FINAL

Focused Feasibility Study Report

Upper Basin of the Coeur d'Alene River, Bunker Hill Mining and Metallurgical Complex Superfund Site

Volume 2

Figures and Tables Accompanying Main Text



United States
Environmental Protection
Agency Region 10

AES10 Task Order 49
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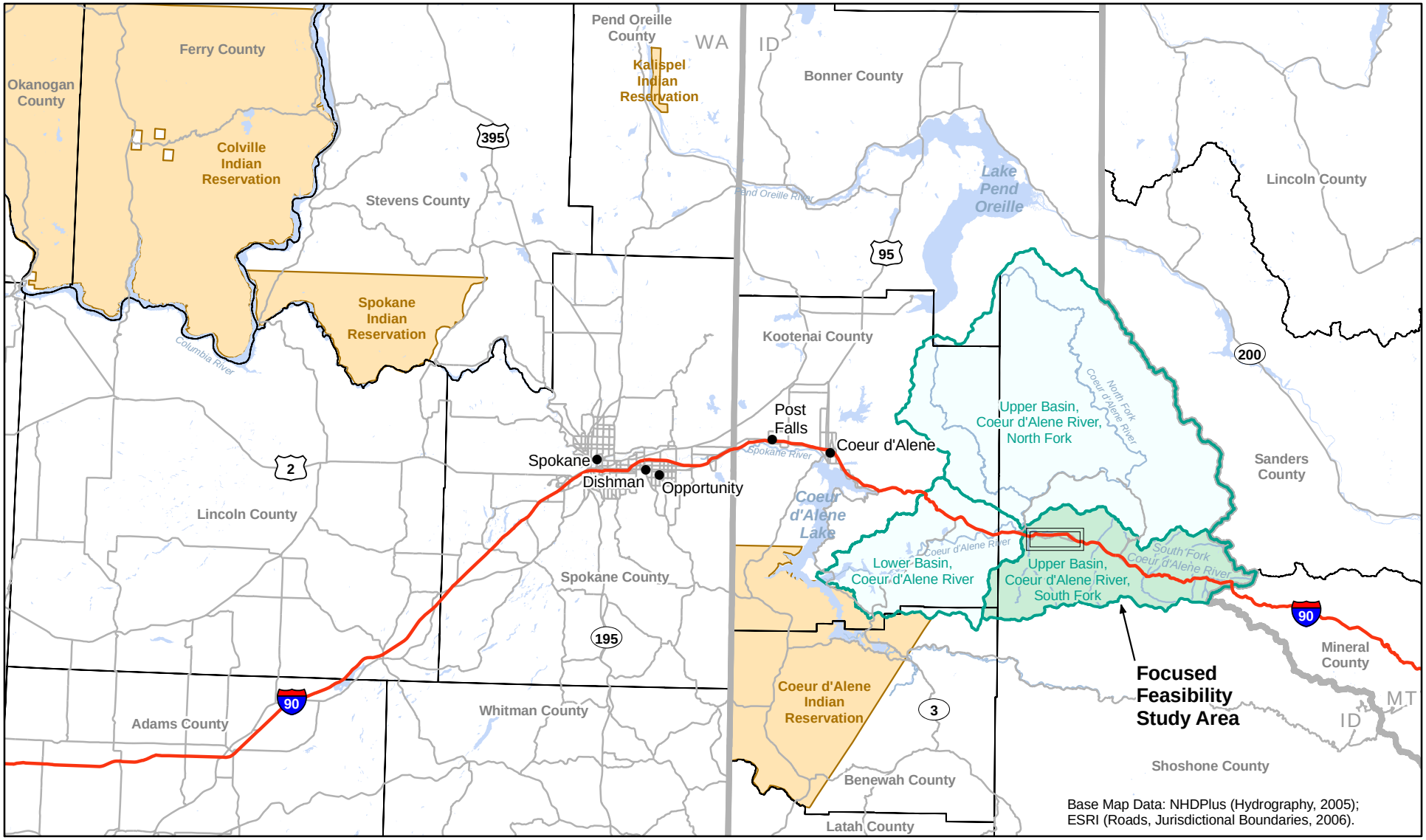
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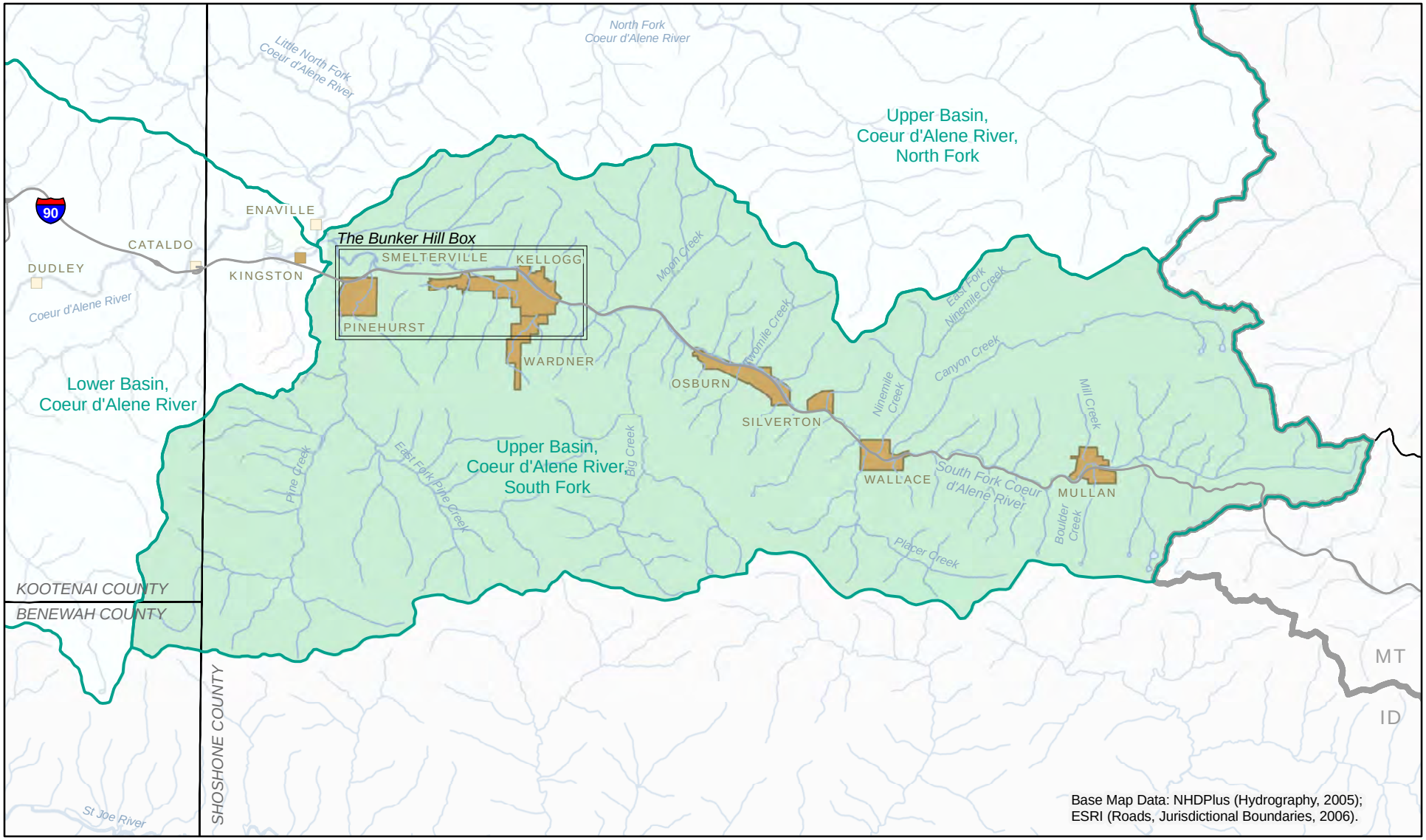
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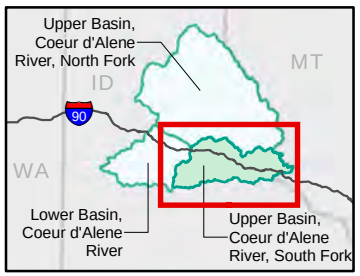
Figures



Notes:
1. The geographic extent of the Bunker Hill Mining and Metallurgical Complex Superfund Site is defined by Operable Units 1, 2, and 3.
2. Operable Unit 3 is defined as all contaminated areas in the Coeur d'Alene River Basin, Coeur d'Alene Lake, and the Spokane River, outside the Box.

Figure 1-1
Location Map: Bunker Hill Mining and Metallurgical Complex Superfund Site
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

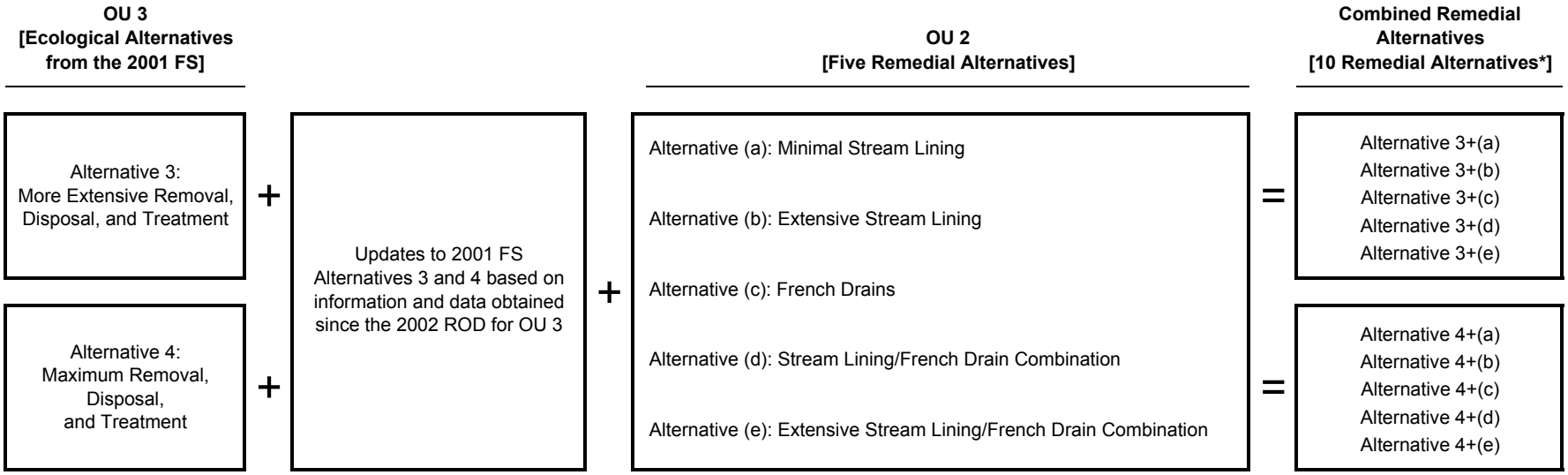




Focused Feasibility Study Area
Approximate Remedy Protection Study Area
Coeur d'Alene River Subbasin Boundary
River/Stream
County Boundary
State Boundary

N
0 1 2 4 Miles

Figure 1-2
Focused Feasibility Study Area
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE



* ***The five OU 2 alternatives are combined with each of the two OU 3 alternatives to form 10 remedial alternatives for evaluation in this FFS Report. The No Action Alternative was rejected in the 2002 ROD for OU 3, but is included in this FFS Report for comparative purposes.***

FS = Feasibility Study
OU = Operable Unit
ROD = Record of Decision
TCD = typical conceptual design

Figure 1-3
Development of Remedial Alternatives
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

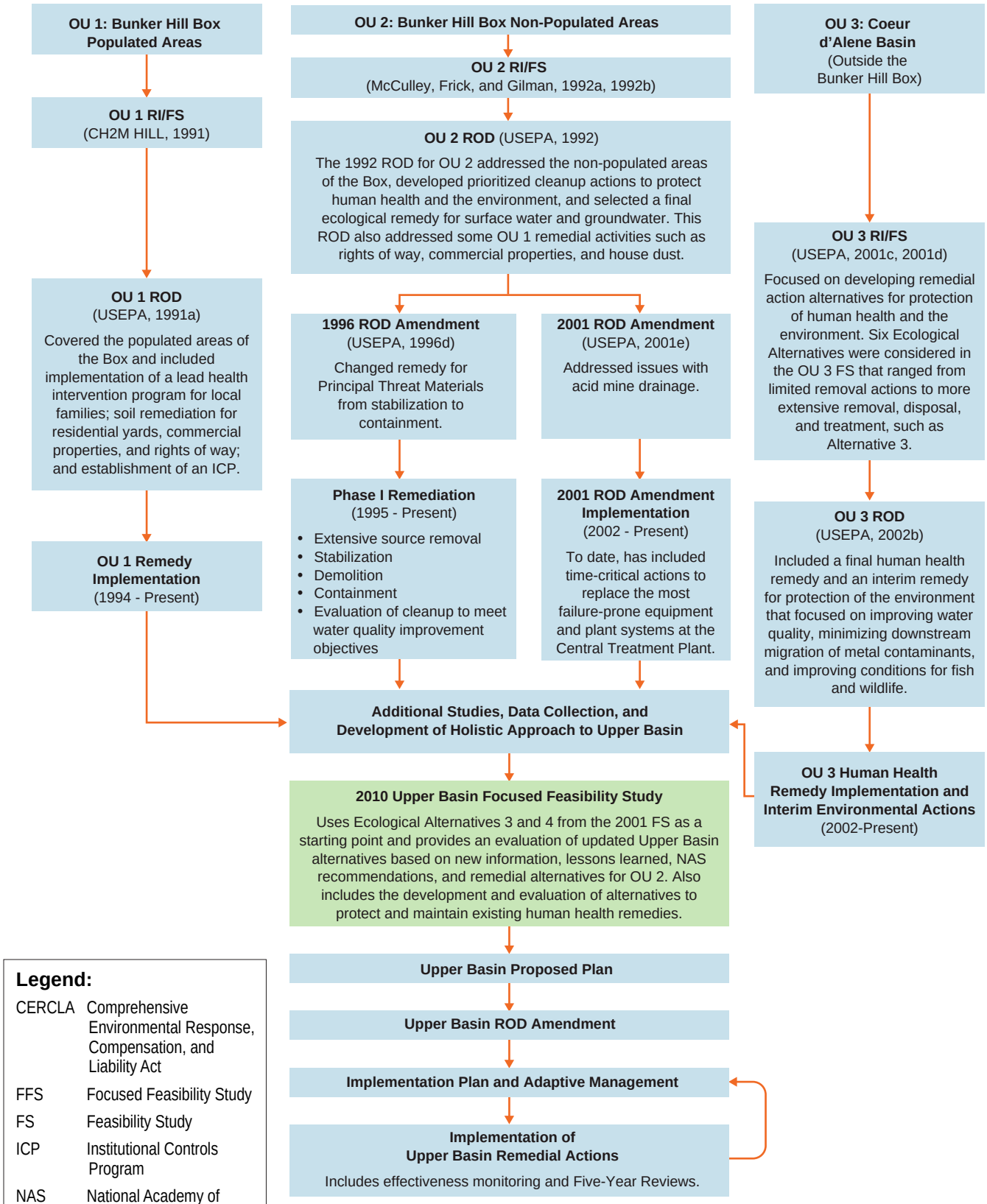
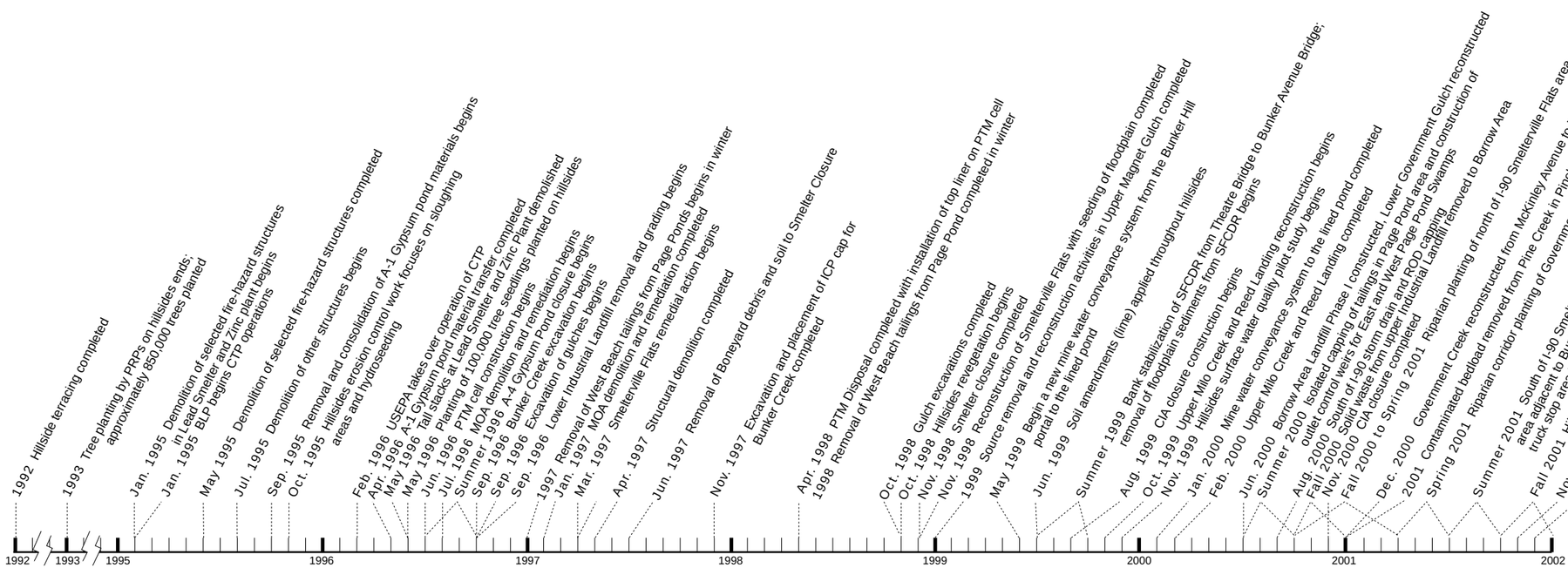
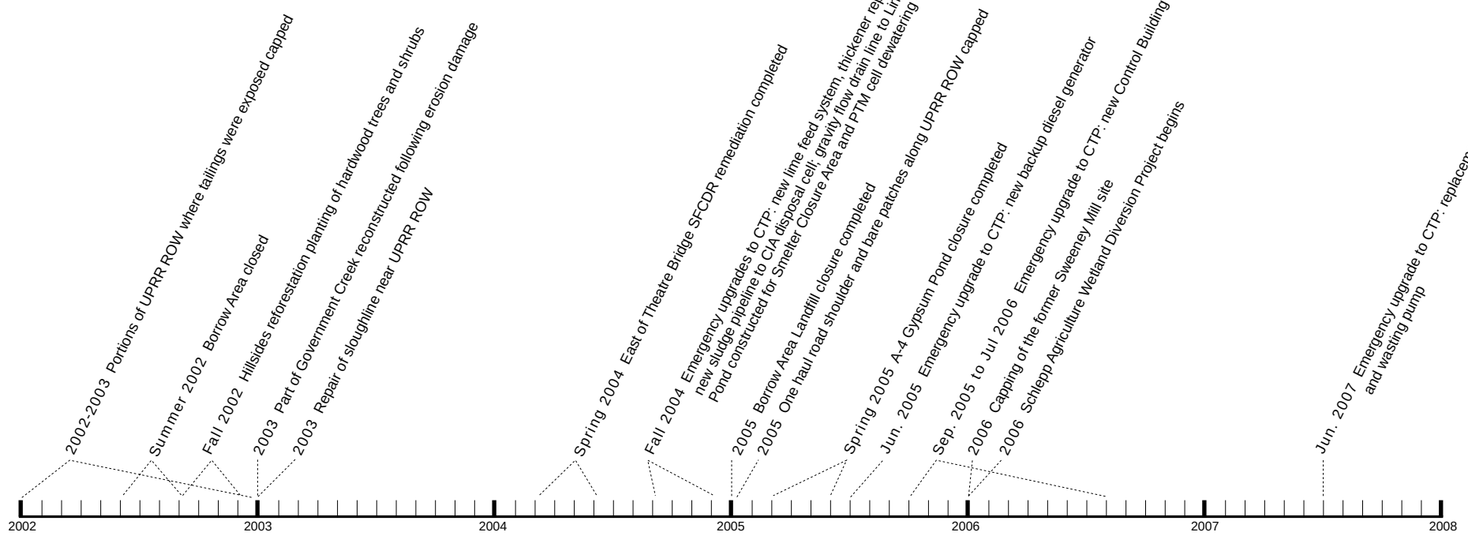


Figure 2-1
CERCLA Decision Flow Chart, Bunker Hill Mining and Metallurgical Complex Superfund Site
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

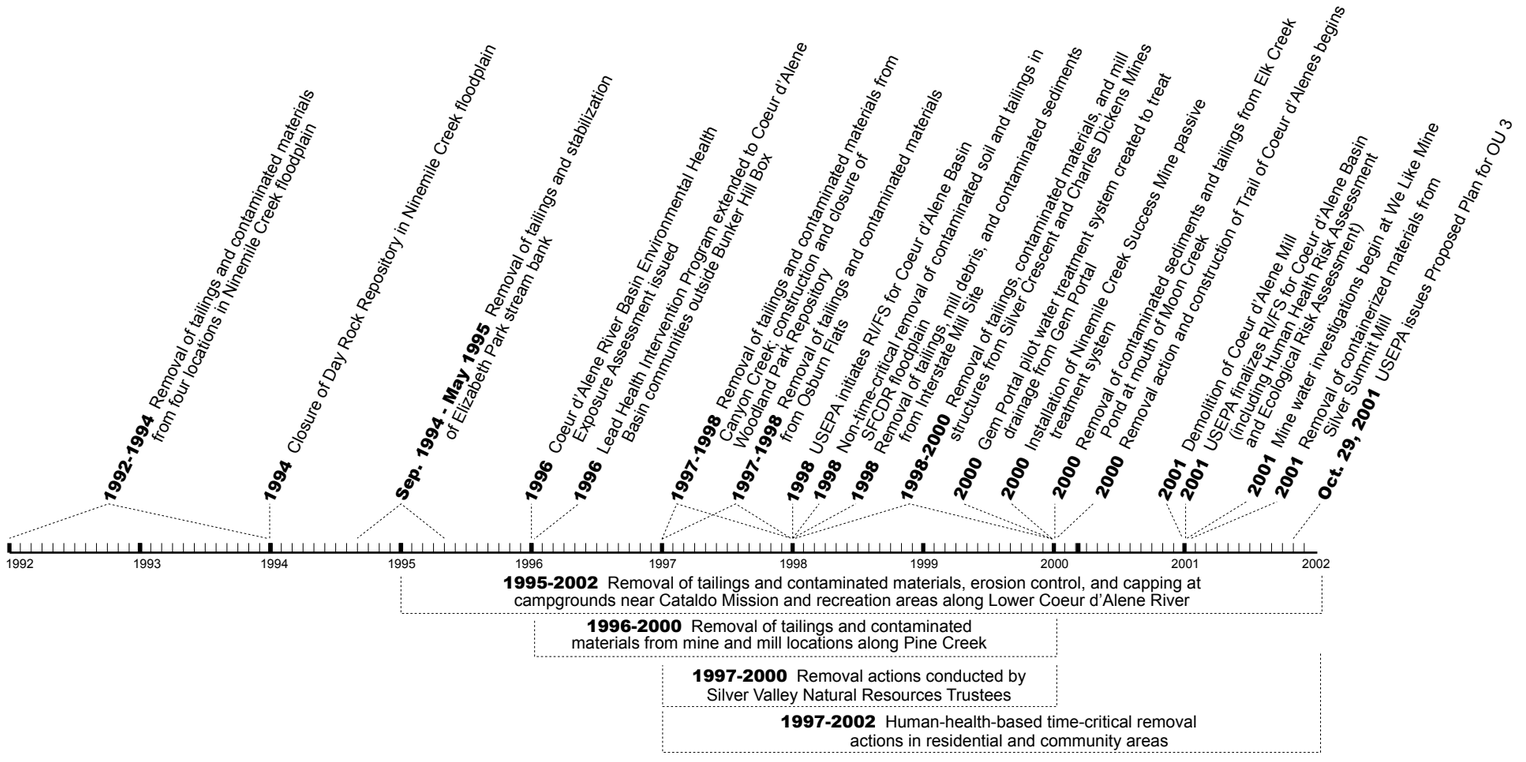




Legend:

BLP	Bunker Limited Partnership
CIA	Central Impoundment Area
CTP	Central Treatment Plant
MOA	Mine Operations Area
PRP	potentially responsible party
PTM	Principal Threat Materials
ROD	Record of Decision
ROW	right of way
SFCDR	South Fork of the Coeur d'Alene River
UPRR	Union Pacific Railroad
USEPA	U.S. Environmental Protection Agency

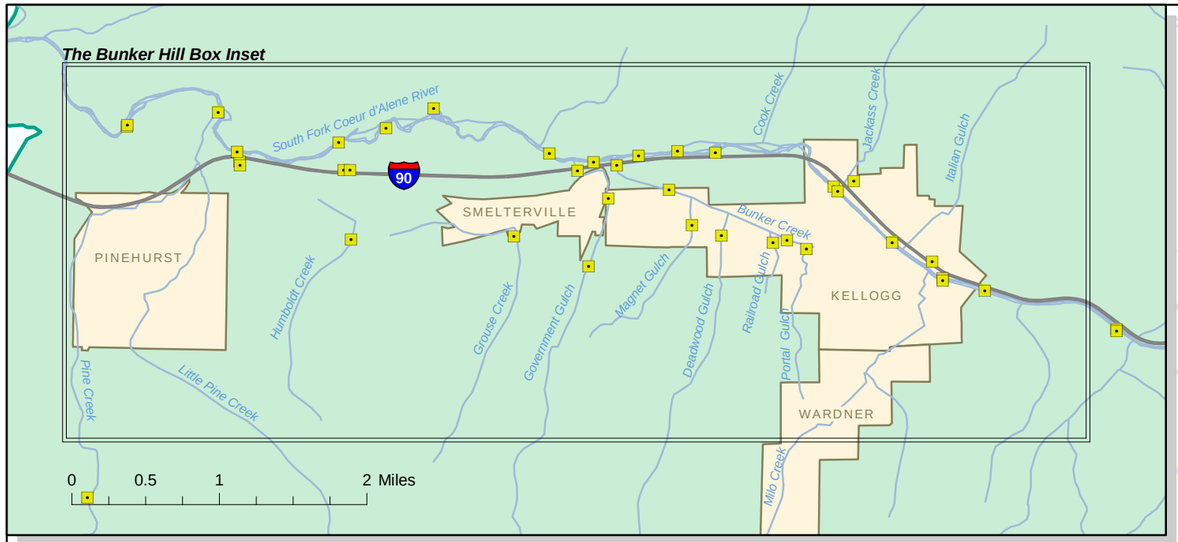
Figure 2-2
OU 2 Removal and Remedial Actions Timeline, Bunker Hill Superfund Site
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

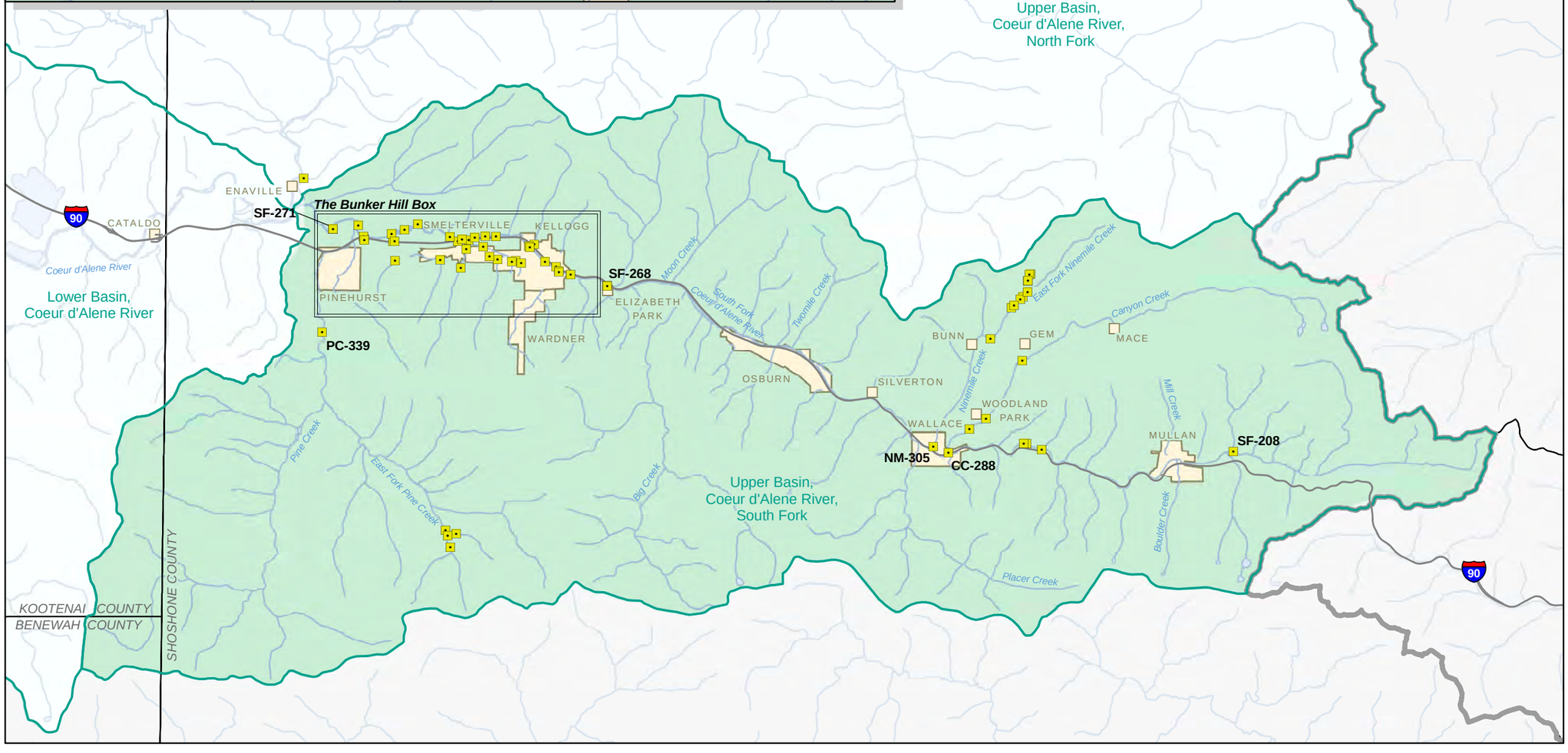


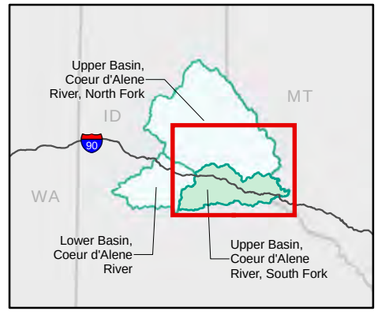
Legend:

OU	Operable Unit
RI/FS	Remedial Investigation/ Feasibility Study
ROD	Record of Decision
SFCDR	South Fork of the Coeur d'Alene River
USEPA	U.S. Environmental Protection Agency

Figure 2-3
OU 3 Removal and Remedial Actions Timeline, Bunker Hill Superfund Site
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE







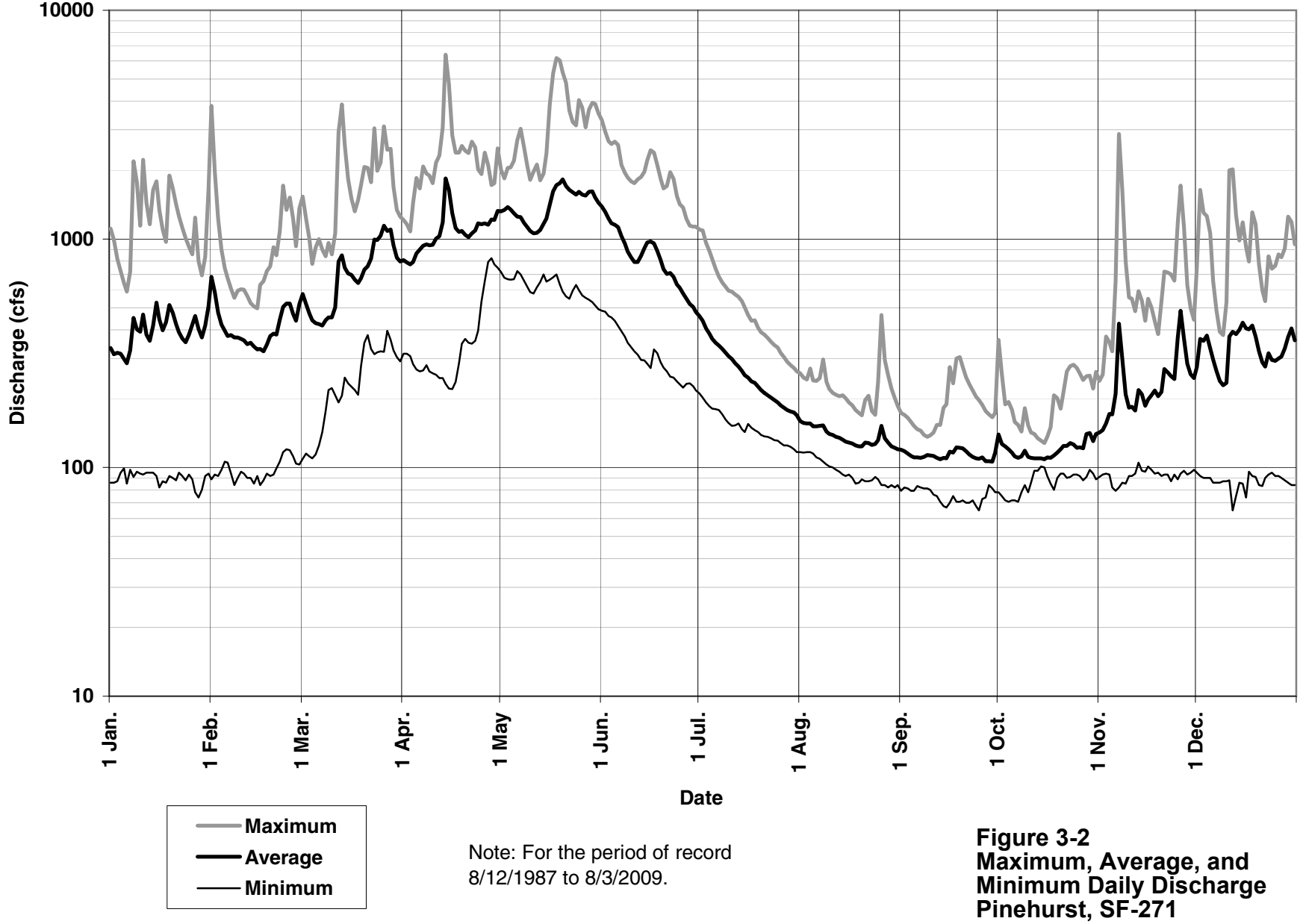
- Surface Water Monitoring Location
- River/Creek
- Focused Feasibility Study Area
- Coeur d'Alene River Subbasin Boundary
- City Limit
- County Boundary
- State Boundary

N 0 1 2 4 Miles

Base Map Data: NHDPlus (Hydrography, 2005; ESRI (Roads, Jurisdictional Boundaries, 2006).

