HAZARD RANKING SYSTEM (HRS) DOCUMENTATION RECORD COVER SHEET

Name of Site: Barite Hill/Nevada Goldfields (Barite Hill)

EPA ID No.: SCN000407714

Contact Persons

Documentation Record:

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Pathways, Components, or Threats Not Scored

The ground water migration, soil exposure, and air migration pathways were not scored in this Hazard Ranking System (HRS) documentation record because they do not significantly contribute to the overall score.

Ground Water Migration Pathway: No private drinking water wells were observed within the immediate vicinity of the Barite Hill property (Reference [Ref.] 16). One private well is located within a 4-mile radius of the Barite Hill property. Specifically, the private well is located about 2.5 miles north of the Barite Hill property (Ref. 24). Municipal water, which serves residents within the 4-mile radius, is obtained from surface water intakes (Refs. 14; 26; 74; 75, pages [pp.], i, 1, 2, 3; 76; 77; 80, pp. i, 1, 2).

Soil Exposure Pathway: About 95 people reside within 1 mile of the Barite Hill property (Ref. 29). The surrounding area is very rural, undeveloped, and sparsely populated. No buildings, homes, or commercial facilities are located within a 0.25-mile radius of the Barite Hill property (Refs. 35; 46, page [p.]. 1; 48, p. 8) (see Figure 1 of this HRS documentation record). Access to the property is restricted by fences, two gates, and natural barriers. The first gate is located directly off secondary Highway S-33-30, and the second is located at the former office trailer south of the Main Pit (Refs. 10; 40, Appendix C, Team B, p. 38). However, during the 2007 expanded site inspection several children on all terrain vehicles were observed and when questioned stated they frequently use the property for recreational activities (Ref. 40, Appendix C, Team B, p. 14). Several federally designated endangered and threatened species inhabit McCormick County, South Carolina; however, specific habitat locations are not documented for scoring purposes (Ref. 22, pp. 1 through 8). No samples were collected on residential properties, schools, or day care centers; therefore, the soil exposure pathway was not scored (Ref. 40, Appendix C, Logbook Team B, p. 38).

Air Migration Pathway: No air samples have been collected at the Barite Hill property. The residential population within 4 radial miles of the property is about 3,736 people (Ref. 29, p. 1). Several federally designated endangered and threatened species inhabit McCormick County, South Carolina; however, specific habitat locations are not documented for scoring purposes (Ref. 22).

HAZARD RANKING SYSTEM (HRS) DOCUMENTATION RECORD

Name of Site:	Barite Hill/Nevada Goldfields (Barite Hill) (Ref. 39, pp. i, 5)
EPA Region:	4
Date Prepared:	September 2008
Street Address of Site*:	Northern side of secondary Highway S-33-30 and about 0.75 mile northwest of the intersection of Highways S-33-44 and S-33-30 (Ref. 38, pp. 1, 3)
City, County, State, Zip Code:	McCormick, McCormick County, South Carolina, 29835
General Location in the State:	Western side of state, near the Georgia border
Topographic Map:	Plum Branch, South Carolina and Georgia, 1987, and McCormick, South Carolina, 1987
Latitude:	33.87309º North
Longitude:	-82.30067º West

The coordinates above for Barite Hill were measured from the process area pregnant pond (Pond A) (Refs. 3, pp. 1, 2, 3; 6, Figure 2; 34, pp. 24, 28)

* The street address, coordinates, and contaminant locations presented in this HRS documentation record identify the general area in which the site is located. They represent one or more locations EPA considers to be part of the site based on the screening information EPA used to evaluate the site for NPL listing. EPA lists its national priorities among the known "releases or threatened releases" of hazardous substances; thus, the focus is on the release, not precisely delineated boundaries. A site is defined as where a hazardous substance has been "deposited, stored, placed, or otherwise come to be located." Generally, HRS scoring and the subsequent listing of a release represent the initial determination that a certain area may need to be addressed under CERCLA. Accordingly, EPA contemplates that the preliminary description of facility boundaries at the time of scoring will be refined as more information is developed as to where the contamination has come to be located.

Migration Pathway	Pathway Score
Ground Water Migration Pathway	NS
Surface Water Pathway	100.00
Soil Exposure Pathway	NS
Air Migration Pathway	NS
HRS SITE SCORE	**50.00**

Note:

NS Not scored

WORKSHEET FOR COMPUTING HRS SITE SCORE

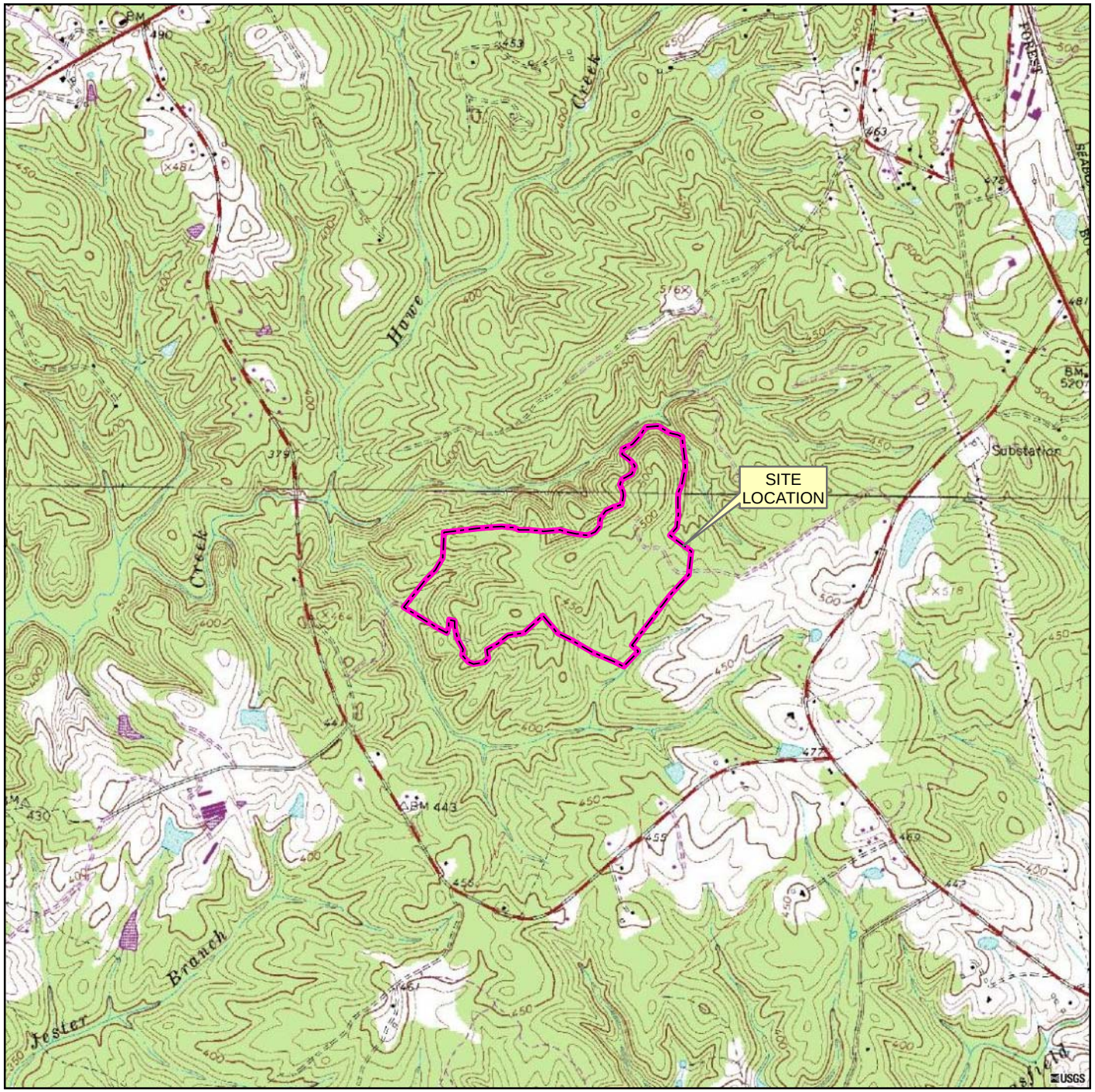
	S pathway	**S^2 pathway**
Ground Water Migration Pathway Score (S_{gw})	NS	NS
Surface Water Migration Pathway Score (S_{sw})	100	10,000
Soil Exposure Pathway Score (S_s)	NS	NS
Air Migration Pathway Score (S_a)	NS	NS
$S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$		10,000
$(S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2)/4$		2,500
$\sqrt{(S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2)/4}$		50.00

Note:

NS = Not scored

Table 4-1 –Surface Water Overland/Flood Migration Component Scoresheet			
Factor Categories and Factors	**Maximum Value**	**Value Assigned**	
Drinking Water Threat			
Likelihood of Release:			
1. Observed Release	550	550	
2. Potential to Release by Overland Flow:			
2a. Containment	10		
2b. Runoff	25		
2c. Distance to Surface Water	25		
2d. Potential to Release by Overland Flow [lines 2a(2b + 2c)]	500		
3.Potential to Release by Flood:			
3a. Containment (Flood)	10		
3b. Flood Frequency	50		
3c. Potential to Release by Flood (lines 3a x 3b)	500		
4. Potential to Release (lines 2d + 3c, subject to a maximum of 500)	500		
5. Likelihood of Release (higher of lines 1 and 4)	550		550
Waste Characteristics:			
6. Toxicity/Persistence	(a)	10,000	
7. Hazardous Waste Quantity	(a)	10,000	
8. Waste Characteristics	100		100
Targets:			
9. Nearest Intake	50		
10. Population:			
10a. Level I Concentrations	(b)		
10b. Level II Concentrations	(b)		
10c. Potential Contamination	(b)		
10d. Population (lines 10a + 10b + 10c)	(b)		
11. Resources	5	5	
12. Targets (lines 9 + 10d + 11)	(b)		5
Drinking Water Threat Score:			
13. Drinking Water Threat Score [(lines 5x8x12)/82,500, subject to a maximum of 100]	100		3.33
Human Food Chain Threat			
Likelihood of Release:			
14. Likelihood of Release (same value as line 5)	550		550
Waste Characteristics:			
15. Toxicity/Persistence/Bioaccumulation	(a)	500,000,000	
16. Hazardous Waste Quantity	(a)	10,000	
17. Waste Characteristics	1,000		1,000
Targets:			
18. Food Chain Individual	50	20	

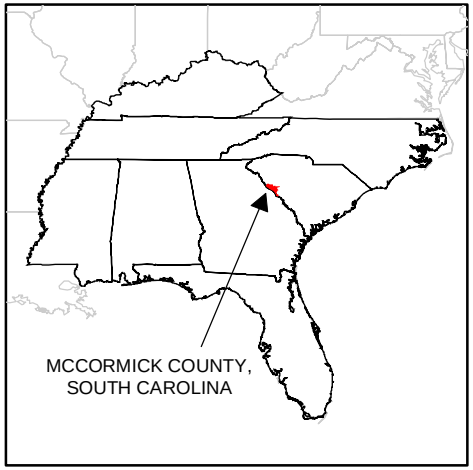
Table 4-1 –Surface Water Overland/Flood Migration Component Scoresheet (Continued)				
	Factor Categories and Factors	**Maximum Value**	**Value Assigned**	
	19. Population			
	19a. Level I Concentrations	(b)		
	19b. Level II Concentrations	(b)		
	19c. Potential Human Food Chain Contamination	(b)	NS	
	19d. Population (lines 19a + 19b + 19c)	(b)		
	20. Targets (lines 18 + 19d)	(b)		20
Human Food Chain Threat Score:				
	21. Human Food Chain Threat Score [(lines 14x17x20)/82,500, subject to maximum of 100]	100		100
Environmental Threat				
Likelihood of Release:				
	22. Likelihood of Release (same value as line 5)	550		550
Waste Characteristics:				
	23. Ecosystem Toxicity/Persistence/Bioaccumulation	(a)	500,000,000	
	24. Hazardous Waste Quantity	(a)	10,000	
	25. Waste Characteristics	1,000		1,000
Targets:				
	26. Sensitive Environments			
	26a. Level I Concentrations	(b)		
	26b. Level II Concentrations	(b)	150	
	26c. Potential Contamination	(b)		
	26d. Sensitive Environments (lines 26a + 26b + 26c)	(b)	150	
	27. Targets (value from line 26d)	(b)		150
Environmental Threat Score:				
	28. Environmental Threat Score [(lines 22x25x27)/82,500 subject to a maximum of 60]	60		60
Surface Water Overland/Flood Migration Component Score for a Watershed				
	29. Watershed Score[c] (lines 13+21+28, subject to a maximum of 100)	100		100
Surface Water Overland/Flood Migration Component Score				
	30. Component Score (S_{of})[c] (highest score from line 29 for all watersheds evaluated, subject to a maximum of 100)	100		100
	[a] Maximum value applies to waste characteristics category [b] Maximum value not applicable [c] Do not round to nearest integer			



0 1,000 2,000 Feet

1:24,000

Map Source:
USGS, McCormick, SC & Plum Branch, SC-GA Topographic Quadrangles, 1987.
References 6, Figure 2; 8, p. 77; 46, p. 19.



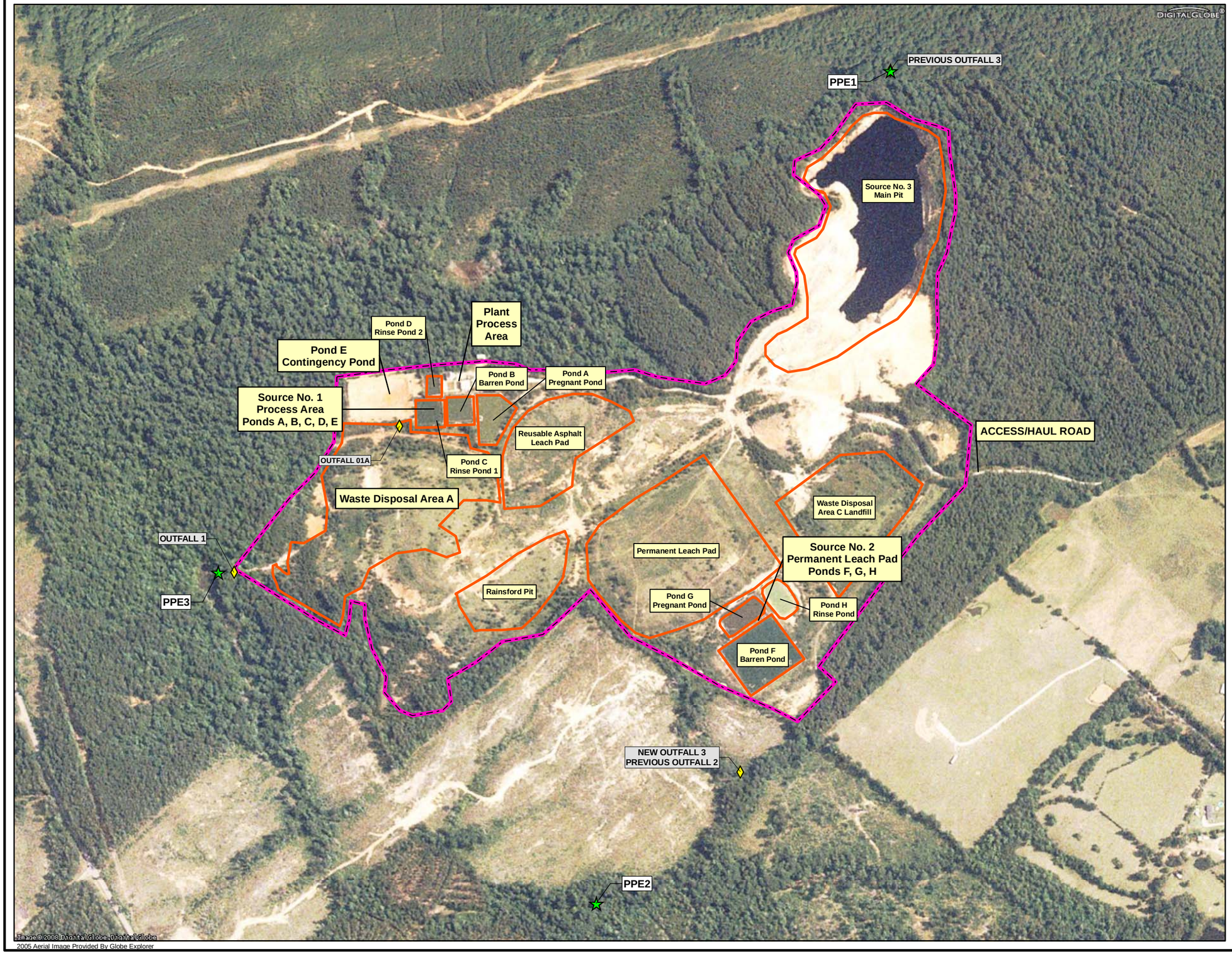
United States Environmental Protection Agency

BARITE HILL/NEVADA GOLDFIELDS
MCCORMICK,
MCCORMICK COUNTY,
SOUTH CAROLINA
TDD No. TTEMI-05-003-0019

FIGURE 1
SITE LOCATION

TETRA TECH

2008-01-30 \GIS_Workspace\TTEMI-05-003-0019_Barite_Hills_Nevada_Gold_Fields\GISMXDs\ESI_Figures\Site Location\FIG-1 SITE LOC MAP 01-30-08.mxd TTEMI-KY dale.vonbusch



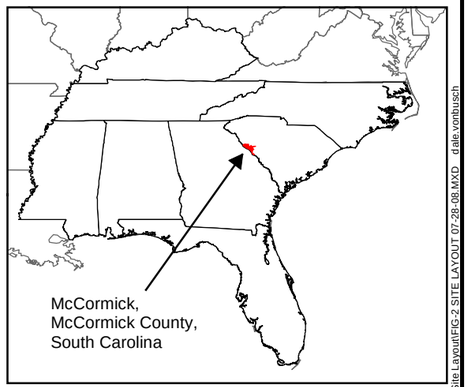
LEGEND

- PROBABLE POINT OF ENTRY
- OUTFALLS
- PROPERTY BOUNDARY
- PROPERTY FEATURES

Map Source:
GlobeXplorer, A Digitial Globe Company,
www.globexplorer.com,
Using ImageConnect Tool for ArcGIS,
Aerial Photography from Airphoto USA,
Date 2007-07, 1m Resolution,
Spatial Accuracy 1:12,000.
No. - Number
PPE - Probable Point of Entry
References 5, Figure 2; 6, Figure 2; 12, pp. 5, 6; 18, pp. 4, 5; 33, pp. 1, 21; 34, p. 23.
The property boundary was obtained from References 6, Figure 2; 8, p. 77; 46, p. 19.

0 250 500 Feet

1:6,000



United States
Environmental Protection Agency

BARITE HILL/NEVADA GOLDFIELDS
MCCORMICK,
MCCORMICK COUNTY,
SOUTH CAROLINA
TDD No. TTEMI-05-003-0019

FIGURE 2
SITE LAYOUT

TETRA TECH

2008-07-28 IGIS Workspace\TTEMI-05-003-0019 Barite Hills Nevada Gold Fields\GIS\MXDs\ESI Figures\Site Layout\FIG-2 SITE LAYOUT 07-28-08.MXD dale.vorbusch

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88. Tetra Tech. Record of Telephone Conversation Regarding Location of Dorn Sport Fishing Facility. Between Shanna Davis, Environmental Scientist and Peggy Whitt, Park Attendant, U.S. Army Corp of Engineers. June 10, 2008. 2 Pages.

89. Tetra Tech. Record of Communication Regarding Depth of Sediment Samples Collected Along Unnamed Tributaries of Hawe Creek and Hawe Creek During the March 2007 REAC Field Event. Between Shanna Davis, Environmental Scientist and Jonathan McBurney, REAC Task Leader, Lockheed Martin Technology Services. July 11, 2008. 2 Pages.

90. Tetra Tech. Project Note to File with Attachment Regarding SCDHEC Bureau of Land and Waste Management Standard Operating Procedures. Shanna Davis, Environmental Scientist. July 17, 2008. 539 Pages.

91. Tetra Tech. Record of Telephone Conversation Regarding Definitions of Minimum Reporting Limit, Minimum Quantitation Limit, Contract Required Quantitation Limit, and Sample Quantitation Limit. Between Shanna Davis, Environmental Scientist and Charlie Appleby, Quality Assurance Section, Science and Ecosystem Support Division, Management and Technical Services Branch, EPA Region 4. July 9, 2008. 1 Page.

92. Tetra Tech. Project Note to File with Attachments Regarding Contract Laboratory Program Statement of Work ILM 05.3 and ILM05.4. Shanna Davis, Environmental Scientist. July 29, 2008. 8 Pages.

SITE DESCRIPTION

Barite Hill/Nevada Goldfields (Barite Hill) is located about 2.5 miles south of the town of McCormick on the northern side of secondary Highway S-33-30 and about 0.75 mile northwest of the intersection of Highways S-33-44 and S-33-30 in McCormick County, South Carolina (Refs. 13, p. 1; 38, pp, i, 1, 2; 42, p. 1; 48, p. 2) (see Figure 1 of this HRS documentation record). Specifically, the geographic coordinates for Barite Hill, as measured from the process area pregnant pond (Pond A), are latitude 33° 52' 23.1" (33.87309) north and longitude 82° 18' 2.4" (-82.30067) west (Refs. 3, pp. 1, 2, 3; 6, Figure 2; 34, pp. 24, 28). The EPA identification number as recorded in the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) database is SCN000407714 (Ref. 39, pp. i, 2, 5). Barite Hill also has an EPA identification number recorded in the Resource Conservation and Recovery Act Information (RCRAInfo) database, SCD987597903 (Ref. 39, pp. i, 2, 11). The surrounding area is rural, undeveloped, and sparsely populated. No buildings, homes, or commercial facilities are located within a 0.5-mile radius of the Barite Hill property (Ref. 48, p. 8) (see Figure 1 of this HRS documentation record). Access to the Barite Hill property is restricted by fences, two gates, and natural barriers. The first gate is located directly off secondary Highway S-33-30, and the second is located at the former office trailer south of the main pit (Refs. 10; 40, Appendix C, Logbook Team B, pp. 21, 22). However, during the 2007 expanded site inspection (ESI) several children on all terrain vehicles were observed and when questioned stated they frequently use the property for recreational activities (Ref. 40, Appendix C, Logbook Team B, p. 14).

The Barite Hill property covers about 795.2 acres. Mining operations encompassed 135.5 acres, and the remaining 659.7 acres served as a buffer zone of areas not to be disturbed beyond their natural state (Ref. 48, p. 5). Two mine pits are located at the Barite Hill property: the 20-acre Main Pit that consists of a 10-acre lake and 10-acres of disturbed uplands, which drain towards the Main Pit lake which contains about 89,000,000 gallons of water and the reclaimed 3.93-acre Rainsford Pit (Refs. 5, p. 1; 6, p. 1-1, Figure 2; 25, pp. 1, 2, 3; 41 p. 3; 55, p. 18). During mining operations, the Barite Hill facility also included a process plant; a reusable heap leach facility consisting of an asphalt-lined leach pad; a permanent leach pad; eight ponds; two waste disposal areas; and diversion ditches (Refs. 5, Figure 2; 6, p. 1-2, Figure 2; 8, pp. 3, 78; 34, pp. 23, 28; 42, p. 1) (see Figure 2 in this HRS documentation record). In this HRS documentation record, the five ponds located in the northwestern portion of the Barite Hill property are referred to as the process area ponds and the three ponds located in the southeastern portion of the Barite Hill property are referred to as the permanent leach pad ponds (see Figure 2 of this HRS documentation record). The process area ponds consist of a pregnant pond (Pond A), barren pond (Pond B), rinse pond 1 (Pond C), rinse pond 2 (Pond D), and an overflow pond (Pond E). The permanent leach pad ponds consist of a barren pond (Pond F), a pregnant pond (Pond G), and a rinse pond (Pond H) (Refs. 6, Figure 2; 8, pp. 3, 77; 34, pp. 7, 23, 28; 55, p. 53) (see Figure 2 of this HRS documentation record).

Three sources have been identified on the Barite Hill property: Source No. 1, five ponds that comprise the process area ponds (Ponds A through E); Source No. 2, three ponds that comprise the permanent leach pad ponds (Ponds F, G, and H); and Source No. 3, the 10-acre Main Pit lake containing about 89,000,000 gallons of water with an average pH that is less than 2 standard units (Refs. 6, Figure 2; 34, pp. 28; 41, p. 3; 54, p. 3; 55, p. 53).

OPERATIONAL AND REGULATORY HISTORY

The Barite Hill facility was previously owned by Nevada Goldfields Inc. who operated a mine on the property. Mining operations began in 1989 and the Barite Hill facility actively mined gold and silver until October 1994 (Refs. 11, p. 1; 42, p. 1). The gold ore was mined from the two pits, crushed, agglomerated, and placed on a leach pad (Ref. 42, p. 3). A cyanide solution was then pumped from the barren pond to the leach pad and allowed to percolate through the heaps (Refs. 8, Figure 2.2; 42, pp. 4, 5).

The solution drained from the leach pad to the pregnant solution pond. The pregnant pond solution was pumped through a series of carbon adsorption tanks where the precious metals were recovered from the leach solution (Refs. 42, p. 5; 43, p. 6). The solution from the pregnant pond was pumped to the process plant for gold recovery (Refs. 8, Figure 2.2; 42, p. 4).

Gold recovery at the process plant began with the adsorption of the gold in the pregnant solution onto beds of activated carbon (Ref. 43, p. 6). The loaded carbon was stripped using an electrowinning process and the precious metals were recovered (Ref. 42, p. 5). The product from the recovery process was then melted into doré bars that were shipped to a refinery for final separation of gold and silver (Ref. 42, p. 5).

