.
Cellan	Private	NS	No	Yes	Initial cleanup in 2004 under ROD. Subsequent cleanup in 2009
Rufe	Private	NS	No	Yes	Initial cleanup in 2006 under ROD. Subsequent cleanup in 2009
Bevan	Private	NS	Yes	Yes	Initial cleanup in 2000. Partially cleaned up again in 2009. Additional cleanup required.
Hade	Private	NS	NS	NS	Initial cleanup in 2006 [FRAN TO ADD TEXT ABOUT AUTHORITY FOR CLEANUP AT HADE HERE]. Not sampled in 2008 or 2009

NS – Not sampled



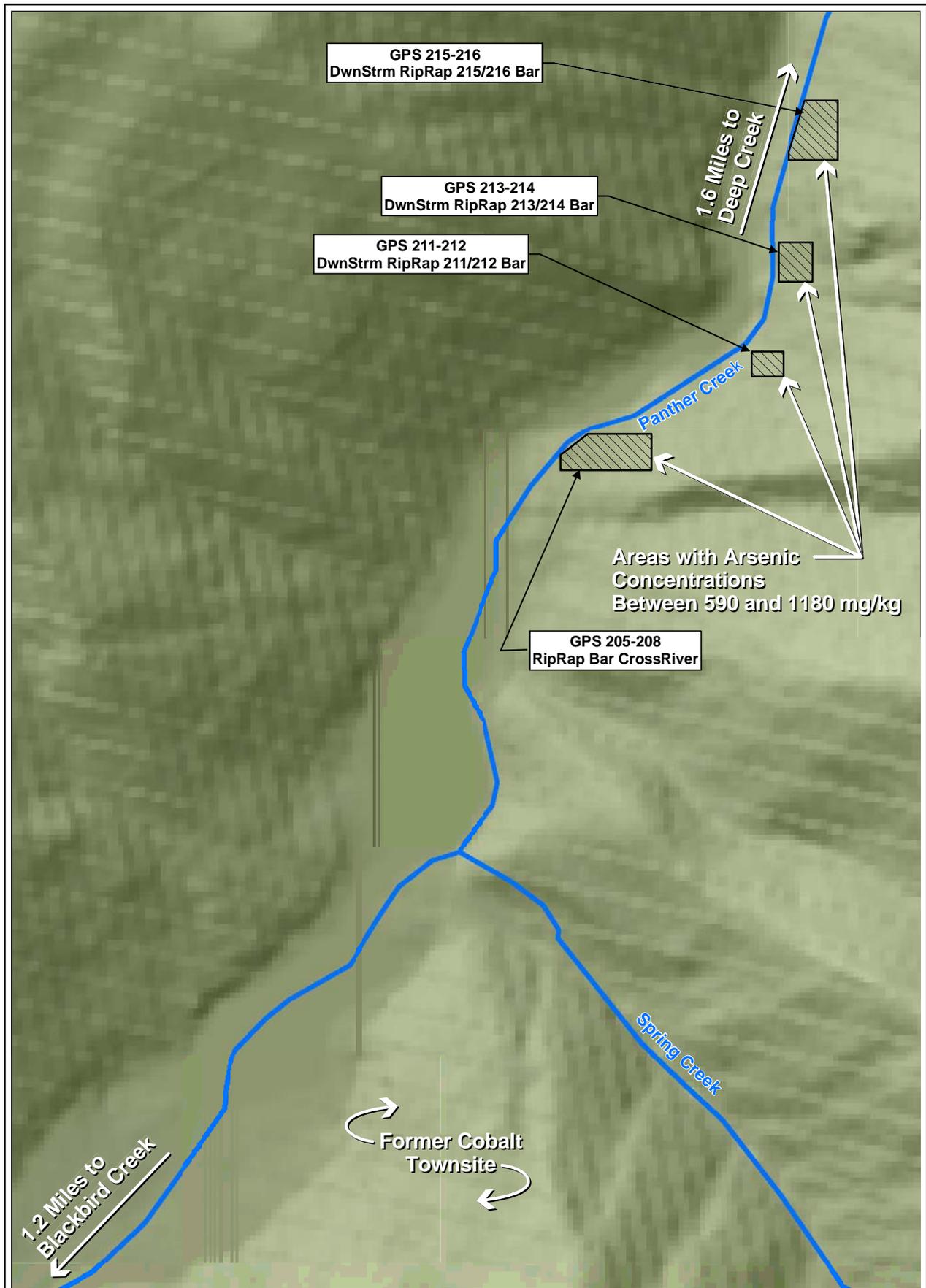
**Figure 1**  
**Vicinity Map**  
 Explanation of Significant Differences—Blackbird Mine Site

Source: ERT 1982



**Figure 2**  
**Blackbird Mine Remedial Facilities**  
 Explanation of Significant Differences—Blackbird Mine Site





This figure was originally produced in color. Reproduction in black and white may result in a loss of information.

0 500  
Scale in Feet

Map Projection:  
UTM Zone 11N NAD 1983  
Source:  
USGS (10m DEM), ESRI (base data),  
Golder Associates, Inc.



**Figure 4**  
**USFS Properties Across Panther Creek from Road with**  
**Arsenic Concentrations Between 590 and 1180 mg/kg**  
 Explanation of Significant Differences—Blackbird Mine Site