Figure 3-1
Upper Basin Hydrology
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

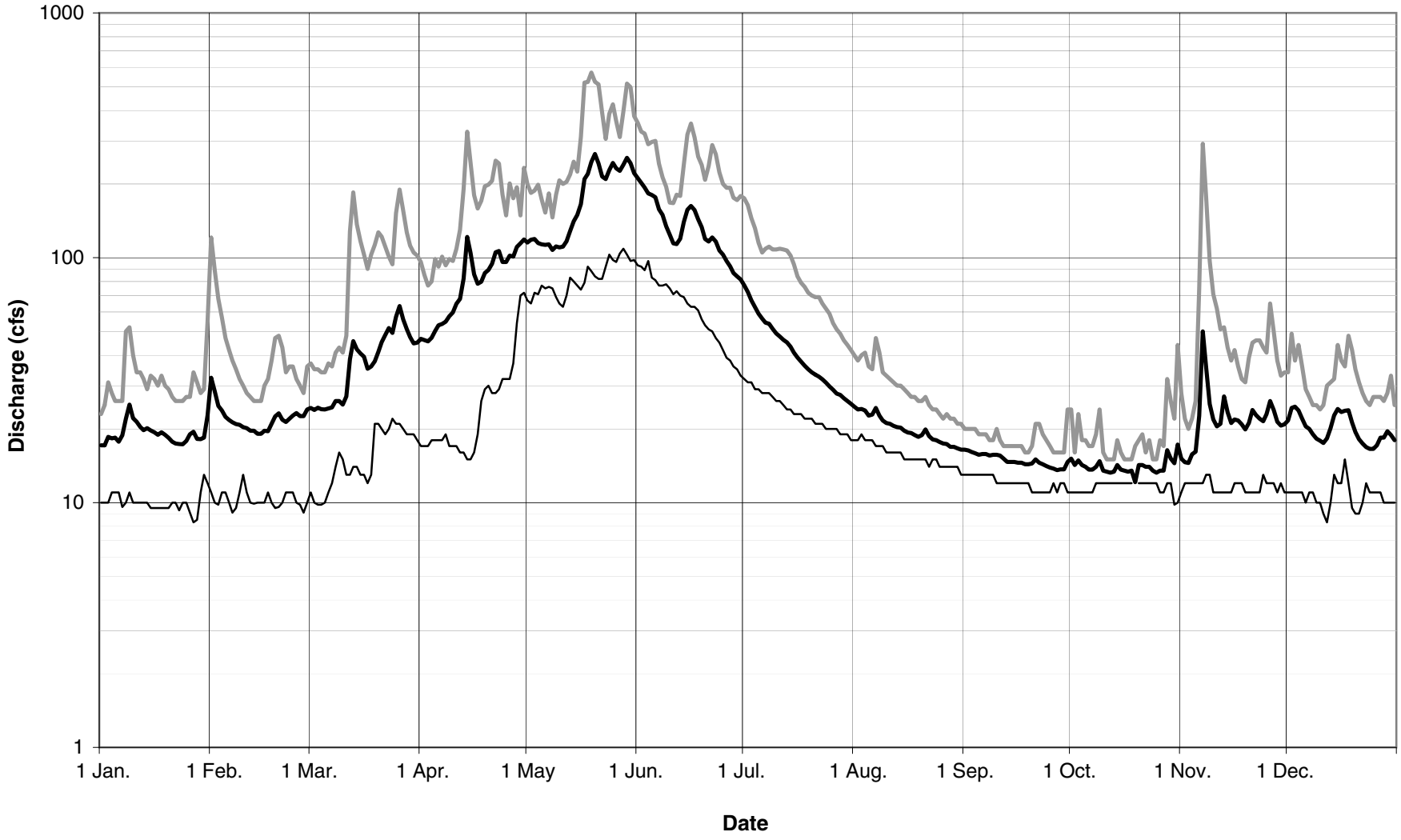
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Note: For the period of record 8/12/1987 to 8/3/2009.

Figure 3-2
Maximum, Average, and Minimum Daily Discharge
Pinehurst, SF-271
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

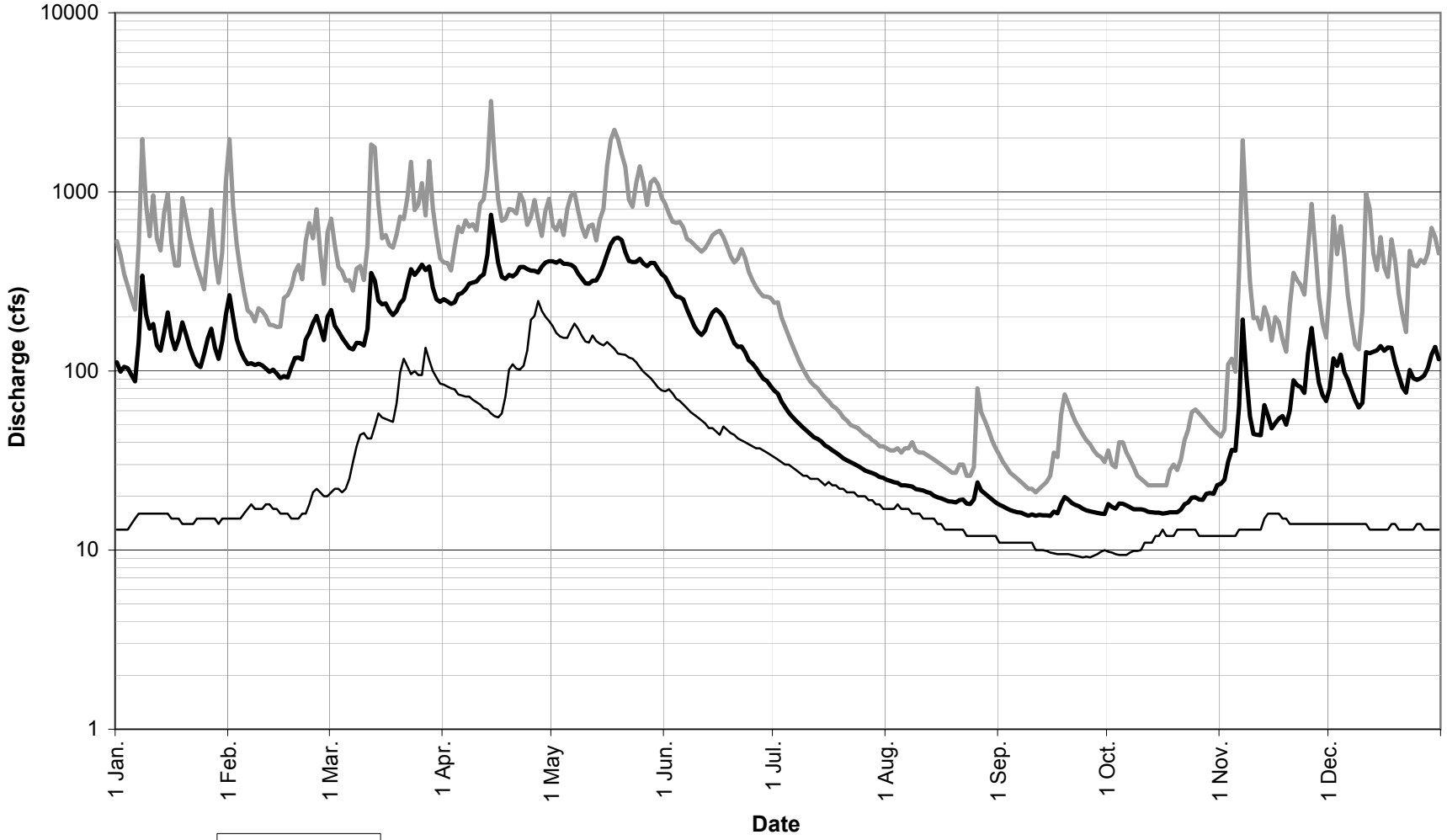
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Note:
For the period of record
10/21/1998 to 10/21/2009.

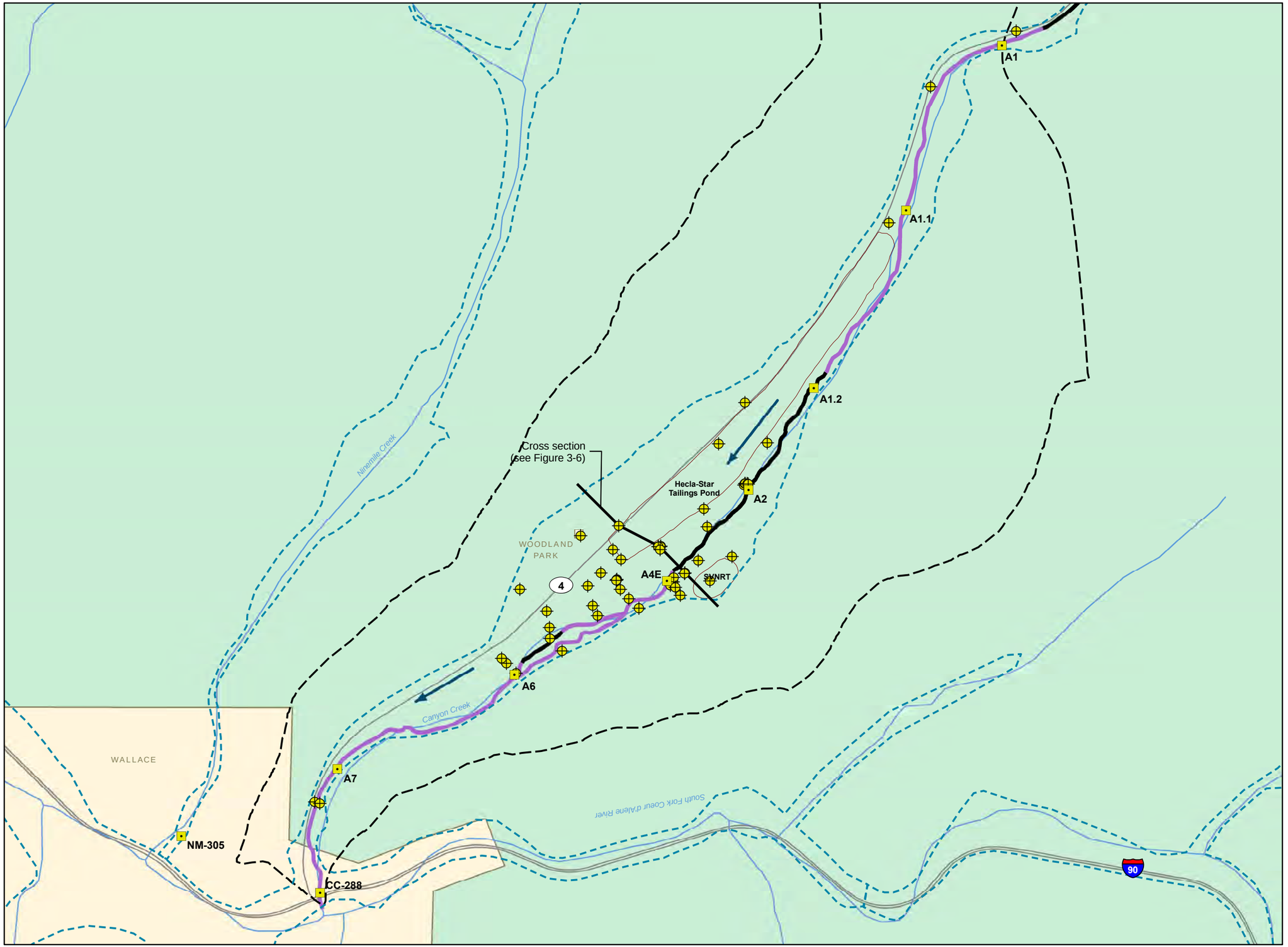
Figure 3-3
Maximum, Average, and Minimum Daily Discharge
Canyon Creek, CC-288
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

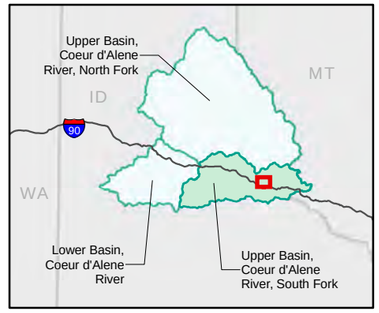
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Note:
For the period of record
11/6/1997 to 8/12/2009.

Figure 3-4
Maximum, Average, and Minimum Daily Discharge
Pine Creek, PC-339
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





- Groundwater Monitoring Location
- CC-288 Surface Water Monitoring Location
- Approximate Groundwater Flow Direction, Base-Flow Conditions
- SFCDR Primarily Gaining Reach
- SFCDR Primarily Losing Reach
- Cross Section
- River/Creek
- Major Highway
- Approximate Alluvial Aquifer
- Woodland Park Study Boundary
- Contaminant Sources
- Focused Feasibility Study Area
- City Limit

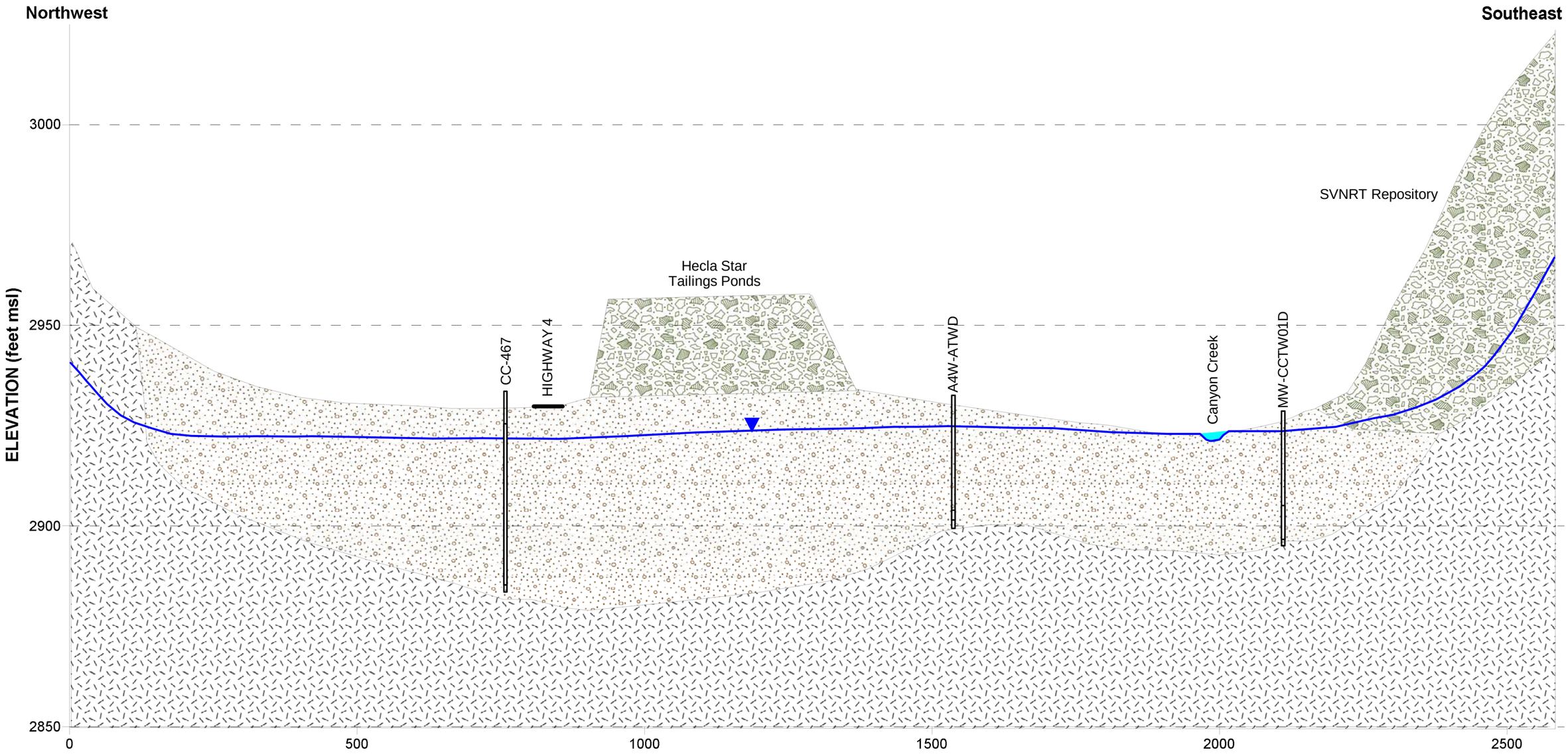
N

0 500 1,000 2,000 Feet

Source: NHDPlus (Hydrography, 2005); ESRI (Roads, Jurisdicitional Boundaries, 2006).

Notes:
1. Gaining and losing reaches were determined from base-flow numerical simulation results, and are presented as approximate conditions during base-flow conditions.
2. For cross section detail, see Figure 3-6.

Figure 3-5
Hydrogeology – Woodland Park
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE



LEGEND

- Contaminated Fill
- Alluvial Silty Gravel with Sand
- Bedrock
- Well Screen

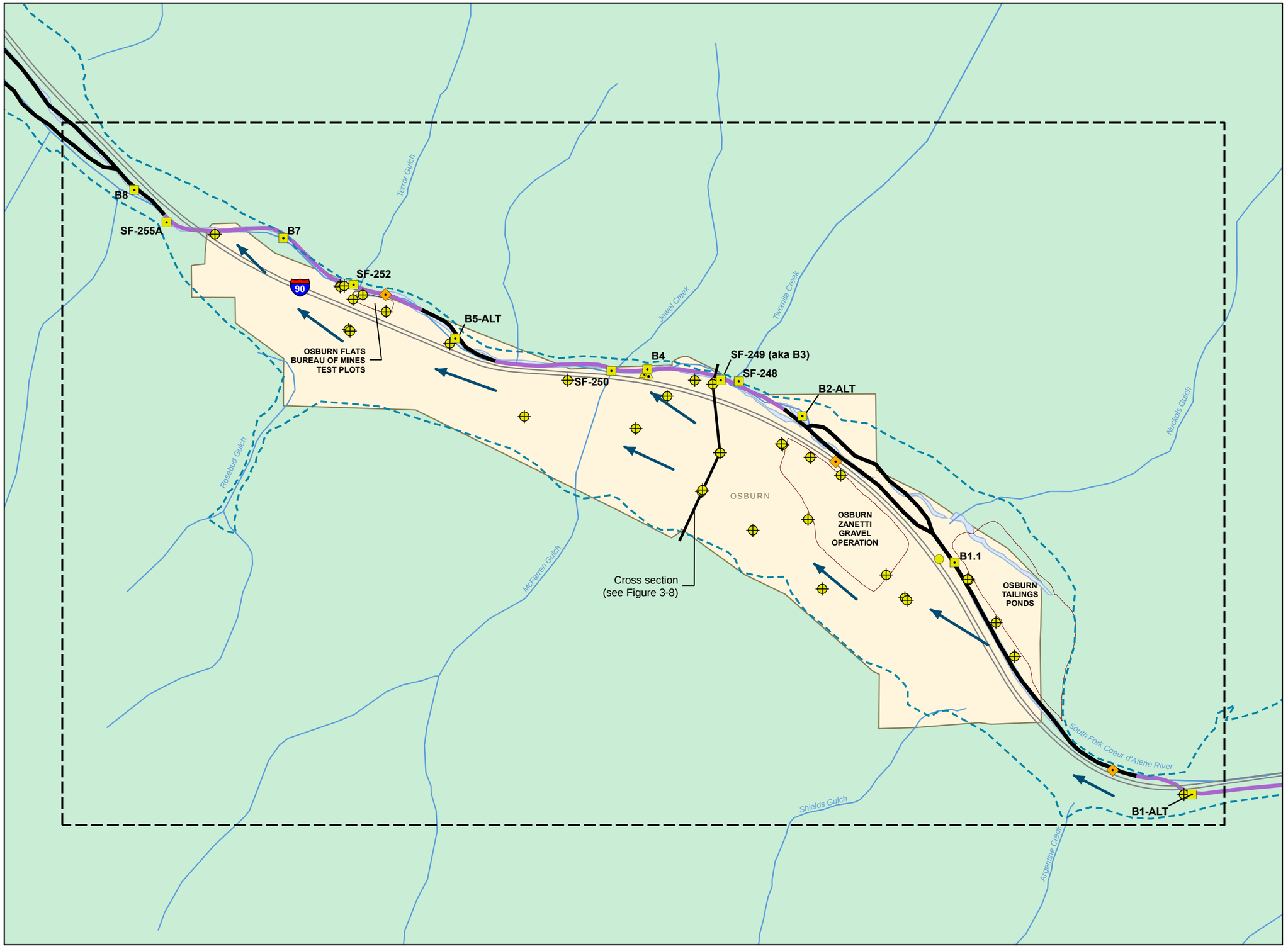
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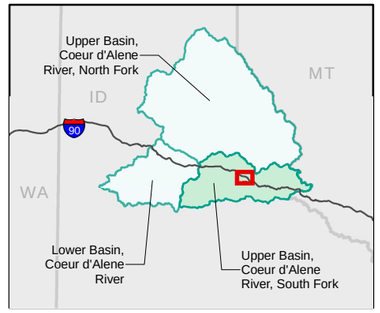
1. Contact between fill material and alluvial sediment is inferred.
2. A layer of tailings mixed with alluvium mantles the majority of the Canyon Creek floodplain in Woodland Park except where removal actions have occurred. This layer is not depicted on this figure.
3. This cross section is strictly conceptual, and monitoring wells are shown for reference only.
4. Cross section location is shown on Figure 3-5.

Scale 7:1 (V:H)
1 inch = 25 feet vertical

Figure 3-6
Cross Section – Woodland Park
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

EPA





- Groundwater Monitoring Location
- Original 1999 Station, Moved in 2008
- Surface Water Monitoring Location (B1.1)
- Tailings Pile Seep
- Discharge Pipe
- Approximate Groundwater Flow Direction, Base-Flow Conditions
- SFCDR Primarily Gaining Reach
- SFCDR Primarily Losing Reach
- River/Creek
- Major Highway
- Approximate Alluvial Aquifer
- Osburn Flats Study Boundary
- Contaminant Sources
- Focused Feasibility Study Area
- City Limit

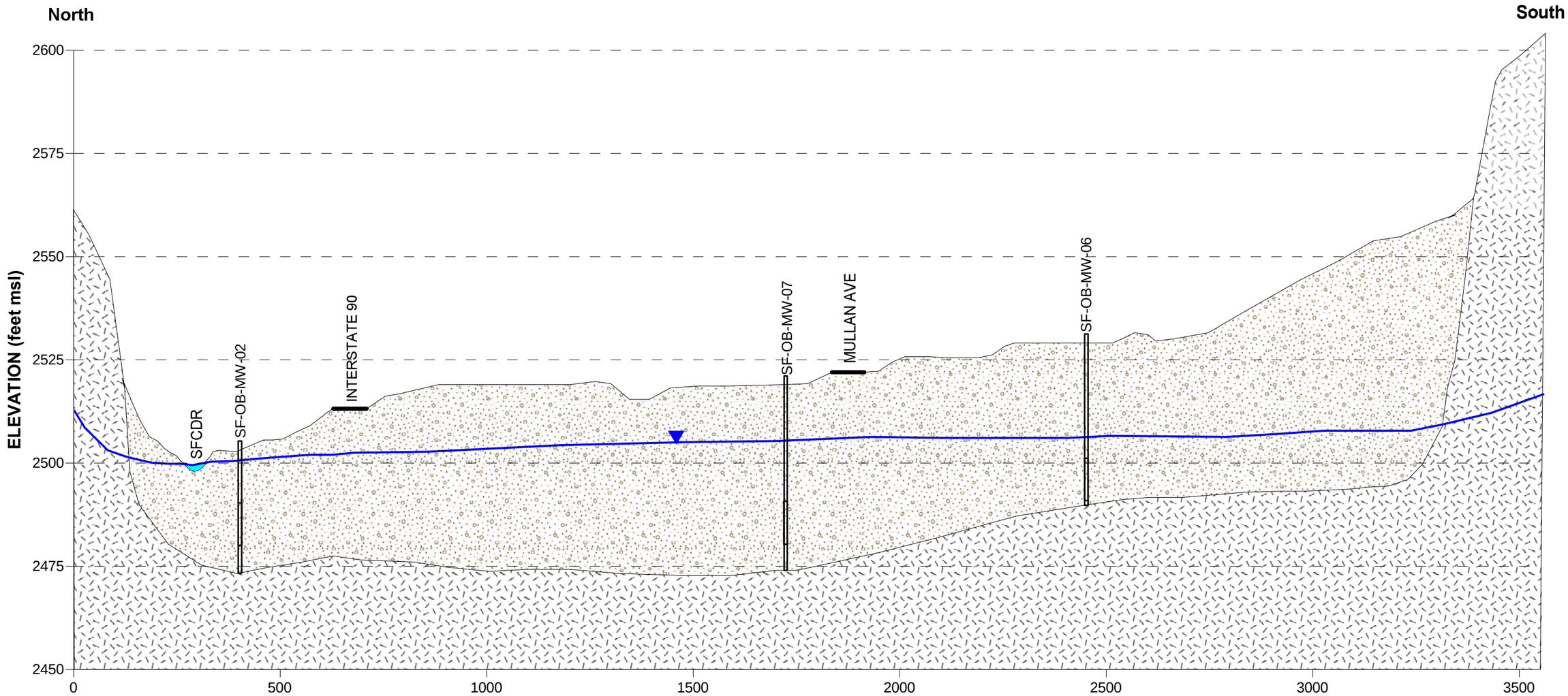
N

0 1,000 2,000 Feet

Source: NHDPlus (Hydrography, 2005); ESRI (Roads, Jurisdictional Boundaries, 2006).

Notes:
1. Gaining and losing reaches were determined from base-flow numerical simulation results, and are presented as approximate conditions during base-flow conditions.
2. For cross section detail, see Figure 3-8.

Figure 3-7
Hydrogeology – Osburn Flats
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE



LEGEND

- Alluvial Silty Gravel with Sand
- Bedrock
- Well Screen

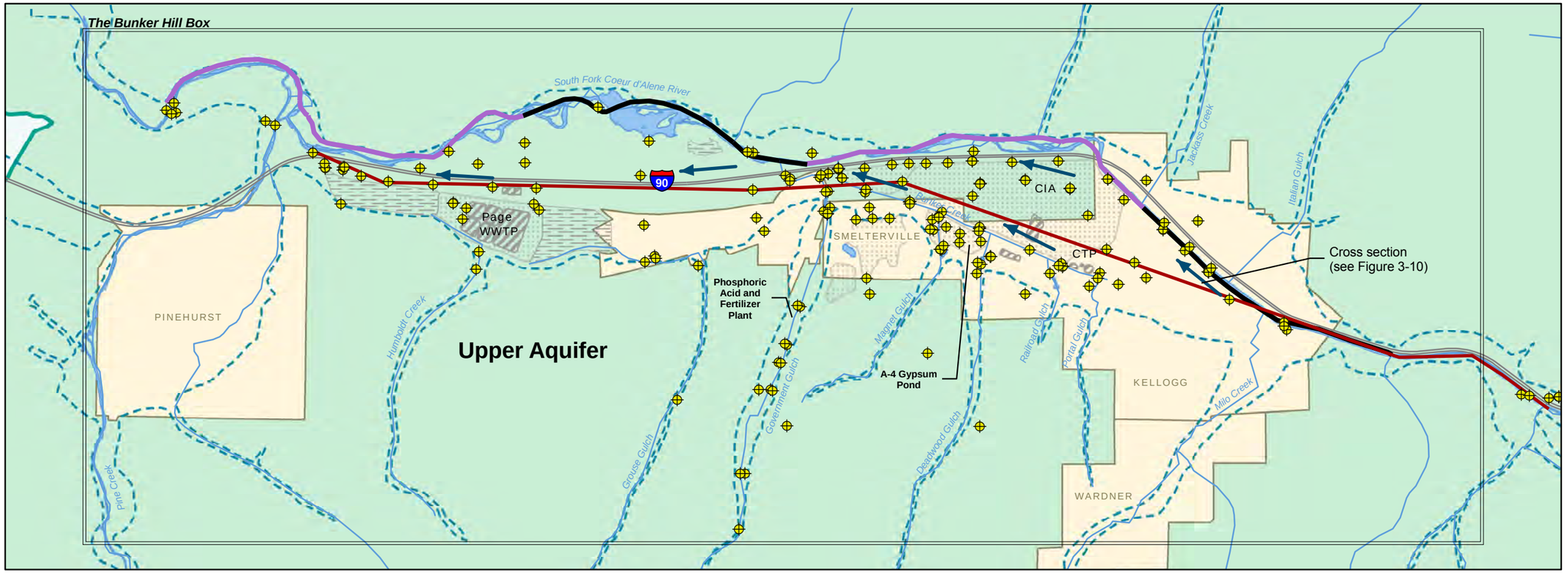
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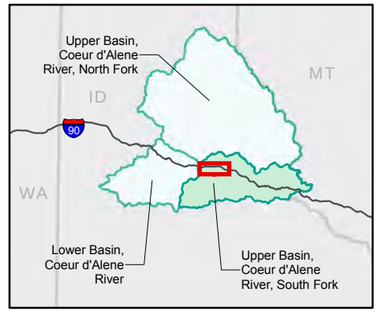
1. Contact between fill material and alluvial sediment is inferred.
2. A layer of tailings mixed with alluvium mantles the majority of the SFCDR and tributary floodplains in OU 2 except where removal actions have occurred. This layer is not depicted on this figure.
3. This cross section is strictly conceptual, and monitoring wells are shown for reference only.
4. Cross section location is shown on Figure 3-7.