After the solution was stripped and the precious metals were recovered, the leach solution, which now contains very little of the precious metals was pumped to the barren pond where the cyanide concentration and pH were adjusted (Ref. 8, Figure 2-2; 42, p. 5; 43, p. 6). The leach solution was re-sprayed onto the heaps to extract more gold and silver and the process was repeated until all the leachable gold was extracted from the heaps (Refs. 8, Figure 2.2; 43, p. 6).

Once the heaps were leached, the ore was rinsed to remove any excess cyanide solution and metals (Ref. 43, p. 6). Rinsing was accomplished by spraying a solution containing little or no cyanide onto the ore and letting the solution rinse the ore clean (Ref. 43, p. 6). The rinse solution was kept in a separate pond from the higher cyanide solution used to leach the gold from the heaps (Ref. 43, p. 6). Hydrogen peroxide and alkaline chlorination were used to keep the cyanide level in the rinse pond at a level that facilitates rinsing the heaps. Beginning in 1995, the solution was also used as a starting solution for the water treatment system (Ref. 42, pp. 1, 6; 43, p. 6).

A wastewater treatment system was added in January 1995 to treat excess process solution to National Pollution Discharge Elimination System (NPDES) limits for discharge to the environment (Ref. 42, pp. 1, 7). The pretreated solution with most of the metals and cyanide removed by hydrogen peroxide or alkaline chlorination was pumped into the wastewater treatment building (Ref. 42, p. 7). The water passed through multimedia filters to remove particulate matter and then through carbon to remove organics. The pH was adjusted down and the water was pumped through the reverse osmosis system to remove most of the ions. The pH was adjusted upward before the water was pumped through the ion-exchange columns, which removed the remaining metal ions (Ref. 42, p. 7). The water was then combined with storm water in the NPDES Outfall 001 basin and subsequently discharged (Ref. 42, p. 7).

Waste by-products from mining operations included waste rock excavated from the mine to expose the ore and leached agglomerated ore after gold and silver values were recovered and the ore was rinsed (Refs. 5, p. 3; 42, p. 14). Waste rock was disposed of in the Rainsford Pit and the waste rock dump (Waste Disposal Area A) (Refs. 5, Figure 1; 6, Figure 2; 42, p. 14). Ore that underwent cyanide leaching and was not rinsed was subsequently disposed of in Waste Disposal Areas C, a lined hazardous waste disposal area (Ref. 42, p. 14). In 1992, the Barite Hill facility obtained a permit to change Waste Disposal Area C to a permanent leach pad facility. In addition, construction of the Waste Disposal Area C landfill occurred in 1992 (Refs. 6, p. 1-1; 8, p. 78). This landfill was permitted as an industrial solid waste landfill to store partially rinsed spent ore from the reusable leach pad that could not meet leachate water quality standards (Ref. 6, p. 1-2).

In 1995, reclamation activities at the Barite Hill property began (Ref. 7, p. 7). Reclamation activities are conducted to rehabilitate affected land for useful purposes and to protect natural resources of the surrounding area within reason (Ref. 27, p. 3). Areas that have been reclaimed include the permanent leach pad, the Waste Disposal Area C landfill, Rainsford Pit, Waste Disposal Area A, and the former crusher/reusable leach pad area (mineralized zone) (Ref. 5, p. 1). Areas remaining to be reclaimed include the Main Pit, permanent leach pad solution ponds, and process area ponds (Ref. 5, p. 1). Reclamation activities ceased in 1997 (Ref. 7, p. 7).

In June 1999, Nevada Goldfields Inc. filed for Chapter 7 bankruptcy, and in July of the same year, the keys to the Barite Hill facility were given to South Carolina Department of Health and Environmental Control (SCDHEC), and the property was abandoned (Refs. 7, p. 8; 9, p. 1). Prior to closure, lime was added to the water in the Main Pit to raise the pH of the water to 11 standard units, entrances to the property and the perimeters of all process ponds were fenced, and warning signs were posted around potentially dangerous areas (Ref. 9, p. 2).

PREVIOUS INVESTIGATIONS

In July 2003, SCDHEC's Bureau of Water visited the Barite Hill property. A heavy sulfur odor was noted on entrance through the main gate, about 0.25 mile from the Main Pit, the odor was persistent in the Main Pit area. The Main Pit was partially filled, and high-sulfide rock with an estimated 30 to 40 percent sulfide was present at the surface of the pit in the fill above the water table (Ref. 23, p. 1). A barbed wire fence was located around the treatment ponds; however, the area was easily accessed. Treatment ponds were at capacity, and liners were present. At one end of the treatment lagoons, a large unlined excavation was present. The excavation extended into the saprolite and contained about a foot or two of water. The excavation was located in an area that received overflow from the basins and the overflow seeped into the ground. Further investigation of the Barite Hill property was recommended to prevent acid generation and runoff (Ref. 23, p. 2).

In November 2003, SCDHEC conducted another visit at Barite Hill. Water in the Main Pit had a pH of 2 to 2.2 standard units. SCDHEC stated that because of the sulfide waste rock in the Main Pit, the water quality of the Main Pit was adversely affecting ground water and surface waters in the vicinity of the Barite Hill property (Ref. 46, p. 6).

In 2004, SCDHEC conducted a preliminary assessment/site inspection (PA/SI) at the Barite Hill property (Ref. 46, pp. 1, 2). PA/SI activities included the collection of 21 samples (eight surface water, seven sediment, and six surface soil samples) from the process area ponds, permanent leach pad ponds, the Main Pit and the 22-acre mineralized zone (Refs. 5, p. 1, Figure 1; 36; 46, pp. 16, 17, 22; 65). Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) hazardous substances detected in the source samples include arsenic, cadmium, chromium, copper, lead, zinc, mercury, and cyanide (Ref. 46, pp. 7 through 16). SCDHEC also collected 11 sediment samples and eight surface water samples from Hawe Creek and unnamed tributaries of Hawe Creek (Refs. 37; 46, p. 22; 65). Constituents detected at elevated concentrations in the sediment samples collected from Hawe Creek and the unnamed tributaries include arsenic, barium, cadmium, copper, lead, and zinc (Ref. 46, pp. 23, 24). The concentration of an analyte is considered elevated if the concentration is greater than or equal to three times the background concentration or greater than or equal to the sample quantitation limit if not detected in the background sample (Ref. 1, Section 2.3, Table 2-3). Constituents detected at elevated concentrations in surface water samples collected from unnamed tributaries of Hawe Creek include copper, and lead (Ref. 37).

The PA/SI report states that the Main Pit represents the greatest potential for adverse impacts to the ground water and surface water pathways; however, other areas of concern also were noted and include (1) process waters have not been treated to acceptable qualities for discharge; (2) construction of wetlands to act as passive treatment for leachate drainage from the capped leach pads and industrial waste landfills was not implemented allowing untreated leachate to reach surface water bodies; (3) improper closure of the concrete buildings that housed the gold processing plant and associated process ponds; (4) lack of maintenance of clay caps, grasslands, and run-on and runoff controls; (5) absence of ground water monitoring at Barite Hill facility; and (6) absence of monitoring of process water discharging to surface water bodies surrounding Barite Hill facility (Ref. 46, p. 26).

In January 2007, Tetra Tech, EPA, SCDHEC, and Response Engineering and Analytical Contract (REAC) conducted a site reconnaissance at the Barite Hill property. Reconnaissance activities included a site walk to observe the Main Pit, process ponds, wetland areas, and former structures (Ref. 40, pp. 5, 6). During the site walk, a seep from the northern side of the Main Pit was observed to be flowing into an unnamed tributary of Hawe Creek (Ref. 40, Appendix C, Team B, pp. 2, 3, 4).

In February 2007, EPA directed REAC to conduct a removal site evaluation (RSE) at the Barite Hill property (Ref. 34, p. 1). Activities included collecting sediment samples along unnamed tributaries of Hawe Creek, which receive runoff from the Barite Hill property, sediment samples from process ponds, surface water samples from the leakage detection pits of the site ponds as well as collecting physical characterization and water quality data (Ref. 34, pp. 2, 3, 8). Analytical results for surface water samples collected from the leakage detection pits of the process ponds contained arsenic, cadmium, chromium, copper, nickel, selenium, zinc, and cyanide (Refs. 34, pp. 8, 20; 36). Sediment samples collected from the process ponds contained arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, zinc, and cyanide (Refs. 34, p. 15; 36). Analytical results for sediment samples collected from unnamed tributaries of Hawe Creek indicated the presence of chromium, copper, and lead at elevated concentrations (Refs. 56, pp. 39 through 73, 101 through 117; 37). The focus of the REAC investigation was to determine the impacts to Hawe Creek and Strom Thurmond Lake under normal weather conditions and during catastrophic weather such as a hurricane over a short term and longer term period (Ref. 34, p. 2).

In March 2007, the U.S. Department of the Interior's Bureau of Reclamation conducted a site inventory at the Barite Hill property at the request of EPA Region 4 (Ref. 55, p. 1). Hazardous materials were observed on the property as well as signs of frequent uncontrolled trespass (Ref. 55, p. 1). The most significant hazardous materials encountered at the Barite Hill property included two wood pallets containing both opened and unopened bags of caustic soda, an insulated tank containing caustic solution, a tank of acid, three ventilating systems that contained heavy metal oxide flue dust, a polyethylene tank labeled as containing cyanide solution, and a 55-gallon drum labeled methyl-ethyl ketone (MEK). All of the above materials except the 55-gallon drum labeled MEK and the cyanide solution tank were disposed of in the Main Pit during an emergency response action (Ref. 55, p. 1). At the time of the site inventory, the Main Pit was noted as the most significant remaining hazard at the Barite Hill property (Ref. 55, p. 1). Subsequent pH readings collected by SCDHEC ranged from 2.5 standard units at the water surface to -3.9 standard units at about 4 feet deep (Ref. 55, p. 2).

In June 2007, Tetra Tech conducted an ESI on behalf of EPA (Ref. 40, pp. 1, 6). During the ESI, Tetra Tech collected 26 surface water and 27 sediment samples (Refs. 40, p. 6; 79). Specifically, co-located surface water and sediment samples were collected from six on-site ponds (14 samples), one on-site depression (two samples), Tributary 1 (two samples), Tributary 2 (six samples), Tributary 3 (14 samples), an unnamed tributary downgradient of new NPDES Outfall 003 (former NPDES Outfall 002) (four samples), and Hawe Creek (four samples) (Refs. 40, pp. 6, 7; 53; 58). Tributaries 1, 2, and 3 are unnamed tributaries of Hawe Creek. Tributary 1 is located to the east, Tributary 2 (also referred to as Stream B) is located north, and Tributary 3 (also referred to as Stream A) is located south and west of the Barite Hill property (Refs. 20, p. 3; 30; 40, p. 7). The sampling locations and results from the ESI are depicted on References 53 and 58. Analytical results for the liquid source samples collected from the on-site ponds indicated the presence of arsenic, cadmium, copper, nickel, selenium, silver, zinc, and cyanide (Ref. 40, Appendix B, Table 3). Analytical results for the solid source samples collected from the on-site ponds indicated the presence of arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, zinc, and cyanide (Ref. 40, Appendix B, Table 4).

Analysis of surface water samples collected from Tributaries 1, 2, 3, and Hawe Creek indicated the presence of cadmium, chromium, copper, lead, mercury, zinc and cyanide at elevated concentrations. The highest elevated concentrations of these site-related hazardous substances are as follows: cadmium, 790 micrograms per liter (µg/L); chromium, 29 µg/L; copper, 93,000 µg/L; lead, 98 µg/L; mercury, 0.6 µg/L;

zinc, 20,000 µg/L; and cyanide, 11 µg/L (Ref. 40, Appendix B, pp. B-11, B-13, B-14, B-17, B-18, B-19, B-23). Analysis of sediment samples collected from Tributaries 1, 2, 3, and Hawe Creek indicated the presence of arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc at elevated concentrations. The highest elevated concentrations of these site-related hazardous substances are as follows: arsenic, 67 milligrams per kilogram (mg/kg); cadmium, 10 mg/kg; chromium, 480 mg/kg; copper, 5,900J mg/kg; lead, 270J mg/kg; and mercury, 1.2 mg/kg; nickel, 130 mg/kg; zinc, 1,300J mg/kg (Ref. 40, Appendix B, pp. B-12, B-15, B-16, B-20, B-21, B-22, B-24). A "J" value indicates the identification of the analyte is acceptable; however, the reported value is an estimate.

In October 2007, EPA began removal activities at the Barite Hill property. Activities planned for the removal action includes a Bureau of Reclamation designed cap for the 250,000 cubic yards of acid producing waste rock adjacent to the Main Pit, neutralization of the water contained in the Main Pit, as well as cyanide deactivation of one of the process ponds (Ref. 81, p. 5). Treatment of the Main Pit water includes neutralization and carbon loading (Ref. 81, p. 11). As of the May 24, 2008 Pollution Report, neutralization activities have included the addition of 1,860 tons of carbide lime and carbon loading activities have included the addition of about 400 tons of molasses blend, 21 tons of methanol, 1,300 tons of fresh and aged wood chips, and 23 tons of sodium hydroxide (Ref. 81, pp. 11, 13, 18, 19). The water quality of the Main Pit has significantly improved. According to the June 12, 2008 Pollution Report, the pH of the Main Pit is maintaining an approximate average of 5.5 standard units (Ref. 81, p. 24). In addition, the July 12, 2008 Pollution Report indicates that concentrations of antimony, arsenic, cadmium, chromium, copper, lead, nickel, selenium, and zinc in the Main Pit have been reduced since October 2007 (Ref. 81, p. 27). Also, the water quality in the Main Pit continues to improve (Ref. 81, p. 26). Additional removal activities at the Barite Hill property include:

- Sonar mapping of the Main Pit floor with ROVER technology (Ref. 81, pp. 6, 9).
- Land survey of drainage areas surrounding the Main Pit (Ref. 81, pp. 6, 9).
- Designed and implemented a centrally located Main Pit monitoring station to document baseline conditions, provide performance data during removal activities, and compile data for future water quality. The satellite recorded mini-trolls operate in the Main Pit at 5 foot and 40 foot intervals and measure parameters such as DO (dissolved oxygen), ORP (oxidation reduction potential), pH, temperature, and turbidity (Ref. 81, pp. 11, 13).
- Deforestation and grubbing of the eastern ridge and borrow pit edge to be used as part of the clay borrow for capping (Ref. 81, p. 11).
- Grading of the south and north waste rock piles (Ref. 81, pp. 11, 15, 17).
- Excavation, transport, and grading of site sourced clay to the former north and south waste rock piles (Ref. 81, p. 24).
- Watershed hydrology evaluation (Ref. 81, p. 11).
- Collection of samples from the pregnant pond sump (Ref. 81, p. 11).
- Installation of two wells upgradient of the Main Pit to explore for an additional source of total watershed water to the Main Pit (Ref. 81, p. 15).

2.2 SOURCE CHARACTERIZATION

2.2.1 SOURCE IDENTIFICATION

Number of source: 1

Name of source: Process Area Ponds

Source Type: Surface Impoundments

Description and Location of Source (with reference to a map of the site):

Source No. 1 consists of five process area ponds (Ponds A through E) (Ref. 8, p. 77; 34, p. 28) (see Figure 2 of this HRS documentation record). Specifically, the process area ponds include Pond A (pregnant pond), Pond B (barren pond), Pond C (rinse pond 1), Pond D (rinse pond 2), and Pond E, (contingency-overflow pond) (Refs. 8, p. 77; 34, pp. 7, 23, 28). These ponds were used in conjunction with the reusable asphalt leach pad. The surface areas of the five ponds area as follows: Pond A (36,700 feet squared [ft^2]), Pond B (18,200 ft^2), Pond C (16,600 ft^2), Pond D (8,300 ft^2), and Pond E (26,000 ft^2) (Refs. 5, Figure 1; 8, p. 77; 34, pp. 17, 23; 45). The ponds are all source type "surface impoundment," have containment values of greater than zero, contain the same types of hazardous substances, and impact the same surface water bodies (see sections 2.2.2, 2.2.3, and 4.1.1 of this documentation record).

Ponds A, B, C, D, and E were designed to contain process solution and wastewater. After the gold ore was mined, crushed, agglomerated, and placed on a leach pad, a cyanide solution was pumped to the leach pad from the barren pond and allowed to percolate through the heaps (Refs. 8, Figure 2.2; 42, p. 5; 42, pp. 4, 5). This solution drained from the leach pad to the pregnant solution pond (Ref. 42, p. 4). The solution from the pregnant pond was pumped to the process plant for gold recovery (Refs. 6, Figure 2; 8, Figure 2.2; 42, p. 4). Once the heaps were leached, the ore was rinsed to remove any excess cyanide solution and metals (Ref. 43, p. 6). Rinsing was accomplished by spraying a solution containing little or no cyanide onto the ore and letting the ore rinse clean (Ref. 43, p. 6). The rinse solution was kept in a separate pond from the higher cyanide solution used to leach the gold from the heaps (Ref. 43, p. 6). The reusable leach pad was decommissioned in 1992 (Ref. 6, p. 1-2, 3-1, Figure 2). At the time of abandonment in 1999, the ponds contained liquid and were neutralized with hydrogen peroxide to reduce the cyanide concentration (Ref. 4).

Several investigations were conducted at the Barite Hill property from October 2004 to June 2007. Analytical results for liquid source samples collected from Source No. 1 from October 2004 to June 2007 indicated the presence of arsenic, copper, nickel, selenium, zinc, and cyanide (Refs. 36). The highest concentrations of these hazardous substances are as follows: arsenic, 15 µg/L; copper, 1,700 µg/L; nickel, 240 µg/L; selenium, 200 µg/L; zinc, 210 µg/L; and cyanide, 11 µg/L (Ref. 36). Analytical results for solid source samples collected from Source No. 1 from October 2004 to June 2007 indicated the presence of arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, zinc, and cyanide (Ref. 36). The highest concentrations of these analytes are as follows: arsenic, 470 mg/kg; cadmium, 14 mg/kg; chromium, 170 mg/kg, copper, 78,000 J (estimated) mg/kg; mercury, 4.0 J mg/kg; nickel, 290 mg/kg; selenium, 5,900 mg/kg; silver, 1,000 mg/kg; zinc, 720 J mg/kg; and cyanide, 2,200 J mg/kg (Ref. 36).

Table 1 contains a list of the ponds contained in Source No. 1, their former use, surface area, volume of process solution/wastewater as of March 2007, and hazardous substances detected during the October 2004, March 2007, and June 2007 investigations (see tables 2 through 4 of this HRS documentation record) (Refs. 6, Figure 2; 36; 34, pp. 7, 23, 28; 45; 82).

TABLE 1: DESCRIPTION OF PONDS CONTAINED IN SOURCE NO. 1					
Pond	**Former Use**	**Surface Area (ft^2)**	**Volume as of March 2007 (ft^3)**	**Hazardous Substances Detected**	**References**
A	Pregnant Pond	36,700	351,219	arsenic, chromium, copper, lead, mercury, nickel, selenium, silver, zinc, cyanide	6, Figure 2; 36; 34, pp. 7, 23, 28; 45; 82, pp. 1, 2; See Tables 2 through 6 of this HRS documentation record
B	Barren Pond	18,200	195,832	arsenic, chromium, copper, lead, nickel, selenium, silver, zinc	
C	Rinse Pond 1	16,600	133,464	arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, zinc, cyanide	
D	Rinse Pond 2	8,300	49,800	arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, zinc, cyanide	
E	Overflow Pond	26,000	NC	arsenic, chromium, copper, lead, nickel, zinc	

Notes:

ft^2 Feet squared
ft^3 Feet cubed
NC Not calculated because the pond is not lined (Ref. 34, p. 7)

2.2.2 HAZARDOUS SUBSTANCES ASSOCIATED WITH THE SOURCE

October 2004 Preliminary Assessment/Site Inspection: South Carolina Department of Health and Environmental Control

The source samples listed in Table 2 were collected by SCDHEC. During the 2004 sampling event, four liquid and four solid source samples were collected from Ponds A through E. Specifically, a liquid sample was collected Pond A (BH-015-SW), Pond B (BH-016-SW), Pond C (BH-013-SW), and Pond D (BH-014-SW) (Refs. 34, pp. 23, 28; 46, pp. 10; 65, pp. 2, 3, 7; 68, pp. 7, 8). Solid samples were collected from Pond A (BH-015-SE), Pond C(BH-013-SE), and Pond E (BH-017-SO and BH-018-SO) (Refs. 34, p. 23, 28; 44, p. 4; 46, p. 10; 65, pp. 2, 3, 6; 68, pp. 7, 8). The source samples were collected in accordance with the SCDHEC, Bureau of Land and Waste Management Standard Operating Procedures (BLWMSOP) and the EPA Region 4, SESD, Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (EISOPQAM) (November 2001) (Refs. 47, p. 11; 49, Sections 10 and 11; 87; 90, Sections 7 and 9). Cyanide analysis was conducted under the EPA Contract Laboratory Program (CLP) (Ref. 65, pp. 5, 6, 7, 8); the contract-required quantitation limit (CRQL) for cyanide is provided in Reference 52. Total metals analysis was conducted by the EPA Region 4 SESD Analytical Support Branch (ASB) (Ref. 65, pp. 1, 2, 3, 4). The EPA Region 4 ASB laboratory operations and quality assurance manual minimum quantitation limits are contained in Reference 51. The minimum quantitation limit as defined in the EPA ASB laboratory operations and quality assurance manual is "the concentration level below which the variance of the results for a particular analyte (element or compound) exceeds the acceptable quality control criteria. This value responds to the lowest quantitative point on the calibration curve or the lowest demonstrated level of acceptable quantitation" (Ref. 51, Chapter 5, p. 8). Analytical data sheets for the samples collected in October 2004 are contained in Reference 50, the traffic reports and chain of custody records are contained in Reference 65, and logbook notes are contained in Reference 68. The locations of the liquid and solid source samples listed in Table 2 are provided in Reference 36.

TABLE 2: Analytical Results for Source No. 1 – October 2004

Sample ID	Hazardous Substance	Hazardous Substance Concentration	MQL[1]	References
Liquid Source Samples				
BH-013-SW	Arsenic	15 µg/L	2.0 µg/L	50, p. 59; 51, Chapter 7, Appendix 1, p. 1; 65, p. 2
BH-013-SW	Copper	420 µg/L	10 µg/L	50, p. 59; 51, Chapter 7, Appendix 1, p. 1; 65, p. 2
BH-013-SW	Nickel	190 µg/L	20 µg/L	50, p. 59; 51, Chapter 7, Appendix 1, p. 1; 65, p. 2
BH-013-SW	Selenium	160 µg/L	5.0 µg/L	50, p. 59; 51, Chapter 7, Appendix 1, p. 1; 65, p. 2
BH-014-SW	Copper	10 µg/L	10 µg/L	50, p. 60; 51, Chapter 7, Appendix 1, p. 1; 65, p. 2
BH-015-SW	Arsenic	18 µg/L	2.0 µg/L	50, p. 62; 51, Chapter 7, Appendix 1, p. 1; 65, p. 3

TABLE 2: Analytical Results for Source No. 1 – October 2004				
Sample ID	**Hazardous Substance**	**Hazardous Substance Concentration**	**MQL[1]**	**References**
BH-015-SW	Copper	100 µg/L	10 µg/L	50, p. 62; 51, Chapter 7, Appendix 1, p. 1; 65, p. 3
BH-015-SW	Nickel	240 µg/L	20 µg/L	50, p. 62; 51, Chapter 7, Appendix 1, p. 1; 65, p. 3
BH-015-SW	Selenium	200 µg/L	5.0 µg/L	50, p. 62; 51, Chapter 7, Appendix 1, p. 1; 65, p. 3
BH-015-SW	Cyanide	91 µg/L	10 µg/L	50, p. 21; 52, p. 1; 65, p. 7
BH-016-SW	Arsenic	12A µg/L	2.0 µg/L	50, p. 63; 51, Chapter 7, Appendix 1, p. 1; 65, p. 3
BH-016-SW	Copper	94 µg/L	10 µg/L	50, p. 63; 51, Chapter 7, Appendix 1, p. 1; 65, p. 3
BH-016-SW	Nickel	200 µg/L	20 µg/L	50, p. 63; 51, Chapter 7, Appendix 1, p. 1; 65, p. 3
BH-016-SW	Selenium	90A µg/L	5.0 µg/L	50, p. 63; 51, Chapter 7, Appendix 1, p. 1; 65, p. 3
Solid Source Samples				
BH-013-SE	Arsenic	77A mg/kg	1.0 mg/kg	50, p. 58; 51, Chapter 7, Appendix 1, p. 1; 65, p. 2
BH-013-SE	Copper	24,000A mg/kg	1.0 mg/kg	50, p. 58; 51, Chapter 7, Appendix 1, p. 1; 65, p. 2
BH-013-SE	Lead	100A mg/kg	0.5 mg/kg	50, p. 58; 51, Chapter 7, Appendix 1, p. 1; 65, p. 2
BH-013-SE	Mercury	1.8 mg/kg	0.05 mg/kg	50, p. 58; 51, Chapter 7, Appendix 1, p. 1; 65, p. 2
BH-013-SE	Nickel	220A mg/kg	2.0 mg/kg	50, p. 58; 51, Chapter 7, Appendix 1, p. 1; 65, p. 2
BH-013-SE	Selenium	280A mg/kg	4.0 mg/kg	50, p. 58; 51, Chapter 7, Appendix 1, p. 1; 65, p. 2
BH-013-SE	Silver	77AJ mg/kg	1.0 mg/kg	50, p. 58; 51, Chapter 7, Appendix 1, p. 2; 65, p. 2
BH-013-SE	Zinc	460A mg/kg	1.0 mg/kg	50, p. 58; 51, Chapter 7, Appendix 1, p. 2; 65, p. 2
BH-013-SE	Cyanide	1,700 mg/kg	2.5 mg/kg	50, p. 17; 52, p. 1; 65, p. 6
BH-015-SE	Arsenic	30 mg/kg	1.0 mg/kg	50, p. 61; 51, Chapter 7, Appendix 1, p. 1; 65, p. 3