Scale 10:1 (V:H)
1 inch = 25 feet vertical

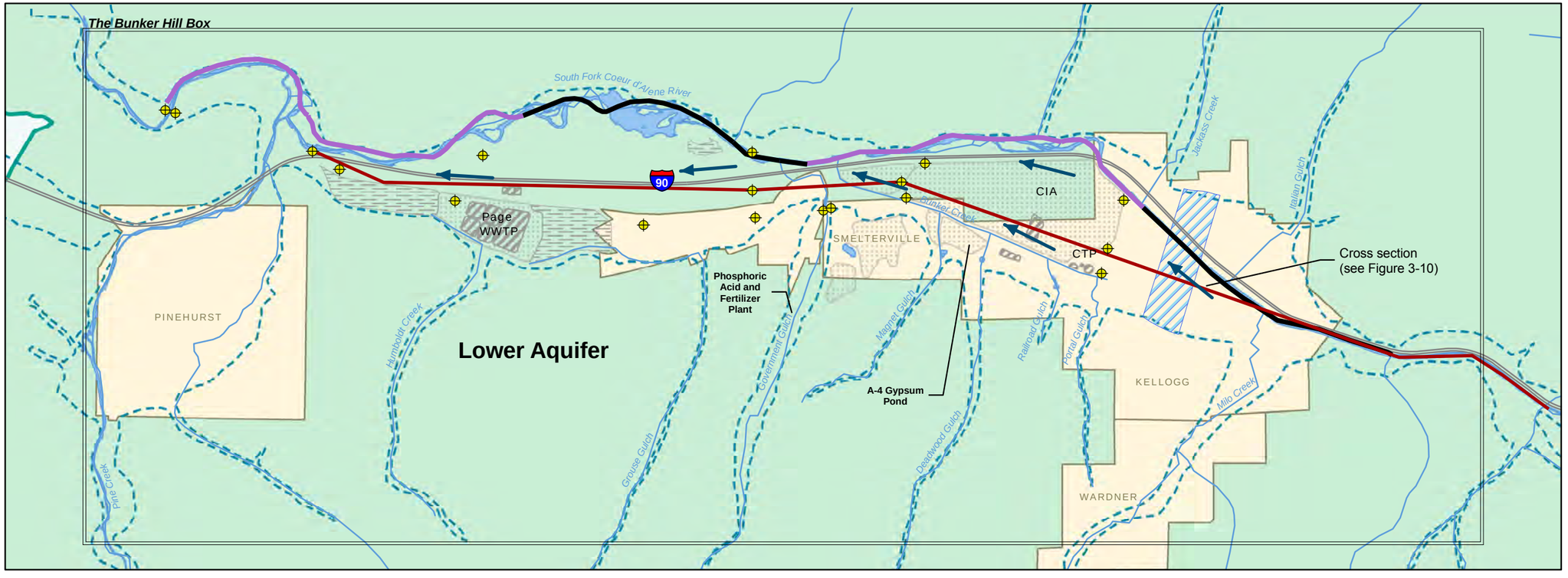
Figure 3-8
Cross Section – Osburn Flats
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

EPA





- Groundwater Monitoring Location
- Approximate Groundwater Flow Direction, Base-Flow Conditions
- SFCDR Primarily Gaining Reach
- SFCDR Primarily Losing Reach
- Cross Section
- River/Creek
- Approximate Alluvial Aquifer
- Wetland
- Industrial or Municipal Water Body
- Waste Consolidation Area
- Inferred Eastern Extent of Confining Unit
- Focused Feasibility Study Area
- City Limit



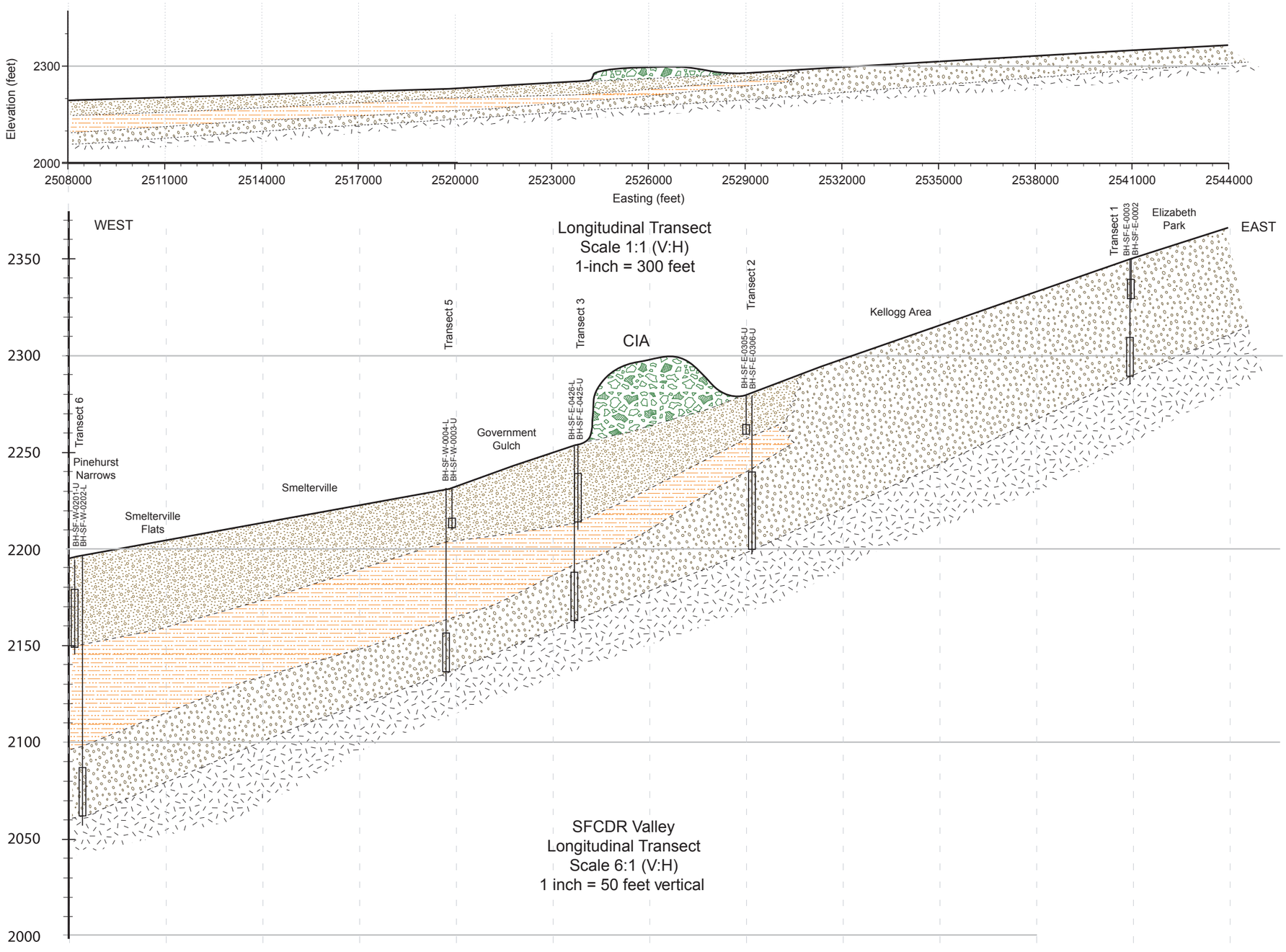
N

0 2,000 4,000 Feet

Source: NHDPlus (Hydrography, 2005); ESRI (Roads, Jurisdictional Boundaries, 2006).

Notes:
1. Gaining and losing reaches were determined from base-flow numerical simulation results, and are presented as approximate conditions during base-flow conditions.
2. For cross section detail, see Figure 3-10.

Figure 3-9
Hydrogeology - Bunker Hill Box
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE



Legend

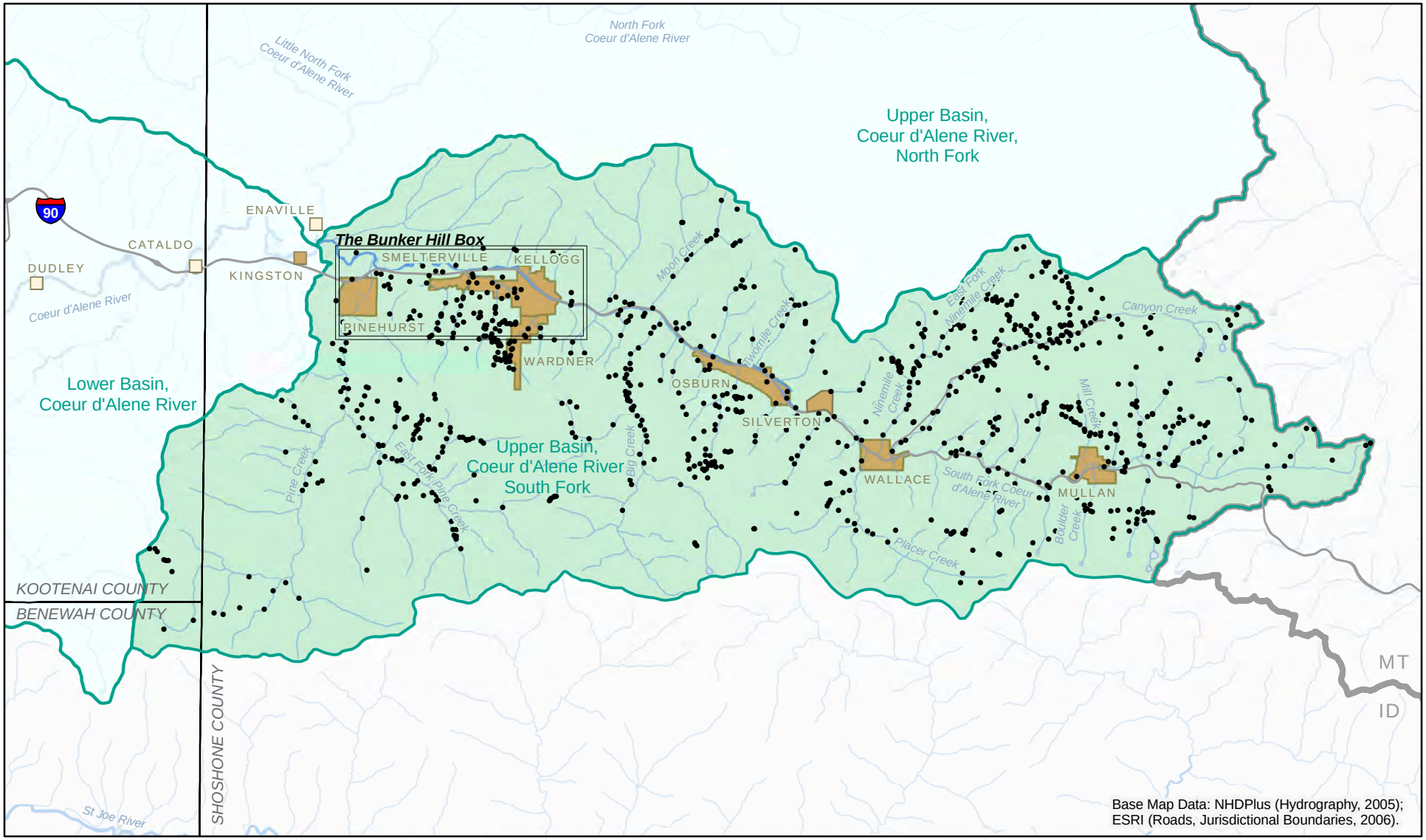
- Contaminated Fill
- Lacustrine Silt/Clay
- Upper Alluvial Sand & Gravel
- Lower Alluvial Sand & Gravel
- Bedrock
- Silty Fine Sand/ Gravel
- Inferred Geologic Contact
- Inferred Surface Topography
- BH-SF-E-0002 Well Information
- Well Screen Interval

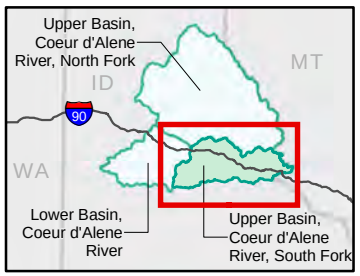
Notes:

1. Contact between fill material and alluvial sediment is inferred.
2. A layer of tailings mixed with alluvium mantles the majority of the SFCDR and tributary floodplains in OU 2 except where removal actions have occurred. This layer is not depicted on this figure.
3. This cross section is strictly conceptual, and monitoring wells are shown for reference only.
4. Cross section location is shown on Figure 3-9.

Figure 3-10
Cross Section – Bunker Hill Box
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

Source: CH2M HILL, 2006a. *Current Status, Conceptual Site Model, Operable Unit 2, Bunker Hill Mining and Metallurgical Complex Superfund Site.* Prepared for U.S. Environmental Protection Agency Region 10.



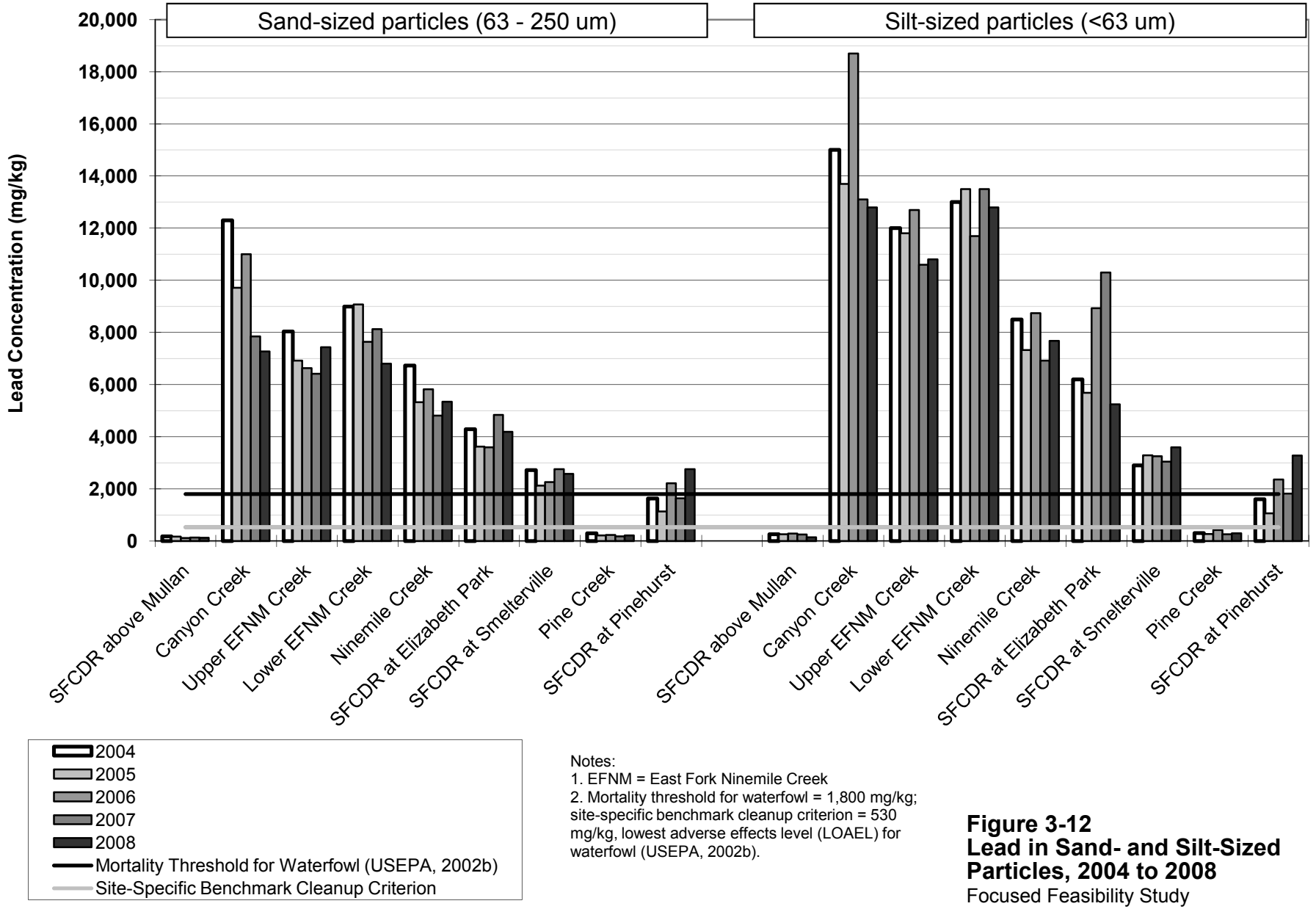


- Source Site
- Approximate Remedy Protection Study Area
- Focused Feasibility Study Area
- Coeur d'Alene River Subbasin Boundary
- City Limit
- State Boundary

Note:
Source sites are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

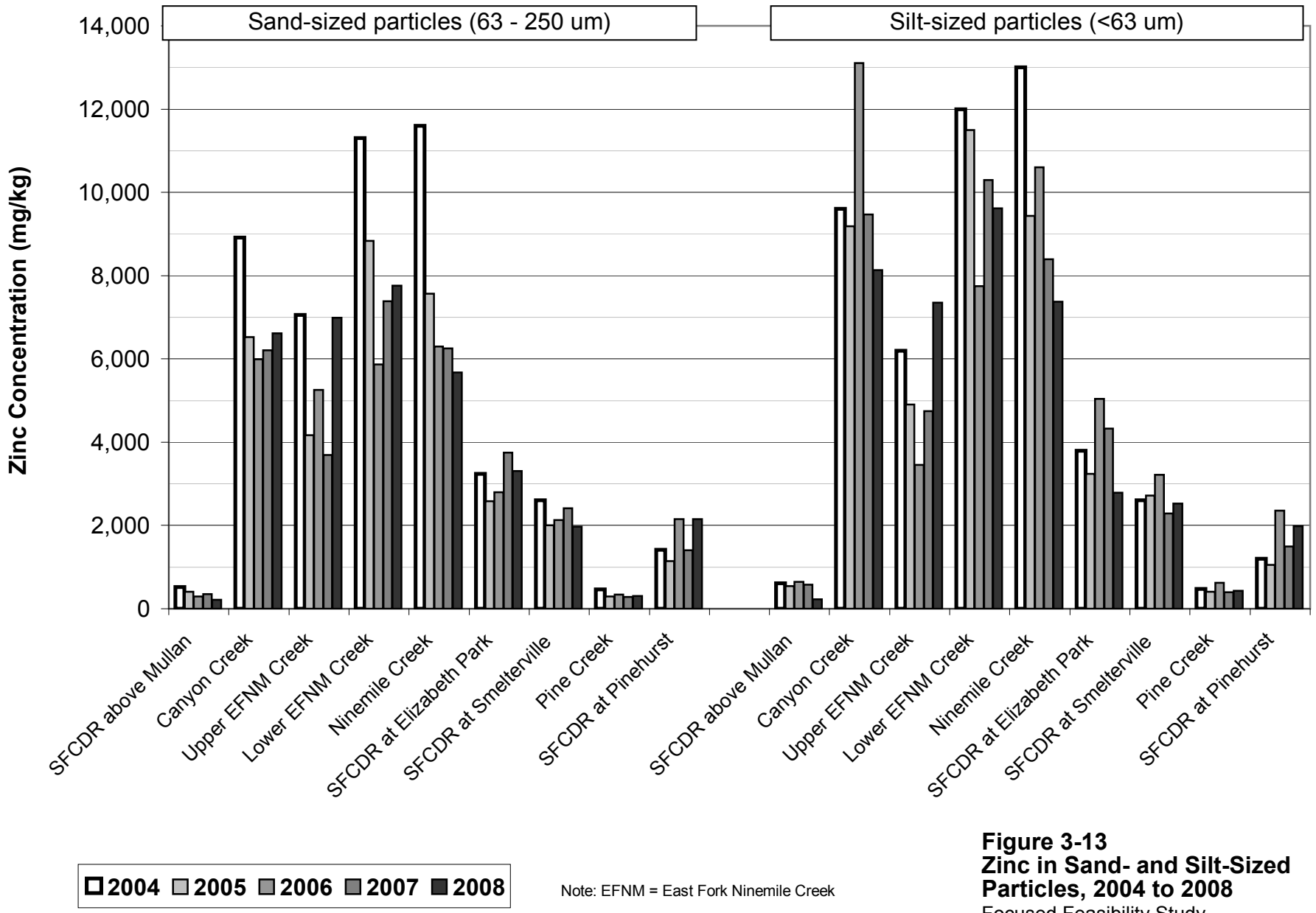
N
0 1 2 4 Miles

Figure 3-11
Source Sites
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE



Notes:
1. EFNM = East Fork Ninemile Creek
2. Mortality threshold for waterfowl = 1,800 mg/kg; site-specific benchmark cleanup criterion = 530 mg/kg, lowest adverse effects level (LOAEL) for waterfowl (USEPA, 2002b).

Figure 3-12
Lead in Sand- and Silt-Sized Particles, 2004 to 2008
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE



Note: EFNM = East Fork Ninemile Creek

Figure 3-13
Zinc in Sand- and Silt-Sized Particles, 2004 to 2008
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

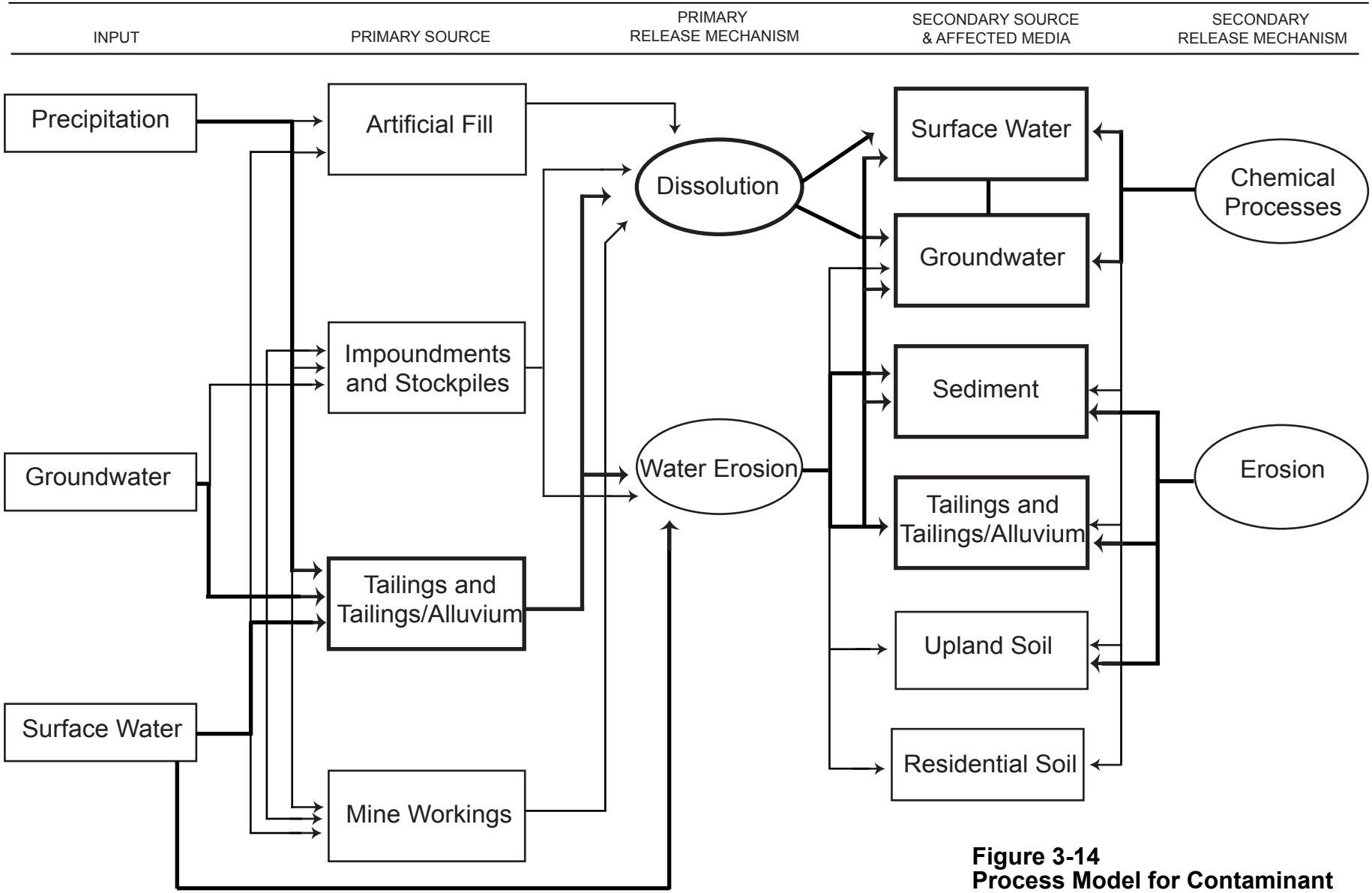


Figure 3-14
Process Model for Contaminant Sources and Release Mechanisms
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

Source: CH2M HILL. January, 2006a. *Current Status, Conceptual Site Model, Operable Unit 2, Bunker Hill Mining and Metallurgical Complex Superfund Site*. Prepared for U.S. Environmental Protection Agency Region 10.

EPA

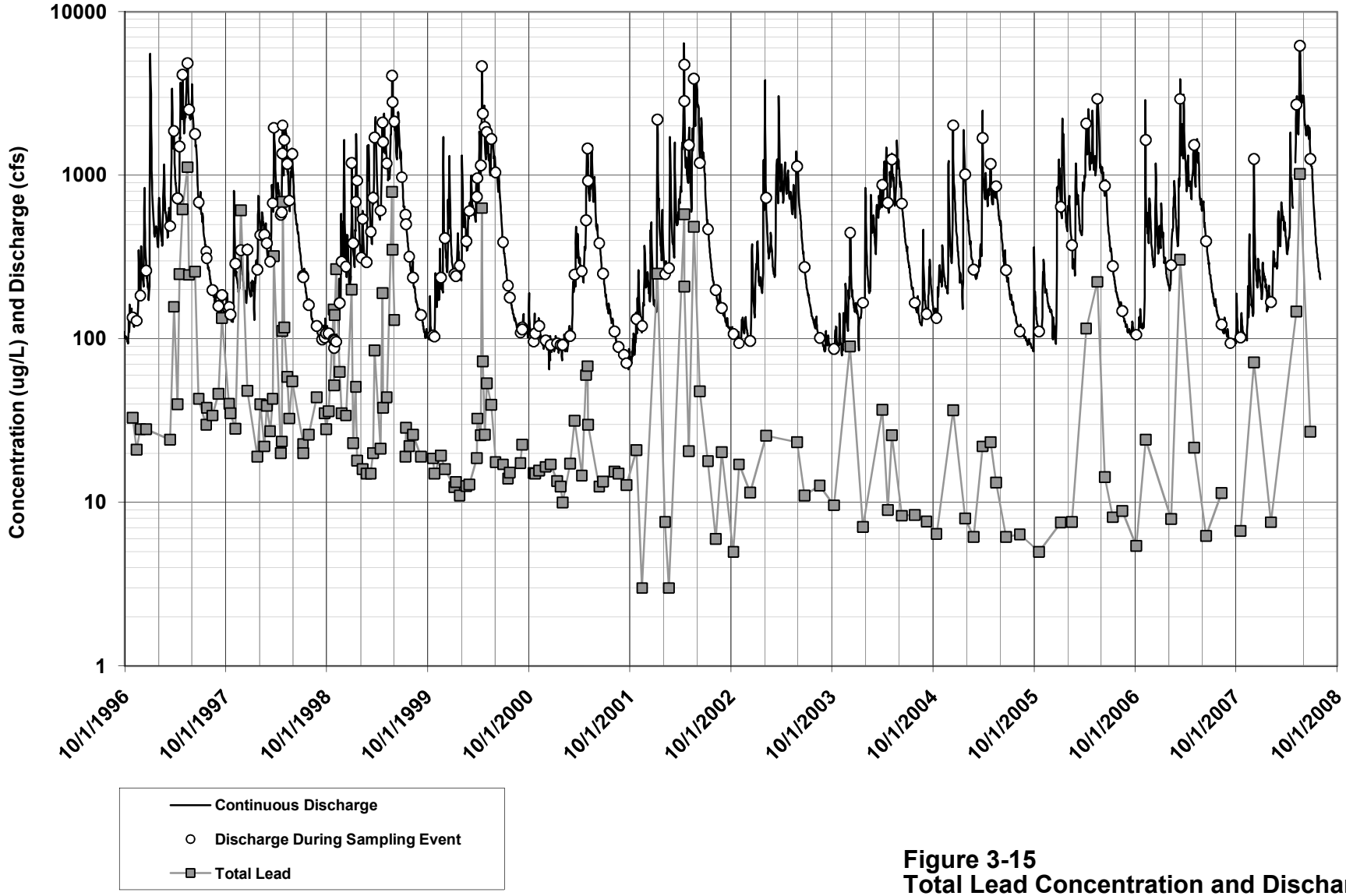


Figure 3-15
Total Lead Concentration and Discharge
Pinehurst, Station SF-271
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

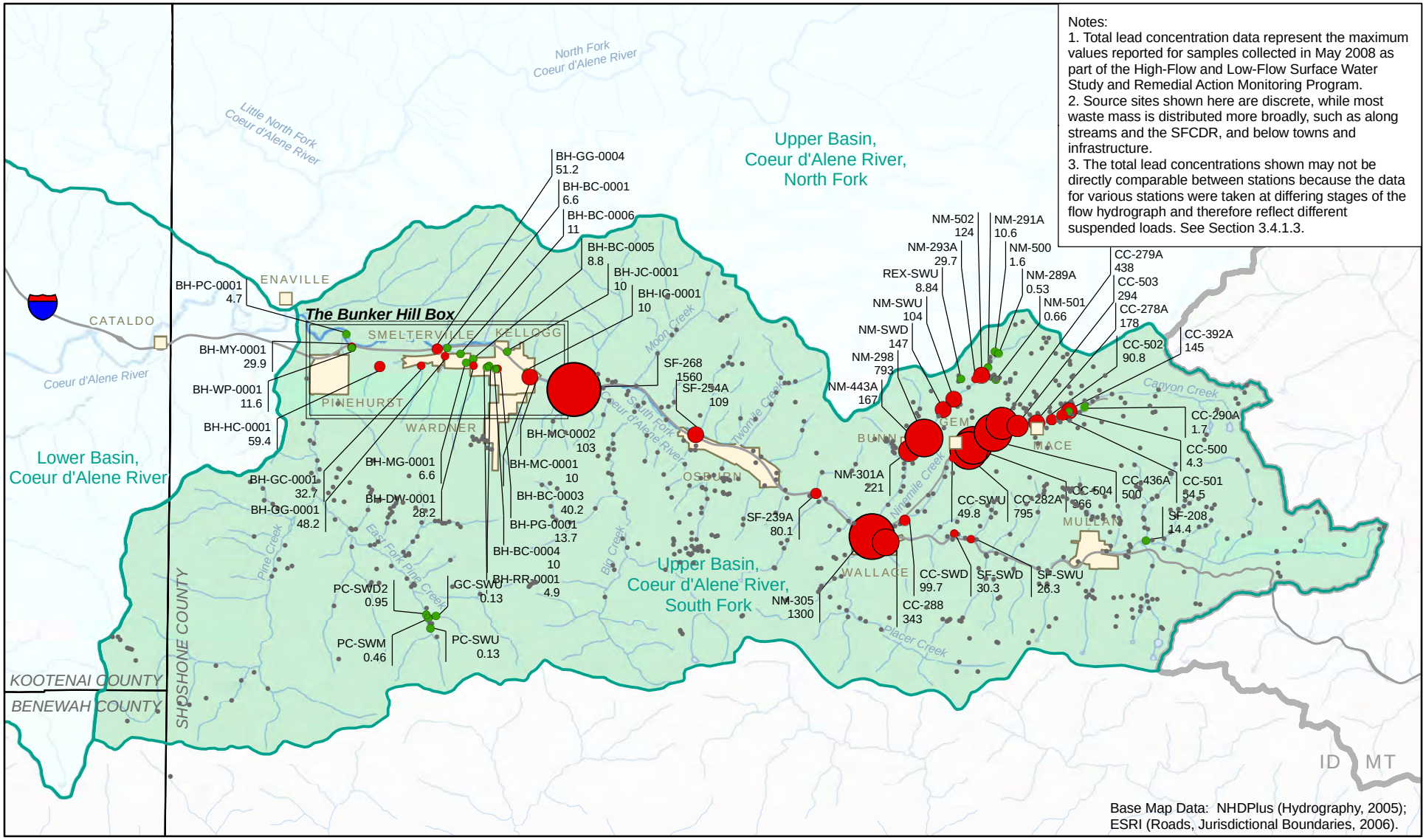


Figure 3-16
Basin-Wide Total Lead Concentrations in Surface Water, May 2008
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

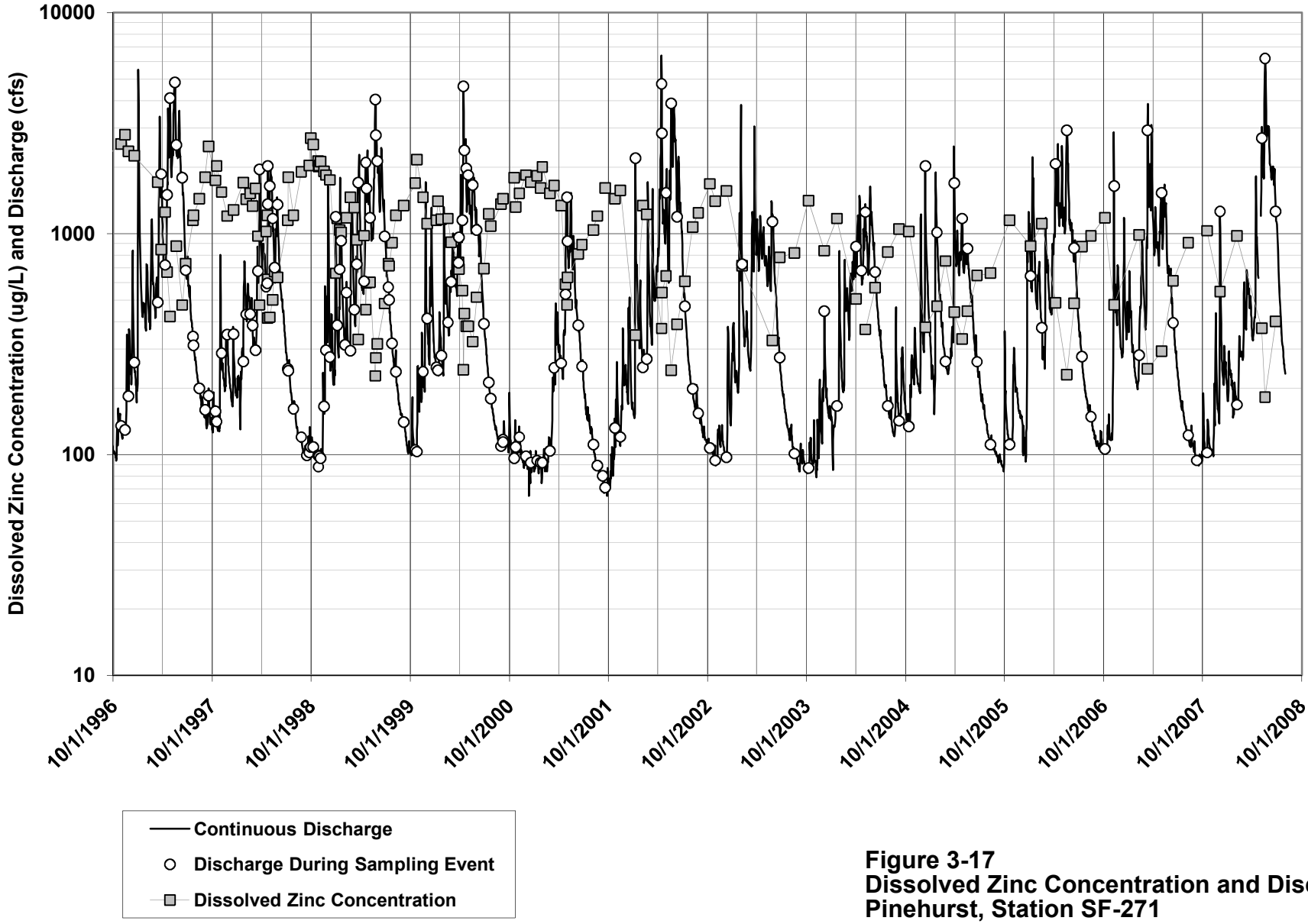
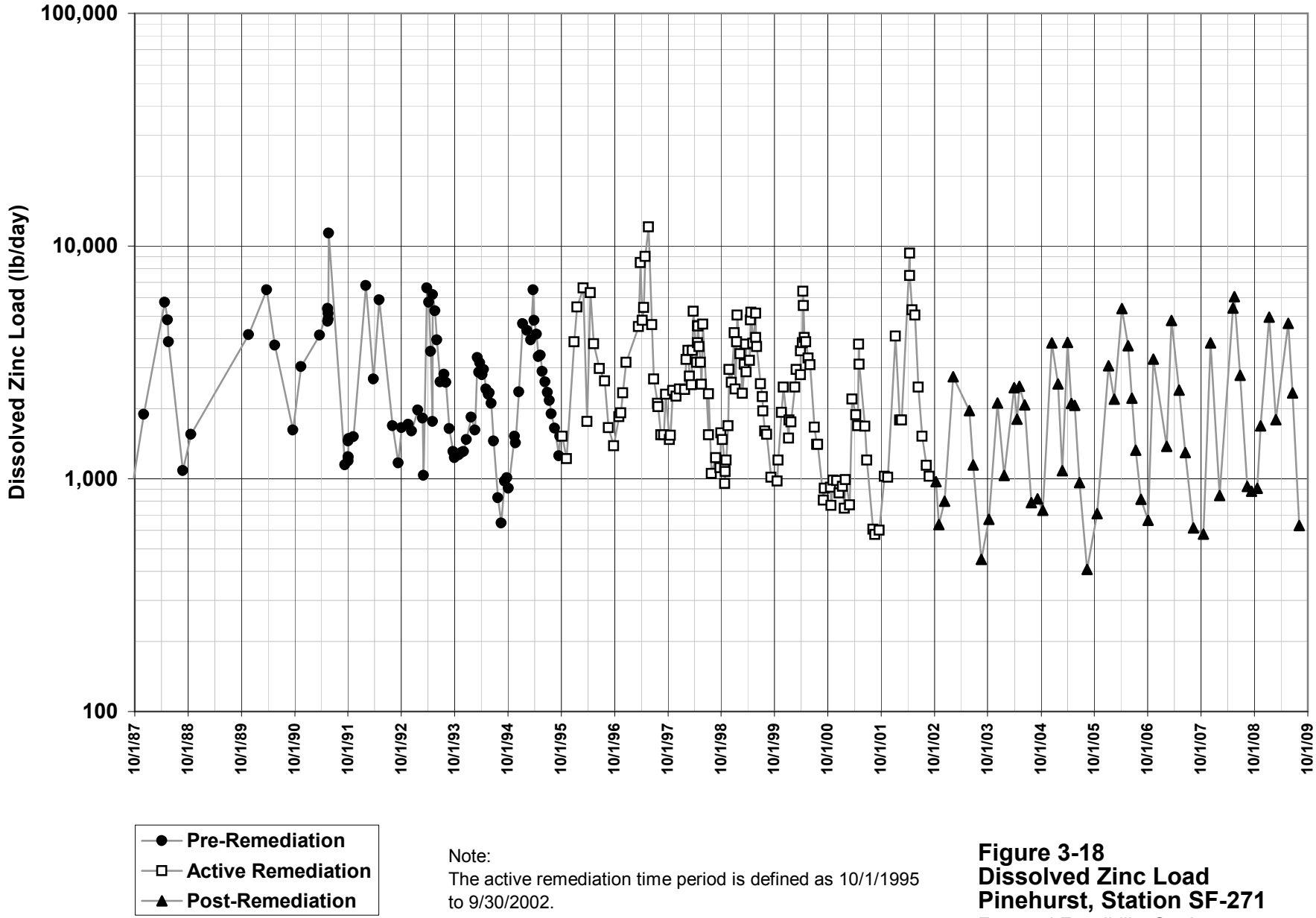


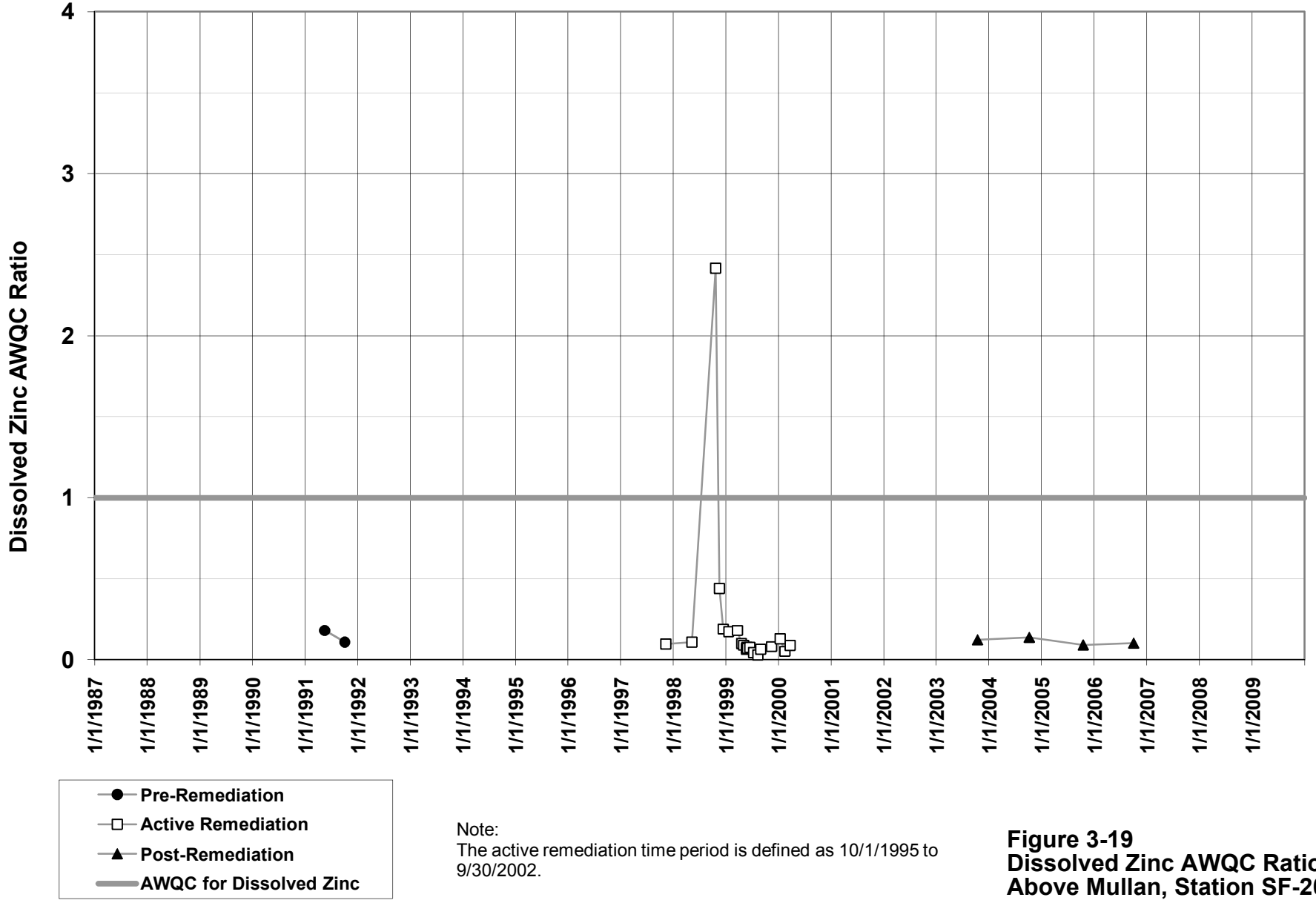
Figure 3-17
Dissolved Zinc Concentration and Discharge
Pinehurst, Station SF-271
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE



Note:
The active remediation time period is defined as 10/1/1995 to 9/30/2002.

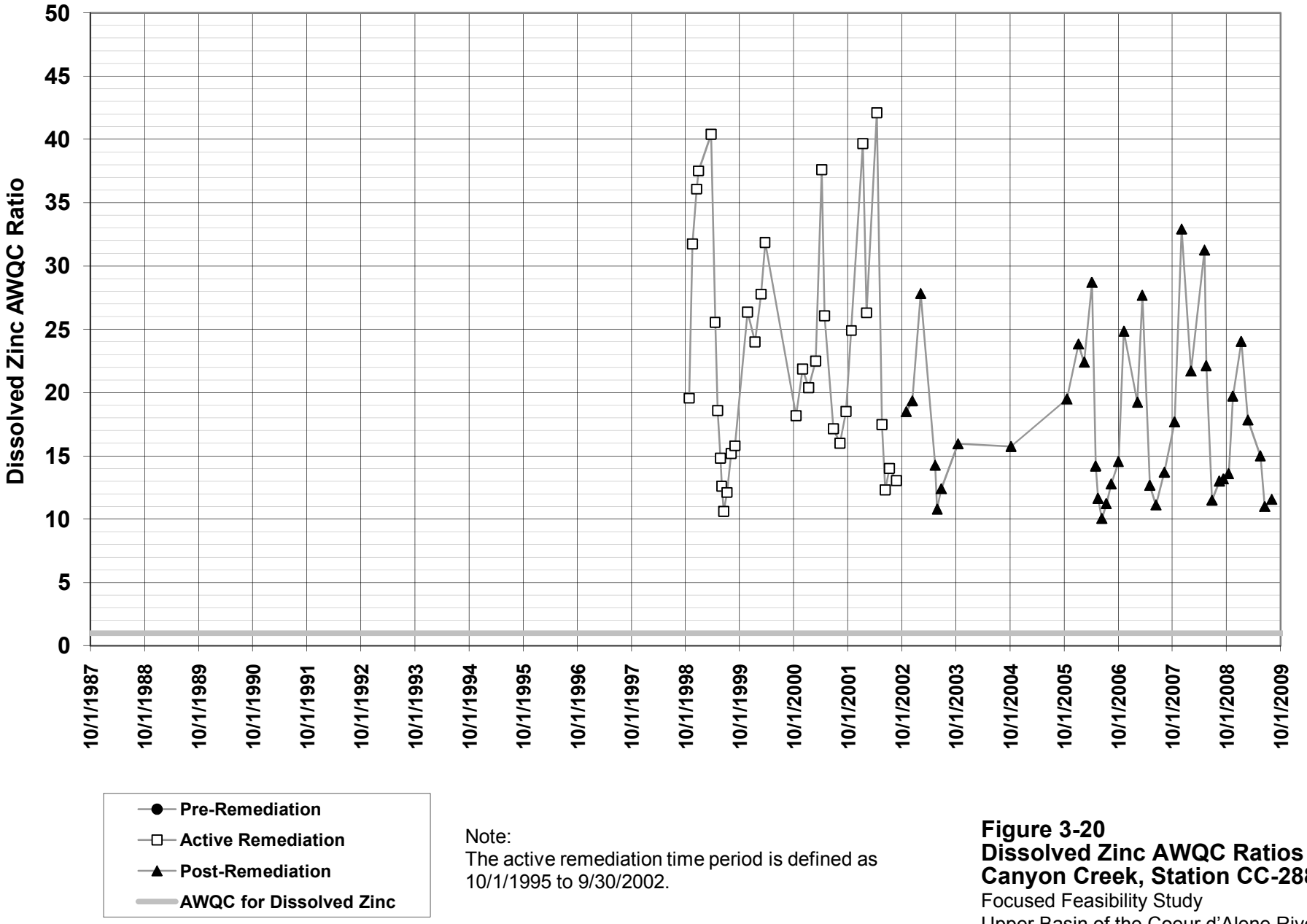
Figure 3-18
Dissolved Zinc Load
Pinehurst, Station SF-271
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

EPA



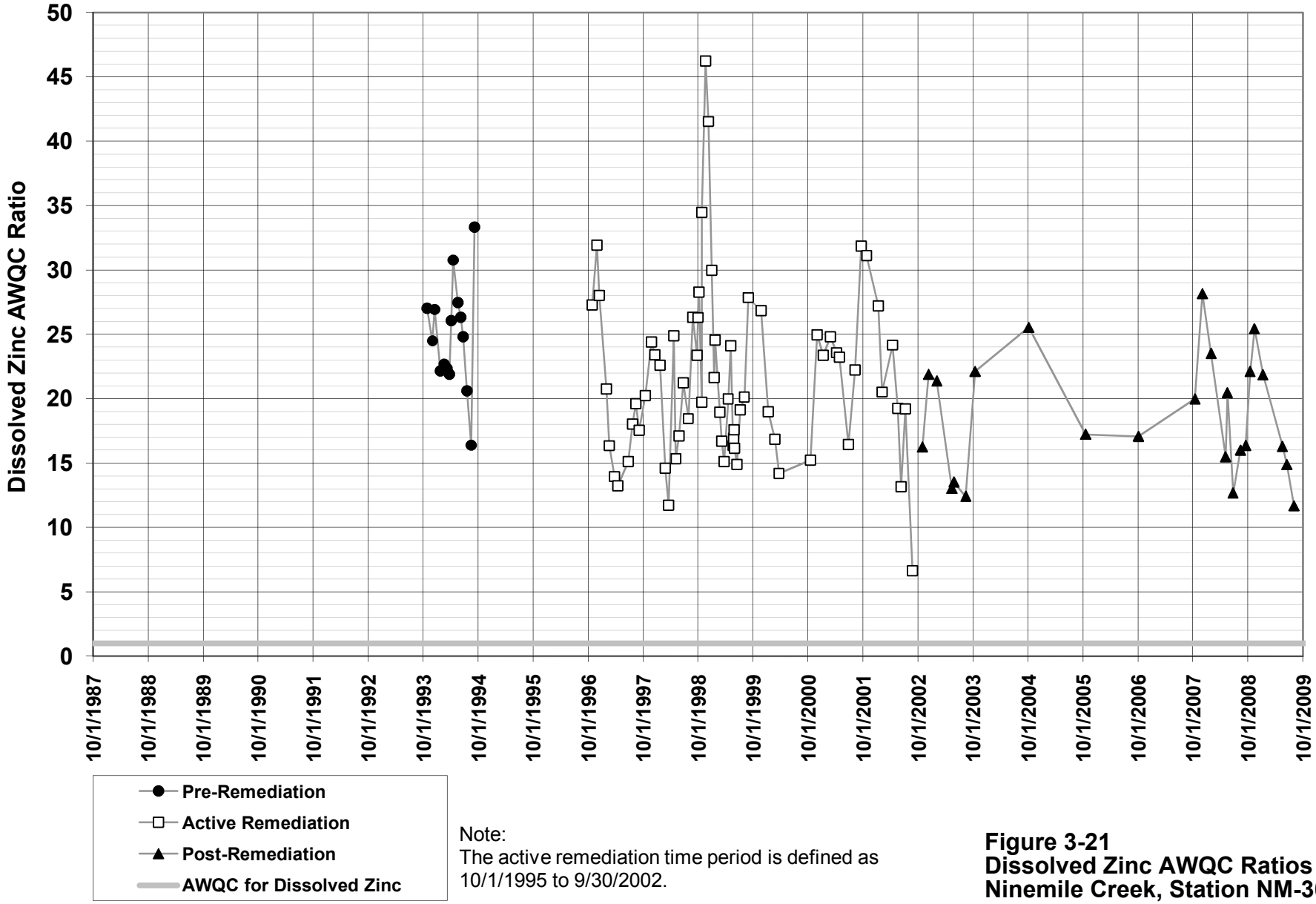
Note:
The active remediation time period is defined as 10/1/1995 to 9/30/2002.

Figure 3-19
Dissolved Zinc AWQC Ratios Above Mullan, Station SF-208
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE



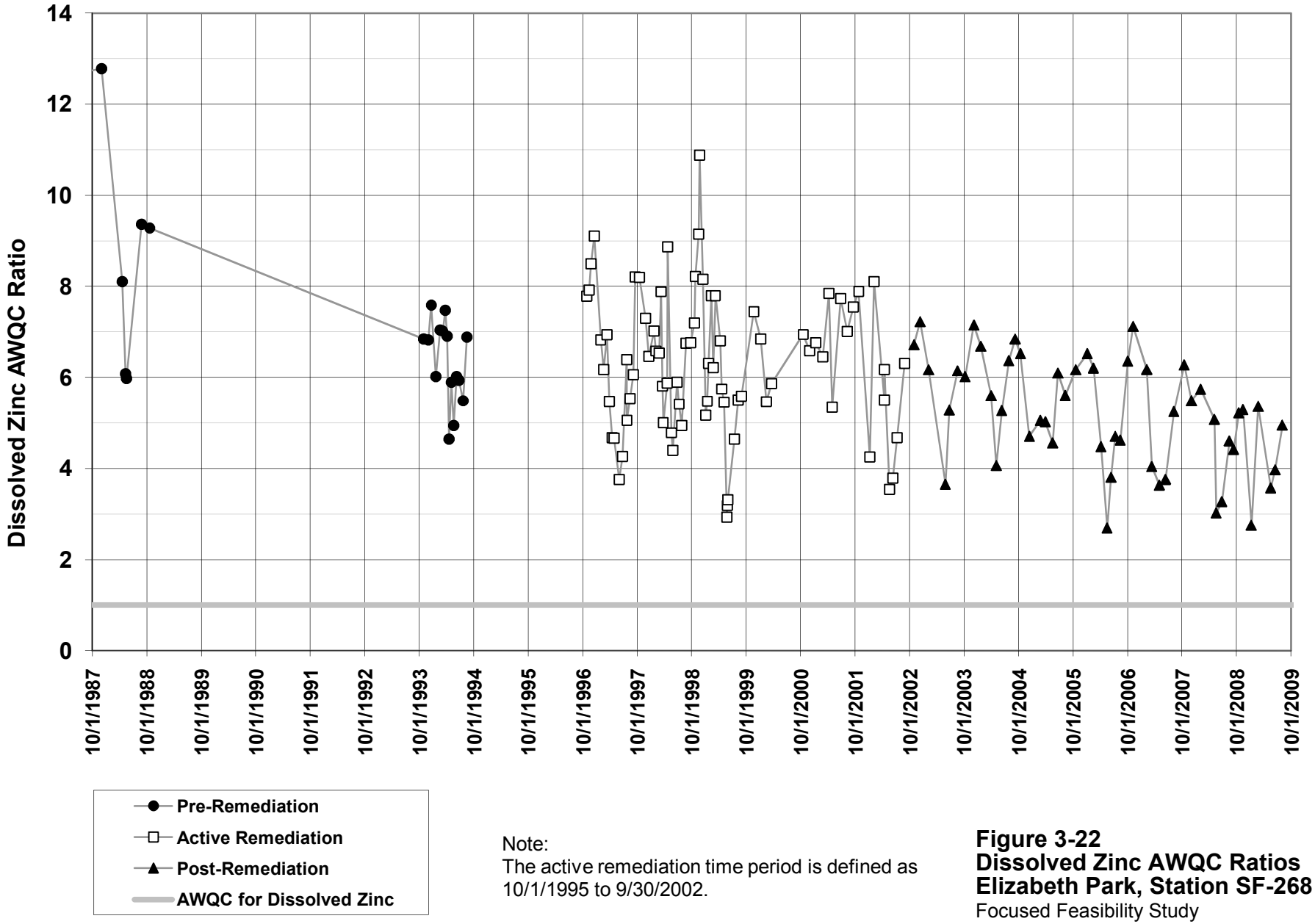
Note:
The active remediation time period is defined as 10/1/1995 to 9/30/2002.

Figure 3-20
Dissolved Zinc AWQC Ratios
Canyon Creek, Station CC-288
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE



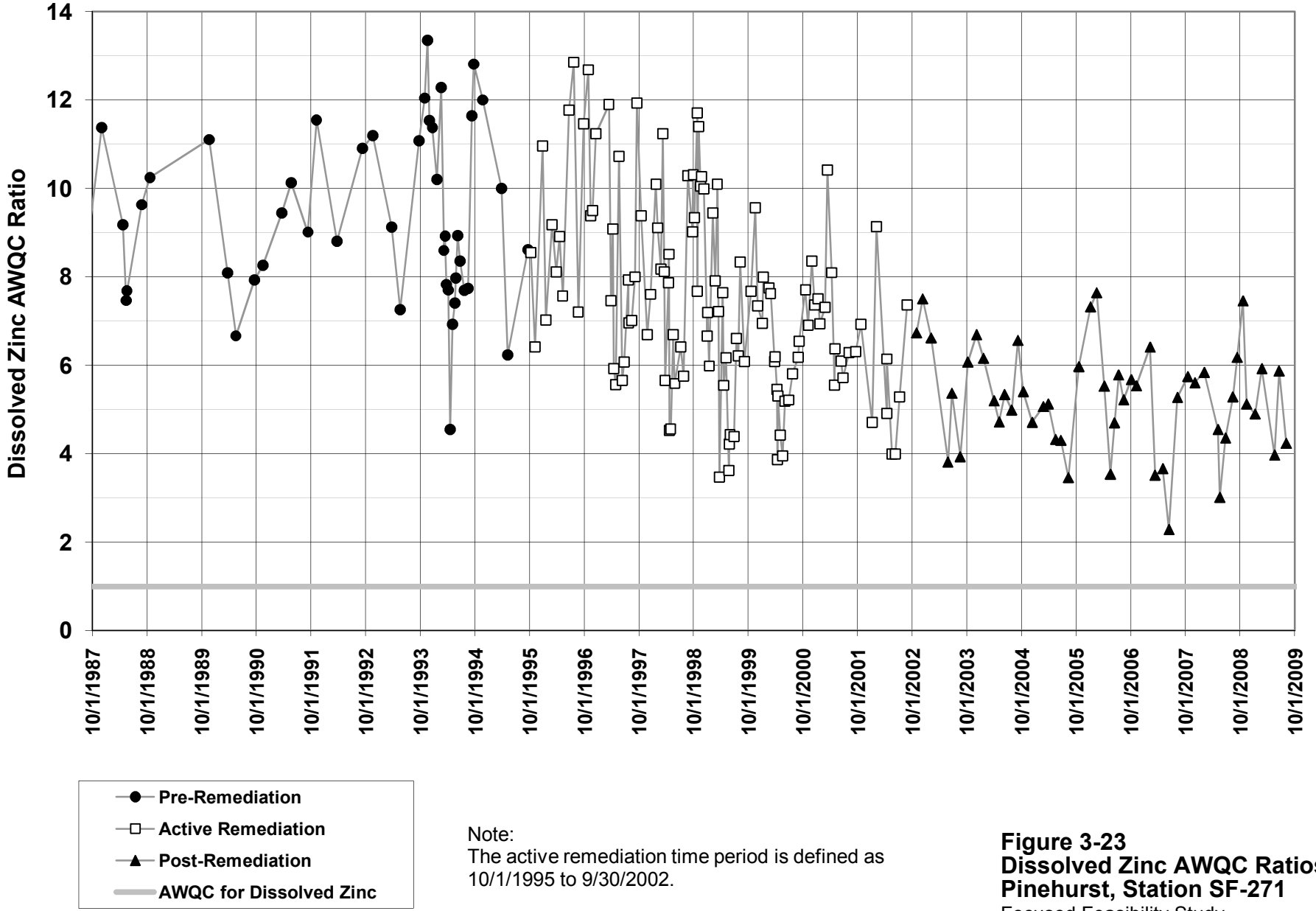
Note:
The active remediation time period is defined as 10/1/1995 to 9/30/2002.

Figure 3-21
Dissolved Zinc AWQC Ratios
Ninemile Creek, Station NM-305
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE



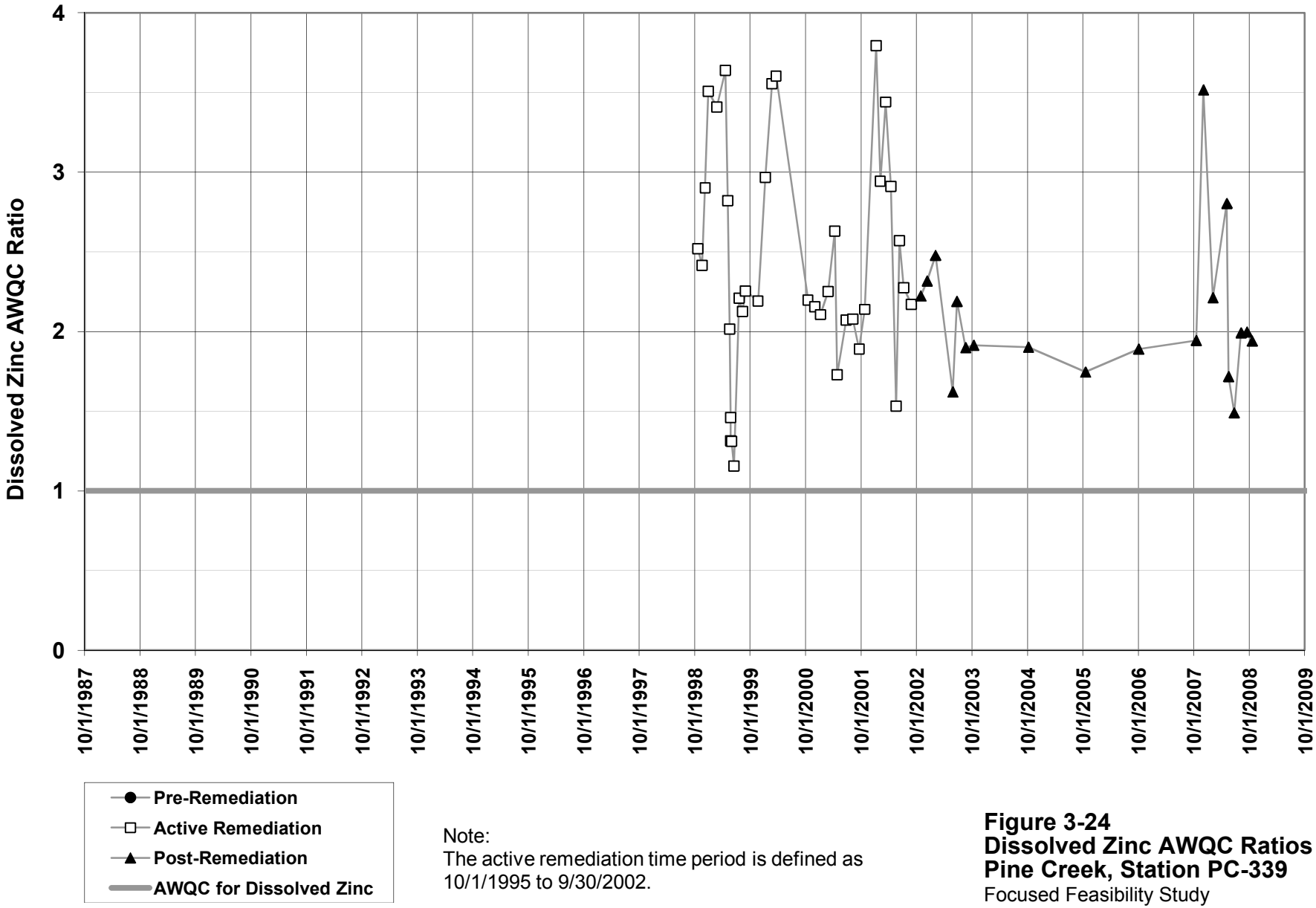
Note:
The active remediation time period is defined as 10/1/1995 to 9/30/2002.

Figure 3-22
Dissolved Zinc AWQC Ratios
Elizabeth Park, Station SF-268
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE



Note:
The active remediation time period is defined as 10/1/1995 to 9/30/2002.

Figure 3-23
Dissolved Zinc AWQC Ratios
Pinehurst, Station SF-271
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

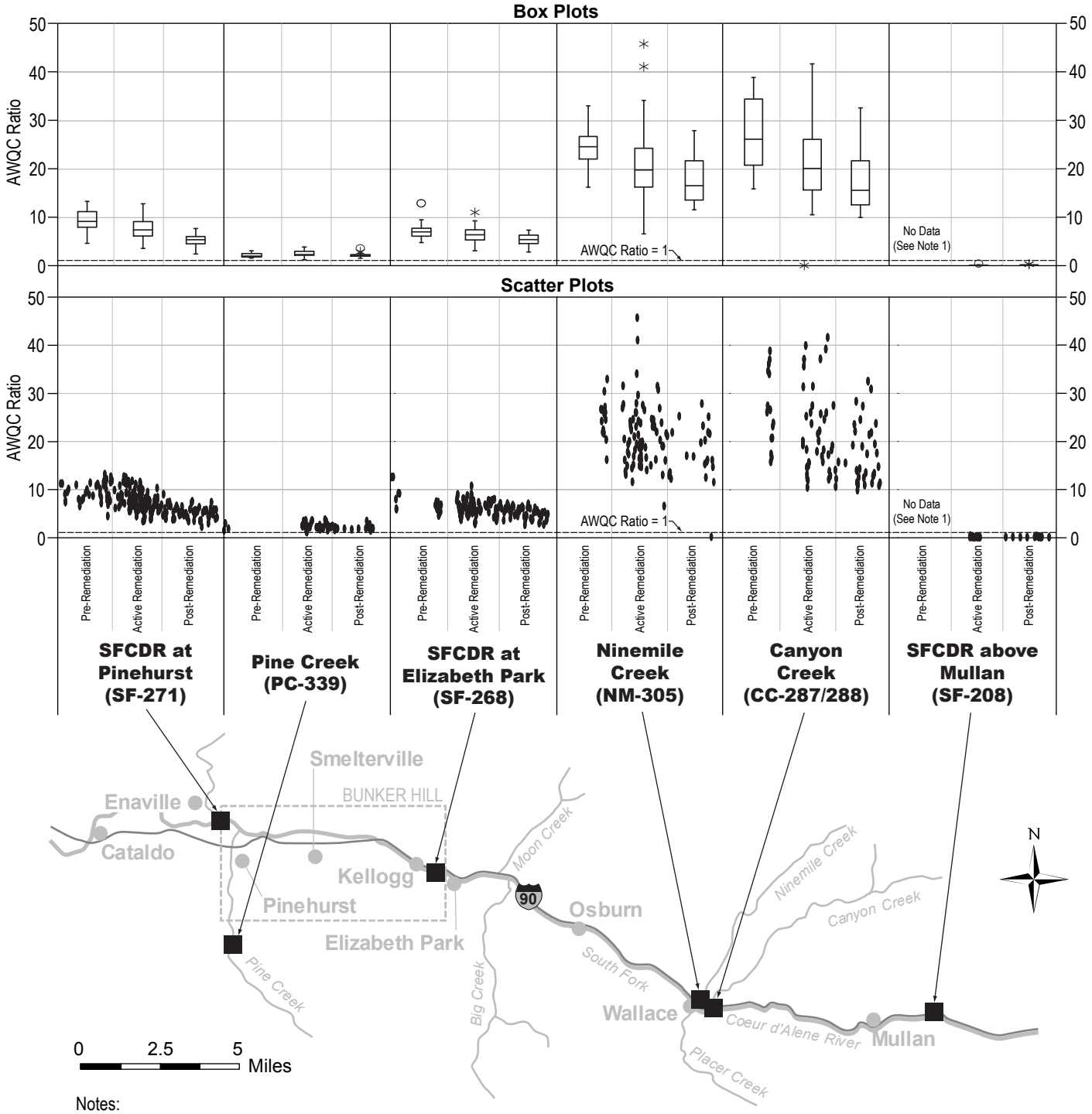


Note:
The active remediation time period is defined as 10/1/1995 to 9/30/2002.

Figure 3-24
Dissolved Zinc AWQC Ratios
Pine Creek, Station PC-339
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

How to Read the Box Plots

The box plot shows the median or 50th percentile (line in the middle of the box), along with the 25th and 75th percentiles (top and bottom of box), and the range (extreme spread) of the data. The stars and circles are statistical outliers, where stars are values 1.5 to 3 interquartile ranges (range from 25th and 75th percentile) away from the nearest box edge, and circles lie three or more interquartile ranges away from the box edge. Box plots provide a way to see the overall distribution and variability associated with the data, and they help when looking at trends between datasets. For example, if only the median values were compared, trends might appear to be more significant. The boxes show there is often a fair degree of overlap among data from different time periods and locations.



Notes:

1. There are no pre-1995 data at Mullan for both dissolved zinc and hardness, which are both needed to calculate the AWQC ratio.
2. At Canyon Creek, the pre-1995 data are from CC-287, while the post-1995 data are from CC-288.