TABLE 2: Analytical Results for Source No. 1 – October 2004				
Sample ID	**Hazardous Substance**	**Hazardous Substance Concentration**	**MQL[1]**	**References**
BH-015-SE	Chromium	17 mg/kg	1.0 mg/kg	50, p. 61; 51, Chapter 7, Appendix 1, p. 1; 65, p. 3
BH-015-SE	Copper	500 mg/kg	1.0 mg/kg	50, p. 61; 51, Chapter 7, Appendix 1, p. 1; 65, p. 3
BH-015-SE	Lead	120 mg/kg	0.5 mg/kg	50, p. 61; 51, Chapter 7, Appendix 1, p. 1; 65, p. 3
BH-015-SE	Mercury	0.067 mg/kg	0.05 mg/kg	50, p. 61; 51, Chapter 7, Appendix 1, p. 1; 65, p. 3
BH-015-SE	Nickel	4.0 mg/kg	2.0 mg/kg	50, p. 61; 51, Chapter 7, Appendix 1, p. 1; 65, p. 3
BH-015-SE	Selenium	6.0 mg/kg	4.0 mg/kg	50, p. 61; 51, Chapter 7, Appendix 1, p. 1; 65, p. 3
BH-015-SE	Silver	2.8 mg/kg	1.0 mg/kg	50, p. 61; 51, Chapter 7, Appendix 1, p. 2; 65, p. 3
BH-015-SE	Zinc	52 mg/kg	1.0 mg/kg	50, p. 61; 51, Chapter 7, Appendix 1, p. 2; 65, p. 3
BH-015-SE	Cyanide	10 mg/kg	2.5 mg/kg	50, p. 20; 65, p. 6
BH-017-SO	Chromium	35 mg/kg	1.0 mg/kg	50, p. 64; 51, Chapter 7, Appendix 1, p. 1; 65, p. 3
BH-017-SO	Copper	110 mg/kg	1.0 mg/kg	50, p. 64; 51, Chapter 7, Appendix 1, p. 1; 65, p. 3
BH-017-SO	Lead	13 mg/kg	0.5 mg/kg	50, p. 64; 51, Chapter 7, Appendix 1, p. 1; 65, p. 3
BH-017-SO	Nickel	3.5 mg/kg	2.0 mg/kg	50, p. 64; 51, Chapter 7, Appendix 1, p. 1; 65, p. 3
BH-017-SO	Zinc	40 mg/kg	1.0 mg/kg	50, p. 64; 51, Chapter 7, Appendix 1, p. 2; 65, p. 3
BH-018-SO	Chromium	46 mg/kg	1.0 mg/kg	50, p. 65; 51, Chapter 7, Appendix 1, p. 1; 65, p. 3
BH-018-SO	Copper	110 mg/kg	1.0 mg/kg	50, p. 65; 51, Chapter 7, Appendix 1, p. 1; 65, p. 3
BH-018-SO	Lead	30 mg/kg	0.5 mg/kg	50, p. 65; 51, Chapter 7, Appendix 1, p. 1; 65, p. 3
BH-018-SO	Nickel	6.6 mg/kg	2.0 mg/kg	50, p. 65; 51, Chapter 7, Appendix 1, p. 1; 65, p. 3

TABLE 2: Analytical Results for Source No. 1 – October 2004				
Sample ID	**Hazardous Substance**	**Hazardous Substance Concentration**	**MQL[1]**	**References**
BH-018-SO	Zinc	44 mg/kg	1.0 mg/kg	50, p. 65; 51, Chapter 7, Appendix 1, p. 2; 65, p. 3

Notes:

µg/L Microgram per liter
A Analyte analyzed in replicate. Reported value is "average" of replicates.
BH Barite Hill
CRQL Contract required quantitation limit
J Identification of the analyte is acceptable; the reported value is an estimate
mg/kg Milligram per kilogram
MQL Minimum quantitation limit. The MQL is equivalent to the sample quantitation limit (SQL) (Ref. 91).
ID Identification number
SE Sediment
SO Soil
SW Surface water
[1] For samples containing cyanide, the value in column number 4 is the CRQL.
The source samples were labeled as SW (surface water) and SE (sediment) for analysis purposes only.

March 2007 Removal Site Evaluation

The source samples listed in Table 3 were collected by REAC on behalf of EPA in March 2007 (Ref. 34, pp. 1, 2, 25; 69). The solid samples were collected using a ponar sampling device and a minimum of two depth samples were used to create the composite solid sample (Ref. 34, p. 7). The solid samples were collected at depths ranging from 0 to 4.1 feet below the surface water sediment interface (Ref. 34, pp. 237, 238). Liquid source samples were collected from the leakage detection pits of Pond A (AL-a), Pond B (BL-a), Pond C (CL-a), and Pond D (DL-a) (Refs. 8, p. 77; 34, pp. 3, 7, 8, 28; 69, pp. 9, 11; 85, Logbook REAC IV-B-0212, pp. 6 through 12). Composite solid samples were collected from Ponds A, B, C, D, and E (Refs. 8, p. 77; 34, pp. 3, 7, 28; 69, p. 3; 85, Logbook REAC IV-B-0212, pp. 6 through 12). Liquid samples were collected from the leakage detection pits located beneath the liner of each pond. The pit was accessed by a six inch chlorinated polyvinyl chloride capped pipe along the bank of each pond. The pits were sampled by pumping each sump with a peristaltic pump (Ref. 34, p. 8). Solid samples were collected in accordance with REAC Standard Operating Procedure (SOP) No. 2016, Sediment Sampling (Refs. 17; 66, p. 8; 86). The samples were analyzed under the EPA CLP, for total metals and cyanide analysis using the CLP Statement of Work (SOW) ILM05.3/ILM05.4 (Refs. 56; 84; 92, pp. 1 through 8). EPA Region 4, SESD reviewed all data according to the contract SOW and EPA guidelines (Ref. 56, p. 2). The minimum reporting limits are contained on the analytical data sheets in Reference 56. The minimum reporting limits on the analytical data sheets are the sample specific and analyte specific CLP CRQLs which correspond to the lowest quantitative point on the calibration curve (Ref. 91). Traffic reports and chain of custody records are contained in Reference 69, and logbook notes are contained in Reference 85, Logbook IV-B-0212, pp. 6 through 12. The locations of the liquid and solid source samples listed in Table 3 are provided in Reference 36.

TABLE 3: Analytical Results for Source No. 1 – March 2007

Sample ID	Hazardous Substance	Hazardous Substance Concentration	MRL	Reference
Liquid Source Samples				
AL-a	Copper	100 µg/L	25 µg/L	56, p. 23; 69, p. 9
AL-a	Nickel	130 µg/L	40 µg/L	56, p. 23; 69, p. 9
AL-a	Selenium	57 µg/L	35 µg/L	56, p. 23; 69, p. 9
BL-a	Copper	730 µg/L	25 µg/L	56, p. 26; 69, p. 11
BL-a	Nickel	96 µg/L	40 µg/L	56, p. 26; 69, p. 11
BL-a	Selenium	110 µg/L	35 µg/L	56, p. 26; 69, p. 11
CL-a	Copper	120 µg/L	25 µg/L	56, p. 29; 69, p. 11
CL-a	Nickel	93 µg/L	40 µg/L	56, p. 29; 69, p. 11
CL-a	Selenium	110 µg/L	35 µg/L	56, p. 29; 69, p. 11
DL-a	Copper	320 µg/L	25 µg/L	56, p. 32; 69, p. 11
DL-a	Nickel	150 µg/L	40 µg/L	56, p. 32; 69, p. 11
DL-a	Selenium	44 µg/L	35 µg/L	56, p. 32; 69, p. 11
DL-a	Zinc	210 µg/L	60 µg/L	56, p. 32; 69, p. 11
DL-a	Cyanide	11 µg/L	10 µg/L	56, p. 33; 69, p. 11

TABLE 3: Analytical Results for Source No. 1 – March 2007				
Sample ID	**Hazardous Substance**	**Hazardous Substance Concentration**	**MRL**	**Reference**
Solid Source Samples				
Pond A	Arsenic	470 mg/kg	2.0 mg/kg	56, p. 81; 69, p. 3
Pond A	Cadmium	8.2 mg/kg	0.98 mg/kg	56, p. 81; 69, p. 3
Pond A	Chromium	120 mg/kg	2.0 mg/kg	56, p. 81; 69, p. 3
Pond A	Copper	52,000J mg/kg	25 mg/kg	56, p. 81; 69, p. 3
Pond A	Lead	150 mg/kg	2.0 mg/kg	56, p. 81; 69, p. 3
Pond A	Mercury	4.0J mg/kg	0.98 mg/kg	56, , p. 81; 69, p. 3
Pond A	Nickel	55 mg/kg	7.9 mg/kg	56, p. 81; 69, p. 3
Pond A	Selenium	1,000 mg/kg	6.9 mg/kg	56, p. 81; 69, p. 3
Pond A	Silver	260 mg/kg	2.0 mg/kg	56, p. 81; 69, p. 3
Pond A	Zinc	300J mg/kg	12 mg/kg	56, p. 81; 69, p. 3
Pond A	Cyanide	2,200J mg/kg	250 mg/kg	56, p. 82; 69, p. 3
Pond B	Arsenic	53 mg/kg	12 mg/kg	56, p. 83; 69, p. 3
Pond B	Chromium	55 mg/kg	12 mg/kg	56, p. 83; 69, p. 3
Pond B	Copper	37,000J mg/kg	29 mg/kg	56, p. 83; 69, p. 3
Pond B	Lead	21 mg/kg	12 mg/kg	56, p. 83; 69, p. 3
Pond B	Nickel	130 mg/kg	46 mg/kg	56, p. 83; 69, p. 3
Pond B	Selenium	5,900 mg/kg	41 mg/kg	56, p. 83; 69, p. 3
Pond B	Silver	1,000 mg/kg	12 mg/kg	56, p. 83; 69, p. 3
Pond B	Zinc	190J mg/kg	70 mg/kg	56, p. 83; 69, p. 3
Pond C	Arsenic	200 mg/kg	2.3 mg/kg	56, p. 85; 69, p. 3
Pond C	Cadmium	14 mg/kg	1.1 mg/kg	56, p. 85; 69, p. 3
Pond C	Chromium	70 mg/kg	2.3 mg/kg	56, p. 85; 69, p. 3
Pond C	Copper	78,000J mg/kg	29 mg/kg	56, p. 85; 69, p. 3
Pond C	Lead	66 mg/kg	2.3 mg/kg	56, p. 85; 69, p. 3
Pond C	Mercury	1.6J mg/kg	1.1 mg/kg	56, p. 85; 69, p. 3
Pond C	Nickel	230 mg/kg	9.2 mg/kg	56, p. 85; 69, p. 3
Pond C	Selenium	1,500 mg/kg	8.0 mg/kg	56, p. 85; 69, p. 3
Pond C	Silver	180 mg/kg	2.3 mg/kg	56, p. 85; 69, p. 3
Pond C	Zinc	720J mg/kg	14 mg/kg	56, p. 85; 69, p. 3

TABLE 3: Analytical Results for Source No. 1 – March 2007				
Sample ID	**Hazardous Substance**	**Hazardous Substance Concentration**	**MRL**	**Reference**
Pond C	Cyanide	1,700J mg/kg	290 mg/kg	56, p. 86; 69, p. 3
Pond D	Arsenic	110 mg/kg	2.1 mg/kg	56, p. 87; 69, p. 3
Pond D	Cadmium	1.7 mg/kg	1.1 mg/kg	56, p. 87; 69, p. 3
Pond D	Chromium	19 mg/kg	2.1 mg/kg	56, p. 87; 69, p. 3
Pond D	Copper	16,000J mg/kg	16 mg/kg	56, p. 87; 69, p. 3
Pond D	Lead	130 mg/kg	2.1 mg/kg	56, p. 87; 69, p. 3
Pond D	Mercury	2.2J mg/kg	1.1 mg/kg	56, p. 87; 69, p. 3
Pond D	Nickel	290 mg/kg	8.4 mg/kg	56, p. 87; 69, p. 3
Pond D	Selenium	210 mg/kg	7.4 mg/kg	56, p. 87; 69, p. 3
Pond D	Silver	270 mg/kg	2.1 mg/kg	56, p. 87; 69, p. 3
Pond D	Zinc	280J mg/kg	13 mg/kg	56, p. 87; 69, p. 3
Pond D	Cyanide	400J mg/kg	53 mg/kg	56, p. 88; 69, p. 3
Pond E	Arsenic	2.9 mg/kg	1.7 mg/kg	56, p. 89; 69, p. 3
Pond E	Chromium	55 mg/kg	1.7 mg/kg	56, p. 89; 69, p. 3
Pond E	Copper	130J mg/kg	4.4 mg/kg	56, p. 89; 69, p. 3
Pond E	Lead	19 mg/kg	1.7 mg/kg	56, p. 89; 69, p. 3
Pond E	Nickel	8.5 mg/kg	7.0 mg/kg	56, p. 89; 69, p. 3
Pond E	Zinc	90J mg/kg	10 mg/kg	56, p. 89; 69, p. 3

Notes:

a Total metals and cyanide analysis
AL Pond A liquid
BL Pond B liquid
CL Pond C liquid
DL Pond D liquid
µg/L Microgram per liter
ID Identification number
J The identification of the analyte is acceptable; the reported value is an estimate
mg/kg Milligram per kilogram
MRL Minimum reporting limit. The MRL is equivalent to the sample quantitation limit (SQL) (Ref. 91).
Pond A Pond A solid
Pond B Pond B solid
Pond C Pond C solid
Pond D Pond D solid
Pond E Pond E solid

June 2007 Expanded Site Inspection

The source samples listed in Table 4 were collected by Tetra Tech on behalf of EPA in June 2007 (Refs. 40, p. 1; 79). Co-located liquid and solid source samples were collected from Pond A (BH-SW/SD-18), Pond B (BH-SW/SD-19), and Pond C (BH-SW/SD-20) (Refs. 40, Appendix B, pp. B-1, B-2, B-4, Appendix C, Logbook Team A, pp. 12, 13; 34, p. 23; 79, pp. 2, 3, 5). The liquid samples were collected from the surface of the water, and the solid samples were collected from the side walls of each pond (Refs. 32, p. 10; 40, p. 6, Appendix C, Logbook Team B, p. 38). The source samples were collected in accordance with the EPA Region 4 SESD EISOPQAM dated November 2001 (Refs. 40, p. 7, Appendix C, Team B, p. 7; 49 Sections 10 and 11). The samples were analyzed under the EPA CLP for total metals and cyanide analysis using the CLP SOW ILM05.3/ILM05.4 (Refs. 40, Appendix E; 84; 92, pp. 1 through 8). EPA Region 4, SESD reviewed all data according to the contract Statement of Work and EPA guidelines (Ref. 40, Appendix E, pp. 2 of 160, 2 of 20). The minimum reporting limits are contained on the analytical data sheets in Appendix E of Reference 40. The minimum reporting limits on the analytical data sheets are the sample specific and analyte specific CLP CRQLs which correspond to the lowest quantitative point on the calibration curve (Ref. 91). The traffic reports and chain of custody records are provided in Reference 79. The logbook notes are provided in Reference 40, Appendix C. The locations of the liquid and solid source samples listed in Table 4 are provided in Reference 53.

TABLE 4: Analytical Results for Source No. 1 – June 2007

Sample ID	Hazardous Substance	Hazardous Substance Concentration	MRL	Reference
Liquid Source Samples				
BH-SW-18	Copper	51 µg/L	25 µg/L	40, Appendix E, p. 100 of 160; 79, p. 5
BH-SW-18	Nickel	180 µg/L	40 µg/L	40, Appendix E, p. 100 of 160; 79, p. 5
BH-SW-18	Selenium	82 µg/L	35 µg/L	40, Appendix E, p. 100 of 160; 79, p. 5
BH-SW-19	Arsenic	11 µg/L	10 µg/L	40, Appendix E, p. 102 of 160; 79, p. 5
BH-SW-19	Copper	68 µg/L	25 µg/L	40, Appendix E, p. 102 of 160; 79, p. 5
BH-SW-19	Nickel	170 µg/L	40 µg/L	40, Appendix E, p. 102 of 160; 79, p. 5
BH-SW-19	Selenium	71 µg/L	35 µg/L	40, Appendix E, p. 102 of 160; 79, p. 5
BH-SW-20	Arsenic	14 µg/L	10 µg/L	40, Appendix E, p. 104 of 160; 79, p. 5
BH-SW-20	Copper	1,700 µg/L	25 µg/L	40, Appendix E, p. 104 of 160; 79, p. 5
BH-SW-20	Nickel	170 µg/L	40 µg/L	40, Appendix E, p. 104 of 160; 79, p. 5
BH-SW-20	Selenium	130 µg/L	35 µg/L	40, Appendix E, p. 104 of 160; 79, p. 5
Solid Source Samples				
BH-SD-18	Arsenic	81 mg/kg	11 mg/kg	40, Appendix E, p. 48 of 160; 79, p. 2
BH-SD-18	Chromium	42 mg/kg	11 mg/kg	40, Appendix E, p. 48 of 160; 79, p. 2
BH-SD-18	Copper	1,600J mg/kg	28 mg/kg	40, Appendix E, p. 48 of 160; 79, p. 2
BH-SD-18	Lead	130J mg/kg	11 mg/kg	40, Appendix E, p. 48 of 160; 79, p. 2

TABLE 4: Analytical Results for Source No. 1 – June 2007				
Sample ID	**Hazardous Substance**	**Hazardous Substance Concentration**	**MRL**	**Reference**
BH-SD-18	Nickel	63 mg/kg	46 mg/kg	40, Appendix E, p. 48 of 160; 79, p. 2
BH-SD-18	Selenium	110 mg/kg	40 mg/kg	40, Appendix E, p. 48 of 160; 79, p. 2
BH-SD-18	Zinc	110J mg/kg	68 mg/kg	40, Appendix E, p. 48 of 160; 79, p. 2
BH-SD-19	Arsenic	56 mg/kg	8.5 mg/kg	40, Appendix E, p. 50 of 160; 79, p. 2
BH-SD-19	Chromium	170 mg/kg	8.5 mg/kg	40, Appendix E, p. 50 of 160; 79, p. 2
BH-SD-19	Copper	3,600J mg/kg	21 µg/L	40, Appendix E, p. 50 of 160; 79, p. 2
BH-SD-19	Lead	31J mg/kg	8.5 mg/kg	40, Appendix E, p. 50 of 160; 79, p. 2
BH-SD-19	Nickel	89 mg/kg	34 mg/kg	40, Appendix E, p. 50 of 160; 79, p. 2
BH-SD-19	Selenium	330 mg/kg	30 mg/kg	40, Appendix E, p. 50 of 160; 79, p. 2
BH-SD-19	Silver	31 mg/kg	8.5 mg/kg	40, Appendix E, p. 50 of 160; 79, p. 2
BH-SD-19	Zinc	190J mg/kg	51 mg/kg	40, Appendix E, p. 50 of 160; 79, p. 2
BH-SD-20	Arsenic	120 mg/kg	1.8 mg/kg	40, Appendix E, p. 52 of 160; 79, p. 3
BH-SD-20	Cadmium	11J mg/kg	0.89 mg/kg	40, Appendix E, p. 52 of 160; 79, p. 3
BH-SD-20	Chromium	47 mg/kg	1.8 mg/kg	40, Appendix E, p. 52 of 160; 79, p. 3
BH-SD-20	Copper	180,000J mg/kg	67 mg/kg	40, Appendix E, p. 52 of 160; 79, p. 3
BH-SD-20	Mercury	0.32J mg/kg	0.18 mg/kg	40, Appendix E, p. 52 of 160; 79, p. 3
BH-SD-20	Nickel	110 mg/kg	7.1 mg/kg	40, Appendix E, p. 52 of 160; 79, p. 3
BH-SD-20	Selenium	1,700 mg/kg	6.2 mg/kg	40, Appendix E, p. 52 of 160; 79, p. 3
BH-SD-20	Zinc	550J mg/kg	11 mg/kg	40, Appendix E, p. 52 of 160; 79, p. 3
BH-SD-20	Cyanide	660 mg/kg	89 mg/kg	40, Appendix E, p. 53 of 160; 79, p. 3

Notes:

µg/L Microgram per liter
BH Barite Hill
ID Identification number
J The identification of the analyte is acceptable; the reported value is an estimate
mg/kg Milligram per kilogram
MRL Minimum reporting limit. The MRL is equivalent to the sample quantitation limit (SQL) (Ref. 91).
SD Sediment
SW Surface water
The source samples were labeled as SW (surface water) and SD (sediment) for analysis purposes only.

2.2.3 HAZARDOUS SUBSTANCES AVAILABLE TO A PATHWAY

Liquid and solid source samples collected from Source No. 1 contain arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, zinc, and cyanide (Ref. 40, Appendix E; 50; 56) (also see Tables 2, 3, and 4 of this HRS documentation record). Source No. 1 consists of process area ponds (Ponds A, B, C, D, and E) (Refs. 6, Figure 2; 34, pp. 23, 28). Analytical results for surface water and sediment samples collected from Tributary 3 and Hawe Creek, which receive runoff from Source No. 1, indicate that a release of hazardous substances has occurred to the surface water migration pathway as documented in Section 4.0 of this HRS documentation record. In 1999, the owners of the Barite Hill facility filed for Chapter 7 bankruptcy and abandoned the property (Refs. 7, p. 8; 9, p. 1). At the time of abandonment, the process area ponds contained liquid and were neutralized with hydrogen peroxide to reduce the cyanide concentration (Ref. 4). During the 2007 ESI conducted by Tetra Tech, no run-on or runoff control systems were observed (Ref. 40, Appendix C, Logbook Team B, p. 38). However, during the 2007 Bureau of Reclamation site inventory, a major diversion ditch was observed. The ditch begins near the Rainsford Pit, flows north then west between Waste Rock Disposal Area A and the process area ponds. The ditch continues through a failed sediment control structure and ultimately discharges into a small sediment basin near the former Sediment Dam A. The ditch was observed to be dry, extremely eroded, and pyrite containing waste rock was observed in the bed of the ditch (Ref. 55, pp. 9, 66). Free liquids were present in Source No. 1 at the time of abandonment as well as during the September 2004, March 2007, and June 2007 sampling events (Refs. 4; 34, pp. 7, 8, Table 10a; 40, pp. 8, 9, Table 1; 46, p. 10). Therefore, a containment factor value of 10 as noted in Table 5 was assigned for the surface water migration pathway (Ref. 1, Section 4.1.2.1.2.1.1).

TABLE 5: Containment Factors for Source No. 1

Containment Description	Containment Factor Value	References
Gas release to air	NS	NA
Particulate release to air	NS	NA
Release to ground water	NS	NA
Release via overland migration and/or flood: Free liquids present with diking that is not regularly inspected and maintained; no run-on or runoff control system.	10	1, Section 4.1.2.1.2.1.1; 7, p. 8; 4; 6, Figure 2; 9, p. 1; 34, pp. 3, 28; 40, Appendix C, Logbook Team B, p. 38; 45; 55, p. 9, 66

Notes:

NA Not applicable
NS Not scored

2.4.2.1 SOURCE HAZARDOUS WASTE QUANTITY

2.4.2.1.1 Hazardous Constituent Quantity

The information available is not sufficient to evaluate Tier A, hazardous constituent quantity, as required by Reference 1, Section 2.4.2.1.1.

Hazardous Constituent Quantity Assigned Value: 0.00

2.4.2.1.2 Hazardous Wastestream Quantity

The information available is not sufficient to evaluate Tier B, hazardous wastestream quantity, as required by Reference 1, Section 2.4.2.1.2.

Hazardous Wastestream Quantity Assigned Value: 0.00

2.4.2.1.3 Volume

The volume of the process/wastewater remaining in the ponds at the time of abandonment in 1999 is not known. Tier C, volume, is therefore not scored.

Volume Assigned Value: 0.00

2.4.2.1.4 Area

The area of Source No.1 is 105,800 ft^2 (Refs. 34, p. 17; 45).

Sum (ft^2): 105,800 (Refs. 34, p. 17; 45)
Equation for Assigning Value (Ref. 1, Table 2-5): Area (A)/13

Area Assigned Value: 8,138.46

2.4.2.1.5 Calculation of Source Hazardous Waste Quantity Value

A source hazardous waste quantity (HWQ) value of 8,138.46 is assigned for Source No. 1 (Ref. 1, Section 2.4.2.1.5).

Source HWQ Value: 8,138.46

2.2 SOURCE CHARACTERIZATION

2.2.1 SOURCE IDENTIFICATION

Number of source: 2

Name of source: Permanent Leach Pad Ponds

Source Type: Surface Impoundments

Description and Location of Source (with reference to a map of the site):

Source No. 2 consists of three permanent leach pad ponds (Ponds F, G, and H) (Ref. 8, p. 77; 34, p. 28) (see Figure 2 of this HRS documentation record. Specifically, the permanent leach pad ponds include Pond F (barren pond), Pond G (pregnant pond), and Pond H (rinse pond) (Refs. 8, p. 77; 34, pp. 23, 28; 45). The surface areas of the three ponds are as follows: Pond F (100,000 ft^2), Pond G (26,900 ft^2), and Pond H (22,200 ft^2) (Refs. 8, p. 77; 34, pp. 17, 23; 45). The ponds are all source type "surface impoundment," have containment values of greater than zero, contain the same types of hazardous substances, and impact the same surface water bodies (see sections 2.2.2, 2.2.3, and 4.1.1 of this documentation record).