Pre-Remediation = 9/15/1987 to 9/30/1995
Active Remediation = 10/1/1995 to 9/30/2002
Post-Remediation = 10/1/2002 to Present

Figure 3-25
Mean AWQC Ratios
Pre-, Active, and Post-Remediation
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

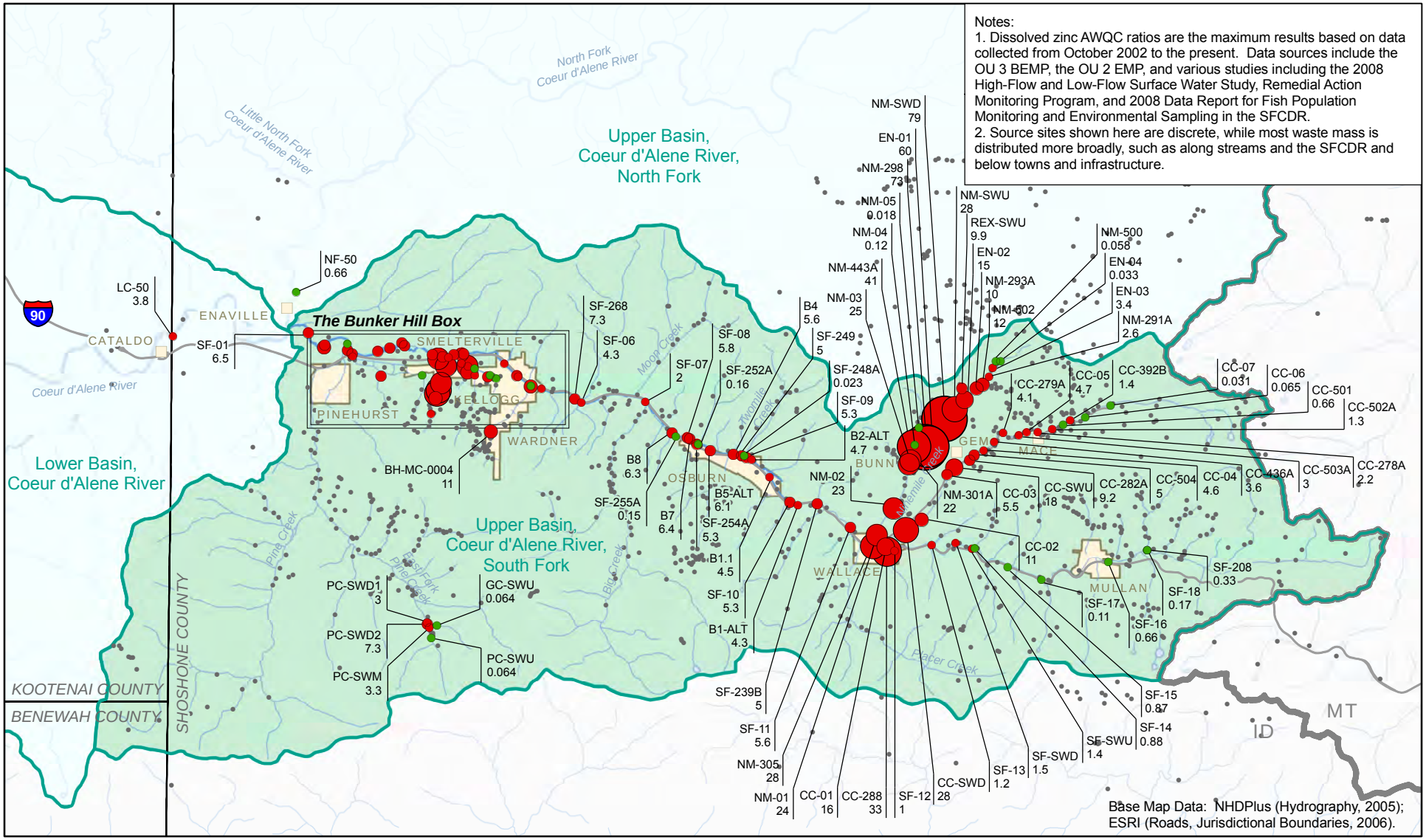


Figure 3-26
Maximum Basin-Wide Zinc AWQC Ratios in Surface Water, Post-2002
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

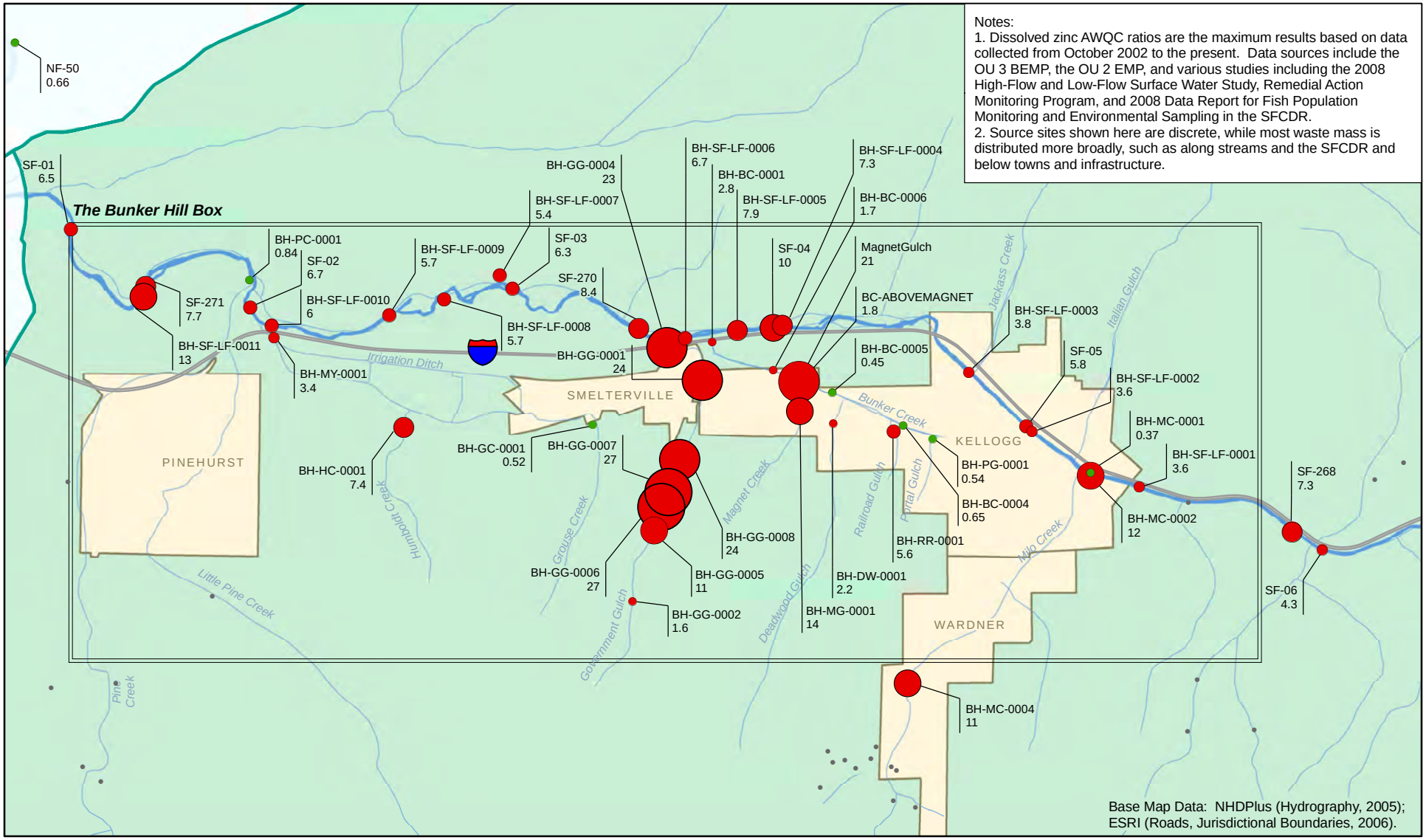


Figure 3-27
Maximum Bunker Hill Box Zinc AWQC Ratios in Surface Water, Post-2002
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

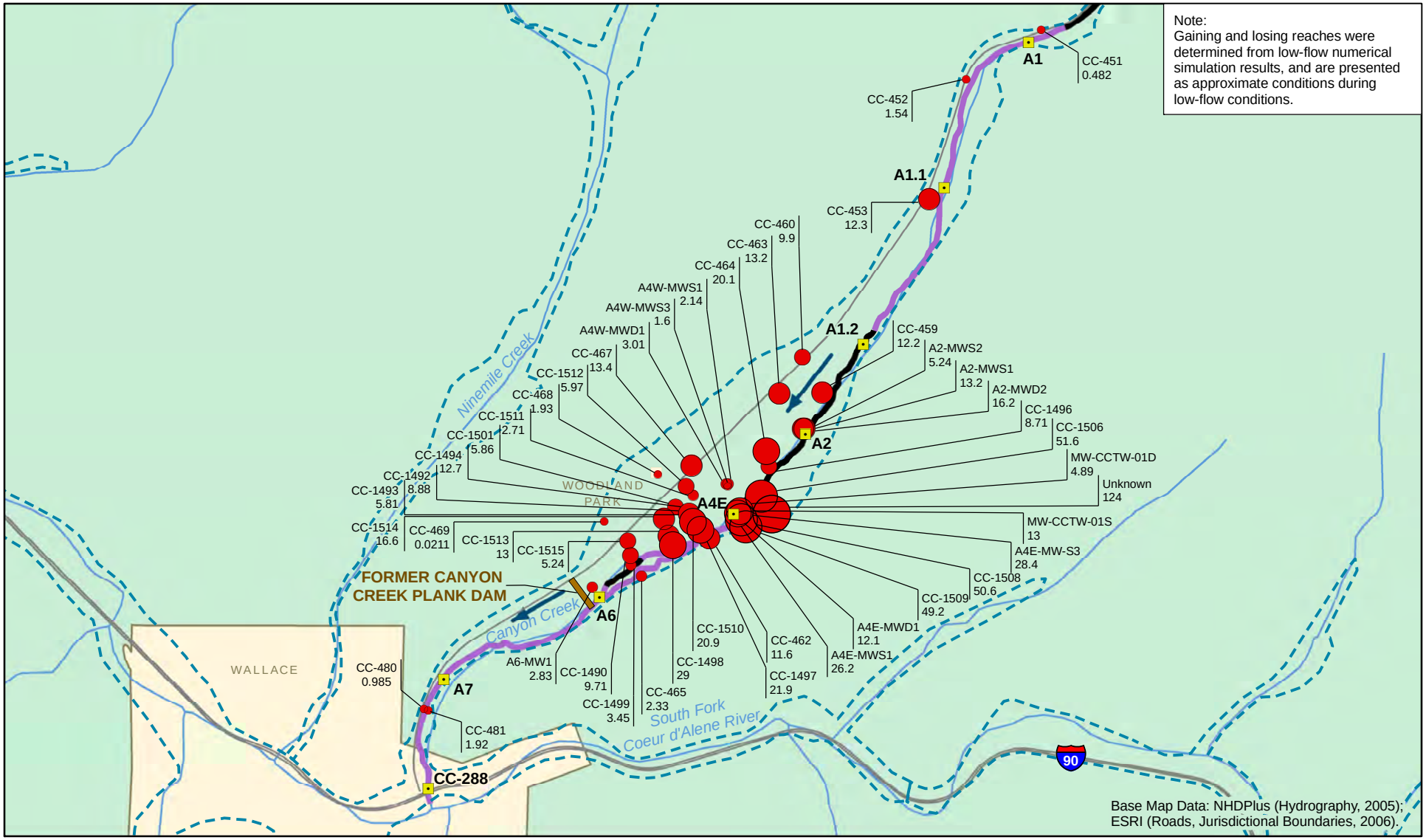
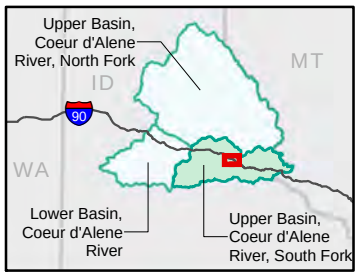


Figure 3-28
Hydrogeology and Dissolved Zinc Concentrations in Groundwater at Woodland Park, September and October 2008
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





Dissolved Zinc Concentrations (mg/L)

- 0.5
- 1
- 2
- 3

Site B7 Surface Water Monitoring Location

SFCDR Primarily Gaining Reach

SFCDR Primarily Losing Reach

Former Osburn Plank Dam (Approximate Historical Location)

Approximate Groundwater Flow Direction, Base-Flow Conditions

Osburn Flats Study Boundary

Approximate Alluvial Aquifer

Focused Feasibility Study Area

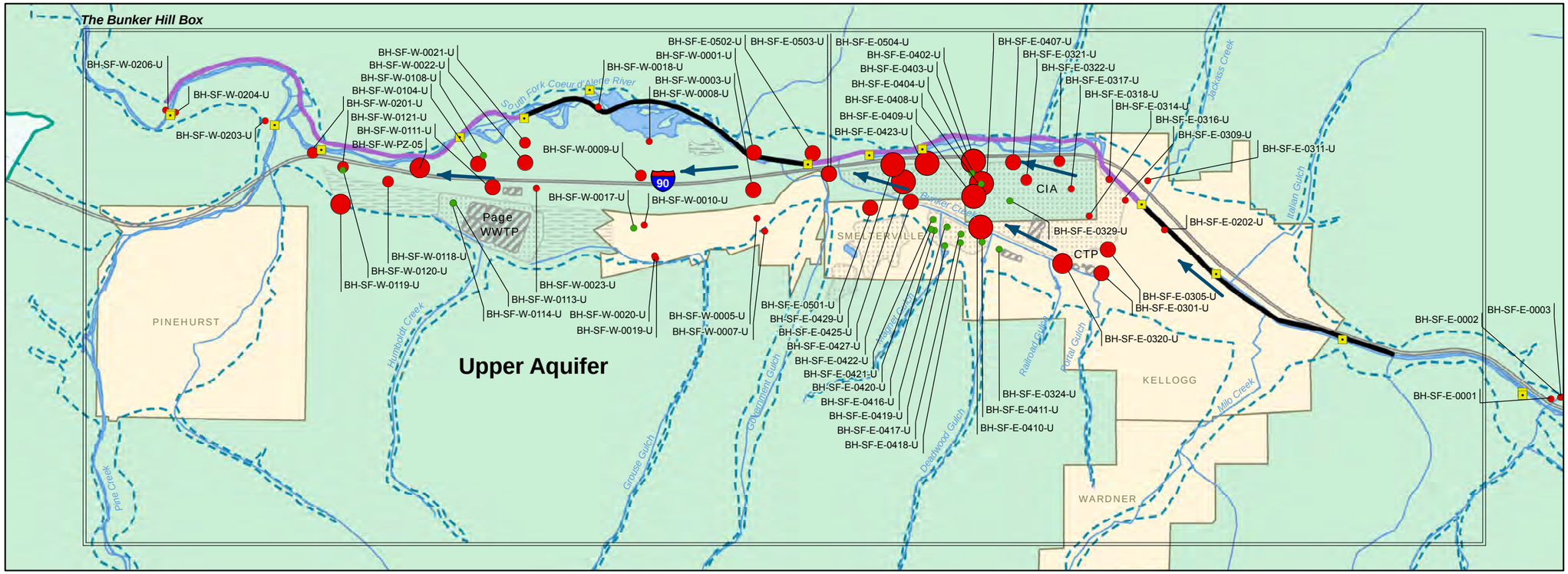
City Limit

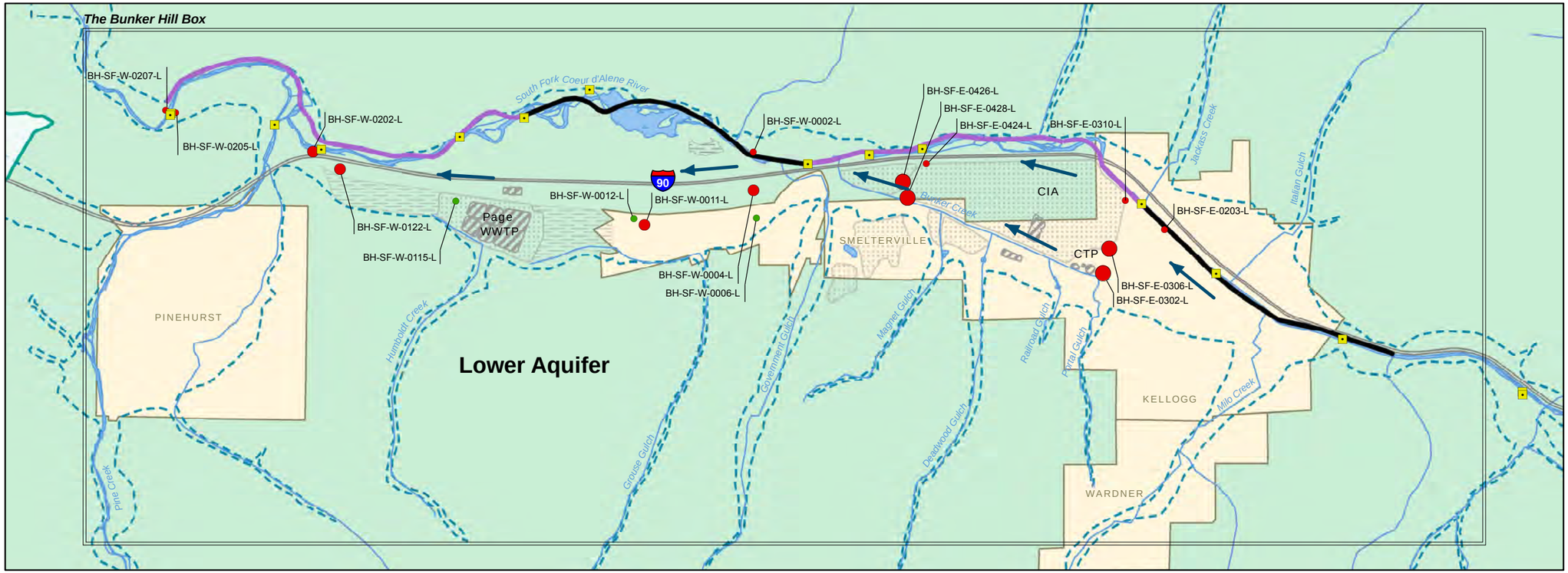
N

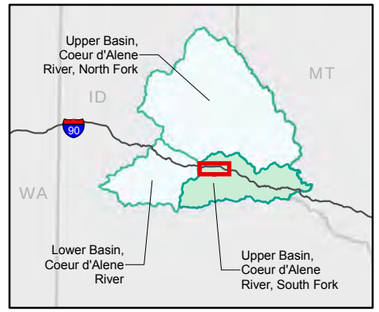
0 1,000 2,000 Feet

Figure 3-29
Hydrogeology and Dissolved Zinc Concentrations in Groundwater at Osburn Flats, October and November 2006
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

EPA







Dissolved Zinc Concentrations (mg/L)

- Nondetect
- 1
- 4
- 8
- 15
- 25
- Surface Water Monitoring Location
- River/Creek
- Approximate Groundwater Flow Direction, Base-Flow Conditions
- SFCDR Primarily Gaining Reach
- SFCDR Primarily Losing Reach
- Approximate Alluvial Aquifer
- Wetland
- Industrial or Municipal Water Body
- Waste Consolidation Area
- Focused Feasibility Study Area
- Coeur d'Alene River Subbasin Boundary

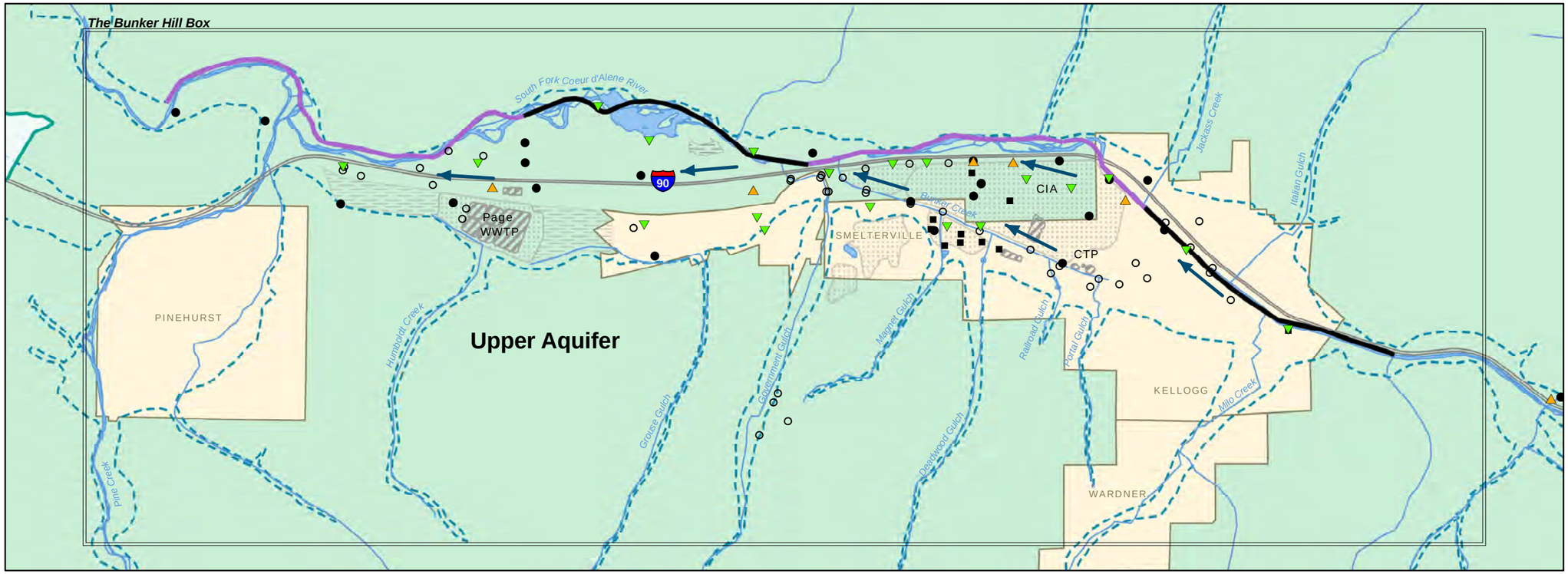
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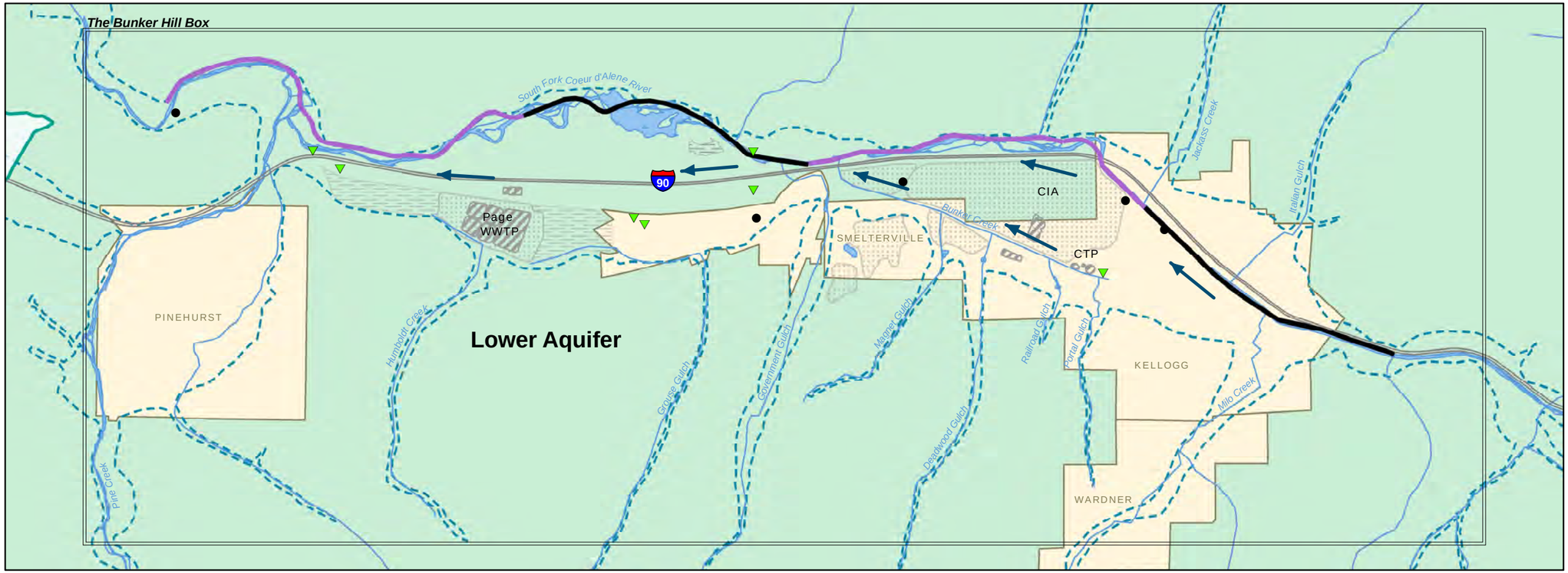
0 2,000 4,000 Feet

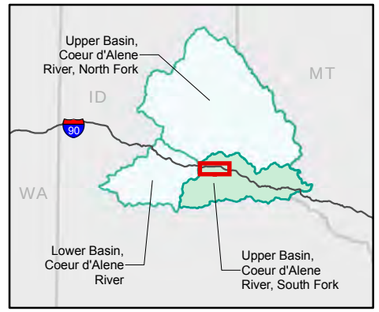
Source: NHDPlus (Hydrography, 2005); ESRI (Roads, Jurisdictional Boundaires, 2006).

Note: Gaining and losing reaches were determined from low-flow numerical simulation results, and are presented as approximate conditions during low-flow conditions.

Figure 3-30
Hydrogeology and Dissolved Zinc Concentrations in Groundwater in the Bunker Hill Box, September and October 2008
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE







Dissolved Zinc Concentration Trend, All Wells

- Decreasing
- Increasing
- No Trend or Stable
- Insufficient Data
- No Data
- Approximate Groundwater Flow Direction, Base-Flow Conditions
- SFCDR Primarily Gaining Reach
- SFCDR Primarily Losing Reach
- River/Creek
- Approximate Alluvial Aquifer
- Wetland
- Industrial or Municipal Water Body
- Waste Consolidation Area
- Focused Feasibility Study Area
- Coeur d'Alene River Subbasin Boundary

N

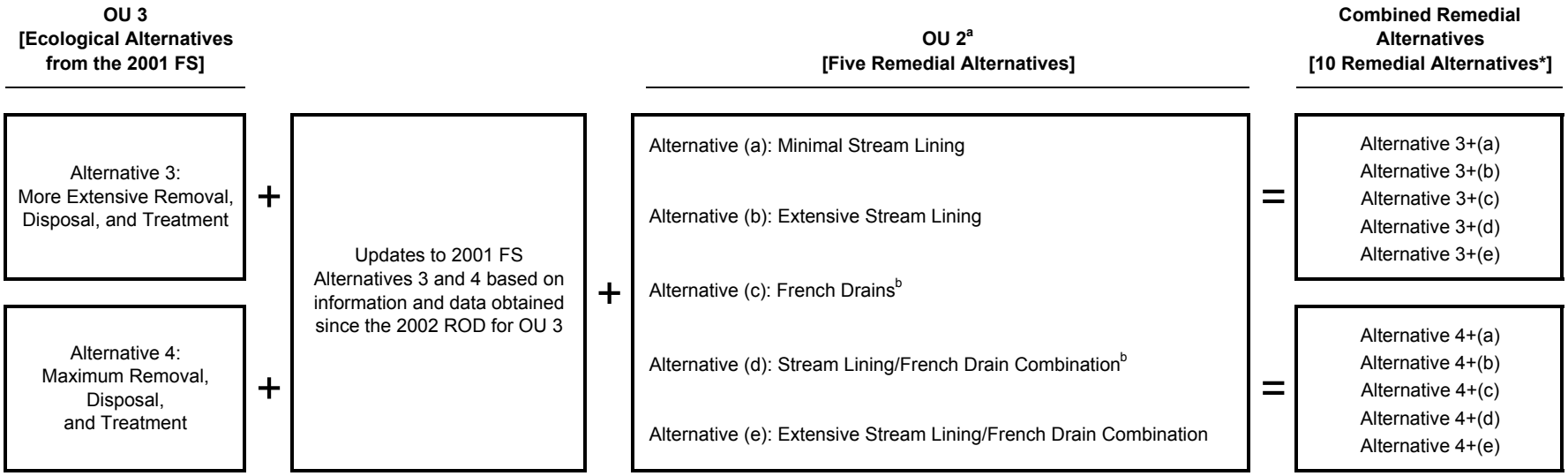
0 2,000 4,000 Feet

Source: NHDPlus (Hydrography, 2005); ESRI (Roads, Jurisditional Boundaries, 2006).

Note:
1. Trends determined with Mann-Kendall Analysis to 95% certainty. Data from 2000 through 2008.

Figure 3-31
Dissolved Zinc Trends in Groundwater in the Bunker Hill Box, 2000 to 2008
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

EPA



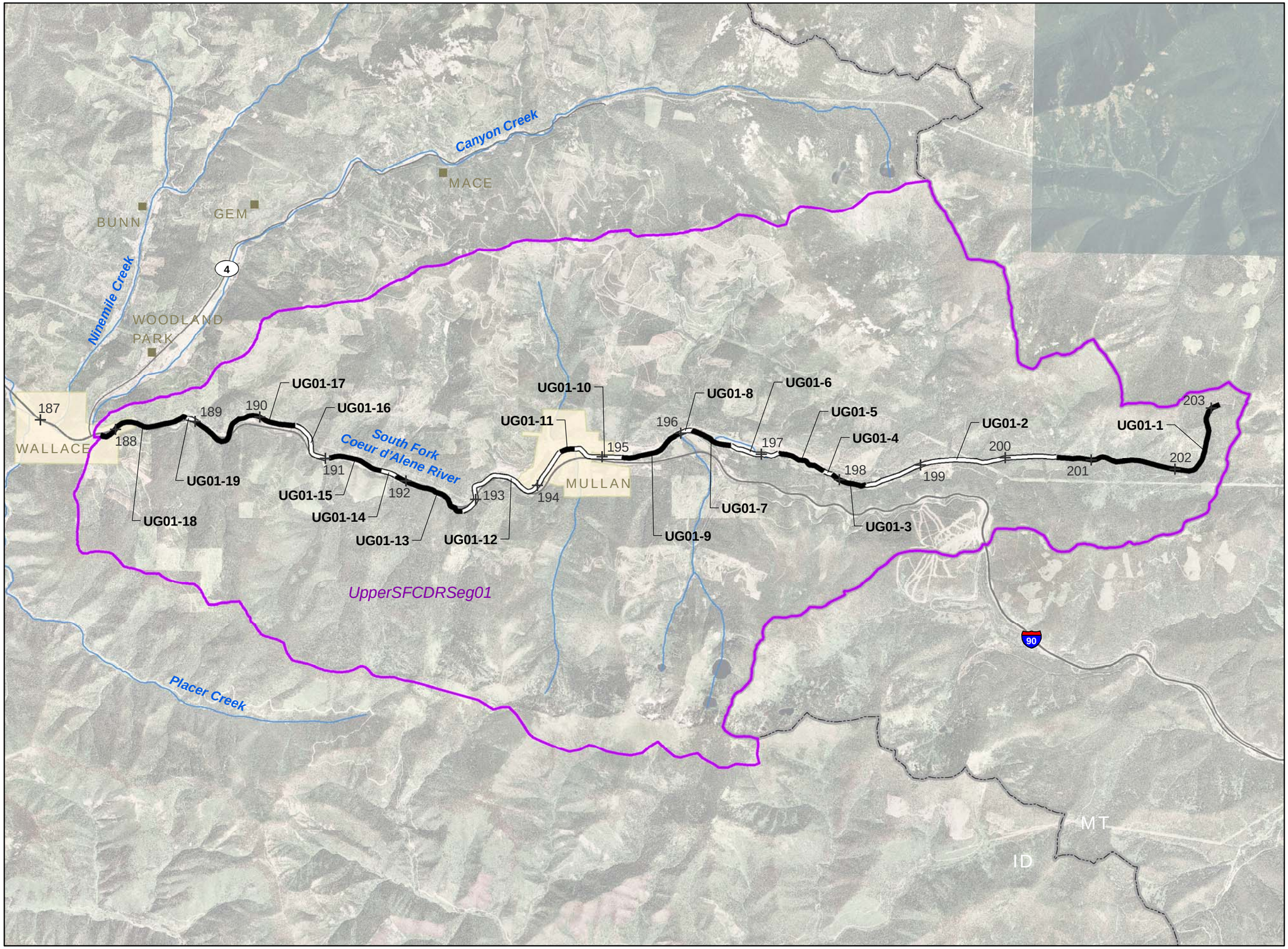
[*] ***The five OU 2 alternatives are combined with each of the two OU 3 alternatives to form 10 remedial alternatives for evaluation in this FFS Report. The No Action Alternative was rejected in the 2002 ROD for OU 3, but is included in this FFS Report for comparative purposes.***

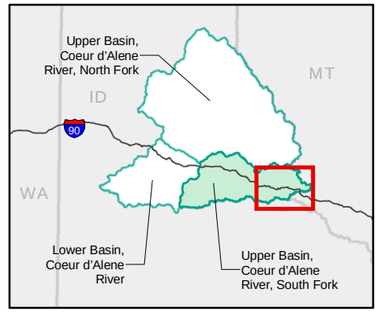
FS = Feasibility Study
OU = Operable Unit
ROD = Record of Decision
TCD = typical conceptual design

[a] All the OU 2 alternatives also include the same set of actions for the Reed and Russell Tunnel adit flows: installation of a check dam to reduce or eliminate the flow of contaminated water, with a contingency plan for collection and treatment of discharge water if needed.

[b] A limestone permeable reactive barrier (PRB) was evaluated as a potential option in place of a portion of the French drain in these alternatives (as discussed in Section 6.3 and Appendix F). However, based on the results of this evaluation, the PRB option has not been retained for direct inclusion in the alternatives. Additional study would be needed to further evaluate the potential effectiveness and cost of the PRB option.

Figure 6-1
Development of Remedial Alternatives
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





203 River Mile

River/Creek

Stream and Riparian Reach

UG01-1 (Stream and Riparian Reach ID)

Watershed Segment

State Boundary

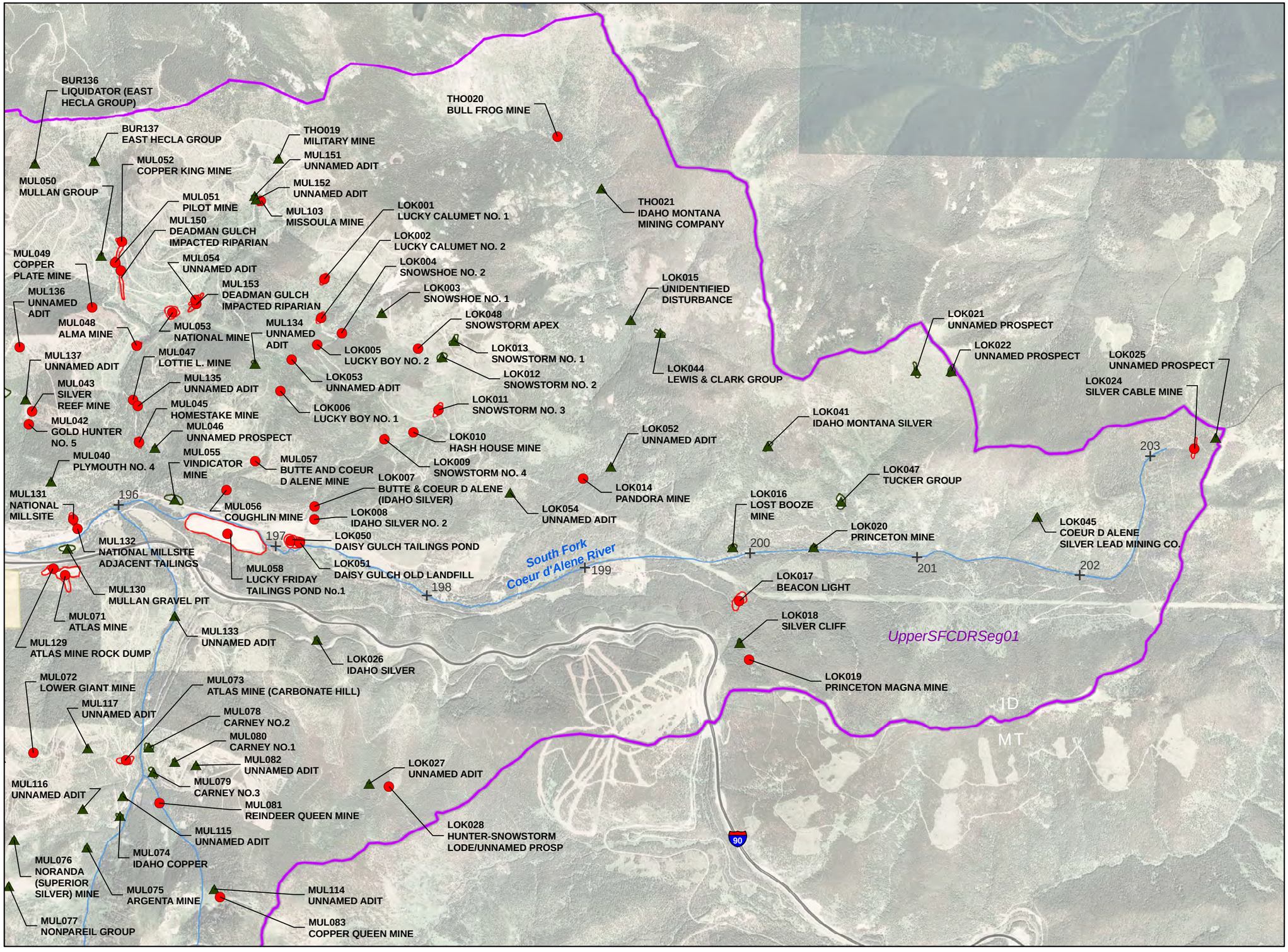
City Limit

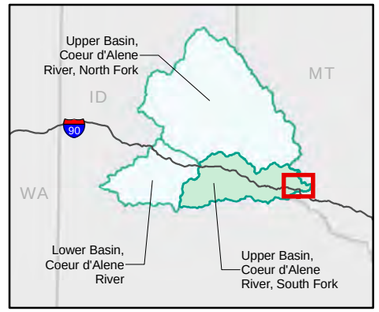
N

0 0.5 1 2 Miles

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006);
NRIS (Aerial Imagery, 2005).

Figure 6-2
Stream and Riparian Reaches, Upper SFCDR Watershed
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





203 River Mile

River/Creek

Sites Included in FFS Alternatives 3+ and 4+

Sites Included in FFS Alternative 4+

LOK024 (Site ID)
SILVER CABLE MINE (Site Name[1])

Watershed Segment

City Limit

State Boundary

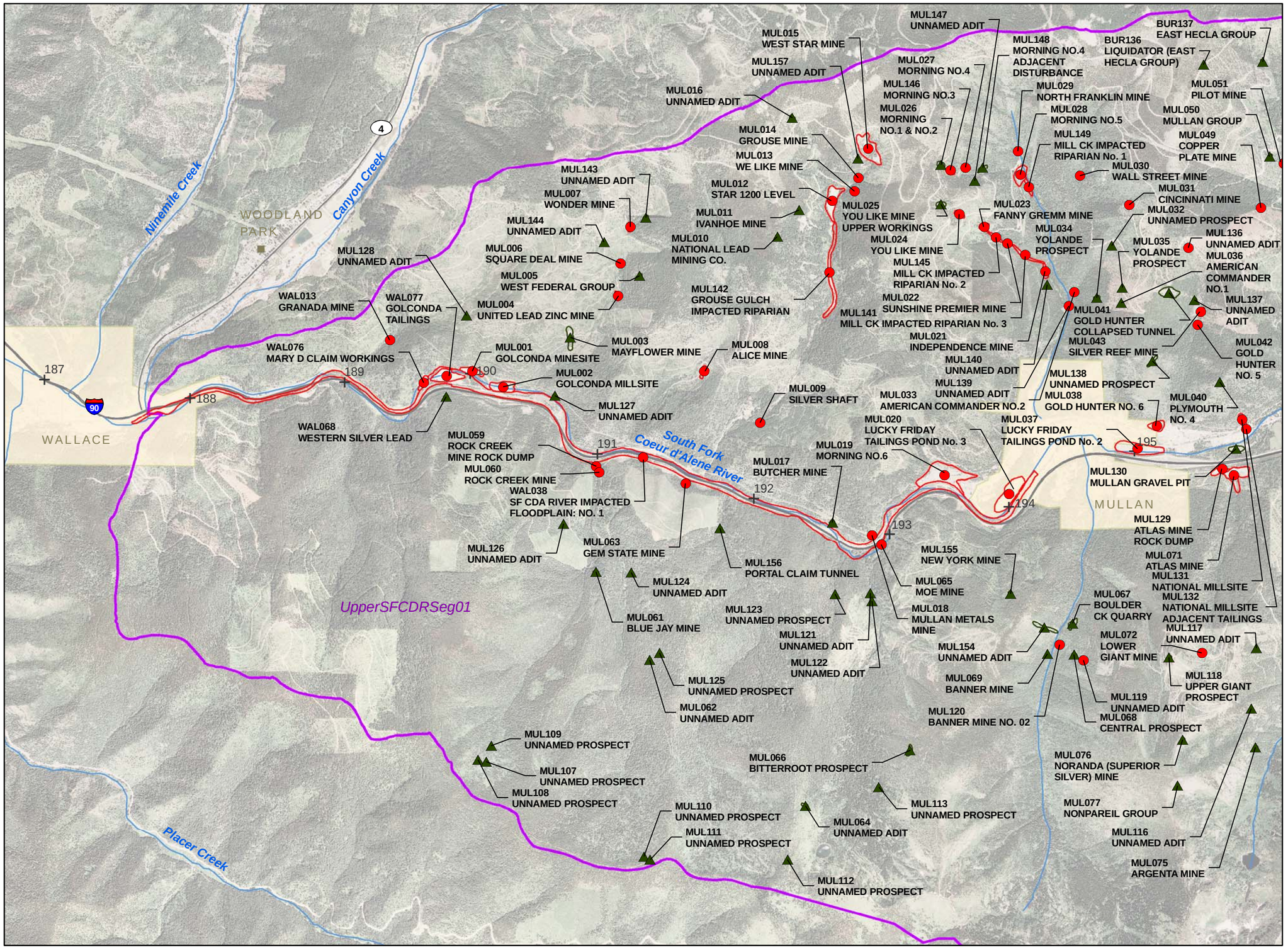
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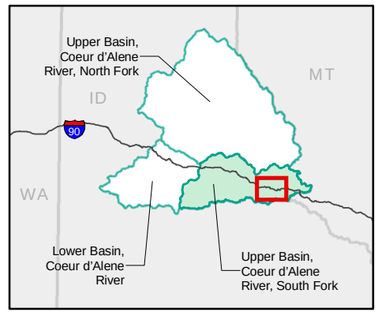
0 1,000 2,000 4,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006);
NRIS (Aerial Imagery, 2005).

Note:
The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-3
Sites Included in Focused Feasibility Study, Upper SFCDR Watershed, Eastern Portion
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





195 River Mile

River/Creek

Sites Included in FFS Alternatives 3+ and 4+

Sites Included in FFS Alternative 4+

MUL131 (Site ID)
NATIONAL MILLSITE (Site Name[1])

Watershed Segment

City Limit

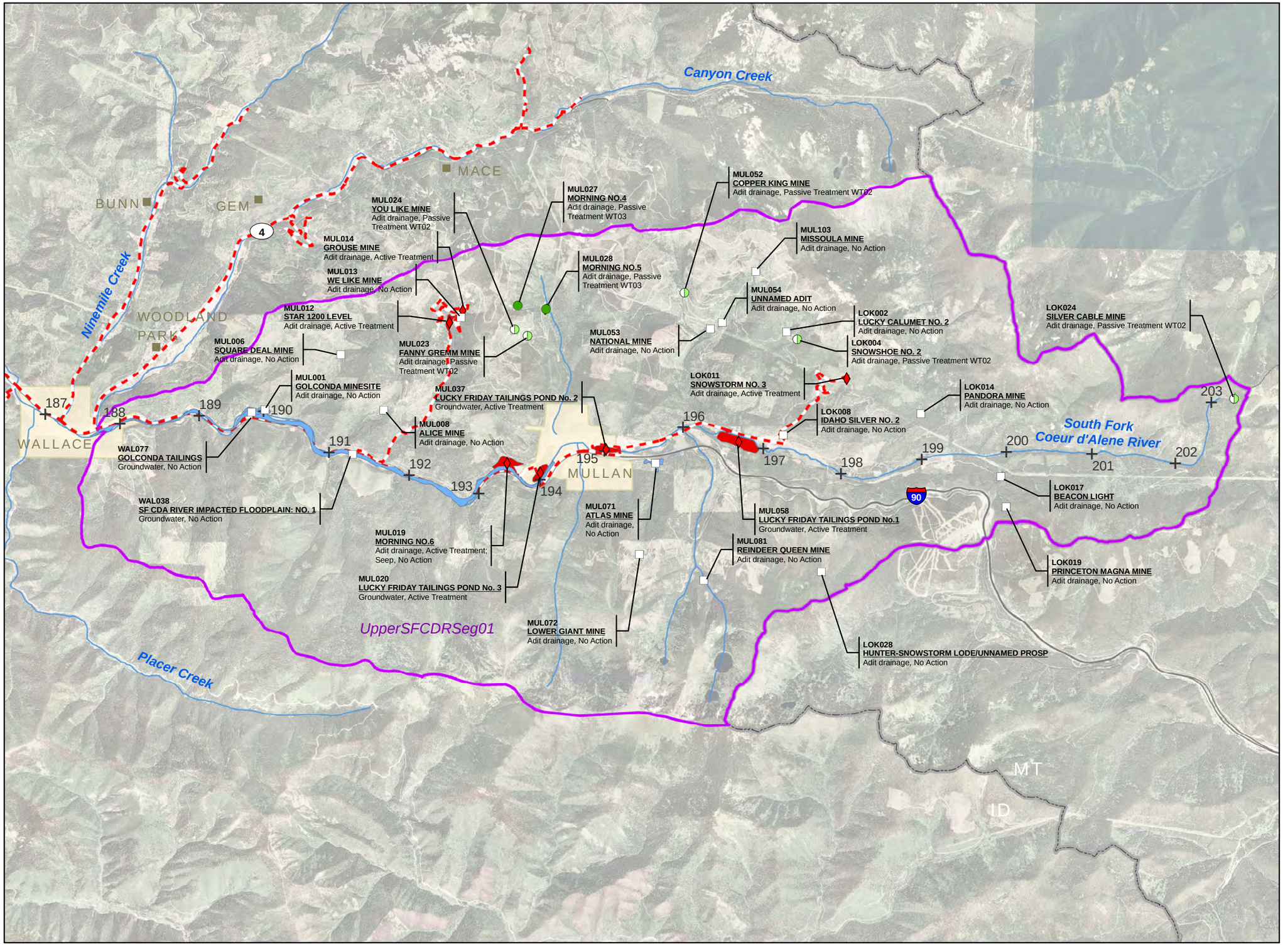
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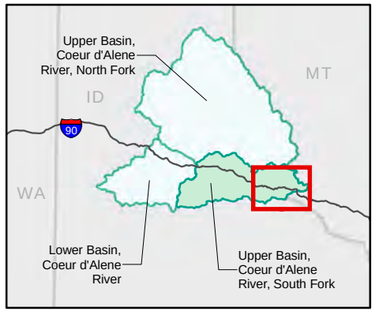
0 1,000 2,000 4,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Notes:
1. The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).
2. Site WAL077 was not included in Ecological Alternative 3 in the 2001 FS Report.

Figure 6-4
Sites Included in Focused Feasibility Study, Upper SFCDR Watershed, Western Portion
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





+203 River Mile

River/Creek

Gravity Pipeline to CTP

Water Sources Considered for Treatment

Active Treatment (WT01)

No Action

Passive Treatment (WT02)

Passive Treatment (WT03)

LOK024 (Site ID)
SILVER CABLE MINE (Site Name[1])
Adit drainage, Passive Treatment WT02 (Water Source Type, Water Treatment Typical Conceptual Design [TCD])

Watershed Segment

City Limit

State Boundary

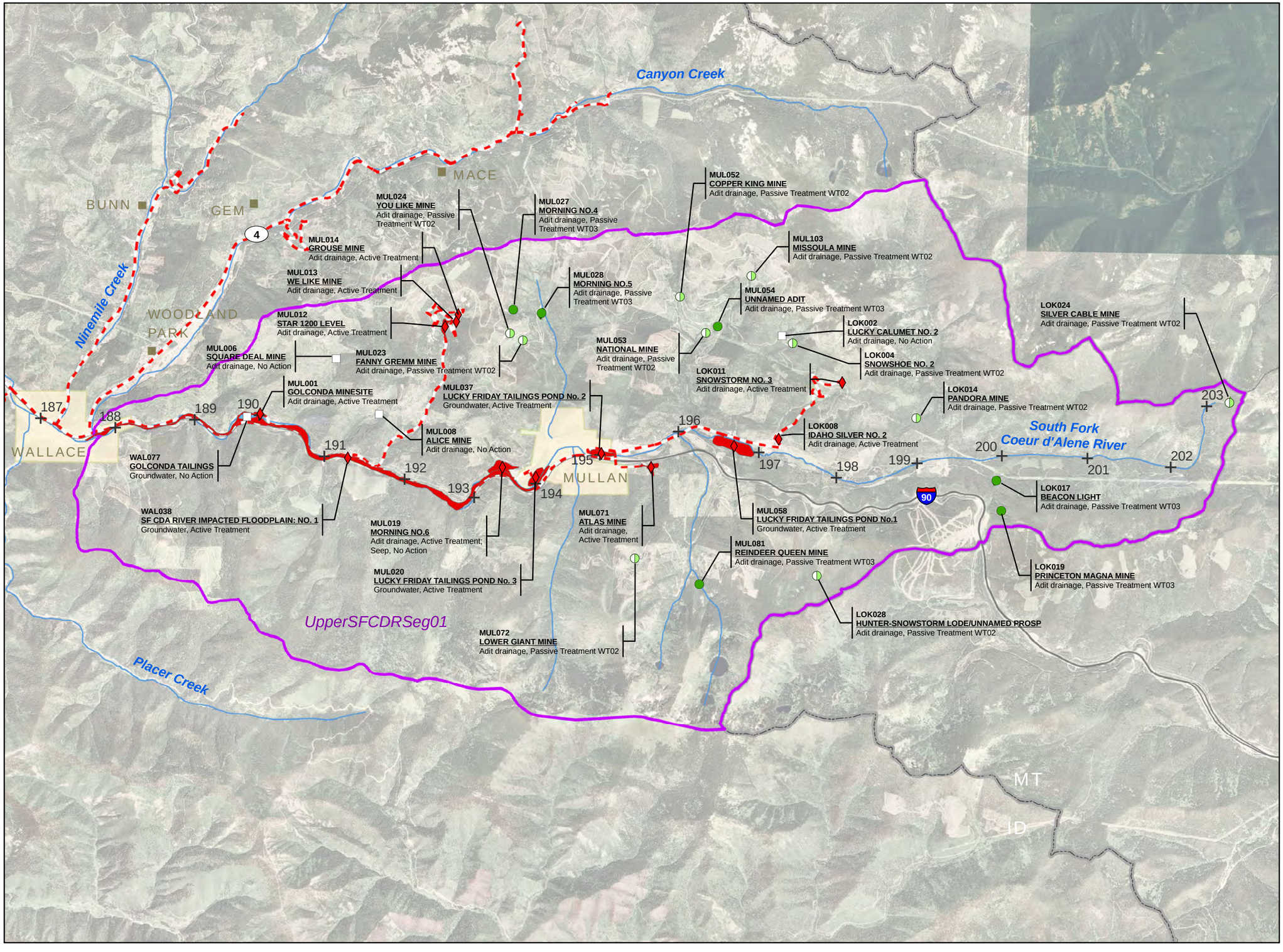
CTP = Central Treatment Plant in Kellogg, Idaho

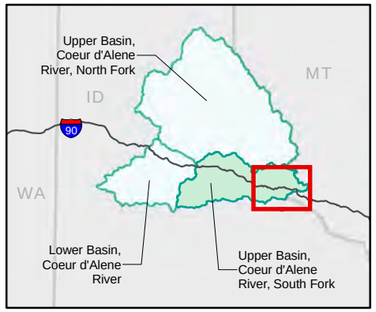
N
0 2,000 4,000 8,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006);
NRIS (Aerial Imagery, 2005).

Note:
The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-5
Water Treatment Approach, Upper SFCDR Watershed, Alternative 3+
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





203 River Mile

River/Creek

Gravity Pipeline to CTP

Water Sources Considered for Treatment

Active Treatment (WT01)

No Action

Passive Treatment (WT02)

Passive Treatment (WT03)

LOK024 (Site ID)
SILVER CABLE MINE (Site Name[1])
Adit drainage, Passive Treatment WT02 (Water Source Type, Water Treatment Typical Conceptual Design [TCD])

Watershed Segment

City Limit

State Boundary

CTP = Central Treatment Plant in Kellogg, Idaho

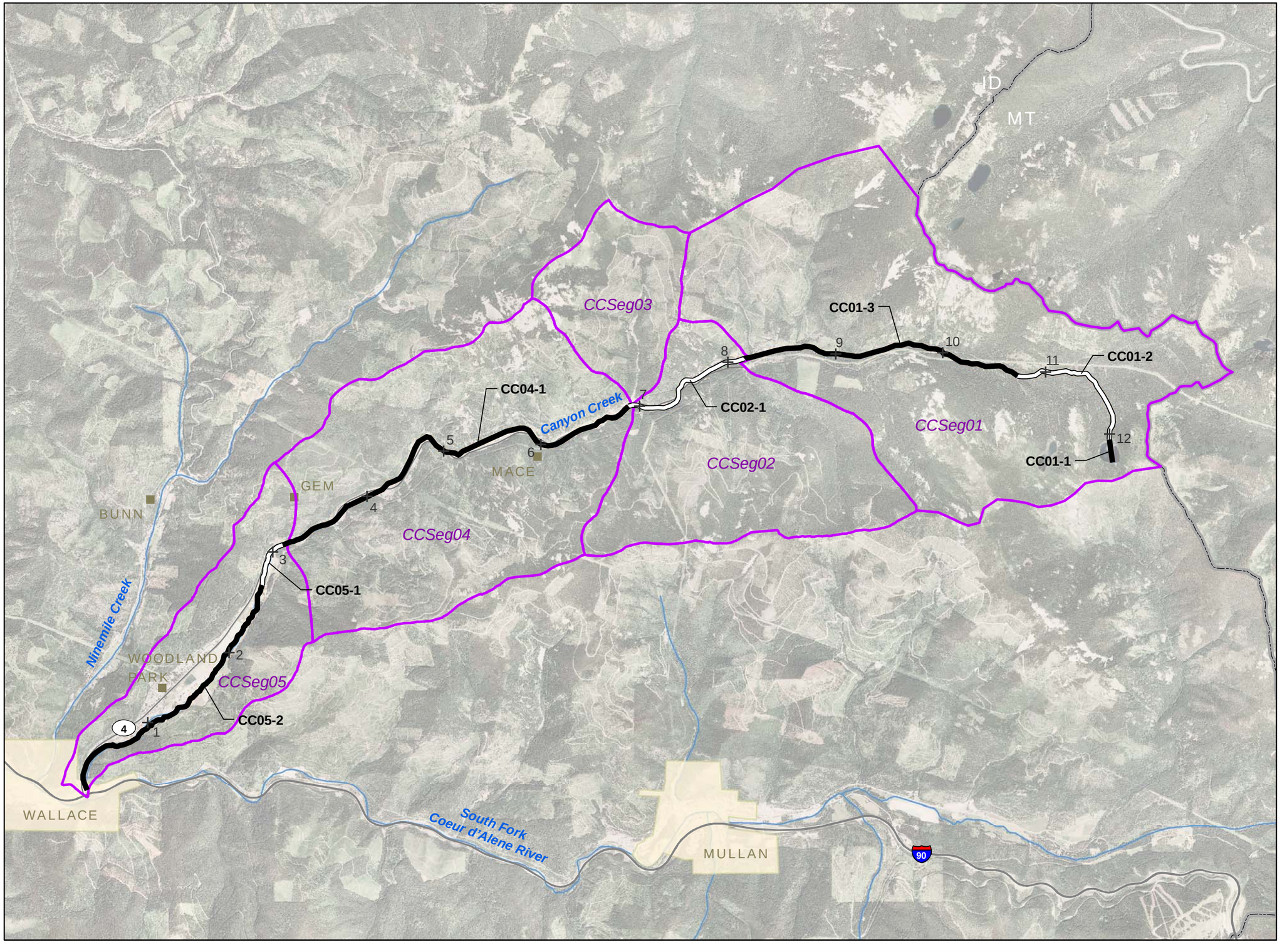
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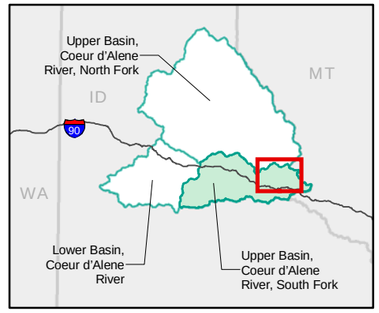
0 2,000 4,000 8,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006);
NRIS (Aerial Imagery, 2005).

Note:
The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-6
Water Treatment Approach, Upper SFCDR Watershed, Alternative 4+
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





4 River Mile

River/Creek

Stream and Riparian Reach

CC01-1 (Stream and Riparian Reach ID)

City Limit

State Boundary

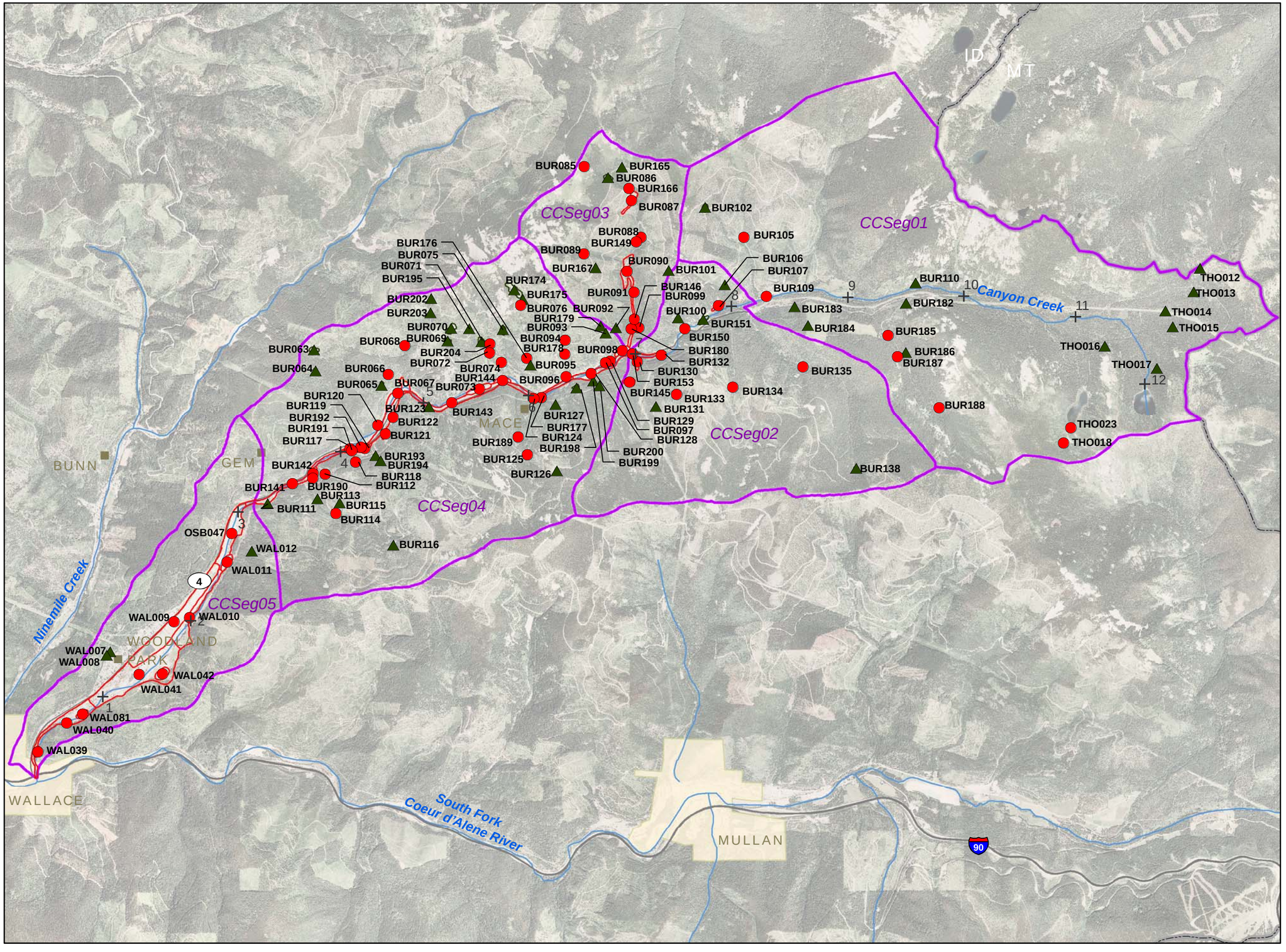
Watershed Segment

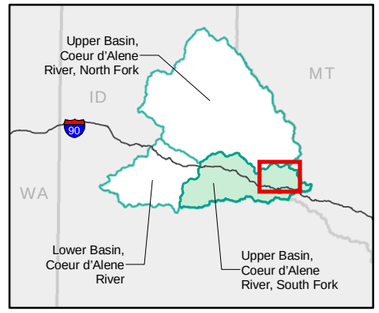
N

0 0.25 0.5 1 Miles

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Figure 6-7
Stream and Riparian Reaches, Canyon Creek Watershed
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





+4 River Mile

River/Creek

Sites Included in FFS Alternatives 3+ and 4+

Sites Included in FFS Alternative 4+

LOK024 (Site ID[1])

Watershed Segment

City Limit

State Boundary

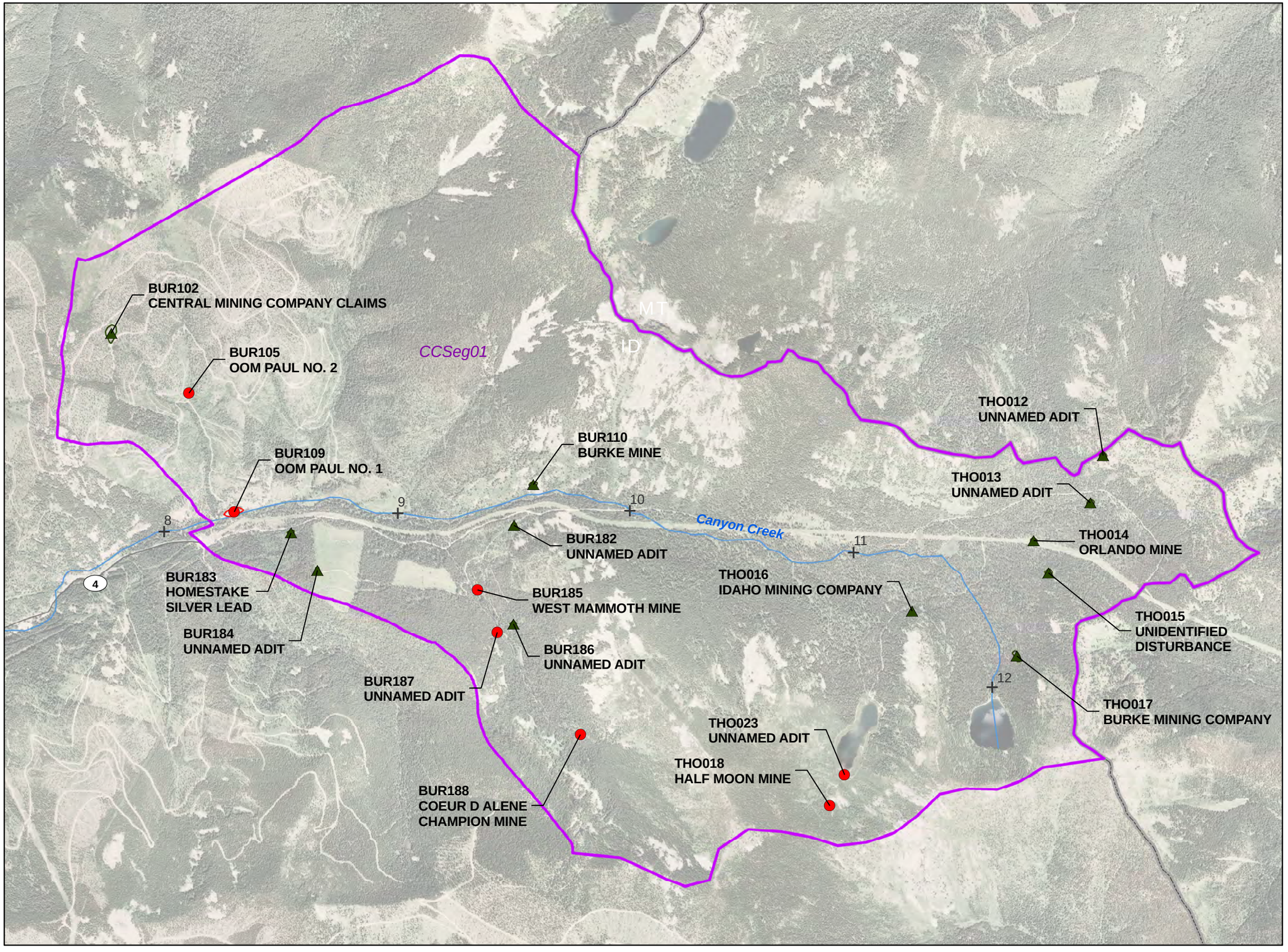
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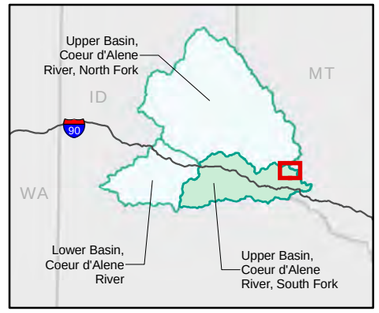
0 1,500 3,000 6,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Notes:
1. The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).
2. Sites BUR094, BUR119, BUR120, BUR124, and BUR125 were not included in Ecological Alternative 3 in the 2001 FS Report.