Ponds F, G, and H were designed to contain process solution and wastewater. After the gold ore was mined, crushed, agglomerated, and placed on a leach pad, a cyanide solution was pumped to the leach pad from the barren pond and allowed to percolate through the heaps (Refs. 8, Figure 2.2; 42, p. 5; 42, pp. 4, 5). This solution drained from the leach pad to the pregnant solution pond (Ref. 42, p. 4). The solution from the pregnant pond was pumped to the process plant for gold recovery (Refs. 6, Figure 2; 8, Figure 2.2; 42, p. 4). Once the heaps were leached, the ore was rinsed to remove any excess cyanide solution and metals (Ref. 43, p. 6). Rinsing was accomplished by spraying a solution containing little or no cyanide onto the ore and letting the ore rinse clean (Ref. 43, p. 6). The rinse solution was kept in a separate pond from the higher cyanide solution used to leach the gold from the heaps (Ref. 43, p. 6). During permanent pad operations, the solution from the permanent pad pregnant pond was pumped to the process plant for gold recovery (Refs. 6, Figure 2; 42, p. 4). Prior to abandonment in 1999, the permanent leach pad ponds were neutralized with hydrogen peroxide to reduce the cyanide concentration (Ref. 4).

Several investigations were conducted at the Barite Hill property from October 2004 to June 2007. Analytical results for liquid source samples collected from Source No. 2 from October 2004 to June 2007 indicated the presence of arsenic, cadmium, copper, nickel, selenium, silver, zinc, and cyanide (Refs. 36; 40, Appendix B, Table 3). The highest concentrations of these hazardous substances are as follows: arsenic, 140 µg/L; cadmium, 29 µg/L; copper, 7,400 µg/L; nickel, 89 µg/L; selenium, 2,700 µg/L; silver, 19 µg/L; and cyanide, 30,000 µg/L (Ref. 36). Analytical results for solid source samples collected from Source No. 2 from October 2004 to June 2007 indicated the presence of arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, zinc, and cyanide (Refs. 36; 40, Appendix B, Table 4). The highest concentrations of these analytes are as follows: arsenic, 340 mg/kg; cadmium, 9.5 J (estimated) mg/kg; chromium, 110 mg/kg; copper, 100,000 J mg/kg; mercury, 7.8 J mg/kg; nickel, 260 mg/kg; selenium, 3,200 mg/kg; silver, 1,100J mg/kg; zinc, 840 J mg/kg; and cyanide, 3,100 mg/kg (Ref. 36).

Table 6 below contains a list of the ponds contained in Source No. 2, their former use, surface area, current volume, and hazardous substances detected during the October 2004, March 2007, and June 2007 investigations (see tables 5 through 7 of this HRS documentation record) (Refs. 34, pp. 23, 28; 6, Figure 2; 45; 82).

TABLE 6: DESCRIPTION OF PONDS CONTAINED IN SOURCE NO. 2					
Pond	**Former Use**	**Surface Area (ft^2)**	**Volume as of March 2007 (ft^3)**	**Hazardous Substances Detected**	**Reference**
F	Barren Pond	100,000	1,111,000	arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, zinc, cyanide	6, Figure 2; 36; 34, pp. 7, 23, 28; 45; 82, pp. 1, 2 See Tables 7 through 9 of this HRS documentation record
G	Pregnant Pond	26,900	223,001	arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, zinc, cyanide	
H	Rinse Pond	22,200	238,206	arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, zinc, cyanide	

Notes:

ft^2 Feet squared
ft^3 Feet cubed

2.2.2 HAZARDOUS SUBSTANCES ASSOCIATED WITH THE SOURCE

October 2004 Preliminary Assessment/Site Inspection: South Carolina Department of Health and Environmental Control

The source samples listed in Table 7 were collected by SCDHEC. During the 2004 sampling event, three liquid and two solid samples were collected from the permanent leach pad ponds (Ref. 65). Specifically, a liquid sample was collected from each of the three ponds that make up the permanent leach pad ponds (Pond F, BH-008-SW; Pond G, BH-007-SW; and Pond H, BH-006-SW) (Refs. 8, p. 77; 34, pp. 23, 28; 46, pp. 13; 65, pp. 1, 2, 5, 6; 68, pp. 12, 13). A solid sample was collected from Pond H, (BH-007-SE, BH-006-SE) (Refs. 8, p. 77; 34, p. 23; 44, p. 2; 46, pp. 13, 14; 65, pp. 2, 5; 68, p. 13). The source samples were collected in accordance with the SCDHEC, BLWMSOP and the EPA Region 4, SESD, EISOPQAM (November 2001) (Ref. 47, p. 11; 49, Sections 10 and 11; 87; 90, Sections 7 and 9). Cyanide analysis was conducted under the EPA CLP (Ref. 65, pp. 5, 6, 7, 8); the CRQL for cyanide is provided in Reference 52. Total metals analysis was conducted by the EPA Region 4 SESD ASB (Ref. 65, pp. 1, 2, 3, 4). The EPA Region 4 ASB laboratory operations and quality assurance manual minimum quantitation limits are contained in Reference 51. The minimum quantitation limit as defined in the EPA ASB laboratory operations and quality assurance manual is "the concentration level below which the variance of the results for a particular analyte (element or compound) exceeds the acceptable quality control criteria. This value responds to the lowest quantitative point on the calibration curve or the lowest demonstrated level of acceptable quantitation" (Ref. 51, Chapter 5, p. 8). Analytical data sheets for the samples collected in October 2004 are contained in Reference 50, traffic reports and chain of custody records are contained in Reference 65, and logbook notes are contained in Reference 68. The locations of the liquid and solid source samples listed in Table 7 are provided in Reference 36.

TABLE 7: Analytical Results for Source No. 2 – October 2004

Sample ID	Hazardous Substance	Hazardous Substance Concentration	MQL[1]	References
Liquid Source Samples				
BH-006-SW	Arsenic	76 µg/L	2.0 µg/L	50, p. 50; 51, p. 1; 65, p. 1
BH-006-SW	Cadmium	2.7 µg/L	1.0 µg/L	50, p. 50; 51, p. 1; 65, p. 1
BH-006-SW	Copper	1,200 µg/L	10 µg/L	50, p. 50; 51, p. 1; 65, p. 1
BH-006-SW	Nickel	40 µg/L	20 µg/L	50, p. 50; 51, p. 1; 65, p. 1
BH-006-SW	Selenium	1,200 µg/L	5.0 µg/L	50, p. 50; 51, p. 1; 65, p. 1
BH-006-SW	Zinc	130 µg/L	10 µg/L	50, p. 50; 51, p. 2; 65, p. 1
BH-006-SW	Cyanide	48 µg/L	10 µg/L	50, p. 9; 52, p. 1; 65, p. 5
BH-007-SW	Arsenic	140 µg/L	2.0 µg/L	50, p. 52; 51, p. 1; 65, p. 2
BH-007-SW	Copper	5,100 µg/L	10 µg/L	50, p. 52; 51, p. 1; 65, p. 2
BH-007-SW	Mercury	0.24 µg/L	0.2 µg/L	50, p. 52; 51, p. 1; 65, p. 2
BH-007-SW	Nickel	37 µg/L	20 µg/L	50, p. 52; 51, p. 1; 65, p. 2
BH-007-SW	Selenium	1,800 µg/L	5.0 µg/L	50, p. 52; 51, p. 1; 65, p. 2

TABLE 7: Analytical Results for Source No. 2 – October 2004				
Sample ID	**Hazardous Substance**	**Hazardous Substance Concentration**	**MQL[1]**	**References**
BH-007-SW	Silver	19 µg/L	10 µg/L	50, p. 52; 51, p. 2; 65, p. 2
BH-007-SW	Zinc	32 µg/L	10 µg/L	50, p. 52; 51, p. 2; 65, p. 2
BH-007-SW	Cyanide	1,300 µg/L	10 µg/L	50, p. 11; 52, p. 1; 65, p. 6
BH-008-SW	Arsenic	81 µg/L	2.0 µg/L	50, p. 53; 51, p. 1; 65, p. 2
BH-008-SW	Cadmium	2.8 µg/L	1.0 µg/L	50, p. 53; 51, p. 1; 65, p. 2
BH-008-SW	Copper	1,200 µg/L	10 µg/L	50, p. 53; 51, p. 1; 65, p. 2
BH-008-SW	Nickel	40 µg/L	20 µg/L	50, p. 53; 51, p. 1; 65, p. 2
BH-008-SW	Selenium	1,200 µg/L	5.0 µg/L	50, p. 53; 51, p. 1; 65, p. 2
BH-008-SW	Zinc	120 µg/L	10 µg/L	50, p. 53; 51, p. 2; 65, p. 2
BH-008-SW	Cyanide	60J µg/L	10 µg/L	50, p. 12; 52, p. 1; 65, p. 6
Solid Source Samples				
BH-006-SE	Cyanide	260 mg/kg	2.5 mg/kg	50, p. 10; 52, p. 1; 65, p. 5
BH-007-SE	Arsenic	160 mg/kg	1.0 mg/kg	44, p. 2; 50, p. 51; 51, p. 1; 65, p. 2
BH-007-SE	Cadmium	6.8 mg/kg	0.5 mg/kg	44, p. 2; 50, p. 51; 51, p. 1; 65, p. 2
BH-007-SE	Copper	20,000 mg/kg	1.0 mg/kg	44, p. 2; 50, p. 51; 51, p. 1; 65, p. 2
BH-007-SE	Lead	5.9 mg/kg	0.5 mg/kg	44, p. 2; 50, p. 51; 51, p. 1; 65, p. 2
BH-007-SE	Mercury	2.8A mg/kg	0.05 mg/kg	44, p. 2; 50, p. 51; 51, p. 1; 65, p. 2
BH-007-SE	Nickel	76 mg/kg	2.0 mg/kg	44, p. 2; 50, p. 51; 51, p. 1; 65, p. 2
BH-007-SE	Selenium	1,700 mg/kg	4.0 mg/kg	44, p. 2; 50, p. 51; 51, p. 1; 65, p. 2
BH-007-SE	Silver	60 mg/kg	1.0 mg/kg	44, p. 2; 50, p. 51; 51, p. 1; 65, p. 2
BH-007-SE	Zinc	620 mg/kg	1.0 mg/kg	44, p. 2; 50, p. 51; 51, p. 1; 65, p. 2

Notes:

µg/L Microgram per liter

A	Analyte analyzed in replicate. Reported value is "average" of replicates.
BH	Barite Hill
CRQL	Contract required quantitation limit
mg/kg	Milligram per kilogram
MQL	Minimum quantitation limit. The MQL is equivalent to the sample quantitation limit (SQL) (Ref. 91).
ID	Identification number
SE	Sediment
SW	Surface water
[1]	For samples containing cyanide, the value in column number 4 is the CRQL.

The source samples were labeled as SW (surface water) and SE (sediment) for analysis purposes only.

March 2007 Removal Site Evaluation

The liquid and solid source samples listed in Table 8 were collected by REAC on behalf of EPA in March 2007 (Ref. 34, pp. 1, 2, 25; 69). The solid samples were collected using a ponar sampling device and a minimum of two depth samples were used to create the composite solid sample (Ref. 34, p. 7). The solid samples were collected at depths ranging from 0 to 6.9 feet below the surface water sediment interface (Ref. 34, pp. 240 through 242). Liquid source samples were collected from the leakage detection pits of Pond F (FL-a), Pond G (GL-a), and Pond H (HL-a) (Refs. 8, p. 77; 34, pp. 3, 7, 8, 28; 69, pp. 9; 85, Logbook REAC IV-B-0212, pp. 12 through 17). Composite solid samples were also collected from Ponds F, G, and H (Refs. 8, p. 77; 34, pp. 3, 7, 28; 69, p. 3; 85, Logbook REAC IV-B-0212, pp. 12 through 17). Liquid samples were collected from the leakage detection pits located beneath the liner of each pond. The pit was accessed by a six inch chlorinated polyvinyl chloride capped pipe along the bank of each pond. The pits were sampled by pumping each sump with a peristaltic pump (Ref. 34, p. 8). Solid samples were collected in accordance with REAC SOP No. 2016, Sediment Sampling (Refs. 17; 66, p. 8; 86). The samples were analyzed under the EPA CLP, for total metals and cyanide analysis by using the CLP SOW ILM05.3/ILM05.4 (Refs. 56; 84; 92, pp. 1 through 8). EPA Region 4, SESD reviewed all data according to the contract Statement of Work and EPA guidelines (Ref. 56, p. 2). The minimum reporting limits are contained on the analytical data sheets in Reference 56. The minimum reporting limits on the analytical data sheets are the sample specific and analyte specific CLP CRQLs which correspond to the lowest quantitative point on the calibration curve (Ref. 91). Traffic reports and chain of custody forms are contained in Reference 69, and logbook notes are contained in Reference 85, Logbook REAC IV-B-0212, pp. 12 through 17. The locations of the liquid and solid source samples listed in Table 8 are provided in Reference 36.

TABLE 8: Analytical Results for Source No. 2 – March 2007

Sample ID	Hazardous Substance	Hazardous Substance Concentration	MRL	Reference
Liquid Source Samples				
FL-a	Copper	620 µg/L	25 µg/L	56, p. 11; 69, p. 9
FL-a	Selenium	130 µg/L	35 µg/L	56, p. 11; 69, p. 9
FL-a	Cyanide	53 µg/L	10 µg/L	56, p. 12; 69, p. 9
GL-a	Arsenic	30 µg/L	10 µg/L	56, p. 14; 69, p. 9
GL-a	Chromium	10 µg/L	10 µg/L	56, p. 14; 69, p. 9
GL-a	Copper	160 µg/L	25 µg/L	56, p. 14; 69, p. 9
GL-a	Selenium	750 µg/L	35 µg/L	56, p. 14; 69, p. 9
GL-a	Cyanide	30,000 µg/L	1,000 µg/L	56, p. 15; 69, p. 9
HL-a	Arsenic	24 µg/L	10 µg/L	56, p. 17; 69, p. 9
HL-a	Cadmium	29 µg/L	5.0 µg/L	56, p. 17; 69, p. 9
HL-a	Copper	1,400 µg/L	25 µg/L	56, p. 17; 69, p. 9
HL-a	Nickel	89 µg/L	40 µg/L	56, p. 17; 69, p. 9
HL-a	Selenium	2,700 µg/L	35 µg/L	56, p. 17; 69, p. 9
HL-a	Zinc	340 µg/L	60 µg/L	56, p. 17; 69, p. 9

TABLE 8: Analytical Results for Source No. 2 – March 2007				
Sample ID	**Hazardous Substance**	**Hazardous Substance Concentration**	**MRL**	**Reference**
Solid Source Samples				
Pond F	Arsenic	210 mg/kg	1.6 mg/kg	56, p. 91; 69, p. 3
Pond F	Cadmium	1.5 mg/kg	0.82 mg/kg	56, p. 91; 69, p. 3
Pond F	Chromium	35 mg/kg	1.6 mg/kg	56, p. 91; 69, p. 3
Pond F	Copper	7,300J mg/kg	4.1 mg/kg	56, p. 91; 69, p. 3
Pond F	Lead	110 mg/kg	1.6 mg/kg	56, p. 91; 69, p. 3
Pond F	Nickel	12 mg/kg	6.5 mg/kg	56, p. 91; 69, p. 3
Pond F	Selenium	470 mg/kg	5.7 mg/kg	56, p. 91; 69, p. 3
Pond F	Silver	96 mg/kg	1.6 mg/kg	56, p. 91; 69, p. 3
Pond F	Zinc	110J mg/kg	9.8 mg/kg	56, p. 91; 69, p. 3
Pond F	Cyanide	86J mg/kg	20 mg/kg	56, p. 92; 69, p. 3
Pond G	Arsenic	77 mg/kg	1.6 mg/kg	56, p. 93; 69, p. 3
Pond G	Chromium	19 mg/kg	1.6 mg/kg	56, p. 93; 69, p. 3
Pond G	Copper	3,100J mg/kg	4.0 mg/kg	56, p. 93; 69, p. 3
Pond G	Lead	150 mg/kg	1.6 mg/kg	56, p. 93; 69, p. 3
Pond G	Nickel	10 mg/kg	6.4 mg/kg	56, p. 93; 69, p. 3
Pond G	Selenium	89 mg/kg	5.6 mg/kg	56, p. 93; 69, p. 3
Pond G	Silver	29 mg/kg	1.6 mg/kg	56, p. 93; 69, p. 3
Pond G	Zinc	56J mg/kg	9.6 mg/kg	56, p. 93; 69, p. 3
Pond G	Cyanide	210J mg/kg	40 mg/kg	56, p. 94; 69, p. 3
Pond H	Arsenic	300 mg/kg	1.8 mg/kg	56, p. 95; 69, p. 3
Pond H	Cadmium	2.4 mg/kg	0.89 mg/kg	56, p. 95; 69, p. 3
Pond H	Chromium	20 mg/kg	1.8 mg/kg	56, p. 95; 69, p. 3
Pond H	Copper	10,000J mg/kg	4.5 mg/kg	56, p. 95; 69, p. 3
Pond H	Lead	250 mg/kg	1.8 mg/kg	56, p. 95; 69, p. 3
Pond H	Nickel	26 mg/kg	7.1 mg/kg	56, p. 95; 69, p. 3
Pond H	Selenium	330 mg/kg	6.2 mg/kg	56, p. 95; 69, p. 3
Pond H	Silver	52 mg/kg	1.8 mg/kg	56, p. 95; 69, p. 3
Pond H	Zinc	240J mg/kg	11 mg/kg	56, p. 95; 69, p. 3
Pond H	Cyanide	200J mg/kg	45 mg/kg	56, p. 96; 69, p. 3

Notes:

FL-a	Pond F liquid
GL-a	Pond G liquid
HL-a	Pond H liquid
µg/L	Microgram per liter
ID	Identification number
J	The identification of the analyte is acceptable; the reported value is an estimate
mg/kg	Milligram per kilogram
MRL	Minimum reporting limit. The MRL is equivalent to the sample quantitation limit (SQL) (Ref. 91).
Pond F	Pond F solid
Pong G	Pond G solid
Pond H	Pond H solid

June 2007 Expanded Site Inspection

The liquid and solid source samples listed in Table 9 were collected by Tetra Tech on behalf of EPA in June 2007 (Refs. 40, p. 1; 79). Liquid and solid source samples were collected from the permanent leach pad ponds (Ref. 40, Appendix B, pp. B-1 through B-4). Specifically, co-located liquid and solid source samples were collected from Pond F (BH-SW/SD-22), Pond G (BH-SW/SD-23), and Pond H (BH-SW/SD-21) (Refs. 40, Appendix B, pp. B-1 through B-4, Appendix C, Logbook Team B, pp. 19, 20; 34, p. 23; 79, pp. 3, 5). The liquid samples were collected from the surface of the water, and the solid samples were collected from the side walls of each pond (Refs. 32, p. 10; 40, p. 6, Appendix C, Logbook Team B, p. 38). The source samples were collected in accordance with the EPA Region 4 SESD EISOPQAM dated November 2001 (Refs. 40, p. 7, Appendix C, Team B, p. 7; 49 Sections 10 and 11). The samples were analyzed under the EPA CLP for total metals and cyanide analysis using the CLP SOW ILM05.3/ILM05.4 (Refs. 40, Appendix E; 84; 92, pp. 1 through 8). EPA Region 4, SESD reviewed all data according to the contract Statement of Work and EPA guidelines (Ref. 40, Appendix E, pp. 2 of 160, 2 of 20). The minimum reporting limits are contained on the analytical data sheets in Appendix E of Reference 40. The minimum reporting limits on the analytical data sheets are the sample specific and analyte specific CLP CRQLs which correspond to the lowest quantitative point on the calibration curve (Ref. 91). The traffic reports and chain of custody forms are provided in Reference 79. Logbook notes are contained in Reference 40, Appendix C. The locations of the liquid and solid source samples listed in Table 9 are provided in Reference 53.

TABLE 9: Analytical Results for Source No. 2 – June 2007

Sample ID	Hazardous Substance	Hazardous Substance Concentration	MRL	Reference
Liquid Source Samples				
BH-SW-21	Arsenic	82 µg/L	10 µg/L	40, Appendix E, p. 106 of 160; 79, p. 5
BH-SW-21	Copper	7,400 µg/L	25 µg/L	40, Appendix E, p. 106 of 160; 79, p. 5
BH-SW-21	Nickel	58 µg/L	40 µg/L	40, Appendix E, p. 106 of 160; 79, p. 5
BH-SW-21	Selenium	2,100 µg/L	35 µg/L	40, Appendix E, p. 106 of 160; 79, p. 5
BH-SW-21	Silver	16 µg/L	10 µg/L	40, Appendix E, p. 106 of 160; 79, p. 5
BH-SW-21	Zinc	81 µg/L	60 µg/L	40, Appendix E, p. 106 of 160; 79, p. 5
BH-SW-21	Cyanide	1,300 µg/L	50 µg/L	40, Appendix E, p. 107 of 160; 79, p. 5
BH-SW-22	Arsenic	21 µg/L	10 µg/L	40, Appendix E, p. 108 of 160; 79, p. 5
BH-SW-22	Copper	1,900 µg/L	25 µg/L	40, Appendix E, p. 108 of 160; 79, p. 5
BH-SW-22	Nickel	62 µg/L	40 µg/L	40, Appendix E, p. 108 of 160; 79, p. 5
BH-SW-22	Selenium	1,500 µg/L	35 µg/L	40, Appendix E, p. 108 of 160; 79, p. 5
BH-SW-22	Zinc	300J µg/L	60 µg/L	40, Appendix E, p. 108 of 160; 79, p. 5
BH-SW-22	Cyanide	18 µg/L	10 µg/L	40, Appendix E, p. 109 of 160; 79, p. 5
BH-SW-22D	Arsenic	21 µg/L	10 µg/L	40, Appendix E, p. 110 of 160; 79, p. 5
BH-SW-22D	Copper	1,900 µg/L	25 µg/L	40, Appendix E, p. 110 of 160; 79, p. 5
BH-SW-22D	Nickel	62 µg/L	40 µg/L	40, Appendix E, p. 110 of 160; 79, p. 5

TABLE 9: Analytical Results for Source No. 2 – June 2007				
Sample ID	**Hazardous Substance**	**Hazardous Substance Concentration**	**MRL**	**Reference**
BH-SW-22D	Selenium	1,500 µg/L	35 µg/L	40, Appendix E, p. 110 of 160; 79, p. 5
BH-SW-22D	Zinc	300J µg/L	60 µg/L	40, Appendix E, p. 110 of 160; 79, p. 5
BH-SW-22D	Cyanide	63 µg/L	10 µg/L	40, Appendix E, p. 111 of 160; 79, p. 5
BH-SW-23	Arsenic	15 µg/L	10 µg/L	40, Appendix E, p. 112 of 160; 79, p. 5
BH-SW-23	Cadmium	7.6 µg/L	5 µg/L	40, Appendix E, p. 112 of 160; 79, p. 5
BH-SW-23	Copper	6,500 µg/L	25 µg/L	40, Appendix E, p. 112 of 160; 79, p. 5
BH-SW-23	Nickel	76 µg/L	40 µg/L	40, Appendix E, p. 112 of 160; 79, p. 5
BH-SW-23	Selenium	1,200 µg/L	35 µg/L	40, Appendix E, p. 112 of 160; 79, p. 5
BH-SW-23	Zinc	570J µg/L	60 µg/L	40, Appendix E, p. 112 of 160; 79, p. 5
Solid Source Samples				
BH-SD-21	Arsenic	340 mg/kg	8.8 mg/kg	40, Appendix E, p. 64 of 160; 79, p. 3
BH-SD-21	Cadmium	9.5J mg/kg	4.4 mg/kg	40, Appendix E, p. 64 of 160; 79, p. 3
BH-SD-21	Chromium	110 mg/kg	8.8 mg/kg	40, Appendix E, p. 64 of 160; 79, p. 3
BH-SD-21	Copper	100,000J mg/kg	44 mg/kg	40, Appendix E, p. 64 of 160; 79, p. 3
BH-SD-21	Lead	59J mg/kg	8.8 mg/kg	40, Appendix E, p. 64 of 160; 79, p. 3
BH-SD-21	Mercury	7.8J mg/kg	0.88 mg/kg	40, Appendix E, p. 64 of 160; 79, p. 3
BH-SD-21	Nickel	260 mg/kg	35 mg/kg	40, Appendix E, p. 64 of 160; 79, p. 3
BH-SD-21	Selenium	3,200 mg/kg	31 mg/kg	40, Appendix E, p. 64 of 160; 79, p. 3
BH-SD-21	Silver	1,100J mg/kg	8.8 mg/kg	40, Appendix E, p. 64 of 160; 79, p. 3
BH-SD-21	Zinc	840J mg/kg	53 mg/kg	40, Appendix E, p. 64 of 160; 79, p. 3
BH-SD-21	Cyanide	3,100 mg/kg	880 mg/kg	40, Appendix E, p. 65 of 160; 79, p. 3
BH-SD-22	Arsenic	11 mg/kg	1.4 mg/kg	40, Appendix E, p. 54 of 160; 79, p. 3
BH-SD-22	Chromium	4.5 mg/kg	1.4 mg/kg	40, Appendix E, p. 54 of 160; 79, p. 3
BH-SD-22	Copper	3,300J mg/kg	3.5 mg/kg	40, Appendix E, p. 54 of 160; 79, p. 3
BH-SD-22	Mercury	0.17J mg/kg	0.14 mg/kg	40, Appendix E, p. 54 of 160; 79, p. 3
BH-SD-22	Nickel	19 mg/kg	5.6 mg/kg	40, Appendix E, p. 54 of 160; 79, p. 3
BH-SD-22	Selenium	160 mg/kg	4.9 mg/kg	40, Appendix E, p. 54 of 160; 79, p. 3
BH-SD-22	Silver	22J mg/kg	1.4 mg/kg	40, Appendix E, p. 54 of 160; 79, p. 3
BH-SD-22	Zinc	62J mg/kg	8.4 mg/kg	40, Appendix E, p. 54 of 160; 79, p. 3
BH-SD-22	Cyanide	26 mg/kg	3.5 mg/kg	40, Appendix E, p. 55 of 160; 79, p. 3

TABLE 9: Analytical Results for Source No. 2 – June 2007				
Sample ID	**Hazardous Substance**	**Hazardous Substance Concentration**	**MRL**	**Reference**
BH-SD-22D	Arsenic	8 mg/kg	1.1 mg/kg	40, Appendix E, p. 56 of 160; 79, p. 3
BH-SD-22D	Chromium	3.4 mg/kg	1.1 mg/kg	40, Appendix E, p. 56 of 160; 79, p. 3
BH-SD-22D	Copper	2,200J mg/kg	2.9 mg/kg	40, Appendix E, p. 56 of 160; 79, p. 3
BH-SD-22D	Nickel	13 mg/kg	4.6 mg/kg	40, Appendix E, p. 56 of 160; 79, p. 3
BH-SD-22D	Selenium	100 mg/kg	4 mg/kg	40, Appendix E, p. 56 of 160; 79, p. 3
BH-SD-22D	Silver	15J mg/kg	1.1 mg/kg	40, Appendix E, p. 56 of 160; 79, p. 3
BH-SD-22D	Zinc	42J mg/kg	6.9 mg/kg	40, Appendix E, p. 56 of 160; 79, p. 3
BH-SD-22D	Cyanide	26 mg/kg	5.7 mg/kg	40, Appendix E, p. 57 of 160; 79, p. 3
BH-SD-23	Arsenic	200 mg/kg	9.6 mg/kg	40, Appendix E, p. 58 of 160; 79, p. 3
BH-SD-23	Chromium	22 mg/kg	9.6 mg/kg	40, Appendix E, p. 58 of 160; 79, p. 3
BH-SD-23	Copper	28,000J mg/kg	24 mg/kg	40, Appendix E, p. 58 of 160; 79, p. 3
BH-SD-23	Lead	19J mg/kg	9.6 mg/kg	40, Appendix E, p. 58 of 160; 79, p. 3
BH-SD-23	Mercury	2J mg/kg	0.96 mg/kg	40, Appendix E, p. 58 of 160; 79, p. 3
BH-SD-23	Nickel	100 mg/kg	38 mg/kg	40, Appendix E, p. 58 of 160; 79, p. 3
BH-SD-23	Selenium	1,500 mg/kg	34 mg/kg	40, Appendix E, p. 58 of 160; 79, p. 3
BH-SD-23	Silver	98J mg/kg	9.6 mg/kg	40, Appendix E, p. 58 of 160; 79, p. 3
BH-SD-23	Zinc	320J mg/kg	58 mg/kg	40, Appendix E, p. 58 of 160; 79, p. 3
BH-SD-23	Cyanide	91 mg/kg	24 mg/kg	40, Appendix E, p. 59 of 160; 79, p. 3

Notes:

µg/L Microgram per liter
BH Barite Hill
ID Identification number
J The identification of the analyte is acceptable; the reported value is an estimate
mg/kg Milligram per kilogram
MRL Minimum reporting limit. The MRL is equivalent to the sample quantitation limit (SQL) (Ref. 91).
SD Sediment
SW Surface water
The source samples were labeled as SW (surface water) and SD (sediment) for analysis purposes only.