Figure 6-8
Sites Included in Focused Feasibility Study, Canyon Creek Watershed, Overview
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





9 River Mile

River/Creek

Sites Included in FFS Alternatives 3+ and 4+

Sites Included in FFS Alternative 4+

THO013 (Site ID)
ORLANDO MINE (Site Name[1])

Watershed Segment

State Boundary

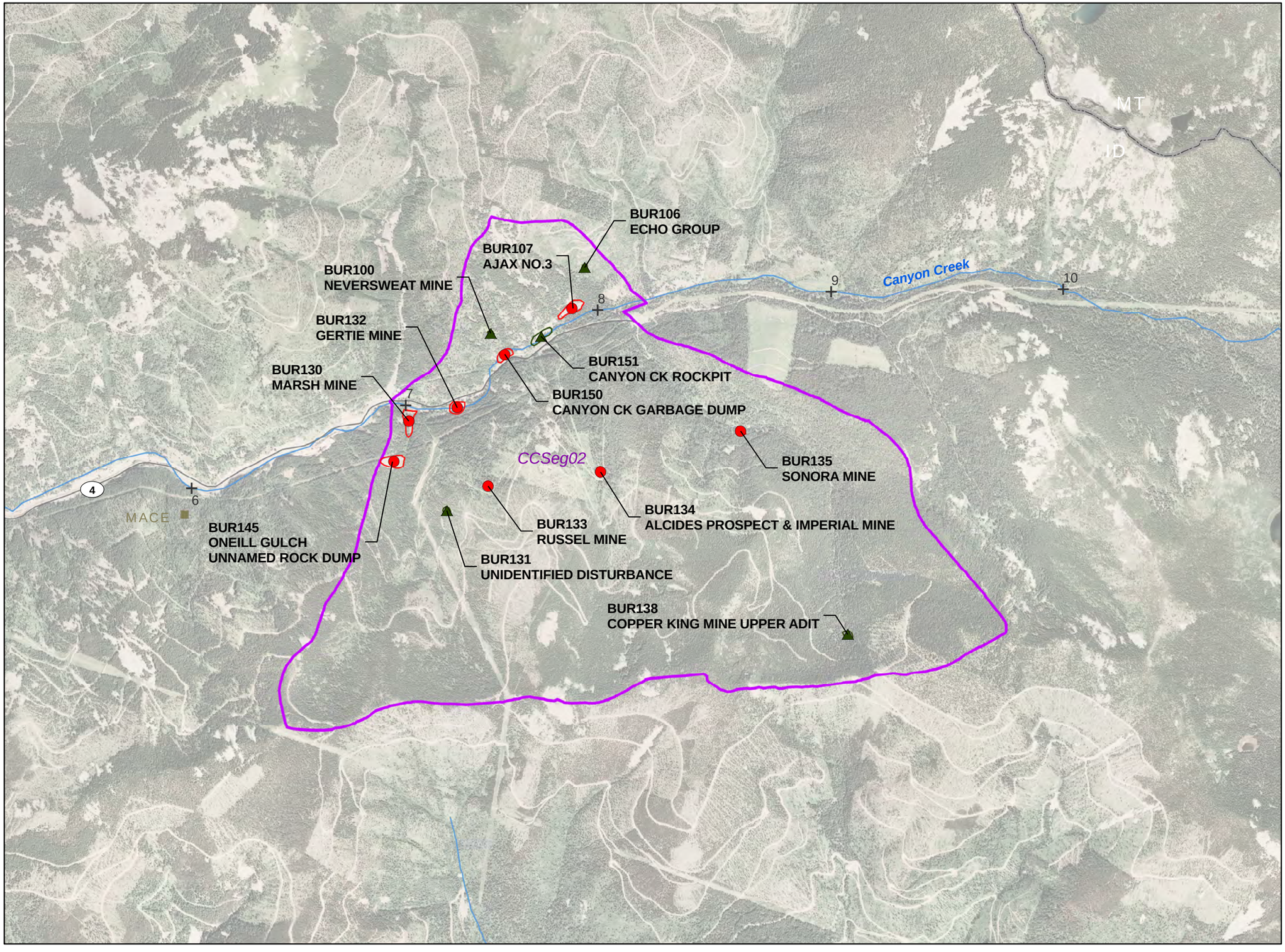
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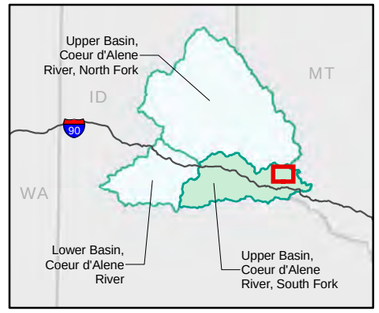
0 750 1,500 3,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note:
The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-9
Sites Included in Focused Feasibility Study, Canyon Creek Watershed, Segment 01
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





+9 River Mile

River/Creek

Sites Included in FFS Alternatives 3+ and 4+

Sites Included in FFS Alternative 4+

BUR135 (Site ID)
SONORA MINE (Site Name[1])

Watershed Segment

State Boundary

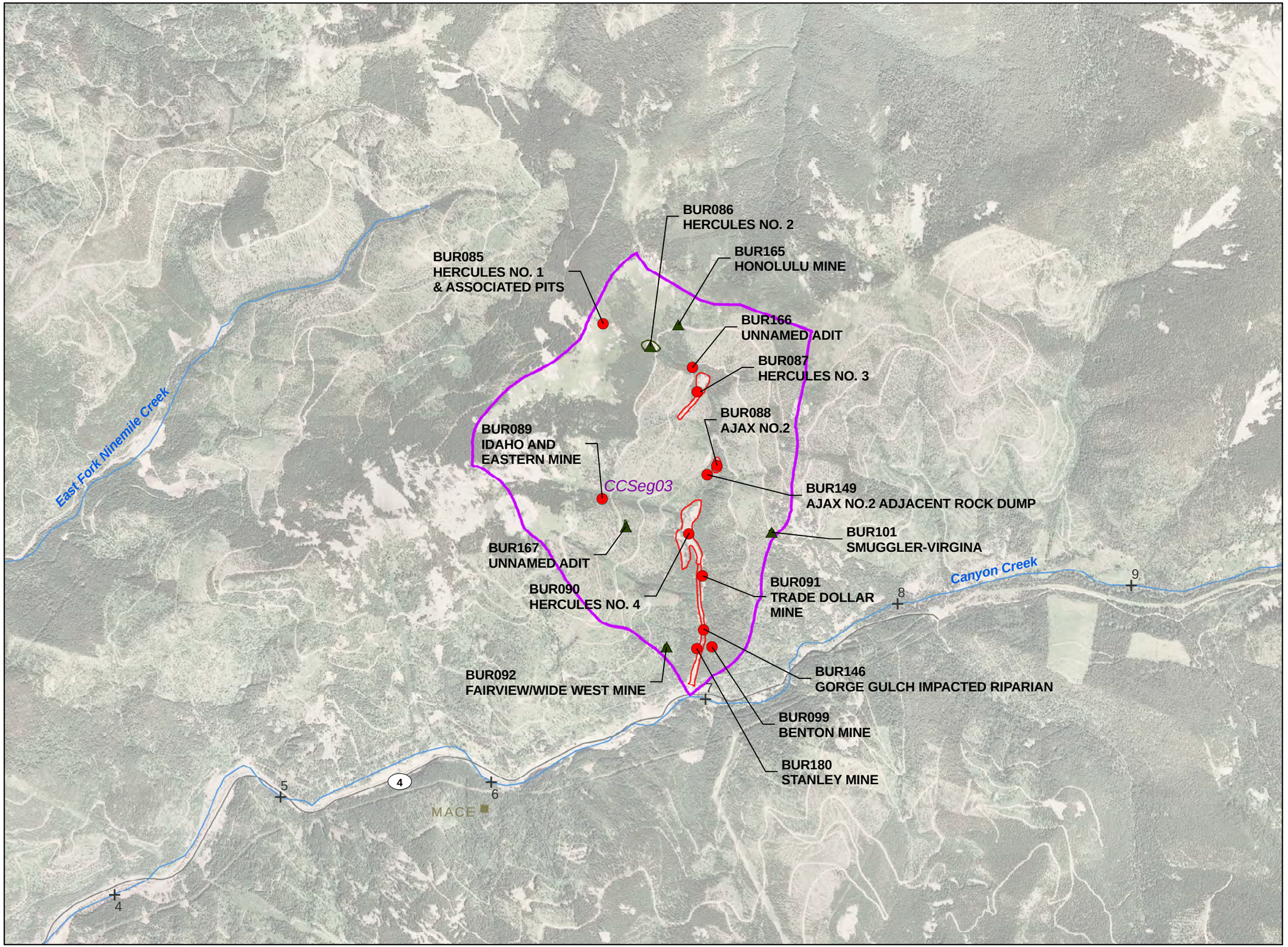
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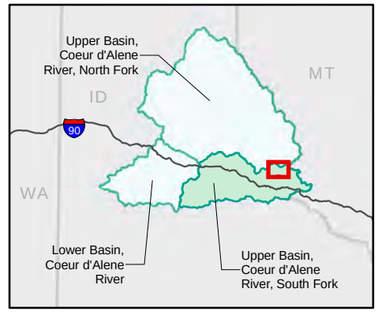
0 750 1,500 3,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note:
The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-10
Sites Included in Focused Feasibility Study, Canyon Creek Watershed, Segment 02
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





- River Mile
- River/Creek
- Sites Included in FFS Alternatives 3+ and 4+
- Sites Included in FFS Alternative 4+
- **BUR165** (Site ID)
  HONOLULU MINE (Site Name[1])
- Watershed Segment

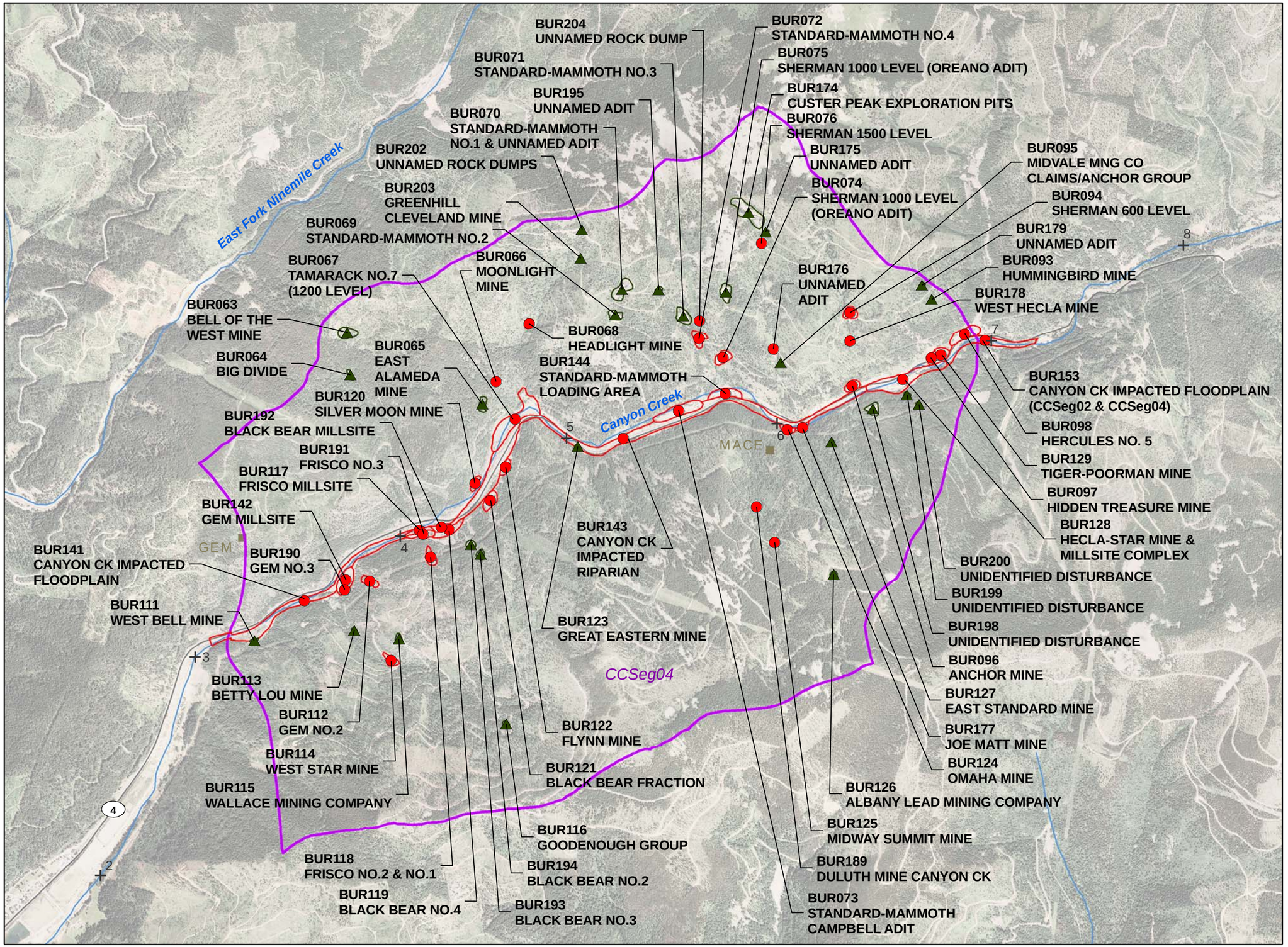
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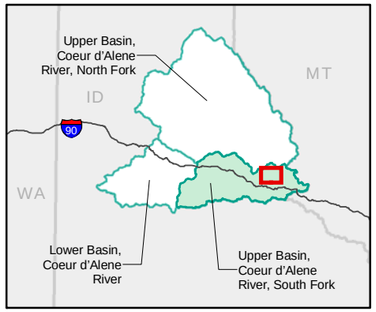
0 750 1,500 3,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note:
The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-11
Sites Included in Focused Feasibility Study, Canyon Creek Watershed, Segment 03
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





+4 River Mile

River/Creek

Sites Included in FFS Alternatives 3+ and 4+

Sites Included in FFS Alternative 4+

BUR178 (Site ID)
WEST HECLA MINE (Site Name[1])

Watershed Segment

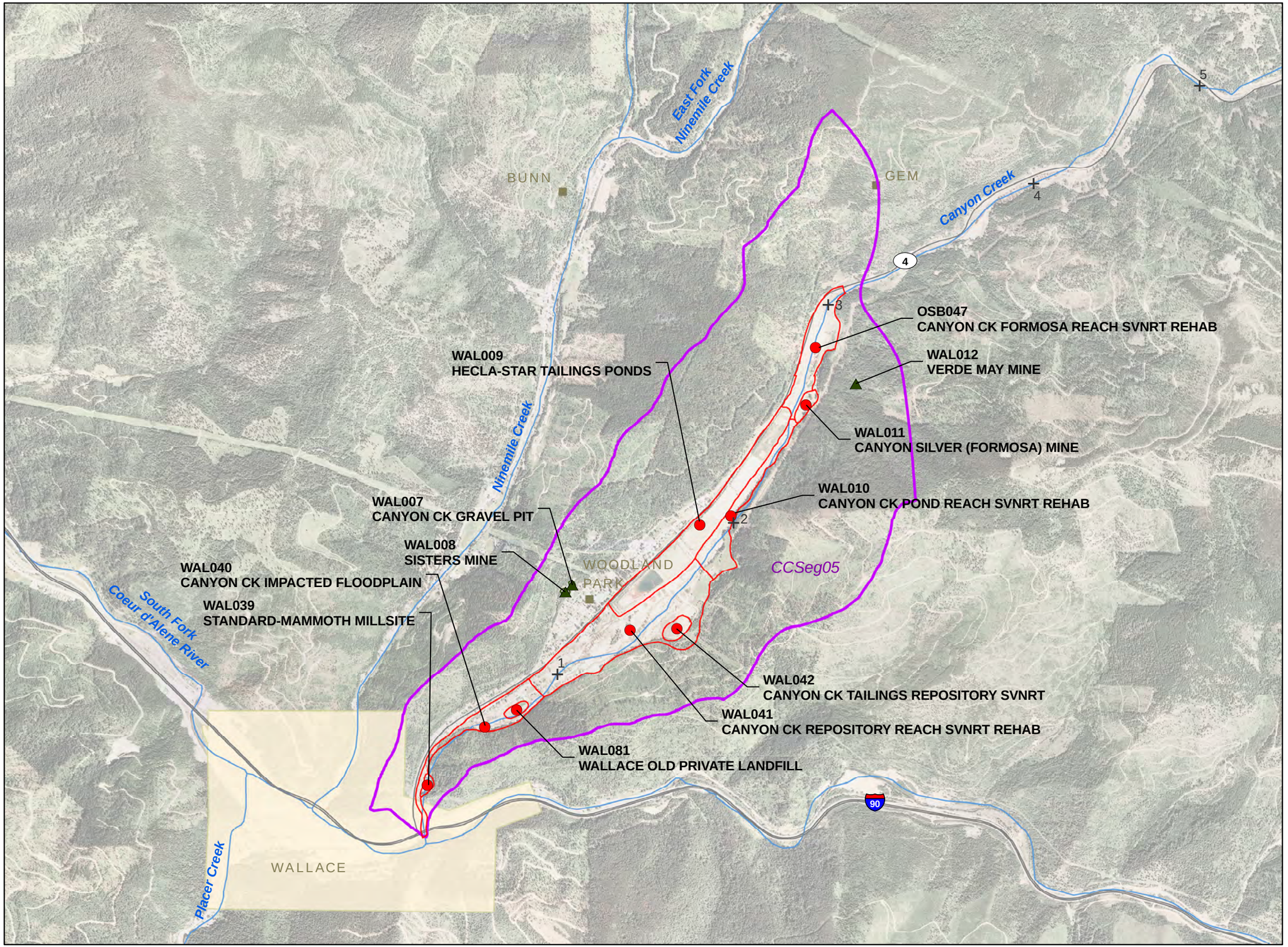
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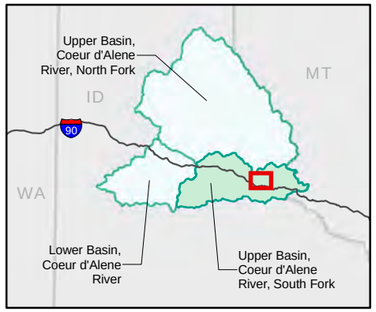
0 750 1,500 3,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Notes:
1. The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).
2. Sites BUR094, BUR119, BUR120, BUR124, and BUR125 were not included in Ecological Alternative 3 in the 2001 FS Report.

Figure 6-12
Sites Included in Focused Feasibility Study, Canyon Creek Watershed, Segment 04
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





+4 River Mile

River/Creek

Sites Included in FFS Alternatives 3+ and 4+

Sites Included in FFS Alternative 4+

WAL012 (Site ID)
VERDE MAY MINE (Site Name[1])

Watershed Segment

City Limit

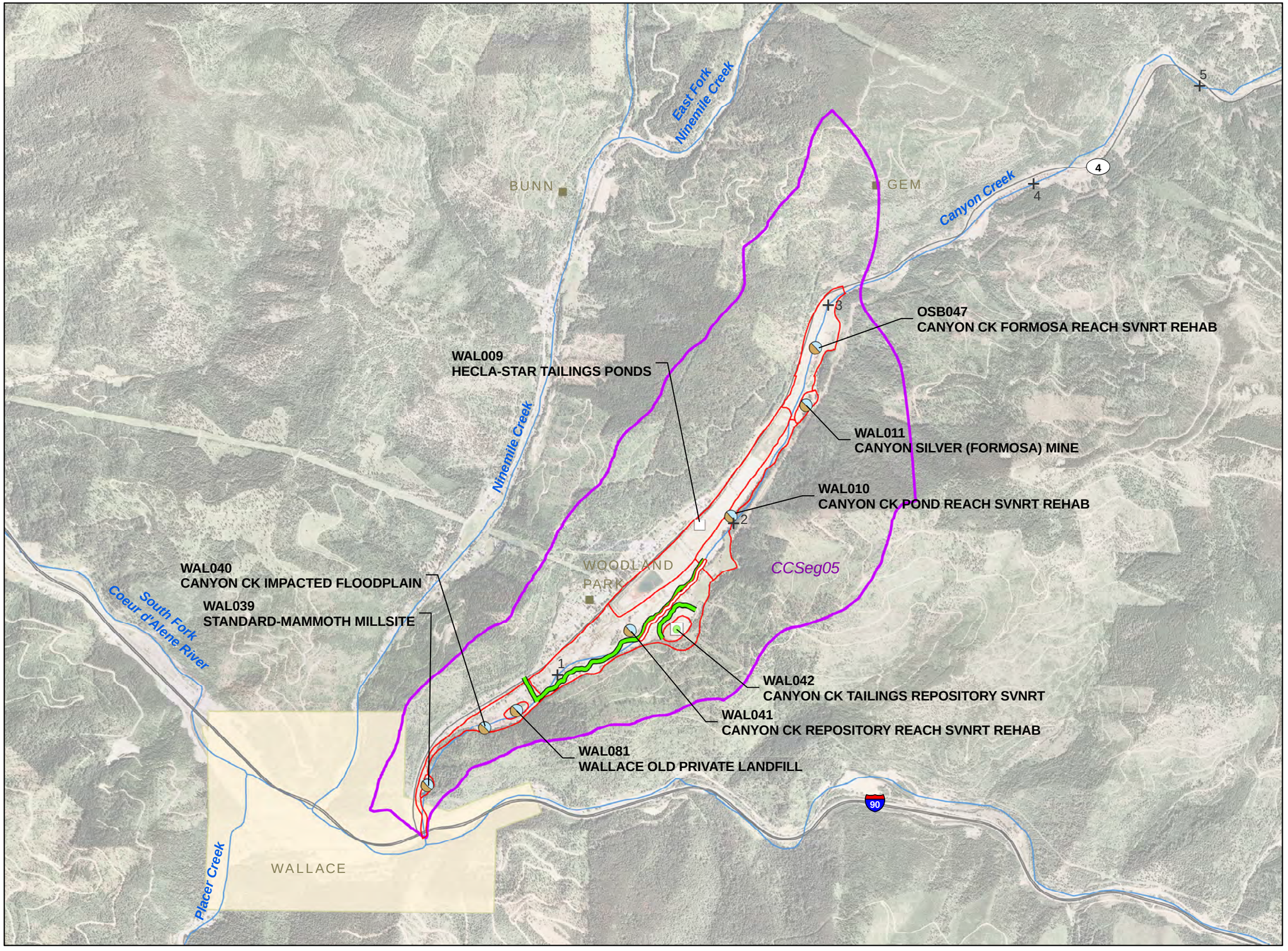
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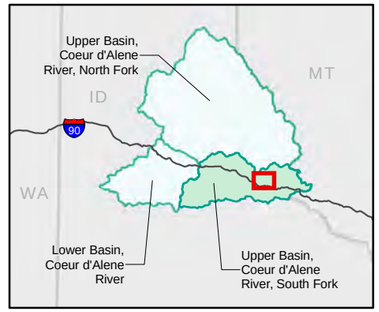
0 750 1,500 3,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note:
The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-13
Sites Included in Focused Feasibility Study, Canyon Creek Watershed, Segment 05
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





4 River Mile

Remedial Action Types:

- Cap
- Cap/Hydraulic Isolation
- Excavation Repository
- Hydraulic Isolation

WAL012 (Site ID)
VERDE MAY MINE (Site Name[1])

- River/Creek
- French Drain
- Stream Liner
- Sites Included in FFS Alternatives 3+ and 4+
- Watershed Segment
- City Limit

N

0 750 1,500 3,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note:
The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-14
Woodland Park Components of Alternative 3+
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

BUR085
HERCULES NO. 1 & ASSOCIATED PITS
Adit drainage, No Action

BUR088
AJAX NO.2
Adit drainage, Active Treatment

BUR087
HERCULES NO. 3
Adit drainage, No Action

BUR099
BENTON MINE
Adit drainage, Active Treatment

BUR107
AJAX NO.3
Adit drainage, Active Treatment; Seep, No Action

BUR091
TRADE DOLLAR MINE
Adit drainage, No Action

BUR109
OOM PAUL NO. 1
Adit drainage, No Action

BUR097
HIDDEN TREASURE MINE
Adit drainage, Active Treatment

BUR076
SHERMAN 1500 LEVEL
Adit drainage, No Action

BUR128
HECLA-STAR MINE & MILLSITE COMPLEX
Adit drainage, No Action

BUR073
STANDARD-MAMMOTH CAMPBELL ADIT
Adit drainage, No Action

BUR185
WEST MAMMOTH MINE
Adit drainage, No Action

BUR067
TAMARACK NO.7 (1200 LEVEL)
Adit drainage, Active Treatment

BUR132
GERTIE MINE
Adit drainage, No Action

BUR188
COEUR D ALENE CHAMPION MINE
(Champion Gold & Silver)
Adit drainage, No Action

BUR190
GEM NO.3
Adit drainage, Active Treatment

BUR098
HERCULES NO. 5
Adit drainage, Active Treatment

BUR134
ALCIDES PROSPECT & IMPERIAL MINE
Adit drainage, No Action

BUR129
TIGER-POORMAN MINE
Adit drainage, Active Treatment

BUR121
BLACK BEAR FRACTION
Adit drainage, Active Treatment

BUR096
ANCHOR MINE
Adit drainage, Active Treatment

THO018
HALF MOON MINE
(Blue Ribbon Group)
Adit drainage, No Action

BUR112
GEM NO.2
Adit drainage, Active Treatment

BUR124
OMAHA MINE
Adit drainage, No Action

BUR114
WEST STAR MINE
Adit drainage, No Action

WAL009
HECLA-STAR TAILINGS PONDS
Groundwater, Active Treatment; Seep, No Action

OSB047
CANYON CK FORMOSA REACH SVNRT REHAB
Groundwater, Active Treatment

WAL011
CANYON SILVER (FORMOSA) MINE
Adit drainage, No Action

WAL010
CANYON CK POND REACH SVNRT REHAB
Groundwater, Active Treatment

WAL041
CANYON CK REPOSITORY REACH SVNRT REHAB
Groundwater, Active Treatment; Seep, No Action

WAL040
CANYON CK IMPACTED FLOODPLAIN
Groundwater, No Action; Surface Water, No Action

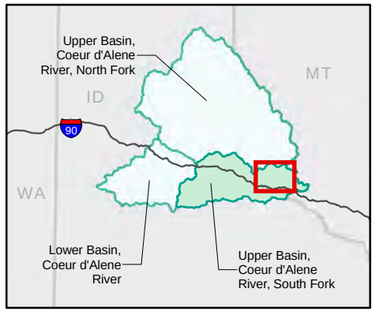
CCSeg01
CCSeg02
CCSeg03
CCSeg04
CCSeg05

Canyon Creek
Ninemile Creek
South Fork Coeur d'Alene River

MACE
BUNN
GEM
WOODLAND PARK
WALLACE
MULLAN

MT
ID

1 2 3 4 5 6 7 8 9 10 11 12



+4 River Mile

River/Creek

Gravity Pipeline to CTP

Water Sources Considered for Treatment

Active Treatment

No Action

BUR185 (Site ID)
WEST MAMMOTH MINE (Site Name[1])
Adit drainage, No Action (Water Source Type, Water Treatment Typical Conceptual Design [TCD])

Watershed Segment

City Limit

State Boundary

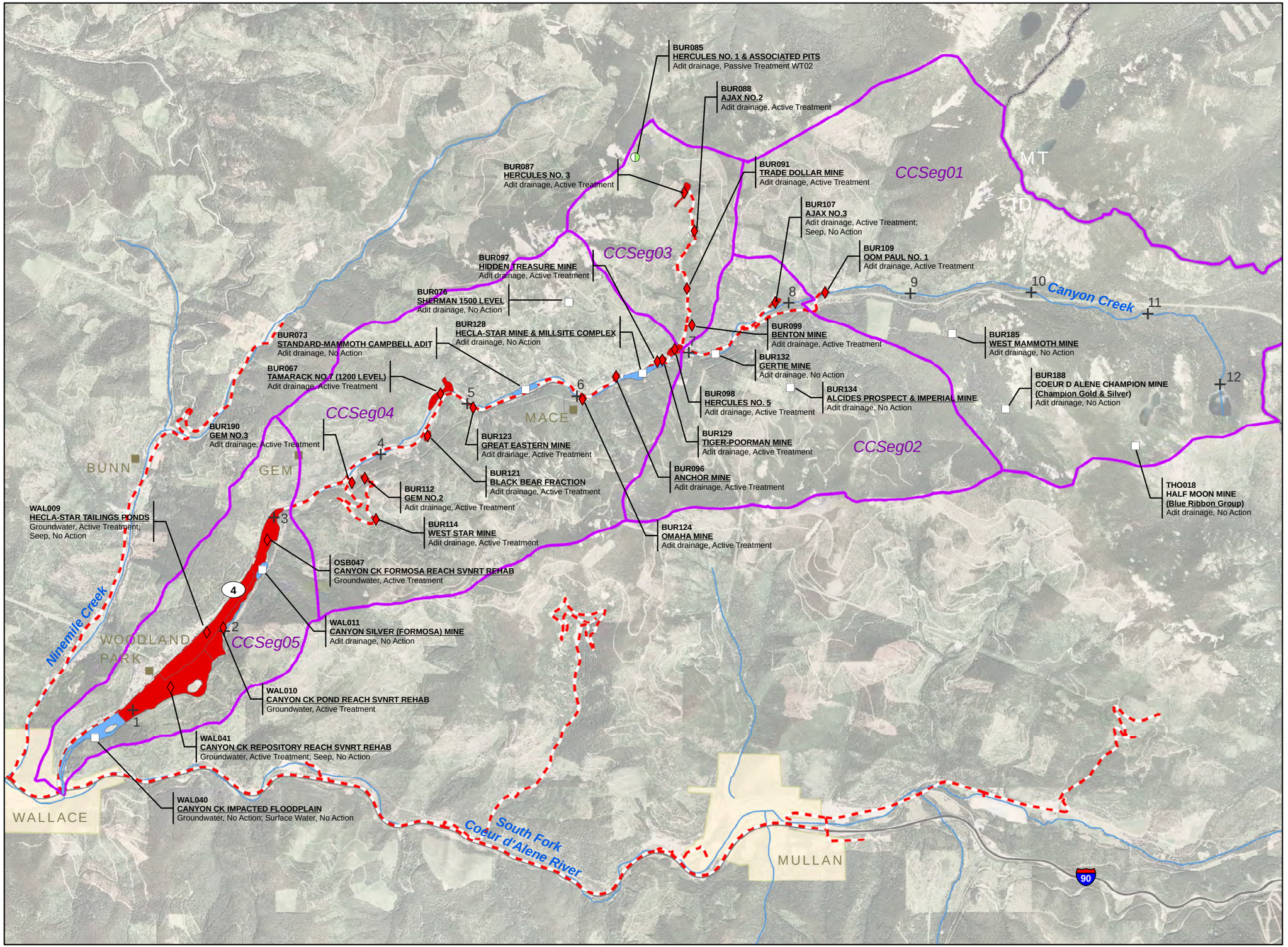
CTP = Central Treatment Plant in Kellogg, Idaho

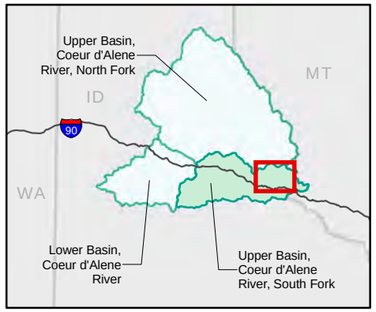
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0 1,500 3,000 6,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note:
The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-15
Water Treatment Approach, Canyon Creek Watershed, Alternative 3+
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





+4 River Mile

River/Creek

Gravity Pipeline to CTP

Water Sources Considered for Treatment

Active Treatment

No Action

Passive Treatment WT02

BUR185 (Site ID)
WEST MAMMOTH MINE (Site Name[1])
Adit drainage, No Action (Water Source Type, Water Treatment Typical Conceptual Design [TCD])

Watershed Segment

City Limit

State Boundary

CTP = Central Treatment Plant in Kellogg, Idaho

N

0 1,500 3,000 6,000 Feet

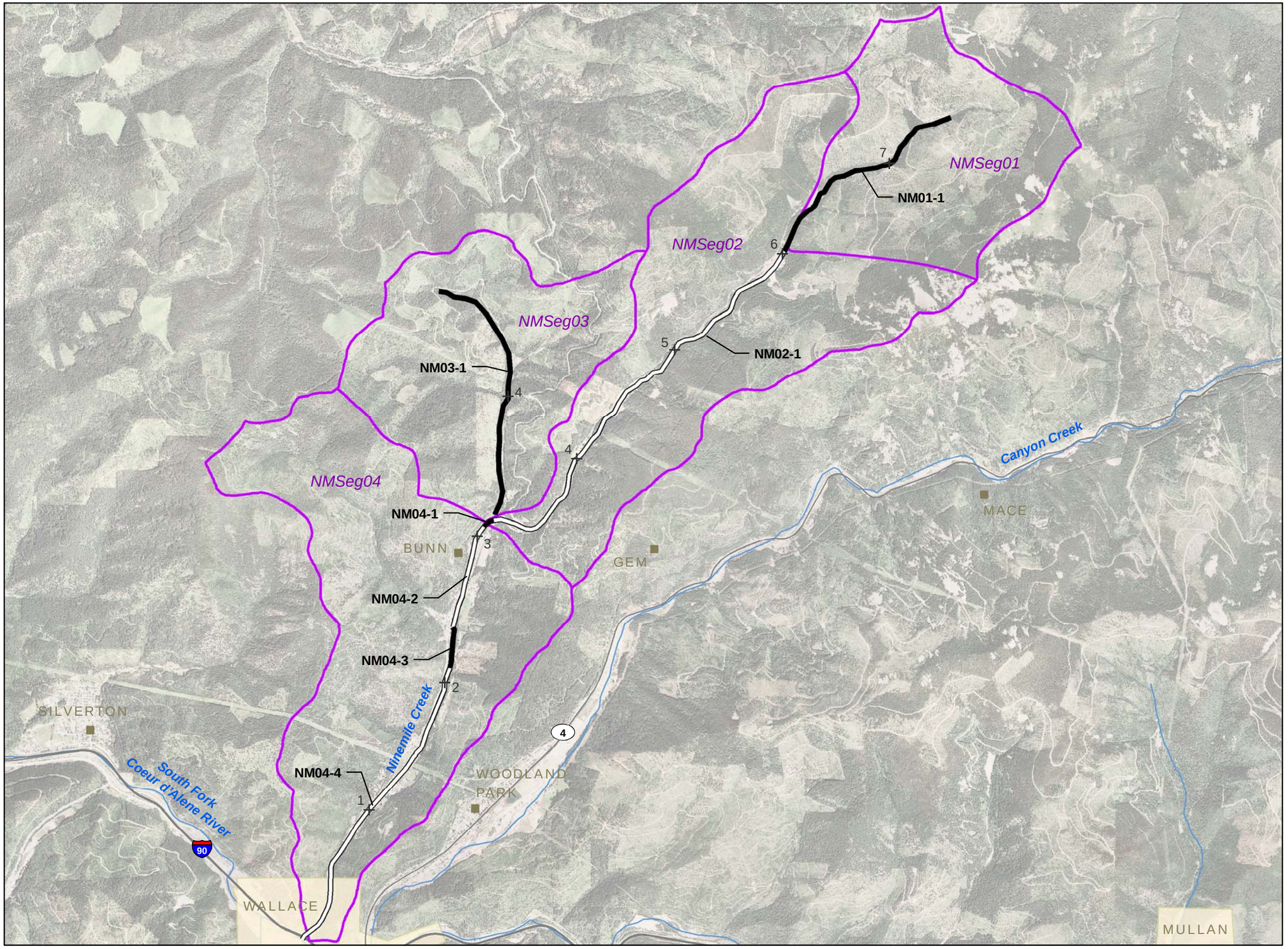
Base Map Data:
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ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