2.2.3 HAZARDOUS SUBSTANCES AVAILABLE TO A PATHWAY

Liquid and solid source samples collected from Source No. 2 contain arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, zinc, and cyanide (Ref. 40, Appendix E; 50; 56) (also see Tables 7, 8, and 9 of this HRS documentation record). Source No. 2 consists of three permanent leach pad ponds (Ponds F, G, and H) (Refs. 6, Figure 2; 34, pp. 23, 28). Prior to abandonment in 1999, the permanent leach pad ponds were neutralized with hydrogen peroxide to reduce the cyanide concentration (Ref. 4). Analytical results for surface water and sediment samples collected from Tributary 3 and Hawe Creek, which receive runoff from Source No. 2, indicate that a release of hazardous substances has occurred to the surface water migration pathway as documented in Section 4.0 of this HRS documentation record. In 1999, the owners of the Barite Hill facility filed for Chapter 7 bankruptcy and abandoned the property (Refs. 7, p. 8; 9, p. 1). During the 2007 ESI conducted by Tetra Tech, no run-on or runoff control systems were observed (Ref. 40, Appendix C, Logbook Team B, p. 38). However, during the 2007 Bureau of Reclamation site inventory, a major diversion ditch was observed near the Industrial Solid Waste Landfill (Waste Area C Landfill) and the permanent leach pad ponds. The ditch flows southeast then west and joins a natural channel. The ditch was observed to be dry and extremely eroded adjacent to the Industrial Solid Waste Landfill (Refs. 6, p. 1-1, Figure 2; 30; 55, p. 9, 66, 67). Free liquids were present in Source No. 2 at the time of abandonment as well as during the September 2004, March 2007, and June 2007 sampling events (Refs. 34, p. 8; 40, pp. 8, 9, Table 1; 46, p. 13; 89). Therefore, a containment factor value of 10 as noted in Table 10 was assigned for the surface water migration pathway (Ref. 1, Section 4.1.2.1.2.1.1).

TABLE 10: Containment Factors for Source No. 2

Containment Description	Containment Factor Value	References
Gas release to air	NS	NA
Particulate release to air	NS	NA
Release to ground water	NS	NA
Release via overland migration and/or flood: Free liquids present with diking that is not regularly inspected and maintained; no run-on or runoff control.	10	1, Section 4.1.2.1.2.1.1; 7, p. 8; 4; 6, Figure 2; 9, p. 1; 34, pp. 3, 28; 40, Appendix C, Logbook Team B, p. 38; 45; 55, p. 9, 66

Notes:

NA Not applicable
NS Not scored

2.4.2.1 SOURCE HAZARDOUS WASTE QUANTITY

2.4.2.1.1 Hazardous Constituent Quantity

The information available is not sufficient to evaluate Tier A, hazardous constituent quantity, as required by Reference 1, Section 2.4.2.1.1.

Hazardous Constituent Quantity Assigned Value: 0.00

2.4.2.1.2 Hazardous Wastestream Quantity

The information available is not sufficient to evaluate Tier B, hazardous wastestream quantity, as required by Reference 1, Section 2.4.2.1.2.

Hazardous Wastestream Quantity Assigned Value: 0.00

2.4.2.1.3 Volume

The volume of the process/wastewater remaining in the ponds at the time of abandonment in 1999 is not known. Tier C, volume, therefore is not scored.

Volume Assigned Value: 0.00

2.4.2.1.4 Area

The area of Source No.2 is 149,100 ft^2 (Refs. 34, p. 17; 45).

Sum (ft^2): 149,100 ft^2 (Refs. 34, p. 17; 45)
Equation for Assigning Value (Ref. 1, Table 2-5): Area (A)/13

Area Assigned Value: 11,469.23

2.4.2.1.5 Calculation of Source Hazardous Waste Quantity Value

A source hazardous waste quantity (HWQ) value of 11,469.23 is assigned for Source No. 1 (Ref. 1, Section 2.4.2.1.5).

Source HWQ Value: 11,469.23

2.2.1 SOURCE IDENTIFICATION

Number of source: 3

Name of source: Main Pit

Source Type: Other

Description and Location of Source (with reference to a map of the site):

Source No. 3 is the 10-acre Main Pit located in the northeastern portion of the Barite Hill property (see Figure 2 of this HRS documentation record). The Main Pit contains about 89,000,000 gallons of low pH water surrounded by 10-acres of disturbed uplands, which drain towards the Main Pit (Refs. 41; 55, p. 18). The Main Pit was not originally constructed to contain waste; however, waste rock was disposed of in the Main Pit (Ref. 60, p. 1-1). When mining operations ceased, the Main Pit began to fill with water. The water interacted with sulfides in the exposed pit wall and the previously backfilled waste rock resulting in highly contaminated water with low pH (Ref. 60, pp. 1-1, 2-1, 2-2). In July 1999, Nevada Goldfields, Inc. determined that there were insufficient funds to continue reclamation activities. The Main Pit was not reclaimed; however, lime was added to the water in the Main Pit to raise the pH of the water to 11 standard units (Refs. 5, p. 1; 9, pp. 1, 2).

Gold bearing ore was mined from the Main Pit from 1989 to October 1994 (Ref. 42, pp. 1, 3). An estimated 1.5 million tons of ore and 2.4 million tons of waste were produced over the life of the mine (Ref. 42, p. 3). Minable ore reserves in the Main Pit were 1.3 million tons (Ref. 42, p. 3). Mining operations included the use of conventional open pit techniques. Mine pits were developed with pit walls sloped at 45 degrees. Benches of 10 feet vertical height were constructed in the pit walls (Ref. 42, p. 3). After the ore and waste rock were broken by drilling and blasting or ripping, the material was placed into trucks using loaders or excavators. Waste rock was hauled to the waste rock disposal area and ore was hauled to the crusher for crushing followed by agglomeration prior to placement on the leach pad (Ref. 42, p. 3).

During the later stages of the mining operation, about 160,000 cubic yards of sulfide (pyrite) bearing waste rock encountered in the Main Pit were placed in a temporary stockpile area adjacent to the Main Pit. The stockpiled sulfide waste rock and sulfide exposed pit wall exposures exhibit acid generating conditions as a result of sulfide (pyrite) oxidation (Ref. 60, p. 1-1).

In 1995, Steffen Robertson and Kirsten Inc. collected samples from the Main Pit water and field tested the exposed sulfide bearing wall rock of the Main Pit (Ref. 60, pp. 2-1, 2-2). Analytical results of the Main Pit water samples indicated the presence of barium (0.043 mg/L), cadmium (1.15 mg/L), copper (24.9 mg/L), lead (0.0350 mg/L), manganese (5.67 mg/L), nickel (0.330 mg/L), selenium (1.35 mg/L), and zinc (15.5 mg/L). Field measurements of the Main Pit water indicated a pH of 2.0 standard units (Ref. 60, p. 2-2, Appendix A, p. A5). Results of the Main Pit exposed sulfide bearing wall rock indicated a pH ranging between 0.9 and 1.9 standard units as well as high total dissolved solids content. The field test results indicated an advanced rate of oxidation in exposed pit wall sulfides and the presence of leachable acid products (Ref. 60, p. 2-1).

In 2004, SCDHEC calculated the volume of water contained in the Main Pit as well as the volume of waste rock located in two different sections of the Main Pit by using a contour averaging process as well as a cross section averaging method. Using these methods, SCDHEC determined that the Main Pit contains about 89,000,000 gallons of water and 177,500 cubic yards of waste rock (Ref. 41).

In January 2007, Tetra Tech, EPA, SCDHEC, and REAC conducted a site reconnaissance at the Barite Hill property (Ref. 10). During the reconnaissance, a seep from the northern side of the Main Pit was

observed to be flowing into the northern unnamed tributary of Hawe Creek. During previous site visits, SCDHEC personnel noticed that where the seep met the northern unnamed tributary the water in the tributary turned white (Ref. 40, Appendix C, Logbook Team B, pp. 2, 3, 4). The seep contains acidic water with high dissolved metal content and is releasing water at a rate of five gpm (gallons per minute) (Ref. 81, p. 5).

During the RSE conducted by REAC in March 2007, field pH measurements were collected from unnamed tributaries which surround the Main Pit (Refs. 30; 34, p. 27). Upstream of the confluence with the Main Pit seep, the pH of the tributary was 6.7 standard units. However, the pH of the tributary decreases to 2.8 standard units directly downstream of the confluence with Main Pit seep. The pH of the northern tributary was collected at several locations downstream from the confluence with the Main Pit seep ranged between 2.76 and 4.04 standard units (Ref. 34, pp. 13, 27).

In July 2007, SCDHEC collected five samples from four locations and five different depths from the water contained in the Main Pit. The pH ranged from 2.42 at the surface to -3.98 at 4 feet below the water surface (Ref. 54, p. 3; 55, p. 2). Water with a pH of less than or equal to 2 standard units is considered a RCRA characteristic hazardous waste (Ref. 70, pp. 1, 2).

2.2.2 HAZARDOUS SUBSTANCES ASSOCIATED WITH THE SOURCE

October 2004 Preliminary Assessment/Site Inspection: SCDHEC

The liquid and solid source samples listed in Table 11 were collected by SCDHEC. Liquid source sample, BH-004-SW, and solid source sample, BH-004-SE, were collected from the western side of the Main Pit (Refs. 46, pp. 7, 8, 22; 65, p. 1; 68, p. 2). The source samples were collected in accordance with the SCDHEC, BLWMSOP and the EPA Region 4, SESD, EISOPQAM (November 2001) (Refs. 47, p. 11; 49 Sections 10 and 11; 87; 90, Sections 7 and 9). Total metals analysis was conducted by the EPA Region 4 SESD ASB (Ref. 65, pp. 1, 2, 3, 4). The EPA Region 4 SESD ASB laboratory operations and quality assurance manual minimum quantitation limits are contained in Reference 51. Analytical data sheets for the samples collected in October 2004 are contained in Reference 50, traffic reports are contained in Reference 65, and logbook notes are contained in Reference 68. The locations of the liquid and solid source samples listed in Table 11 are provided in Reference 36.

TABLE 11: Analytical Results for Source No. 3 – October 2004

Sample ID	Hazardous Substance	Hazardous Substance Concentration	MQL	References
Liquid Source Sample				
BH-004-SW	Arsenic	270 µg/L	2.0 µg/L	50, p. 47; 51, Chapter 7, Appendix 1, p. 1; 65, p. 1
BH-004-SW	Cadmium	930 µg/L	1.0 µg/L	50, p. 47; 51, Chapter 7, Appendix 1, p. 1; 65, p. 1
BH-004-SW	Chromium	52 µg/L	10 µg/L	50, p. 47; 51, Chapter 7, Appendix 1, p. 1; 65, p. 1
BH-004-SW	Copper	160,000 µg/L	10 µg/L	50, p. 47; 51, Chapter 7, Appendix 1, p. 1; 65, p. 1
BH-004-SW	Nickel	200 µg/L	20 µg/L	50, p. 47; 51, Chapter 7, Appendix 1, p. 1; 65, p. 1
BH-004-SW	Lead	41 µg/L	2.0 µg/L	50, p. 47; 51, Chapter 7, Appendix 1, p. 1; 65, p. 1
BH-004-SW	Selenium	150 µg/L	5.0 µg/L	50, p. 47; 51, Chapter 7, Appendix 1, p. 1; 65, p. 1
BH-004-SW	Zinc	22,000 µg/L	10 µg/L	50, p. 47; 51, Chapter 7, Appendix 1, p. 2; 65, p. 1
Solid Source Sample				
BH-004-SE	Arsenic	66 mg/kg	1.0 mg/kg	50, p. 46; 51, Chapter 7, Appendix 1, p. 1; 65, p. 1
BH-004-SE	Cadmium	0.52 mg/kg	0.5 mg/kg	50, p. 46; 51, Chapter 7, Appendix 1, p. 1; 65, p. 1
BH-004-SE	Chromium	6.9 mg/kg	1.0 mg/kg	50, p. 46; 51, Chapter 7, Appendix 1, p. 1; 65, p. 1

TABLE 11: Analytical Results for Source No. 3 – October 2004				
Sample ID	**Hazardous Substance**	**Hazardous Substance Concentration**	**MQL**	**References**
BH-004-SE	Copper	180 mg/kg	1.0 mg/kg	50, p. 46; 51, Chapter 7, Appendix 1, p. 1; 65, p. 1
BH-004-SE	Lead	240 mg/kg	0.5 mg/kg	50, p. 46; 51, Chapter 7, Appendix 1, p. 1; 65, p. 1
BH-004-SE	Mercury	0.056 mg/kg	0.05 mg/kg	50, p. 46; 51, Chapter 7, Appendix 1, p. 1; 65, p. 1
BH-004-SE	Selenium	13 mg/kg	4.0 mg/kg	50, p. 46; 51, Chapter 7, Appendix 1, p. 1; 65, p. 1
BH-004-SE	Silver	1.4 mg/kg	1.0 mg/kg	50, p. 46; 51, Chapter 7, Appendix 1, p. 2; 65, p. 1
BH-004-SE	Zinc	61 mg/kg	1.0 mg/kg	50, p. 46; 51, Chapter 7, Appendix 1, p. 2; 65, p. 1

Notes:

µg/L Microgram per liter
BH Barite Hill
ID Identification number
mg/kg Milligram per kilogram
MQL Minimum quantitation limit. The MQL is equivalent to the sample quantitation limit (SQL) (Ref. 91).
SE Sediment
SW Surface water
The source samples were labeled as SW (surface water) and SD (sediment) for analysis purposes only.

2.2.3 HAZARDOUS SUBSTANCES AVAILABLE TO A PATHWAY

Liquid and solid source samples collected from Source No. 3 contain arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, and zinc (Ref. 50) (also see Table 9 of this HRS documentation record). Source No. 3 consists of the 10-acre Main Pit that contained about 89,000,000 gallons of low pH water in 2004 (Refs. 41; 46, p. 7; 55, p. 18) (see Figure 2 of this HRS documentation record). Analytical results for surface water and sediment samples collected from the surface water bodies that receive runoff from Source No. 3 indicate that a release of hazardous substances has occurred to the surface water migration pathway as documented in Section 4.0 of this HRS documentation record. In 1999, the owners of the Barite Hill facility filed for Chapter 7 bankruptcy and abandoned the property (Refs. 7, p. 8; 9, p. 1). During the 2007 ESI conducted by Tetra Tech, no run-on or runoff control systems were observed (Ref. 40, Appendix C, Logbook Team B, p. 38). Free liquids were present in the Main Pit at abandonment and during the October 2004, March 2007, and June 2007 sampling investigations (Refs. 34, pp. 5, 6; 41; 46, p. 7). During the 2007 site reconnaissance conducted by Tetra Tech, EPA, SCDHEC, and REAC a seep from the northern side of the Main Pit was observed to be flowing into a tributary of Hawe Creek; where the seep enters the tributary, the color of the water in the tributary has been observed to change to white (Refs. 30; 40, Appendix C, Logbook Team B, pp. 2, 3, 4). A containment factor value of 10 as noted in Table 12 was assigned for the surface water migration pathway (Ref. 1, Section 4.1.2.1.2.1.1).

TABLE 12: Containment Factors for Source No. 3

Containment Description	Containment Factor Value	References
Gas release to air	NS	NA
Particulate release to air	NS	NA
Release to ground water	NS	NA
Release via overland migration and/or flood: Free liquids present with diking that is not regularly inspected and maintained; no run-on or runoff control system, and there is evidence of a release to Hawe Creek.	10	1, Section 4.1.2.1.2.1.1; 7, p. 8; 9, p. 1; 30; 40, Appendix C, Team B, pp. 2, 3, 4, 38; 41

Notes:

NA Not applicable
NS Not scored

2.4.2.1 SOURCE HAZARDOUS WASTE QUANTITY

2.4.2.1.1 Hazardous Constituent Quantity

The information available is not sufficient to evaluate Tier A, hazardous constituent quantity, as required by Reference 1, Section 2.4.2.1.1.

Hazardous Constituent Quantity Assigned Value: 0.00

2.4.2.1.2 Hazardous Wastestream Quantity

The information available is not sufficient to evaluate Tier B, hazardous wastestream quantity, as required by Reference 1, Section 2.4.2.1.2.

Hazardous Wastestream Quantity Assigned Value: 0.00

2.4.2.1.3 Volume

At the time of abandonment, the Main Pit contained about 16 million gallons of water containing a pH of 11 standard units (Ref. 9, pp. 1, 2, 4). However, in July 2007, samples collected from the Main Pit indicated a pH ranging from 2.42 to -3.98 standard units (Ref. 54, p. 3; 55, p. 2). Water with a pH of less than or equal to 2 standard units is considered a RCRA characteristic hazardous waste (Ref. 70, pp. 1, 2). It is not known whether the 16 million gallons of water located in the Main Pit contained runoff, rainwater, or ground water. Therefore, the volume of Source No. 3 is undetermined but greater than zero.

Sum: >0 ft^3
Equation for Assigning Value (Ref. 1, Table 2-5): Volume/2.5

Volume Assigned Value: >0

2.4.2.1.4 Area

The volume of Source No. 3 is provided in Section 2.4.2.1.3. Area is not evaluated for source type other (Ref. 1, Section 2.4.2.1.4, Table 2-5).

Area Assigned Value: 0.00

2.4.2.1.5 Calculation of Source Hazardous Waste Quantity Value

A source HWQ value of greater than zero, but unknown is assigned for Source No. 3 (Ref. 1, Section 2.4.2.1.5).

Source HWQ Value: >0

SUMMARY OF SOURCE DESCRIPTIONS

TABLE 13: Summary of Source Descriptions						
Source No.	Source Hazardous Waste Quantity Value	Source Hazardous Constituent Quantity Complete? (Yes/No)	Containment Factor Value by Pathway			
			Ground Water (Ref. 1, Table 3-2)	Surface Water Overland/ Flood (Ref. 1, Table 4-2)	Air	
					Gas (Ref. 1, Table 6-3)	Particulate (Ref. 1, Table 6-9)
1	8,138.46	No	NS	10	NS	NS
2	11,469.23	No	NS	10	NS	NS
3	>0	No	NS	10	NS	NS

Notes:

NS Not scored

2.4.2.2 Calculation of Hazardous Waste Quantity Factor Value

The hazardous waste quantity factor value for Sources Nos. 1, 2, and 3 is 10,000.

Reference 1, Table 2-6: 10,000

Description of Other Possible On-Site Sources

Other possible on-site sources identified by Bureau of Reclamation personnel during the March 2007 site inventory are listed below:

- 17-acre waste rock disposal area A – This area was capped with clay, covered with soil, and is currently vegetated. An acid seep is beginning to poison vegetation on the north side. The banks of a diversion ditch are vertical and will begin to erode and form gullies. These gullies will eventually extend from the perimeter diversion ditch banks into the capped area degrading the cap (Ref. 55, pp. 4, 30, 31).
- 6.7-acre waste rock disposal area C – A seep was observed on the southwestern side of the area, which has killed surrounding vegetation (Ref. 55, pp. 33 to 36).
- Permanent heap leach pad – Acidic seepage from the liner drains south and discharges into the permanent heap leach pad pregnant pond and rinse pond. Acid seeps are also located along the southern toe of the pad. The cap contains ruts due to all-terrain vehicle (ATV) use and erosion (Ref. 55, pp. 37, 38).
- 6-acre reusable heap leach pad – A small seep is located on the northeastern edge of the pad, which has killed vegetation and caused a small amount of erosion (Ref. 55, p. 40).

Stressed vegetation indicates either hazardous substances or low pH are present.

In addition, there is a 22-acre mineralized zone, where the crusher and agglomeration system processed both oxide ore and sulfide ores mined from the Main Pit and Rainsford Pit (Ref. 5, p. 3, Figure 1). The area was reclaimed in 1995. Post- reclamation monitoring of the mineralized zone identified a number of

sulfide contaminated areas. In 1997, after the area received heavy hurricane related rain, the pH of the surface water runoff at NPDES outfall 001 was 3.3 standard units and it became apparent that extensive residual sulfide-ore contamination remained around the perimeter of the former crusher area (Ref. 5, p. 5, Table 1). During the 2004 SCDHEC sampling event, three surface soil samples were collected from the mineralized zone at a depth of 0 to 4 inches below land surface. The samples indicated the presence of arsenic, copper, lead, silver, and cyanide. The greatest concentrations of these constituents detected in soil samples are as follows: arsenic, 56 mg/kg; copper, 230 mg/kg; lead, 200A (average); silver, 1.5A; and cyanide, 43 mg/kg (Refs. 46, pp. 15, 16; 50, pp. i, 66, 67, 68; 65, pp. 3, 7; 67, p. 1).

4.0 SURFACE WATER MIGRATION PATHWAY

4.1 OVERLAND/FLOOD MIGRATION COMPONENT – Tributaries 2, 3, and Hawe Creek

4.1.1.1 Definition of Hazardous Substance Migration Path for Overland/Flood Component

Overland flow at the Barite Hill property is directed down the slopes and out of the property's drainage area through defined drainage courses in the topography, non-maintained diversion ditches, and NPDES outfalls (Refs. 6, p. 2-6; 8, p. 78; 40, Appendix C, Logbook Team B, p. 38; 55, p. 66). The most significant surface water drainage features at the Barite Hill property are two unnamed perennial tributaries of Hawe Creek. The first tributary, Tributary 2, flows along the northern boundary of the property for about 1.09 miles and joins Hawe Creek. The second tributary, Tributary 3, begins on the southern boundary of the property and flows west and then north along the western boundary of the property for about 1.11 miles and joins Hawe Creek. The confluence of the two tributaries with Hawe Creek is located about 1,584 feet northwest of the Barite Hill western property boundary (Refs. 6, p. 2-5; 30; 40, p. 7). Hawe Creek continues about 2.2 miles before entering Strom Thurmond Lake on the Savannah River (Refs. 26; 28, p. 4). There is no discernable flow on Strom Thurmond Lake or on the section of Hawe Creek that is influenced by the lake (Hawe Creek Arm) (Ref. 71). Once the Arm of Hawe Creek enters Strom Thurmond Lake, flow continues to the northwest for 10 miles and to the southeast for 10 miles (Ref. 26). Hawe Creek lies within the 1 percent annual chance of flooding and a 26 percent chance of flooding over 30 years (Ref. 57, pp. 1, 4). The flow rates of Tributaries 2 and 3 as well as Hawe Creek are not known (Ref. 72).

During the 2007 Bureau of Reclamation site inventory, two major diversion ditches were observed. The first ditch begins near the Rainsford Pit, flows north then west between Waste Rock Disposal Area A and the process area ponds. The ditch then flows through a failed sediment control structure, turns south and discharges into a small sediment basin near the former Sediment Dam A (Ref. 55, pp. 9, 66) (see Figure 2 of this HRS documentation record). The ditch was observed to be extremely eroded and pyrite containing waste rock was located in the bed of the ditch. The second ditch begins near the Industrial Solid Waste Landfill (Waste Area C Landfill) and the permanent leach pad ponds. The ditch flows southeast then west entering a natural channel. The ditch was observed to be extremely eroded adjacent to the Industrial Solid Waste Landfill (Refs. 6, p. 1-1, Figure 2; 55, p. 9, 66) (see Figure 2 of this HRS documentation record).

In October 1989, the Barite Hill facility acquired a NPDES permit to discharge storm water runoff from the Barite Hill property to three outfalls that flow into the two unnamed tributaries of Hawe Creek (Ref. 33, pp. 1, 21). Barite Hill's property drainage courses and non-maintained diversion ditches direct surface water runoff to the three NPDES outfall locations (Refs. 5, Figure 2; 8, p. 78; 40, Appendix C, Logbook Team B, p. 38). According to the Barite Hill facility's NPDES permit, NPDES Outfall 001 is located directly west of Waste Disposal Area A, NPDES Outfall 002 is located directly south of the permanent leach pad barren pond, and NPDES Outfall 003 is located north of the Main Pit (Refs. 12, pp. 5, 6; 33, pp. 1, 21). However, at an unspecified time, the Barite Hill facility changed the location of NPDES Outfall 003 to NPDES Outfall 002; NPDES Outfall 003 (north of the Main Pit) was discontinued; and an additional outfall location, NPDES Outfall 01A, was added (Refs. 5, Figure 2; 18, pp. 4, 5; 19, p. 6) (see Figure 2 of this HRS documentation record). All NPDES outfall locations flow into unnamed tributaries of Hawe Creek (Ref. 30).

Probable point of entry (PPE) 1 begins at previous NPDES Outfall 003, along Tributary 2 north of the Main Pit. PPE 2 begins about 1,200 feet downstream from new NPDES Outfall 003 (former NPDES Outfall 002) located south of the property. PPE 3 begins 75 feet west of NPDES Outfall 001 located directly west of the property along Tributary 3 (Refs. 26; 30).

Surface water runoff from the reusable leach pad area, mineralized zone, Rainsford Pit, Waste Disposal Area A, and Source No. 1 flows west and enters PPE 3 through NPDES Outfall 001 (Refs. 5, pp. 1, 6, Figure 2; 30). Surface water runoff from Source No. 2 follows the topography and a diversion ditch that has not been maintained, and enters PPE 2 through new NPDES Outfall 003 (former NPDES Outfall 002) (Refs. 5, Figure 2; 8, p. 78; 30; 40, Appendix C, Logbook Team B, p. 38). During the 2007 site reconnaissance conducted by Tetra Tech, EPA, SCDHEC, and REAC, a seep from the northern side of the Main Pit was observed to be flowing into Tributary 2 in the vicinity of PPE 1 (Refs. 10, p. 1; 30; 40, Appendix C, Team B, pp. 2, 3, 4).

During the REAC sampling event, the stream depths were recorded on Tributaries 2 and 3 and Hawe Creek. The stream depth on Tributary 2 ranged from 0.2 to 0.5 meters, the stream depth on Tributary 3 ranged from 0.5 to 1.0 meters, and the stream depth on Hawe Creek ranged from 0.1 to 1.0 meters (Refs. 34, pp. 25, 29 through 111; 37).

4.1.2.1 LIKELIHOOD OF RELEASE

4.1.2.1.1 OBSERVED RELEASE – Direct Observation

Prior to mining activities, surface water and sediment samples were collected from the NPDES Outfall locations 001, 002, and 003 (Refs. 19, pp. 2, 3, 6; 30). Analytical results of surface water samples did not indicate the presence of inorganic constituents (Ref. 19, pp. 18, 20, 22).

An observed release by direct observation has been documented in Tributaries 2 and 3 of Hawe Creek. Tributaries 2 and 3 are the receiving waters specified in the NPDES permit no. SC0043401 (Refs. 30; 33, pp. 1, 21). SCDHEC issued consent order 98-049-W to Nevada Goldfields Inc. on June 11, 1998 after a review of the discharge monitoring reports submitted by Nevada Goldfields Inc. indicated that the waste disposal system failed to meet ammonia-nitrogen, pH, total suspended solids, copper, and zinc limits contained in the NPDES permit (Ref. 18, pp. i, 1).

NPDES permit violations from December 1995 to December 1997 at Outfall 001 which discharges directly into HRS eligible wetlands include cadmium, copper, cyanide, selenium, and zinc (Refs. 5, Figure 2; 18, p. 5; 30; 31; 33, p. 1, 21).

4.1.2.1.1 OBSERVED RELEASE – Chemical Analysis

October 2004 SCDHEC PA/SI Sampling Event

Background Samples

During the October 2004 PA/SI, SCDHEC collected two pairs of background co-located surface water and sediment samples (BH-001-SW/SE and BH-002-SW/SE) (Refs. 46, p. 22; 65, pp. i, 1; 68, pp. 5, 14) as shown in Table 14. Surface water and sediment samples BH-001-SW/SE, collected along Tributary 2 upstream of the Barite Hill property, were compared to samples collected along Tributary 2. Surface water and sediment samples, BH-002-SW/SE, collected along the headwaters of Tributary 3, were compared to samples collected along Tributary 3 (Refs. 37; 46, p. 22). Surface water samples were collected from the surface of the water by partially submerging the sampling container into the water and sediment samples were collected at a depth of 0 to 4 inches below the stream bed (bsb) (Ref. 67, pp. 1, 2).

The portion of Tributary 3 that does not receive runoff from the property is not perennial according to topographic maps of the area (Ref. 30). Therefore, the background co-located surface water and sediment samples BH-002-SW/SE were collected from a non-perennial stream (Ref. 37). According to the National Wetlands Map of the area, Tributary 3 contains HRS eligible wetlands, specifically palustrine forested making Tributary 3 HRS-eligible surface water (Ref. 31).

The surface water and sediment samples were collected in accordance with the SCDHEC BLWMSOP, and with the EPA Region 4 SESD EISOPQAM (November 2001) (Refs. 47, p. 11; 49, Sections 10 and 11; 87; 90, Sections 7 and 9). The locations of the background surface water and sediment samples are provided in Reference 37. Traffic reports and chain of custody records are provided in Reference 65. Logbook notes are provided in Reference 68.

The background surface water and sediment samples are comparable to the downstream surface water and sediment samples because the samples were collected from the same surface water bodies, during the same sampling event and in accordance with the same sampling procedures (see Tables 14 and 16) (Refs. 46; 65; 68).

Sample Description

TABLE 14: Surface Water and Sediment Samples – October 2004				
Sample ID	**Sample Location**	**Depth**	**Date Sampled**	**References**
Surface Water and Sediment Samples				
Background for Tributary 2				
BH-001-SW	Along Tributary 2, about 600 feet upstream from the intersection of Tributaries 1 and 2, wetland area	At the surface of the water	10/26/2004	30; 31; 37; 46, p. 22; 65, p. 1; 67, p. 2; 68, p. 5
BH-001-SE	Along Tributary 2, about 600 feet upstream from the intersection of Tributaries 1 and 2, wetland area	0 to 4 inches below the stream bed	10/26/2004	30; 31; 37; 46, p. 22; 65, p. 1; 67, p. 2; 68, p. 5
Background for Tributary 3				
BH-002-SW	Along the headwaters of Tributary 3, wetland area	At the surface of the water	10/26/2004	30; 31; 37; 46, p. 22; 65, p. 1; 67, p. 2; 68, p. 14
BH-002-SE	Along the headwaters of Tributary 3, wetland area	0 to 4 inches below the stream bed	10/26/2004	30; 31; 37; 46, p. 22; 65, p. 1; 67, p. 2; 68, p. 14

Notes:

BH Barite Hill
ID Identification number
NA Not applicable
SE Sediment
SW Surface Water

Background Concentrations

The surface water and sediment samples listed in Table 15 were collected by SCDHEC during the 2004 PA/SI (Ref. 46, pp. 21, 22, 23, 24; 65, pp. i, 1). Total metals analysis was conducted by the EPA Region 4 SESD ASB (Ref. 65, pp. i, 1). The EPA Region 4 ASB laboratory operations and quality assurance manual minimum quantitation limits are contained in Reference 51. Analytical data sheets for the samples collected in October 2004 are contained in Reference 50.

TABLE 15: Analytical Results for Surface Water and Sediment Samples – October 2004

Sample ID	Hazardous Substance	Concentration	MQL/RL	References
Surface Water and Sediment Samples				
Background for Tributary 2				
BH-001-SW	Cadmium	1.2U µg/L	1.2 µg/L	50, p. 42; 51, p. 1
BH-001-SW	Copper	5U µg/L	5 µg/L	50, p. 42; 51, p. 1
BH-001-SW	Lead	2.5U µg/L	2.5 µg/L	50, p. 42; 51, p. 1
BH-001-SW	Nickel	10U µg/L	10 µg/L	50, p. 42; 51, p. 1
BH-001-SW	Selenium	5U µg/L	5.0 µg/L	50, p. 42; 51, p. 1
BH-001-SW	Zinc	10U µg/L	10 µg/L	50, p. 42; 51, p. 2
BH-001-SE	Cadmium	0.24U mg/kg	0.24 mg/kg	50. p. 41; 51, p. 1
BH-001-SE	Copper	49A mg/kg	1.0 mg/kg	50. p. 41; 51, p. 1
Background for Tributary 3				
BH-002-SW	Copper	5U µg/L	5 µg/L	50, p. 44; 51, p. 1
BH-002-SW	Lead	2.5U µg/L	2.5 µg/L	50, p. 44; 51, p. 1
BH-002-SE	Arsenic	0.46 mg/kg	1.0 mg/kg	50, p. 43; 51, p. 1
BH-002-SE	Cadmium	0.17U mg/kg	0.17 mg/kg	50, p. 43; 51, p. 1
BH-002-SE	Copper	14 mg/kg	1.0 mg/kg	50, p. 43; 51, p. 1
BH-002-SE	Lead	26 mg/kg	0.5 mg/kg	50, p. 43; 51, p. 1
BH-002-SE	Zinc	32 mg/kg	1.0 mg/kg	50, p. 43; 51, p. 2

Notes:

µg/L Microgram per liter
A Analyte analyzed in replicate. Reported value is average of replicates.
BH Barite Hill
ID Identification number
mg/kg Milligram per kilogram
MQL Minimum quantitation limit. The MQL is equivalent to an SQL (Ref. 91).
RL Reporting limit
SE Sediment
SW Surface water
U Analyte not detected at or above reporting limit

For non-detect concentrations, the reporting limit is provided.

Contaminated Samples

Co-located surface water and sediment samples listed in Table 16 were collected along Tributaries 2 and 3 during the October 2004 PA/SI conducted by SCDHEC (Refs. 30; 44, pp. 1, 4; 46, pp. 21 through 25; 65, pp. i, 1, 3, 4; 68, pp. 3, 4). The co-located background surface water and sediment samples BH-001-SW/SE were compared to samples collected along Tributary 2. Co-located background surface water and sediment samples BH-002-SW/SE were compared to samples collected along Tributary 3. The surface water samples were collected from the surface of the water by partially submerging the sampling container into the water and the sediment samples were collected from 0 to 4 inches bsb (Refs. 67, pp. 1, 2; 68, pp. 3, 4, 5). The surface water and sediment samples were collected in accordance with the SCDHEC BLWMSOP and with EPA Region 4 EISOPQAM (November 2001) (Refs. 47, p. 11; 49, Sections 10 and 11; 87; 90, Sections 7 and 9). The locations of the contaminated surface water and sediment samples are provided in Reference 37. Traffic reports and chain of custody records are provided in Reference 65. Logbook notes are provided in Reference 68.

Table 16: Surface Water and Sediment Samples – October 2004

Sample ID	Sample Location	Distance from PPE	Depth	Date Sampled	References
Surface Water and Sediment Samples					
Tributary 2					
BH-005-SW	Tributary 2, northwest of the Main Pit, wetland area	920 feet downstream from PPE1	At the surface of the water	10/26/04	30; 31; 46, p. 22; 65, p. 1; 67, p. 2; 68, p. 4; 73
BH-005-SE	Tributary 2	920 feet downstream from PPE1	0 to 4 inches below stream bed	10/26/04	30; 31; 46, p. 22; 65, p. 1; 68, pp. 4, 5; 73
Tributary 3					
BH-023-SE	Tributary 3, west of NPDES Outfall 001, wetland area	3,270 feet downstream from PPE2	0 to 3 inches below stream bed	10/26/04	30; 31; 46, p. 22; 65, p. 3; 68, p. 3; 73
BH-024-SW	Tributary 3, west of NPDES Outfall 001, wetland area	3,180 feet downstream from PPE2	At the surface of the water	10/26/07	30; 31; 44, pp. 1, 4; 46, p. 22; 65, p. 4; 67, p. 2; 73
BH-024-SE	Tributary 3, west of NPDES Outfall 001, wetland area	3,180 feet downstream from PPE2	0 to 3 inches below stream bed	10/26/04	30; 31; 44, pp. 1, 4; 46, p. 22; 65, p. 4, 8; 67, p. 1; 73
BH-025-SW	Tributary 3, west of NPDES Outfall 001, wetland area	67 feet downstream from PPE3; 3,273 feet downstream from PPE2	At the surface of the water	10/26/04	30; 31; 44, pp. 1, 4; 46, p. 22; 65, p. 4; 67, p. 2; 73

Table 16: Surface Water and Sediment Samples – October 2004					
Sample ID	**Sample Location**	**Distance from PPE**	**Depth**	**Date Sampled**	**References**
BH-025-SE	Tributary 3, west of NPDES Outfall 001, wetland area	67 feet downstream from PPE3; 3,273 feet downstream from PPE2	0 to 3 inches below stream bed	10/26/04	30; 31; 44, pp. 1, 4; 46, p. 22; 65, p. 4, 8; 67, p. 1; 73
BH-026-SW	Tributary 3, west of NPDES Outfall 001, wetland area	144 feet downstream from PPE3; 3,289 feet downstream from PPE2	At the surface of the water	10/26/04	30; 31; 44, pp. 1, 4; 46, p. 22; 65, p. 4; 67, p. 2; 73
BH-026-SE	Tributary 3, west of NPDES Outfall 001, wetland area	144 feet downstream from PPE3; 3,289 feet downstream from PPE2	0 to 3 inches below stream bed	10/26/04	30; 31; 44, pp. 1, 4; 46, p. 22; 65, p. 4; 67, p. 1; 73
BH-027-SW	Tributary 3, west of NPDES Outfall 001, wetland area	110 feet downstream from PPE3; 3,237 feet downstream from PPE2	At the surface of the water	10/26/04	30; 31; 44, pp. 1, 4; 46, p. 22; 65, p. 4; 67, p. 2; 73
BH-027-SE	Tributary 3, west of NPDES Outfall 001, wetland area	110 feet downstream from PPE3; 3,237 feet downstream from PPE2	0 to 3 inches below stream bed	10/26/04	30; 31; 44, pp. 1, 4; 46, p. 22; 65, p. 4; 67, p. 1; 73

Notes:

BH Barite Hill
ID Identification
NA Not applicable
NPDES National Pollutant Discharge Elimination System
PPE Probable point of entry
SE Sediment
SW Surface water

Contaminated Concentrations

Surface water and sediment samples included in Table 17 were collected from Tributaries 2 and 3 during the SCDHEC 2004 PA/SI (Refs. 30; 46, p. 22; 65, pp. i, 1, 3, 4). Total metals analysis was conducted by the EPA Region 4 SESD ASB (Ref. 65, pp. 1, 2, 3, 4). The EPA Region 4 ASB laboratory operations and quality assurance manual minimum quantitation limits are contained in Reference 51. Analytical data sheets are contained in Reference 50.

TABLE 17: Analytical Results for Surface Water and Sediment Samples – October 2004

Sample ID	Hazardous Substance	Concentration	MQL	References
Surface Water and Sediment Samples				
Tributary 2				
BH-005-SW	Cadmium	510 µg/L	1.0 µg/L	50, p. 49; 51, p. 1
BH-005-SW	Copper	66,000 µg/L	10 µg/L	50, p. 49; 51, p. 1
BH-005-SW	Lead	100 µg/L	2.0 µg/L	50, p. 49; 51, p. 1
BH-005-SW	Nickel	120 µg/L	20 µg/L	50, p. 49; 51, p. 1
BH-005-SW	Selenium	61 µg/L	5.0 µg/L	50, p. 49; 51, p. 1
BH-005-SW	Zinc	14,000 µg/L	10 µg/L	50, p. 49; 51, p. 2
BH-005-SE	Cadmium	1.9 mg/kg	0.5 mg/kg	50, p. 48; 51, p. 1
BH-005-SE	Copper	280 mg/kg	1.0 mg/kg	50, p. 48; 51, p. 1
Tributary 3				
BH-023-SE	Arsenic	7.9 mg/kg	1.0 mg/kg	50, p. 70; 51, p. 1
BH-023-SE	Copper	110 mg/kg	1.0 mg/kg	50, p. 70; 51, p. 1
BH-023-SE	Lead	130 mg/kg	0.5 mg/kg	50, p. 70; 51, p. 1
BH-024-SW	Copper	10A µg/L	10 µg/L	50, p. 72; 51, p. 1
BH-024-SW	Lead	4.7 µg/L	2.0 µg/L	50, p. 72; 51, p. 1
BH-024-SE	Arsenic	8.5 mg/kg	1.0 mg/kg	50, p. 71; 51, p. 1
BH-024-SE	Copper	130 mg/kg	1.0 mg/kg	50, p. 71; 51, p. 1
BH-024-SE	Lead	210 mg/kg	0.5 mg/kg	50, p. 71; 51, p. 1
BH-025-SW	Copper	13 µg/L	10 µg/L	50, p. 74; 51, p. 1
BH-025-SW	Lead	4.8 µg/L	2.0 µg/L	50, p. 74; 51, p. 1
BH-025-SE	Arsenic	5.7 mg/kg	1.0 mg/kg	50, p. 73; 51, p. 1
BH-025-SE	Copper	100 mg/kg	1.0 mg/kg	50, p. 73; 51, p. 1
BH-025-SE	Lead	110 mg/kg	0.5 mg/kg	50, p. 73; 51, p. 1
BH-026-SW	Copper	12 µg/L	10 µg/L	50, p. 76; 51, p. 1

TABLE 17: Analytical Results for Surface Water and Sediment Samples – October 2004				
Sample ID	**Hazardous Substance**	**Concentration**	**MQL**	**References**
BH-026-SW	Lead	5.2 µg/L	2.0 µg/L	50, p. 76; 51, p. 1
BH-026-SE	Arsenic	5.2 mg/kg	1.0 mg/kg	50, p. 75; 51, p. 1
BH-026-SE	Copper	180 mg/kg	1.0 mg/kg	50, p. 75; 51, p. 1
BH-027-SW	Copper	15 µg/L	10 µg/L	50, p. 78; 51, p. 1
BH-027-SW	Lead	6.3 µg/L	2.0 µg/L	50, p. 78; 51, p. 1
BH-027-SE	Arsenic	1.6 mg/kg	1.0 mg/kg	50, p. 77; 51, p. 1
BH-027-SE	Cadmium	1.4 mg/kg	0.5 mg/kg	50, p. 77; 51, p. 1
BH-027-SE	Copper	190 mg/kg	1.0 mg/kg	50, p. 77; 51, p. 1
BH-027-SE	Zinc	130 mg/kg	1.0 mg/kg	50, p. 77; 51, p. 2

Notes:

µg/L Microgram per liter
A Analyte analyzed in replicate. Reported value is average of replicates.
BH Barite Hill
ID Identification number
mg/kg Milligram per kilogram
MQL Minimum quantitation limit. The MQL is equivalent to an SQL (Ref. 91).
SE Sediment
SW Surface water

March 2007 Removal Site Evaluation

During the March 2007 RSE, REAC collected background sediment sample, BH247-7 from the headwaters of Tributary 2 (Refs. 21; 30; 34, Figure 2; 69, pp. i, 2; 85, Logbook REAC IV-B-0210, p. 4). A background sediment sample was not collected along Tributary 3 during this investigation (Ref. 30; 34, Figure 2). Sediment sample BH247-7 was selected as the background sample for sediment samples collected along Tributaries 2 and 3. The background (BH247-7) and the release samples (see Table 18) were collected from a palustrine forested wetlands area during the same sampling event and using the same sampling methods (Refs. 17; 31; 66, p. 8; 69, pp. 1, 2; 86). The samples were collected in accordance with the REAC SOP No. 2016 (Ref. 17; 66, p. 8; 86). The location of the sediment sample listed in Table 18 is provided in Reference 37. The traffic report and chain of custody record is provided in Reference 69. Logbook notes are provided in Reference 85, Logbook REAC IV-B-0210.

Background Sample Description

TABLE 18: Background Sediment Sample – Tributaries 2 and 3, March 2007

Sample ID	Sample Location	Depth	Date Sampled	References
BH247-7	Headwaters of Tributary 2, north of the Barite Hill property, wetland area	0 to 6 inches below the stream bed	3/27/07	21; 30; 31; 34, p. 25; 69, p. 2; 85, Logbook REAC IV-B-0210, p. 4; 89

Notes:

BH Barite Hill
ID Identification
NA Not applicable

Background Concentrations

The sediment sample listed in Table 19 was collected during the March 2007 RSE (Refs. 34, p. 25; 69, p. i, 2). The sediment sample was analyzed by an EPA CLP laboratory (Ref. 56, p. 2). The sample was analyzed under the EPA CLP, using ILM05.3/ILM05.4 for total metals analysis (Refs. 34A, Table 4; 56; 84; 92, pp. 1 through 8). EPA Region 4, SESD reviewed all data according to the contract Statement of Work and EPA guidelines (Ref. 56, p. 2). The minimum reporting limits are contained on the analytical data sheets in Reference 56. The minimum reporting limits on the analytical data sheets are the sample specific and analyte specific CLP CRQLs which correspond to the lowest quantitative point on the calibration curve (Ref. 91).

TABLE 19: Analytical Results for the Background Sediment Sample – Tributaries 2 and 3, March 2007

Sample ID	Hazardous Substance	Concentration	MRL	References
BH247-7	Chromium	11 mg/kg	1.4 mg/kg	56, p. 73
BH247-7	Copper	30J (36.60) mg/kg	3.4 mg/kg	56, p. 73; 64, pp. 1, 2
BH247-7	Zinc	47J (70.50) mg/kg	8.2 mg/kg	56, p. 73; 64, pp. 1, 2

Notes:

( ) Concentration was adjusted in accordance with References 61, 62, 63, and 64
BH Barite Hill
ID Identification number
J The identification of the analyte is acceptable; the reported value is an estimate
mg/kg Milligram per kilogram
MRL Minimum reporting limit. The MRL is equivalent to an SQL (Ref. 91).
U Analyte was not detected at or above the reporting limit

Contaminated Samples

Sediment samples listed in Table 20 were collected from Tributaries 2 and 3 during the March 2007 RSE conducted by REAC (Refs. 21; 30; 34, p. 25; 69, pp. i, 1, 2; 85, Logbook REAC IV-B-0210, pp. 4, 5, 7, 10, 14, 15). Sediment sample BH247-525 is a field duplicate of BH247-25 (Ref. 69, p. 2). The samples were collected in accordance with the REAC SOP # 2016, Sediment Sampling (Refs. 17; 66, p. 8; 86). The locations of the background sediment samples are provided in Reference 37. The traffic reports and chain of custody records are provided in Reference 69. Logbook notes are provided in Reference 85, Logbook REAC IV-B-0210.

Table 20: Sediment Samples – March 2007

Sample ID	Sample Location	Distance from PPE	Depth	Date Sampled	References
Tributary 2					
BH247-8	Tributary 2, north Barite Hill property, wetland area	155 feet downstream from PPE1	0 to 6 inches below stream bed	3/27/07	21; 30; 31; 34, p. 25; 69, p. 2; 73; 85, Logbook REAC IV-B-0210, p. 5; 89
BH247-13	Tributary 2, west of Barite Hill property, wetland area	3,057 feet downstream from PPE1	0 to 6 inches below stream bed	3/27/07	21; 30; 31; 34, p. 25; 69, p. 1; 73; 85, Logbook REAC IV-B-0210, p. 7; 89
BH247-19	Tributary 2, northwest of Barite Hill property, wetland area	5,048 feet downstream from PPE1	0 to 6 inches below stream bed	3/27/07	21; 30; 31; 34, p. 25; 69, p. 1; 73; 85, Logbook REAC IV-B-0210, p. 10; 89
Tributary 3					
BH247-25	Tributary 3, west of Barite Hill property, wetland area	255 feet downstream from PPE3; 3,344 feet downstream from PPE2	0 to 6 inches below stream bed	3/28/07	21; 30; 31; 34, p. 25; 69, p. 1; 73; 85, Logbook REAC IV-B-0210, p. 14; 89
BH247-525	Tributary 3, west of Barite Hill property, wetland area	255 feet downstream from PPE3; 3,344 feet downstream from PPE2	0 to 6 inches below stream bed	3/28/07	21; 30; 31; 34, p. 25; 69, p. 2; 73; 85, Logbook REAC IV-B-0210, p. 14; 89
BH247-27	Tributary 3, west of Barite Hill property, wetland area	49 feet downstream from PPE 3; 3,235 feet downstream from PPE2	0 to 6 inches below stream bed	3/28/07	21; 30; 31; 34, p. 25; 69, p. 1; 73; 85, Logbook REAC IV-B-0210, p. 15; 89

Notes:

BH Barite Hill
ID Identification
PPE Probable point of entry

Contaminated Concentrations

Sediment samples included in Table 21 were collected from Tributaries 2 and 3 during the 2007 RSE (Refs. 30; 34, p. 25; 69, pp. i, 1, 2). The samples were analyzed under the EPA CLP for total metals analysis by ILM05.3/ILM05.4 (Refs. 56; 84; 92, pp. 1 through 8). EPA Region 4, SESD reviewed all data according to the contract Statement of Work and EPA guidelines (Ref. 56, p. 2). The minimum reporting limits are contained on the analytical data sheets in Reference 56. The minimum reporting limits on the analytical data sheets are the sample specific and analyte specific CLP CRQLs which correspond to the lowest quantitative point on the calibration curve (Ref. 91).

TABLE 21: Analytical Results for Sediment Samples – March 2007

Sample ID	Hazardous Substance	Concentration	MRL	References
Sediment Samples				
Tributary 2				
BH247-8	Copper	540J (442.62) mg/kg	3.9 mg/kg	56, p. 75; 64, pp. 1, 2
BH247-13	Copper	3,700J (3,032.79) mg/kg	6.4 mg/kg	56, p. 37; 64, pp. 1, 3
BH247-13	Zinc	1,300J (866.67) mg/kg	16 mg/kg	56, p. 37; 64, pp. 1, 3
BH247-19	Copper	300J (245.90) mg/kg	4.1 mg/kg	56, p. 43; 64, pp. 1, 3
Tributary 3				
BH247-25	Chromium	36 mg/kg	1.4 mg/kg	56, p. 51
BH247-25	Copper	180J (147.54) mg/kg	3.6 mg/kg	56, p. 51; 64, pp. 1, 3
BH247-525	Chromium	70 mg/kg	1.5 mg/kg	56, p. 67
BH247-525	Copper	200J (163.93) mg/kg	3.7 mg/kg	56, p. 67; 64, pp. 1, 4
BH247-27	Copper	220J (180.33) mg/kg	4.3 mg/kg	56, p. 55; 64, pp. 1, 4

Notes:

Sediment sample BH-247-525 is a duplicate of BH-247-25 (Ref. 69, p. 2).
( ) Concentration was adjusted in accordance with References 61, 62, 63, and 64
BH Barite Hill
ID Identification
J The identification of the analyte is acceptable; the reported value is an estimate
mg/kg Milligram per kilogram
MRL Minimum reporting limit. The MRL is equivalent to an SQL (Ref. 91).

June 2007 Expanded Site Inspection

Surface water and sediment samples listed in Table 22 were collected by Tetra Tech during the June 2007 ESI on behalf of EPA (Ref. 40, pp. 1, 6, Appendix B, pp. B-1, B-3; 58; 79, pp. i, 1, 3, 4). Background co-located surface water and sediment samples were collected (1) upgradient of the Barite Hill property along Tributary 2 (BH-SW/SD-01), (2) along the headwaters of Tributary 3 (BH-SW/SD-08), and (3) along the headwaters of Hawe Creek, northwest of the Barite Hill property (BH-SW/SD-02) (Refs. 30; 40, p. 13, Appendix B, pp. B-1, B-3; 40, Appendix C, Logbook Team A, pp. 6, 7, Logbook Team B, pp. 8, 18; 58; 79, pp. 1, 3, 4). Surface water and sediment samples BH-SW/SD-01 were compared to samples collected along Tributary 2 and Hawe Creek. Surface water and sediment samples BH-SW/SD-02 were compared to samples collected along Hawe Creek. Surface water and sediment sample BH-SW/SD-08 and sediment sample BH-SD-03 were compared to samples collected along Tributary 3 and Hawe Creek. Surface water samples were collected from the surface of the water and sediment samples were collected from 0 to 3 inches bsb (Refs. 32, p. 10; 40, p. 6, Appendix C, Team A, p. 6, Team B, pp. 8, 16, 17, 18).

The portion of Tributary 3 that does not receive runoff from the Barite Hill property is not perennial according to topographic maps of the area (Ref. 30). Therefore, the background sample BH-SW/SD-08 was collected from a non-perennial stream (Ref. 58). According to the National Wetlands Map of the area, Tributary 3 contains HRS-eligible wetlands, specifically palustrine forested, making Tributary 3 HRS-eligible surface water (Ref. 31).

Background surface water and sediment samples were collected in accordance with the EPA Region 4 SESD EISOPQAM, dated November 2001 (Ref. 40, p. 7, Appendix C, Logbook Team B, p. 7; 49, Sections 10 and 11). The locations of the sediment samples listed in Table 19 are provided in Reference 58. The traffic reports are provided in Reference 79.

The background surface water and sediment samples are comparable to the downstream surface water and sediment samples because the samples were collected during the same sampling event and in accordance with the same sampling procedures (see Tables 22 and 24) (Refs. 40, Appendix C, Logbook Team A, Logbook Team B; 79).

Background Samples Description

TABLE 22: Surface Water and Sediment Samples – June 2007

Sample ID	Sample Location	Depth	Date Sampled	References
Background Surface Water and Sediment Samples				
Tributary 2				
BH-SW-01	Tributary 2, north and upstream of Barite Hill property, wetland area	At the surface of the water	6/12/07	30; 31; 40, Appendix C, Team A, p. 7; 58; 79, p. 3; 83
BH-SD-01	Tributary 2, north and upstream of Barite Hill property, wetland area	0 to 3 inches below stream bed	6/12/07	30; 31; 40, Appendix C, Team A, p. 6; 58; 79, p. 1
Hawe Creek				
BH-SW-02	Hawe Creek, wetland area	At the surface of the water	6/11/07	30; 31; 40, Appendix C, Team B, p. 8; 58; 79, p. 3; 83

TABLE 22: Surface Water and Sediment Samples – June 2007				
Sample ID	**Sample Location**	**Depth**	**Date Sampled**	**References**
BH-SD-02	Hawe Creek, wetland area	0 to 3 inches below stream bed	6/11/07	30; 31; 40, Appendix C, Team B, p. 8; 58; 79, p. 1
Tributary 3				
BH-SW-08	Tributary 3, south of Barite Hill property, wetland area	At the surface of the water	6/13/07	30; 31; 40, Appendix C, Team B, p. 18; 58; 79, p. 4; 83
BH-SD-08	Tributary 3, south of Barite Hill property, wetland area	0 to 3 inches below stream bed	6/13/07	30; 31; 40, Appendix C, Team B, p. 18; 58; 79, p. 1

Notes:

BH Barite Hill
ID Identification number
NA Not applicable
SD Sediment
SW Surface water

Background Concentrations

The surface water and sediment samples listed in Table 23 were collected during the June 2007 ESI (Ref. 79, pp. i, 1, 3, 4). The samples were analyzed under the EPA CLP for total metals and cyanide analysis by ILM05.3/ILM05.4 (Refs. 40, Appendix E; 84; 92, pp. 1 through 8). EPA Region 4, SESD reviewed all data according to the contract Statement of Work and EPA guidelines (Ref. 40, Appendix E, p. 2 of 160). The minimum reporting limits are contained on the analytical data sheets in Appendix E of Reference 40. The minimum reporting limits on the analytical data sheets are the sample specific and analyte specific CLP CRQLs which correspond to the lowest quantitative point on the calibration curve (Ref. 91).

TABLE 23: Analytical Results for Surface Water and Sediment Samples - June 2007

Sample ID	Hazardous Substance	Concentration	MRL	References
Surface Water and Sediment Samples				
Background for Tributary 2 and Hawe Creek				
BH-SW-01	Cadmium	5.0U µg/L	5.0 µg/L	40, Appendix E, p. 66 of 160
BH-SW-01	Chromium	10U µg/L	10 µg/L	40, Appendix E, p. 66 of 160
BH-SW-01	Copper	11UJ µg/L	25 µg/L	40, Appendix E, p. 66 of 160
BH-SW-01	Lead	10U µg/L	10 µg/L	40, Appendix E, p. 66 of 160
BH-SW-01	Nickel	40U µg/L	40 µg/L	40, Appendix E, p. 66 of 160
BH-SW-01	Selenium	35U µg/L	35 µg/L	40, Appendix E, p. 66 of 160
BH-SW-01	Zinc	13UJ µg/L	60 µg/L	40, Appendix E, p. 66 of 160
BH-SD-01	Cadmium	4.0UJ mg/kg	4.0 mg/kg	40, Appendix E, p. 12 of 160
BH-SD-01	Copper	160J (160) mg/kg	20 mg/kg	40, Appendix E, p. 12 of 160; 64, pp. 1, 4
BH-SD-01	Mercury	0.80U mg/kg	0.80 mg/kg	40, Appendix E, p. 12 of 160
Background for Hawe Creek				
BH-SW-02	Copper	3.2UJ µg/L	25 µg/L	40, Appendix E, p. 68 of 160
BH-SW-02	Zinc	1.5UJ µg/L	60 µg/L	40, Appendix E, p. 68 of 160
BH-SD-02	Cadmium	1.6U mg/kg	1.6 mg/kg	40, Appendix E, p. 14 of 160
BH-SD-02	Copper	29J (29) mg/kg	7.8 mg/kg	40, Appendix E, p. 14 of 160; 64, pp. 1, 5
Background for Tributary 3 and Hawe Creek				
BH-SW-08	Cadmium	5.0U µg/L	5.0 µg/L	40, Appendix E, p. 78 of 160
BH-SW-08	Copper	25U µg/L	25 µg/L	40, Appendix E, p. 78 of 160
BH-SW-08	Zinc	60U µg/L	60 µg/L	40, Appendix E, p. 78 of 160
BH-SW-08	Cyanide	10U µg/L	10 µg/L	40, Appendix E, p. 79 of 160

TABLE 23: Analytical Results for Surface Water and Sediment Samples - June 2007				
Sample ID	**Hazardous Substance**	**Concentration**	**MRL**	**References**
BH-SD-08	Arsenic	9.7 mg/kg	2.8 mg/kg	40, Appendix E, p. 26 of 160
BH-SD-08	Cadmium	1.4U mg/kg	1.4 mg/kg	40, Appendix E, p. 26 of 160
BH-SD-08	Chromium	150 mg/kg	2.8 mg/kg	40, Appendix E, p. 26 of 160
BH-SD-08	Copper	19J (19) mg/kg	6.9 mg/kg	40, Appendix E, p. 26 of 160; 64, pp. 1, 6
BH-SD-08	Lead	29J (41.76) mg/kg	2.8 mg/kg	40, Appendix E, p. 26 of 160; 64, pp. 1, 6
BH-SD-08	Nickel	8.9J (12.02) mg/kg	11 mg/kg	40, Appendix E, p. 26 of 160; 64, pp. 1, 6
BH-SD-08	Zinc	53J (79.5) mg/kg	17 mg/kg	40, Appendix E, p. 26 of 160; 64, pp. 1, 6

Notes:

( ) Concentration was adjusted in accordance with References 61, 62, 63, and 64
µg/L Microgram per liter
BH Barite Hill
ID Identification number
J The identification of the analyte is acceptable; the reported value is an estimate
mg/kg Milligram per kilogram
MRL Minimum reporting limit. The MRL is equivalent to an SQL (Ref. 91).
SD Sediment
SW Surface water
U Analyte was not detected at or above the reporting limit

Contaminated Samples

Surface water and sediment samples listed in Table 24 were collected along Tributaries 2 and 3 as well as Hawe Creek during the June 2007 ESI conducted by Tetra Tech (Refs. 40, Appendix B, pp. B-1, B-2, B-3, B-4, Appendix C, Logbook Team A, pp. 3, 4, 5, 6, Logbook Team B, pp. 9, 10, 12, 13; 58; 79, pp. i, 1 through 5). Background surface water and sediment samples BH-SW/SD-01 were compared to samples collected along Tributary 2 and Hawe Creek. The surface water samples were collected from the surface of the water and the sediment samples were collected from 0 to 6 inches bsb (Refs. 32, p. 10, Table 2; 40, p. 6, Appendix C, Logbook Team A, pp. 3, 4, 5, Logbook Team B, pp. 9, 10, 13). The samples were collected in accordance with the EPA Region 4 SESD EISOPQAM (November 2001) (Ref. 40, p. 7, Appendix C, Team B, p. 7; 49, Sections 10 and 11). The locations of the surface water and sediment samples are provided in Reference 58. The traffic reports are provided in Reference 79.

Table 24: Surface Water and Sediment Samples – June 2007

Sample ID	Sample Location	Distance from PPE	Depth	Date Sampled	References
Surface Water and Sediment Samples					
Tributary 2					
BH-SW-05	Tributary 2, north of Barite Hill property, wetland area	365 feet downstream from PPE1	At the surface of the water	6/12/07	30; 31; 40, Appendix C, Team A, p. 6; 58; 73; 79, p. 3; 83
BH-SD-05	Tributary 2, north of Barite Hill property, wetland area	365 feet downstream from PPE1	0 to 3 inches below stream bed	6/12/07	30; 31; 40, Appendix C, Team A, p. 5; 58; 73; 79, p. 1
BH-SW-06	Tributary 2, north of Barite Hill property, wetland area	2,087 feet downstream from PPE1	At the surface of the water	6/12/07	30; 31; 40, Appendix C, Team A, p. 5; 58; 73; 79, p. 4; 83
BH-SW-07	Tributary 2, north of Barite Hill property, wetland area	3,220 feet downstream from PPE1	At the surface of the water	6/12/07	30; 31; 40, Appendix C, Team A, p. 4; 58; 73; 79, p. 4; 83
BH-SD-07	Tributary 2, north of Barite Hill property, wetland area	3,220 feet downstream from PPE1	3 to 6 inches below stream bed	6/12/07	30; 31; 40, Appendix C, Team A, p. 4; 58; 73; 79, p. 1
Tributary 3					
BH-SD-11	Tributary 3, west of Barite Hill property, wetland area	105 feet downstream from PPE3; 3,264 feet downstream from PPE2	0 to 3 inches below stream bed	6/12/07	30; 31; 40, Appendix C, Team B, pp. 9, 10; 58; 73; 79, p. 2

Table 24: Surface Water and Sediment Samples – June 2007					
Sample ID	**Sample Location**	**Distance from PPE**	**Depth**	**Date Sampled**	**References**
BH-SD-12	Tributary 3, west of Barite Hill property, wetland area	3,128 feet downstream from PPE2	0 to 3 inches below stream bed	6/12/07	30; 31; 40, Appendix C, Team B, p. 10; 58; 73; 79, p. 2
BH-SD-13	Tributary 3, west of Barite Hill property, wetland area	2,828 feet downstream from PPE2	0 to 3 inches below stream bed	6/12/07	30; 31; 40, Appendix C, Team B, p. 10; 58; 73; 79, p. 2
BH-SD-14	Tributary 3, west of Barite Hill property, wetland area	2,671 feet downstream from PPE2	0 to 3 inches below stream bed	6/12/07	30; 31; 40, Appendix C, Team B, p. 10; 58; 73; 79, p. 2
BH-SW-15	Tributary 3, west of Barite Hill property, wetland area	20 feet downstream from PPE3; 3,216 feet downstream from PPE2	At the surface of the water	6/12/07	30; 31; 40, Appendix C, Team B, p. 12; 58; 73; 79, p. 4; 83
BH-SD-15	Tributary 3, west of Barite Hill property, wetland area	20 feet downstream from PPE3; 3,216 feet downstream from PPE2	0 to 3 inches below stream bed	6/12/07	30; 31; 40, Appendix C, Team B, p. 12; 58; 73; 79, p. 2
BH-SW-24	Tributary 3, west of Barite Hill property, wetland area	2,981 feet downstream from PPE2	At the surface of the water	6/12/07	30; 31; 40, Appendix C, Team B, p. 13; 58; 73; 79, p. 5; 83
Hawe Creek					
BH-SW-16	Hawe Creek, northwest of Barite Hill property, wetland area	2,346 feet downstream from PPE3; 5,364 feet downstream from PPE1; 5,453 feet downstream from PPE2	At the surface of the water	6/11/07	30; 31; 40, Appendix C, Team A, p. 3; 58; 73; 79, p. 5; 83

Table 24: Surface Water and Sediment Samples – June 2007					
Sample ID	**Sample Location**	**Distance from PPE**	**Depth**	**Date Sampled**	**References**
BH-SD-16	Hawe Creek, northwest of Barite Hill property, wetland area	2,346 feet downstream from PPE3; 5,364 feet downstream from PPE1; 5,453 feet downstream from PPE2	0 to 3 inches below stream bed	6/11/07	30; 31; 40, Appendix C, Team A, p. 3; 58; 73; 79, p. 2
BH-SD-17	Hawe Creek, northwest of Barite Hill property, wetland area	3,184 feet downstream from PPE3; 6,202 feet downstream from PPE1, 6,291 feet downstream from PPE2	0 to 3 inches below stream bed	6/11/07	30; 31; 40, Appendix C, Team A, p. 3; 58; 73; 79, p. 2

Notes:

BH Barite Hill
bsb Below stream bed
ID Identification number
NA Not applicable
PPE Probable point of entry
SD Sediment
SW Surface water

Contaminated Concentrations

Samples listed in Table 25 were collected from Tributaries 2 and 3, and Hawe Creek during the 2007 ESI (Refs. 40, Appendix B, pp. B-1, B-2, B-3, B-4; 79, pp. i, 1 through 5). The samples were analyzed under the EPA CLP for total metals and cyanide analysis by ILM05.3/ILM05.4 (Refs. 40, Appendix E; 84; 92, pp. 1 through 8). EPA Region 4, SESD reviewed all data according to the contract Statement of Work and EPA guidelines (Ref. 40, Appendix E, p. 2 of 160). The minimum reporting limits are contained on the analytical data sheets in Appendix E of Reference 40. The minimum reporting limits on the analytical data sheets are the sample specific and analyte specific CLP CRQLs which correspond to the lowest quantitative point on the calibration curve (Ref. 91).

TABLE 25: Analytical Results for Surface Water and Sediment Samples – June 2007

Sample ID	Hazardous Substance	Concentration	MRL	References
Surface Water and Sediment Samples				
Tributary 2				
BH-SW-05	Cadmium	790 µg/L	5.0 µg/L	40, Appendix E, p. 72 of 160
BH-SW-05	Chromium	29 µg/L	10 µg/L	40, Appendix E, p. 72 of 160
BH-SW-05	Copper	93,000 µg/L	50 µg/L	40, Appendix E, p. 72 of 160
BH-SW-05	Lead	98 µg/L	10 µg/L	40, Appendix E, p. 72 of 160
BH-SW-05	Nickel	210 µg/L	40 µg/L	40, Appendix E, p. 72 of 160
BH-SW-05	Selenium	58 µg/L	35 µg/L	40, Appendix E, p. 72 of 160
BH-SW-05	Zinc	20,000 µg/L	60 µg/L	40, Appendix E, p. 72 of 160
BH-SD-05	Copper	810J (663.93) mg/kg	9.6 mg/kg	Refs. 40, Appendix E, p. 20 of 160; 64, pp. 1, 7
BH-SD-05	Mercury	1.2 mg/kg	0.38 mg/kg	Ref. 40, Appendix E, p. 20 of 160
BH-SW-06	Cadmium	370 µg/L	5.0 µg/L	40, Appendix E, p. 74 of 160
BH-SW-06	Chromium	11 µg/L	10 µg/L	40, Appendix E, p. 74 of 160
BH-SW-06	Copper	37,000 µg/L	25 µg/L	40, Appendix E, p. 74 of 160
BH-SW-06	Lead	73 µg/L	10 µg/L	40, Appendix E, p. 74 of 160
BH-SW-06	Nickel	110 µg/L	40 µg/L	40, Appendix E, p. 74 of 160
BH-SW-06	Zinc	9,400 µg/L	60 µg/L	40, Appendix E, p. 74 of 160
BH-SW-07	Cadmium	48 µg/L	5.0 µg/L	40, Appendix E, p. 76 of 160
BH-SW-07	Copper	2,400 µg/L	25 µg/L	40, Appendix E, p. 76 of 160
BH-SW-07	Lead	13 µg/L	10 µg/L	40, Appendix E, p. 76 of 160
BH-SW-07	Zinc	1,700 µg/L	60 µg/L	40, Appendix E, p. 76 of 160
BH-SD-07	Cadmium	5.2 mg/kg	4.6 mg/kg	Ref. 40, Appendix E, p. 24 of 160

TABLE 25: Analytical Results for Surface Water and Sediment Samples – June 2007				
Sample ID	**Hazardous Substance**	**Concentration**	**MRL**	**References**
BH-SD-07	Copper	1,100J (901.64) mg/kg	23 mg/kg	Ref. 40, Appendix E, p. 24 of 160; 64, pp. 1, 7
Tributary 3				
BH-SD-11	Arsenic	64 mg/kg	5.5 mg/kg	40, Appendix E, p. 34 of 160
BH-SD-11	Copper	670J (549.18) mg/kg	14 mg/kg	40, Appendix E, p. 34 of 160; 64, pp. 1, 7
BH-SD-11	Lead	220J (152.78) mg/kg	5.5 mg/kg	40, Appendix E, p. 34 of 160; 64, pp. 1, 7
BH-SD-12	Arsenic	42 mg/kg	29 mg/kg	40, Appendix E, p. 36 of 160
BH-SD-12	Chromium	480 mg/kg	29 mg/kg	40, Appendix E, p. 36 of 160
BH-SD-12	Copper	950J (778.69) mg/kg	74 mg/kg	40, Appendix E, p. 36 of 160; 64, pp. 1, 8
BH-SD-12	Lead	210J (145.83) mg/kg	29 mg/kg	40, Appendix E, p. 36 of 160; 64, pp. 1, 8
BH-SD-12	Nickel	130 mg/kg	120 mg/kg	40, Appendix E, p. 36 of 160
BH-SD-12	Zinc	1,300J (866.67) mg/kg	180 mg/kg	40, Appendix E, p. 36 of 160; 64, pp. 1, 8
BH-SD-13	Copper	1,400J (1,147.54) mg/kg	110 mg/kg	40, Appendix E, p. 38 of 160; 64, pp. 1, 8
BH-SD-13	Lead	240J (166.67) mg/kg	44 mg/kg	40, Appendix E, p. 38 of 160; 64, pp. 1, 9
BH-SD-13	Zinc	640J (426.67) mg/kg	260 mg/kg	40, Appendix E, p. 38 of 160; 64, pp. 1, 9
BH-SD-14	Copper	220J (180.33) mg/kg	30 mg/kg	40, Appendix E, p. 40 of 160; 64, pp. 1, 9
BH-SW-15	Cadmium	5.9 µg/L	5.0 µg/L	40, Appendix E, p. 94 of 160
BH-SW-15	Copper	1,000 µg/L	25 µg/L	40, Appendix E, p. 94 of 160
BH-SW-15	Zinc	220 µg/L	60 µg/L	40, Appendix E, p. 94 of 160
BH-SD-15	Arsenic	67 mg/kg	3.7 mg/kg	40, Appendix E, p. 42 of 160
BH-SD-15	Copper	340J (278.69) mg/kg	9.3 mg/kg	40, Appendix E, p. 42 of 160; 64, pp. 1, 10
BH-SD-15	Lead	270J (187.50) mg/kg	3.7 mg/kg	40, Appendix E, p. 42 of 160; 64, pp. 1, 10
BH-SW-24	Cyanide	11 µg/L	10 µg/L	40, Appendix E, p. 115 of 160

TABLE 25: Analytical Results for Surface Water and Sediment Samples – June 2007				
Sample ID	**Hazardous Substance**	**Concentration**	**MRL**	**References**
Hawe Creek				
BH-SW-16	Copper	310 µg/L	25 µg/L	40, Appendix E, p. 96 of 160
BH-SW-16	Zinc	140 µg/L	60 µg/L	40, Appendix E, p. 96 of 160
BH-SD-16	Cadmium	10 mg/kg	3.5 mg/kg	40, Appendix E, p. 44 of 160
BH-SD-16	Copper	3,200J (2,622.95) mg/kg	17 mg/kg	40, Appendix E, p. 44 of 160; 64, pp. 1, 10
BH-SW-17	Copper	160 µg/L	25 µg/L	40, Appendix E, p. 98 of 160
BH-SW-17	Zinc	91 µg/L	60 µg/L	40, Appendix E, p. 98 of 160
BH-SD-17	Cadmium	9.8 mg/kg	3.5 mg/kg	40, Appendix E, p. 46 of 160
BH-SD-17	Copper	5,900J (4,836.07) mg/kg	18 mg/kg	40, Appendix E, p. 46 of 160; 64, pp. 1, 10

Notes:

( ) Concentration was adjusted in accordance with References 61, 62, 63, and 64
µg/L Microgram per liter
BH Barite Hill
J The identification of the analyte is acceptable; the reported value is an estimate
mg/kg Milligram per kilogram
MRL Minimum reporting limit. The MRL is equivalent to an SQL (Ref. 91).
SD Sediment
SW Surface water

Attribution

The Barite Hill property is located about 2.5 miles south of the town of McCormick in McCormick County, South Carolina (Refs. 38, pp. i, 1, 2; 42, p. 1; 48, p. 2). Nevada Goldfields, Inc. conducted mining activities at the property from 1989 until October 1994 (Ref. 42, p. 1). A heap leach process was used to mine gold (Ref. 43, p. 6). The gold ore was mined from the two pits, crushed, agglomerated, and placed on a leach pad (Ref. 42, p. 3). A cyanide solution was then pumped to the leach pad and allowed to percolate through the heaps (Refs. 8, Figure 2.2; 42, pp. 4, 5). The solution was drained from the leach pad to the pregnant solution pond. The solution was subsequently pumped to the plant for processing (Ref. 42, p. 4).

In October 1989, the Barite Hill Gold Mine acquired a NPDES permit to discharge storm water runoff from the Barite Hill property to three outfalls that flow into two unnamed tributaries of Hawe Creek, Tributaries 2 and 3 (Refs. 30; 33, pp. 1, 21). NPDES Outfall 001 is located directly west of Waste Disposal Area A, NPDES Outfall 002 is located directly south of the permanent leach pad barren pond, and NPDES Outfall 003 is located north of the Main Pit (Refs. 6, Figure 2; 12, pp. 5, 6; 33, p. 21). At an unspecified time, the Barite Hill facility changed the location of NPDES Outfall 003 to NPDES Outfall 002 (new NPDES Outfall 003); NPDES Outfall 003 (north of the Main Pit) was discontinued; and an additional outfall location, NPDES Outfall 01A, was added (Refs. 5, Figure 2; 18, pp. 4, 5; 30).

In January 1995, a wastewater treatment system was added to treat excess process solution to NPDES limits for discharge to the environment (Ref. 42, pp. 1, 7). The pretreated solution with most of the metals and cyanide removed by either hydrogen peroxide oxidation or alkaline chlorination was pumped into the wastewater treatment building for treatment (Ref. 42, p. 7). After treatment, the water was discharged to NPDES Outfall 01A above NPDES Outfall 001; combined with storm water in the NPDES Outfall 001 basin, and subsequently discharged to the receiving tributary (Tributary 3) (Refs. 5, p. 4, Figure 2; 30; 42, p. 7).

SCDHEC issued several notices of violation between December 1995 and December 1997 for concentrations exceeding the Barite Hill facility's NPDES permit limitations. Violations at Outfall 001 included exceedances of ammonia-nitrogen, cadmium, copper, cyanide, pH, selenium, zinc, total residuals, and total suspended solids exceeding permitted limits. One notice of violation was issued for an exceedance of aluminum exceeding the permit limit at Outfall 01A. Violations at Outfall 003 included exceedances of barium, cadmium, copper, cyanide, lead, oil and grease, pH, selenium, total suspended solids, and zinc exceeding permit limits (Ref. 18, pp. 4, 5).

Discharge of treated water through NPDES Outfall 001 was discontinued in December 1996. Therefore, monitoring results after December 1996 are attributable to storm water runoff (Ref. 5, p. 6). Surface water runoff from the mineralized zone and process area ponds, among other structures located in the northwest portion of the Barite Hill property, drain towards NPDES Outfall 001 (Ref. 5, p. 6, Figures 1 and 2). From December 1996 through June 1998, violations at Outfall 001 included concentrations of ammonia-nitrogen, copper, cyanide, pH, total residual, selenium, total suspended solids, and zinc exceeding permitted limits (Refs. 5, Table 1, Figure 3; 18, p. 4). Prior to the discharge of treated water through NPDES Outfall 001(January 1995), exceedances of permit levels at this outfall included pH, copper, zinc, and selenium (Ref. 5, Table 1, Figure 3; 33, pp. 22, 24, 25). While treated process water was being discharged through NPDES Outfall 001 (after January 1995), concentrations of ammonia-nitrogen, cadmium, copper, cyanide, pH, total residual, selenium, and zinc exceeded NPDES permit limits (Refs. 18, p. 4; 42, pp. 1, 7).

The NPDES permit also required macroinvertebrate surveys to be conducted at the Barite Hill property on a bi-annual basis since 1992 (Ref. 18, p. 3). The March 1995 macroinvertebrate study indicated little or no impact to the northern tributary of Hawe Creek (Tributary 2) or to Hawe Creek from mining operations at the Barite Hill facility; however, discharge from NPDES Outfall 001 has significantly

impacted the western unnamed tributary (Tributary 3), downstream to its confluence with Hawe Creek, essentially eliminating the fish and macroinvertebrates from this portion of the tributary (Refs. 20, pp. 3, 11; 30). The northern tributary or Tributary 2 is also referred to as Stream B and the western tributary or Tributary 3 is also referred to as Stream A (Refs. 20, pp. 3, 11; 30).

In July 2007, SCDHEC measured the pH of the Main Pit lake in an effort to assess the impact of acid rock drainage on the pH of the water contained in the Main Pit. Five surface water samples were collected at four different locations. The surface water samples were collected at various depths from the water's surface to 30 feet below the surface of the water. The pH of the water ranged from 2.42 standard units at the surface to -3.98 standard units at 4 feet below the surface of the water (Ref. 54, pp. 1, 3).

During the 2007 site reconnaissance, a seep from the northern side of the Main Pit was observed to be flowing into the northern tributary of Hawe Creek (Tributary 2) (Refs. 40, Appendix C, Logbook Team B, pp. 2, 3; 30). SCDHEC personnel stated that during previous visits to the Barite Hill property, there was a visible difference in water color downstream of this seep location (Ref. 40, Appendix C, Logbook Team B, p. 3). During the 2007 REAC RSE, a biological assessment of the unnamed tributaries of Hawe Creek was conducted (Ref. 34, p. 2). Results of the biological assessment indicated that the seep is impacting the northern unnamed tributary of Hawe Creek, Tributary 2. The diversity and abundance of all species lessen almost to extinction, in the area of the seep (Refs. 34, p. 5; 30). A pH of 2.76 standard units and a high sulfate concentration found after the seep area are indicators of the impact from the Main Pit (Ref. 34, p. 5).

Analytical results of source samples collected from Source Nos. 1, 2, and 3 between October 2004 and June 2007 contained site-related hazardous substances, including arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, zinc, and cyanide (see Tables 2, 3, 4, 7, 8, 9, and 11 in Section 2.2.2 for Source Nos. 1, 2, and 3 of this HRS documentation record). Also, arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, zinc, and cyanide have been documented as observed releases in surface water or sediment samples collected from Tributaries 2 and 3 as well as Hawe Creek (Ref. 37) (see Tables 15, 17, 19, 21, 23, and 25 in Section 4.1.2.1.1, Observed Release, of this HRS documentation record). Also an observed release by direct observation has been documented at Outfall 001. Specifically, NPDES effluent violations from December 1995 to December 1997 at Outfall 001, which discharges directly into HRS eligible wetlands have been documented for cadmium, copper, cyanide, selenium, and zinc (Refs. 5, Figure 2; 18, pp. 1, 2, 3, 4; 30; 31; 33, p. 1, 21).

The hazardous substances listed below have been documented in on-site sources as well as in Tributaries 2, 3, and/or Hawe Creek indicating migration of hazardous substances from the Barite Hill property (See Tables 2, 3, 4, 7, 8, 9, and 11 in Section 2.2.2 for Source Nos. 1, 2, and 3, and Tables 15, 17, 19, 21, 23, and 25 in Section 4.1.2.1.1, Observed Release, of this HRS documentation record). Specifically, NPDES effluent violations from December 1995 to December 1997 at Outfall 001, which discharges directly into HRS eligible wetlands have been documented for cadmium, copper, cyanide, selenium, and zinc (Refs. 5, Figure 2; 18, pp. 1, 2, 3, 4; 30; 31; 33, p. 1, 21).

<u>Hazardous Substances in the Release</u>

Arsenic
Cadmium
Chromium
Copper
Lead
Mercury
Nickel

Selenium
Zinc
Cyanide

Surface Water Observed Release Factor Value: 550.00

4.1.2.2 Drinking Water Threat Waste Characteristics

4.1.2.2.1 TOXICITY/PERSISTENCE

The toxicity and persistence factor values for the hazardous substances detected in the source samples with containment factor values of greater than 0 are summarized in Table 26. The combined toxicity and persistence factor values are assigned in accordance with Reference 1, Section 4.1.2.2.1.

TABLE 26: Surface Water Toxicity/Persistence

Hazardous Substance	Source No.	Toxicity Factor Value	Persistence Factor Value[1]	Does Hazardous Substance Meet Observed Release? (Yes/No)	Toxicity/ Persistence Factor Value (Table 4-12)	Reference
Arsenic	1, 2, 3	10,000	1	Yes	10,000	2, p. BI-1
Cadmium	1, 2, 3	10,000	1	Yes	10,000	2, p. BI-2
Chromium	1, 2, 3	10,000	1	Yes	10,000	2, p. BI-3
Copper	1, 2, 3	0	1	Yes	0	2, p. BI-3
Lead	1, 2, 3	10,000	1	Yes	10,000	2, p. BI-8
Mercury	1, 2, 3	10,000	1	Yes	10,000	2, p. BI-8
Nickel	1, 2, 3	10,000	1	Yes	10,000	2, p. BI-9
Selenium	1, 2, 3	100	1	Yes	100	2, p. BI-10
Silver	1, 2, 3	100	1	No	100	2, p. BI-10
Zinc	1, 2, 3	10	1	Yes	10	2, p. BI-12
Cyanide	1, 2	100	1	Yes	100	2, BI-4

Notes:

[1] Persistence factor value for rivers and lakes

Toxicity/Persistence Factor Value: 10,000.00
(Reference 1, Section 4.1.2.2.1)

4.1.2.2.2 HAZARDOUS WASTE QUANTITY

TABLE 27: Hazardous Waste Quantity		
Source No.	**Source Type**	**Source Hazardous Waste Quantity**
1	Surface Impoundments	8,138.46
2	Surface Impoundments	11,469.23
3	Other	>0
Total HWQ Values		19,607.69

Notes:
HWQ Hazardous Waste Quantity

The hazardous constituent quantity for Source No. 1 (Ponds A, B, C, D, and E) is not adequately determined. The estimated combined area of the five surface impoundments that comprise Source No. 1 is 105,800 ft^2 (Refs. 6, Figure 2; 34, pp. 17, 28; 45).

The hazardous constituent quantity for Source No. 2 (Ponds F, G, and H) is not adequately determined. The estimated combined area of the three surface impoundments that comprise Source No. 2 is 149,100 ft^2 (Refs. 6, Figure 2; 34, pp. 17, 28; 45).

The hazardous constituent quantity for Source No. 3 is not adequately determined. At the time of abandonment, the Main Pit contained about 16 million gallons of water containing a pH of 11 standard units (Ref. 9, pp. 1, 2). However, in July 2007, samples collected from the Main Pit indicated a pH ranging from 2.42 to -3.98 standard units (Ref. 54, p. 3; 55, p. 2). Water with a pH of less than or equal to 2 standard units is considered a Resource Conservation and Recovery Act (RCRA) characteristic hazardous waste (Ref. 70, pp. 1, 2). It is not known whether the 16 million gallons of water contained in the Main Pit contained runoff, rainwater, or ground water. Therefore, the volume of waste contained in Source No. 3 is undetermined but greater than zero.

Hazardous Waste Quantity Factor Value: 10,000
(Reference 1, Table 2-6)

4.1.2.2.3 CALCULATION OF DRINKING WATER THREAT WASTE CHARACTERISTICS FACTOR CATEGORY VALUE

The waste characteristics factor category was obtained by multiplying the toxicity/persistence and HWQ factor values, subject to a maximum product of 1×10^8. Based on this product, a value was assigned in accordance with Reference 1, Table 2-7.

Toxicity/Persistence Factor Value: 10,000.00
Hazardous Waste Quantity Factor Value: 10,000

Toxicity/Persistence Factor Value ×
Hazardous Waste Quantity Factor Value: 1×10^8

Waste Characteristics Factor Category Value: 100
(Reference 1, Table 2-7)

4.1.2.3 DRINKING WATER THREAT TARGETS

No surface water intakes are located within the 15-mile TDL downstream of the Barite Hill property (Refs. 14; 26; 74; 75, pp, i, 1, 2, 3; 76; 77, pp. i, 1, 5, 7; 80, pp. i, 1, 2).

4.1.2.3.3 Resources

Table 28: Resources

Surface Water Body	Resource Use	Reference
Hawe Creek	Major/Designated Recreation Area	59
Strom Thurmond Lake	Major/Designated Recreation Area	28

The lower portion of Hawe Creek and Strom Thurmond Lake, managed by the U.S. Army Corp of Engineers, on the Savannah River are used for recreational activities including fishing and swimming (Refs. 15; 28; 59).

Resources Factor Value: 5.00
(Ref. 1, Section 4.1.2.3.3)

4.1.3.2 HUMAN FOOD CHAIN THREAT WASTE CHARACTERISTICS

4.1.3.2.1 Toxicity/Persistence/Bioaccumulation

The toxicity, persistence, and bioaccumulation factor values for the hazardous substances detected in the source samples with containment factor values of greater than 0 are summarized in Table 29. The combined toxicity, persistence, and bioaccumulation factor values are assigned in accordance with Reference 1, Section 4.1.3.2.1.

Table 29: Toxicity/Persistence/Bioaccumulation

Hazardous Substance	Source No.	Toxicity Factor Value	Persistence Factor Value[1]	Bioaccu-mulation Value[2]	Toxicity/ Persistence/ Bioaccumulation Factor Value (Table 4-16)	Reference
Arsenic	1, 2, 3	10,000	1	5	5E+4	2, p. BI-1
Cadmium	1, 2, 3	10,000	1	5,000	5E+7	2, p. BI-2
Chromium	1, 2, 3	10,000	1	500	5E+6	2, p. BI-3
Copper	1, 2, 3	0	1	500	0	2, p. BI-3
Lead	1, 2, 3	10,000	1	5	5E+4	2, p. BI-8
Mercury	1, 2, 3	10,000	1	50,000	5E+8	2, p. BI-8
Nickel	1, 2, 3	10,000	1	0.5	5E+3	2, p. BI-9
Selenium	1, 2, 3	100	1	50	5E+3	2, p. BI-10
Silver	1, 2, 3	100	1	50	5E+3	2, p. BI-10
Zinc	1, 2, 3	10	1	5	5E+1	2, p. BI-12
Cyanide	1, 2	100	1	0.5	5E+1	2, p. BI-4

Notes:

[1] Persistence factor value for rivers and lakes
[2] Bioaccumulation factor value for fresh water

Toxicity/Persistence/Bioaccumulation Factor Value: 500,000,000.00
(Ref. 1, Section 4.1.3.2.1.4)

4.1.3.2.2 HAZARDOUS WASTE QUANTITY

TABLE 30: Hazardous Waste Quantity		
Source No.	**Source Type**	**Source Hazardous Waste Quantity**
1	Surface Impoundments	8,138.46
2	Surface Impoundments	11,469.23
3	Other	>0
Total HWQ Values		19,607.69

Notes:
HWQ Hazardous Waste Quantity

The hazardous constituent quantity for Source No. 1 (Ponds A, B, C, D, and E) is not adequately determined. The estimated combined area of the five surface impoundments that comprise Source No. 1 is 105,800 ft^2 (Refs. 6, Figure 2; 34, pp. 17, 28; 45).

The hazardous constituent quantity for Source No. 2 (Ponds F, G, and H) is not adequately determined. The estimated combined area of the three surface impoundments that comprise Source No. 2 is 149,100 ft^2 (Refs. 6, Figure 2; 34, pp. 17, 28; 45).

The hazardous constituent quantity for Source No. 3 is not adequately determined. At the time of abandonment, the Main Pit contained about 16 million gallons of water containing a pH of 11 standard units (Ref. 9, pp. 1, 2). However, in July 2007, samples collected from the Main Pit indicated a pH between 2.42 to -3.98 standard units (Ref. 54, p. 3; 55, p. 2). Water with a pH of less than or equal to 2 standard units is considered a RCRA characteristic hazardous waste (Ref. 70, pp. 1, 2). It is not known whether the 16 million gallons of water contained in the Main Pit contained runoff, rainwater, or ground water. Therefore, the volume of waste contained in Source No. 3 is undetermined but greater than zero.

Hazardous Waste Quantity Factor Value: 10,000
(Reference 1, Table 2-6)

4.1.3.2.3 CALCULATION OF HUMAN FOOD CHAIN THREAT WASTE CHARACTERISTICS FACTOR CATEGORY VALUE

The waste characteristics factor category was obtained by multiplying the toxicity/persistence and HWQ factor values, subject to a maximum product of 1×10^8. Then this product was multiplied by the bioaccumulation potential factor value, subject to a maximum product of 1×10^{12}. Based on this product, a value was assigned in accordance with Reference 1, Table 2-7.

Toxicity/Persistence Factor Value: 10,000.00
Hazardous Waste Quantity Factor Value: 10,000

Toxicity/Persistence Factor Value ×
Hazardous Waste Quantity Factor Value: 1×10^8

Toxicity/Persistence Factor Value ×
Hazardous Waste Quantity Factor Value × Bioaccumulation Factor Value (50,000): 5×10^{12}

Waste Characteristics Factor Category Value: 1,000
(Reference 1, Table 2-7)

4.1.3.3 HUMAN FOOD CHAIN THREAT TARGETS

4.1.3.3.1 Food Chain Individual

As noted in Section 4.1.2.1.1 an observed release of hazardous substances having a bioaccumulation factor value of 500 or greater is documented in perennial Tributaries 2 and 3 of Hawe Creek as well as Hawe Creek (see Tables 14, 18, 22, and 26 of this HRS documentation record). Fishing occurs at the Hawe Creek Campground located off of U.S. Highway 378 as well as at the Dorn Sport Fishing Facility, which is downstream of the surface water and sediment sampling locations on Hawe Creek (Refs. 15; 26; 37; 59; 88). According to local residents and campground personnel, fishing occurs on Hawe Creek and the Dorn Sport Fishing Facility; fish caught and consumed include striped and largemouth bass as well as flathead catfish (Ref. 40, Appendix C, Logbook Team A, p. 16).

Food Chain Individual Factor Value: 20 (Ref. 1, Section 4.1.3.3.1)

4.1.3.3.2 Population

4.1.3.3.2.1 Level I Concentrations

No Level I samples were collected.

4.1.3.3.2.2 Level II Concentrations

No Level II samples were collected.

4.1.3.3.2.3 Potential Human Food Chain Contamination

Fishing occurs where Hawe Creek enters Strom Thurmond Lake about 2.2 miles downstream of the Barite Hill property as well as on Strom Thurmond Lake (Refs. 15; 26; 28, pp. 1, 2, 4; 88). According to local residents and Hawe Creek campground personnel, fishing occurs on Hawe Creek; fish caught and consumed include striped and largemouth bass as well as flathead catfish (Ref. 40; Appendix C, Logbook Team A, p. 16). The amount of fish caught on an annual basis is not known.

The flow rate for Hawe Creek is not available (Ref. 72). Information is not available on the annual production of fish caught in Hawe Creek or Strom Thurmond Lake. Therefore, because Hawe Creek and Strom Thurmond Lake on the Savannah River are fisheries, the annual production for each water body is undetermined but greater than zero (Refs. 28, pp. 1, 2, 4; 59; 88).

Potential Human Food Chain Factor Value: >0
(Reference 1, Section 4.1.3.3.2.3)

4.1.4.2 Environmental Threat Waste Characteristics

4.1.4.2.1 Ecosystem Toxicity/Persistence/Bioaccumulation

The ecosystem toxicity, persistence, and bioaccumulation factor values for the hazardous substances detected in the source samples with containment factor values of greater than 0 are summarized in Table 32. The combined ecosystem toxicity, persistence, and bioaccumulation factor values are assigned in accordance with Reference 1, Section 4.1.4.2.1.

Table 31: Ecosystem Toxicity/Persistence/Bioaccumulation						
Hazardous Substances	**Source No.**	**Ecosystem Toxicity Factor Value[1]**	**Persistence Factor Value[2]**	**Bioaccu-mulation Value[3]**	**Ecosystem/ Toxicity/ Bioaccumulation Factor Value (Ref. 1, Table 4-21)**	**Reference**
Arsenic	1, 2, 3	10	1	5,000	5E+4	2, p. BI-1
Cadmium	1, 2, 3	10,000	1	50,000	5E+8	2, p. BI-2
Chromium	1, 2	10,000	1	500	5E+6	2, p. BI-3
Copper	1, 2, 3	1,000	1	5,000	5E+6	2, p. BI-3
Lead	1, 2, 3	1,000	1	50,000	5E+7	2, p. BI-8
Mercury	1, 2, 3	10,000	1	50,000	5E+8	2, p. BI-8
Nickel	1, 2, 3	100	1	500	5E+4	2, p. BI-9
Selenium	1, 2, 3	1,000	1	500	5E+5	2, p. BI-10
Silver	1, 2, 3	10,000	1	50	5E+5	2, p. BI-10
Zinc	1, 2	10	1	50,000	5E+5	2, p. BI-12
Cyanide	1, 2	1,000	1	0.5	5E+2	2, p. BI-4

Notes:
[1] Ecotoxicity for fresh water
[2] Persistence value for rivers and lakes
[3] Bioaccumulation factor value for freshwater, environmental threat

Ecosystem Toxicity/Persistence/Bioaccumulation Factor Value: 5×10^8
(Reference 1, Section 4.1.4.2.1)

4.1.4.2.2 HAZARDOUS WASTE QUANTITY

TABLE 32: Hazardous Waste Quantity		
Source No.	**Source Type**	**Source Hazardous Waste Quantity**
1	Surface Impoundments	8,138.46
2	Surface Impoundments	11,469.23
3	Other	>0
Total HWQ Values		19,607.69

Notes:

The hazardous constituent quantity for Source No. 1 (Ponds A, B, C, D, and E) is not adequately determined. The estimated combined area of the five surface impoundments that comprise Source No. 1 is 105,800 ft^2 (Refs. 6, Figure 2; 34, pp. 17, 28; 45).

The hazardous constituent quantity for Source No. 2 (Ponds F, G, and H) is not adequately determined. The estimated combined area of the three surface impoundments that comprise Source No. 2 is 149,100 ft^2 (Refs. 6, Figure 2; 34, pp. 17, 28; 45).

The hazardous constituent quantity for Source No.3 is not adequately determined. At the time of abandonment, the Main Pit contained about 16 million gallons of water containing a pH of 11 standard units (Ref. 9, pp. 1, 2). However, in July 2007, samples collected from the Main Pit indicated a pH ranging from 2.42 to -3.98 standard units (Ref. 54, p. 3; 55, p. 2). Water with a pH of less than or equal to 2 standard units is considered a RCRA characteristic hazardous waste (Ref. 70, pp. 1, 2). It is not known whether the 16 million gallons of water contained in the Main Pit contained runoff, rainwater, or ground water. Therefore, the volume of waste contained in Source No. 3 is undetermined but greater than zero.

Hazardous Waste Quantity Factor Value: 10,000
(Reference 1, Table 2-6)

4.1.4.2.3 CALCULATION OF ENVIRONMENTAL CHAIN THREAT WASTE CHARACTERISTICS FACTOR CATEGORY VALUE

The waste characteristics factor category was obtained by multiplying the ecosystem toxicity/persistence and HWQ factor values, subject to a maximum product of 1×10^8. Then this product was multiplied by the bioaccumulation potential factor value, subject to a maximum product of 1×10^{12}. Based on this product, a value was assigned in accordance with Reference 1, Table 2-7.

Ecosystem Toxicity/Persistence Factor Value: 10,000.00
Hazardous Waste Quantity Factor Value: 10,000

Ecosystem Toxicity/Persistence Factor Value ×
Hazardous Waste Quantity Factor Value: 1×10^8

Ecosystem Toxicity/Persistence Factor Value ×
Hazardous Waste Quantity Factor Value × Bioaccumulation Factor Value (50,000): 5×10^{12}

Waste Characteristics Factor Category Value: 1,000
(Reference 1, Table 2-7)

4.1.4.3 Environmental Threat Targets

Level I Concentrations

No Level I concentrations have been documented.

Level II Concentrations

Actual contamination has been documented in wetland areas along Tributaries 2 and 3 as well as Hawe Creek, as documented in Section 4.1.2.1.1 of this HRS documentation record. The sampling locations are shown in Reference 37. Wetland areas are identified on Reference 31, Wetlands Inventory Maps. The wetland areas evaluated are palustrine forested and palustrine scrub/shrub (Refs. 31; 40, Appendix F).

Most Distant Level II Sample

Investigation:	2007 ESI
Sample ID:	BH-SW-17
Sample Medium:	Aqueous
Hazardous Substance:	Copper, zinc
Location:	Hawe Creek about 6,202 feet downstream from PPE1, about 6,291 feet downstream from PPE2, and about 3,184 feet downstream from PPE3
References:	37; 73; see Tables 24 and 25 of this HRS documentation record

4.1.4.3.1 Sensitive Environments

4.1.4.3.1.1 Level I Concentrations

Sensitive Environments

Sensitive environments other than wetlands have not been identified within the 15-mile target distance limit.

Wetlands

No Level I wetlands were scored.

4.1.4.3.1.2 Level II Concentrations

Sensitive Environments

Sensitive environments other than wetlands have not been identified within the 15-mile target distance limit.

Wetlands

The wetland areas were identified from Reference 31, Wetlands Inventory Maps and during wetland delineation activities conducted during the 2007 ESI (Ref. 40, Appendix F). The wetland areas evaluated are palustrine forested and palustrine scrub/shrub (Ref. 31). The surface water samples evaluated at Level II concentrations are located in these wetland areas. The total wetland frontage from PPE 1 on Tributary 2 to the confluence with Hawe Creek is 1.92 miles. The total wetland frontage from PPE 2 located on Tributary 3 to the confluence with Hawe Creek is 1.95 miles. The total wetland frontage on Hawe Creek (at the confluence of Tributaries 2 and 3 with Hawe Creek) to the most downstream sample containing

Level II concentrations (BH-SW-17) is 0.45 mile (Refs. 30; 31; 37). Both sides of the tributaries and Hawe Creek were included in the determination of the wetland frontage (Refs. 30; 31).

Table 33: Wetland Frontage

Wetland	Water Body	Wetland Frontage	References
Palustrine forested and palustrine scrub/shrub	Tributary 2	1.92 miles	31; 37
Palustrine forested and palustrine scrub/shrub	Tributary 3	1.95 miles	31; 37
Palustrine scrub/shrub	Hawe Creek (at the confluence of Tributaries 2 and 3 with Hawe Creek) to sample BH-SW-17	0.45 mile	30; 31; 37
Total Wetland Frontage		4.32 miles	31; 37

Total Wetland Frontage: 4.32 miles

The wetland ratings value for 4.32 miles is obtained from Reference 1, Table 4-24 and is 150.

Wetland Value: 150
(Ref. 1, Table 4-24)

For wetlands subject to Level II concentrations the wetland value (150) is multiplied by 1 (Ref. 1, Section 4.1.4.3.1.1).

Wetland Value: 150 × 1
Level II Concentrations Factor Value: 150 (Ref. 1, Section 4.1.4.3.1.1)

4.1.4.3.1.3 Potential Contamination

Sensitive Environments

Potential sensitive environments were not evaluated because the presence of sensitive environments other than wetlands has not been identified.

Wetlands

Potential contamination of wetlands was not evaluated because potential contamination does not contribute significantly to the overall site score.

Potential Contamination Factor Value: 0.0