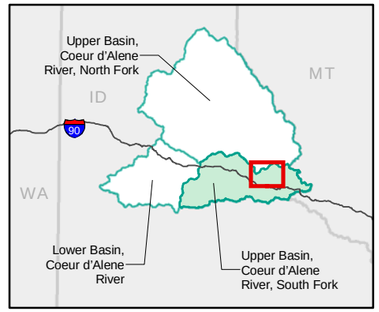
Note:
The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-16
Water Treatment Approach, Canyon Creek Watershed, Alternative 4+
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

EPA

\\CASTAIC\PROJ\EPA\CDABASIN_382081\GIS\MAPFILES\FFS\SECTION6\FFS_SEC6_FIG06-16_CC_ALT4.MXD JCARR3 6/23/2010 09:19:25





4 River Mile

River/Creek

Stream and Riparian Reach

NM01-1 (Stream and Riparian Reach ID)

Watershed Segment

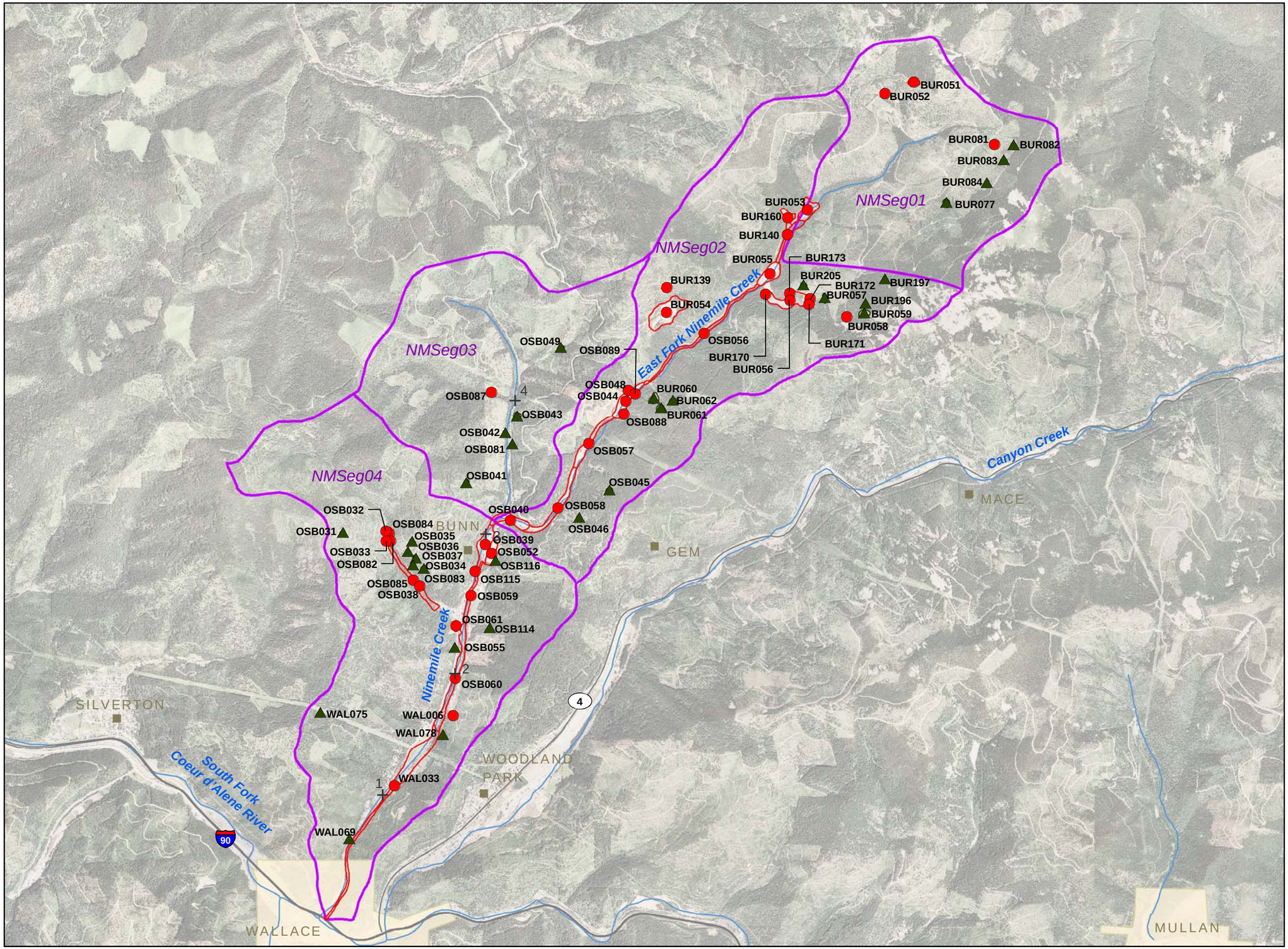
City Limit

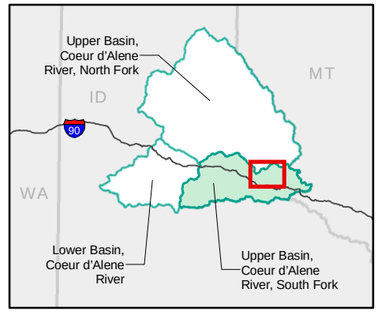
N

0 0.25 0.5 1 Miles

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Figure 6-17
Stream and Riparian Reaches, Ninemile Creek Watershed
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





+4 River Mile

River/Creek

Sites Included in FFS Alternatives 3+ and 4+

Sites Included in FFS Alternative 4+

BUR077 (Site ID[1])

Watershed Segment

City Limit

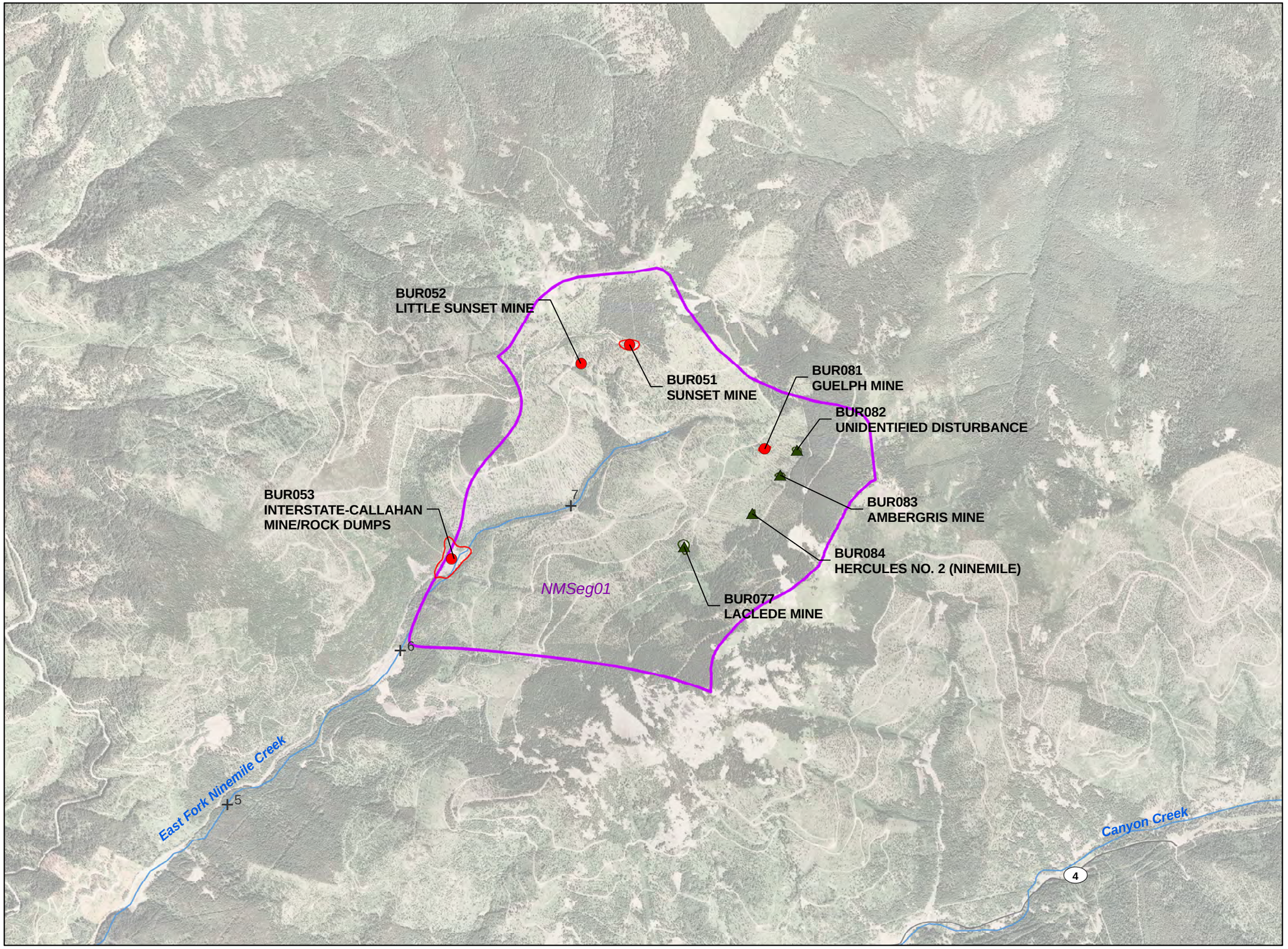
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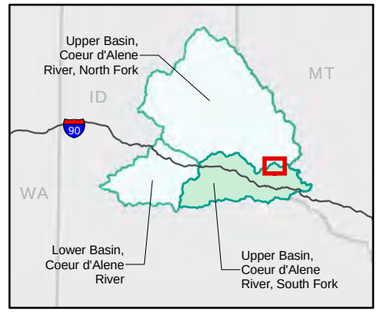
0 1,500 3,000 6,000 Feet

Base Map Data:
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ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Notes:
1. The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).
2. Site OSB048 was not included in Ecological Alternative 3 in the 2001 FS Report, sites BUR139 and BUR160 were not included in Ecological Alternative 4 in the 2001 FS Report, and sites OSB084 and OSB085 were not included in Ecological Alternative 3 or 4 in the 2001 FS Report.

Figure 6-18
Sites Included in Focused Feasibility Study, Ninemile Creek Watershed, Overview
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





+6 River Mile

River/Creek

Sites Included in FFS Alternatives 3+ and 4+

Sites Included in FFS Alternative 4+

BUR081 (Site ID)
GUELPH MINE (Site Name[1])

Watershed Segment

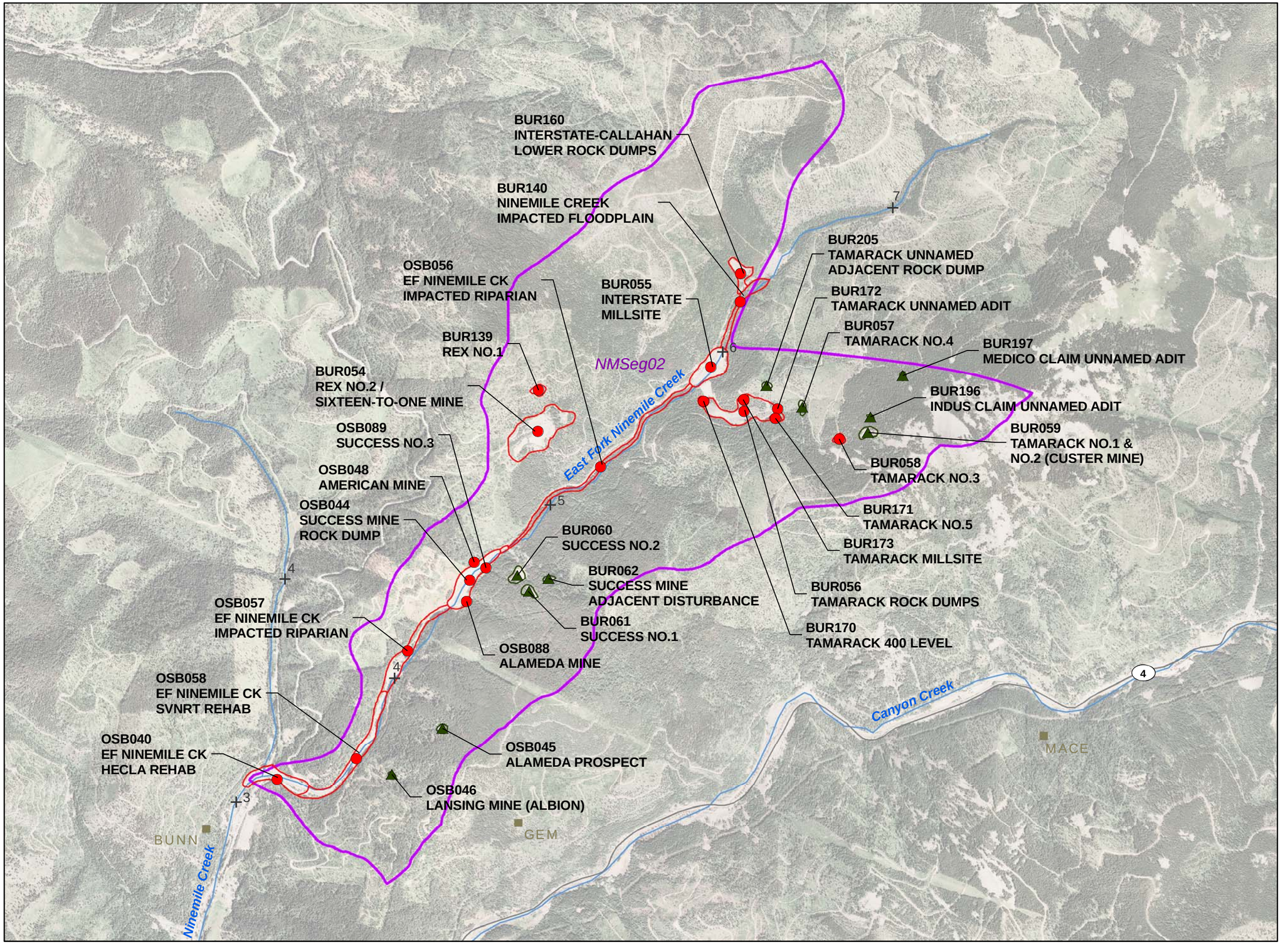
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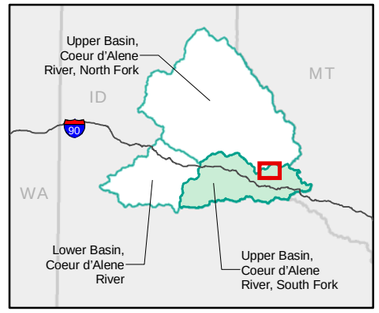
0 750 1,500 3,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note:
The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-19
Sites Included in Focused Feasibility Study, Ninemile Creek Watershed, Segment 01
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





+6 River Mile

River/Creek

Sites Included in FFS Alternatives 3+ and 4+

Sites Included in FFS Alternative 4+

BUR173 (Site ID)
TAMARACK MILLSITE (Site Name[1])

Watershed Segment

N

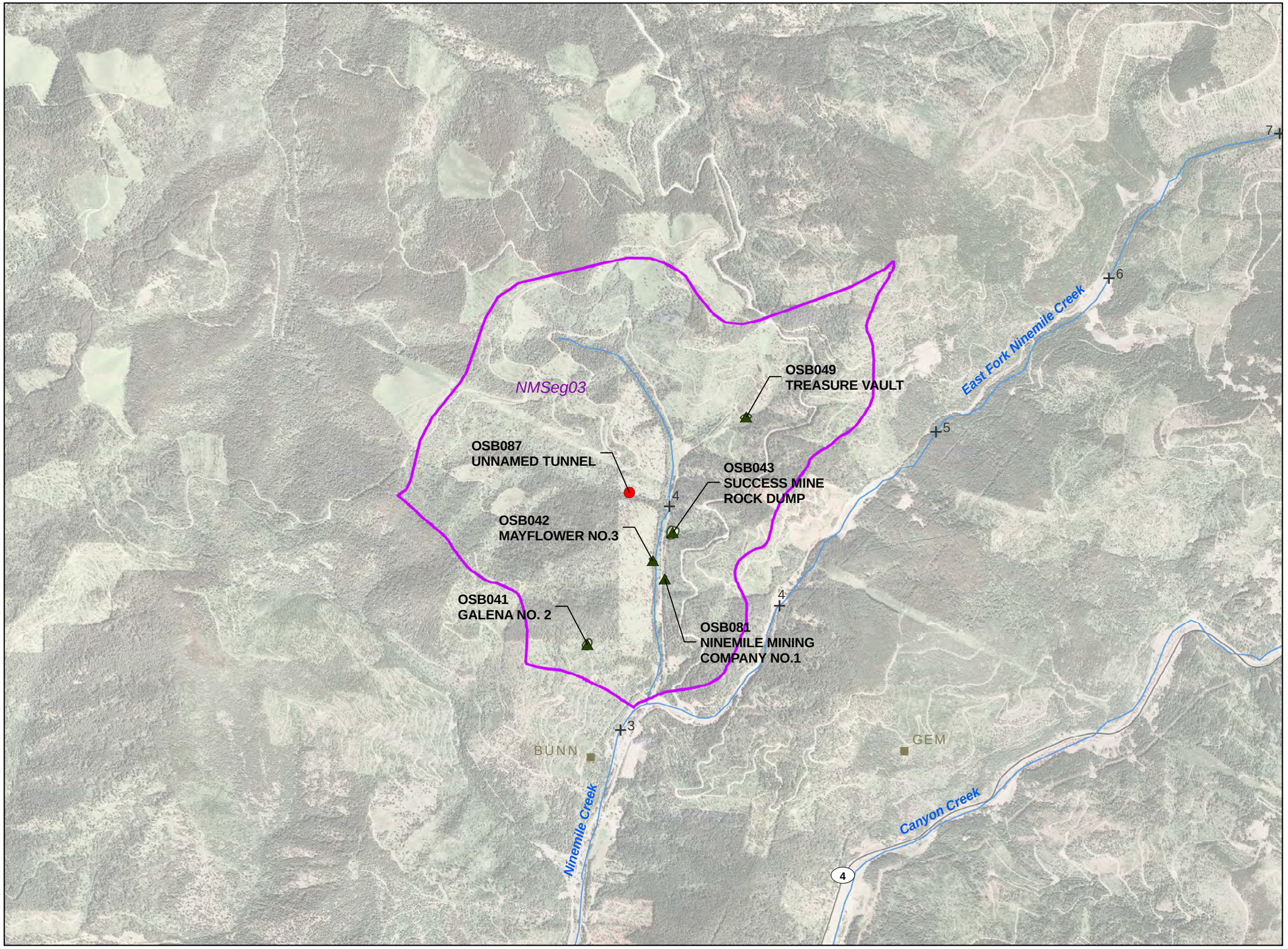
0 750 1,500 3,000 Feet

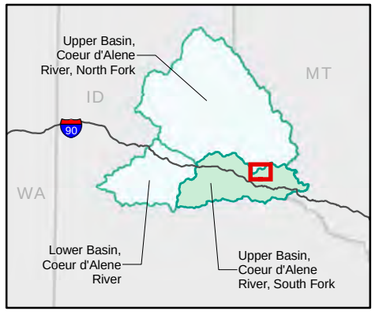
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ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Notes:
1. The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).
2. Site OSB048 was not included in Ecological Alternative 3 in the 2001 FS Report and sites BUR139 and BUR160 were not included in Ecological Alternative 4 in the 2001 FS Report.

Figure 6-20
Sites Included in Focused Feasibility Study, Ninemile Creek Watershed, Segment 02
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

EPA





4 River Mile

River/Creek

Sites Included in FFS Alternatives 3+ and 4+

Sites Included in FFS Alternative 4+

OSB049 (Site ID)
TREASURE VAULT (Site Name[1])

Watershed Segment

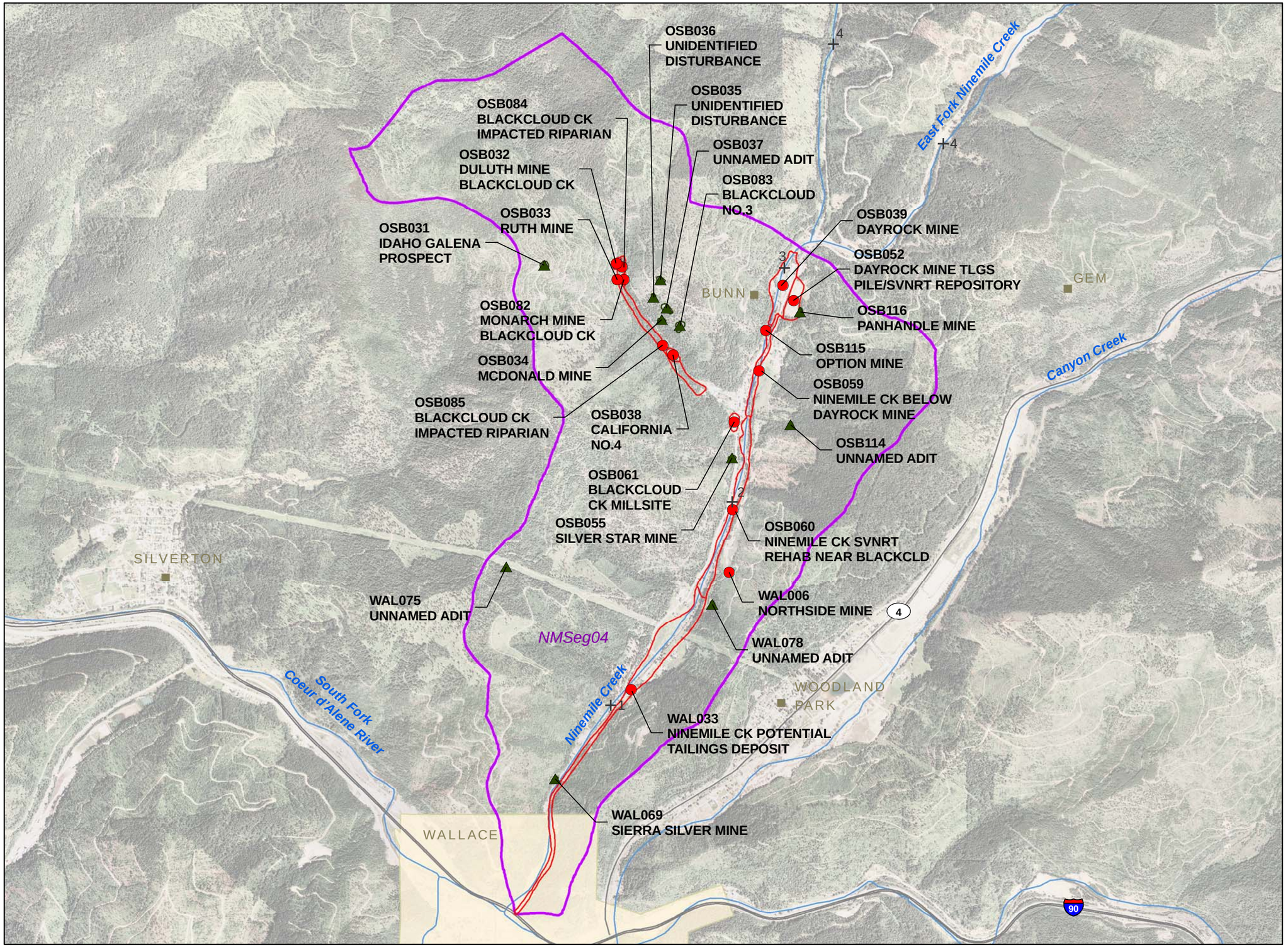
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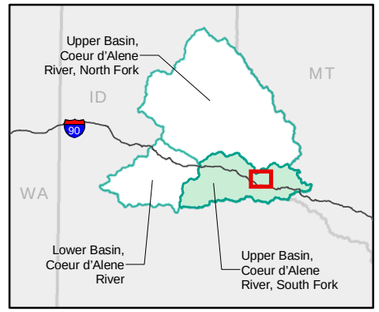
0 750 1,500 3,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note:
The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-21
Sites Included in Focused Feasibility Study, Ninemile Creek Watershed, Segment 03
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





4 River Mile

River/Creek

Sites Included in FFS Alternatives 3+ and 4+

Sites Included in FFS Alternative 4+

OSB039 (Site ID)
DAYROCK MINE (Site Name[1])

Watershed Segment

City Limit

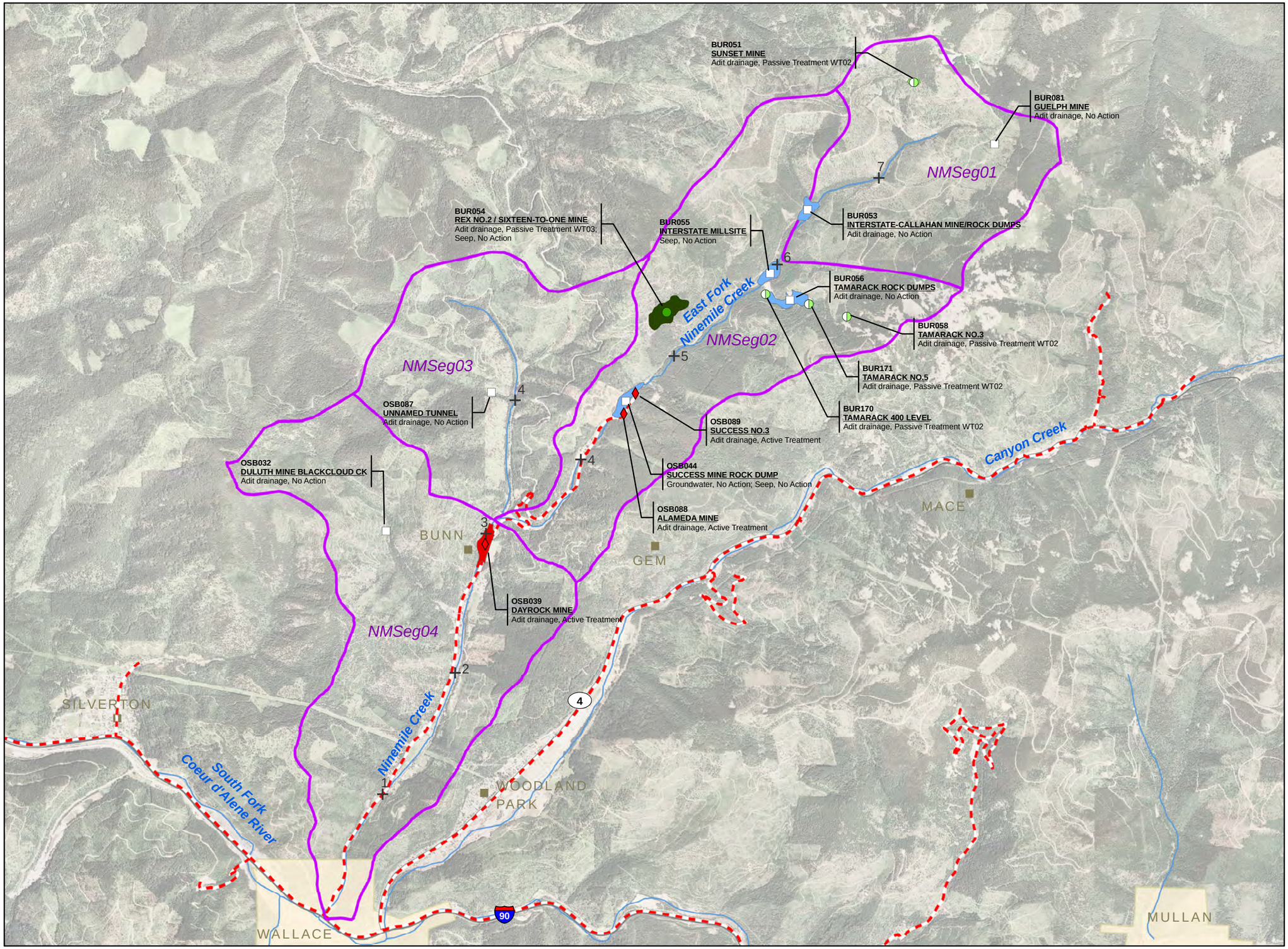
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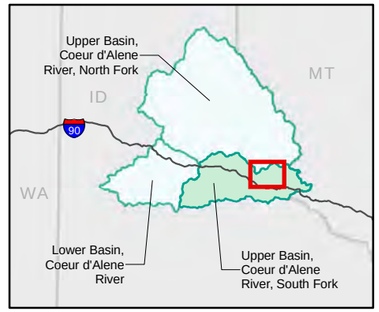
0 750 1,500 3,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Notes:
1. The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).
2. Sites OSB084 and OSB085 were not included in Ecological Alternative 3 or 4 in the 2001 FS Report.

Figure 6-22
Sites Included in Focused Feasibility Study, Ninemile Creek Watershed, Segment 04
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





+4 River Mile

River/Creek

Gravity Pipeline to CTP

Water Sources Considered for Treatment

Active Treatment (WT01)

No Action

Passive Treatment (WT02)

Passive Treatment (WT03)

BUR058 (Site ID)
TAMARACK NO. 3 (Site Name[1])
Adit drainage, Passive Treatment WT02 (Water Source Type, Water Treatment Typical Conceptual Design [TCD])

Watershed Segment

City Limit

CTP = Central Treatment Plant in Kellogg, Idaho

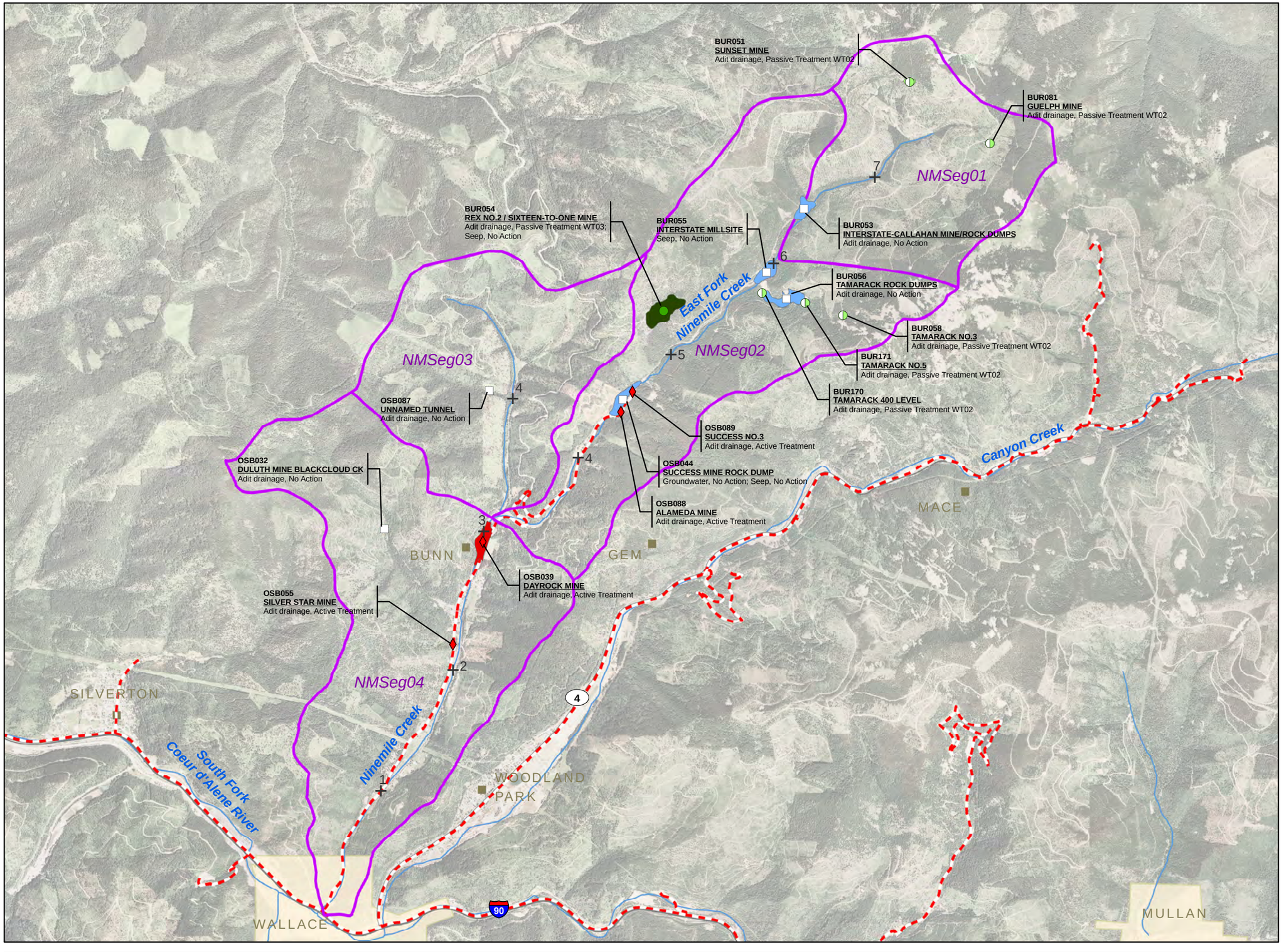
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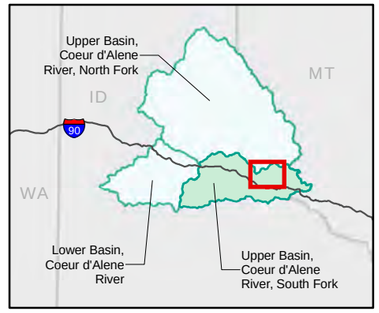
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Base Map Data:
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ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note:
The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-23
Water Treatment Approach, Ninemile Creek Watershed, Alternative 3+
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





+4 River Mile

River/Creek

Gravity Pipeline to CTP

Water Sources Considered for Treatment

Active Treatment (WT01)

No Action

Passive Treatment (WT02)

Passive Treatment (WT03)

BUR058 (Site ID)
TAMARACK NO. 3 (Site Name[1])
Adit drainage, Passive Treatment WT02 (Water Source Type, Water Treatment Typical Conceptual Design [TCD])

Watershed Segment

City Limit

CTP = Central Treatment Plant in Kellogg, Idaho

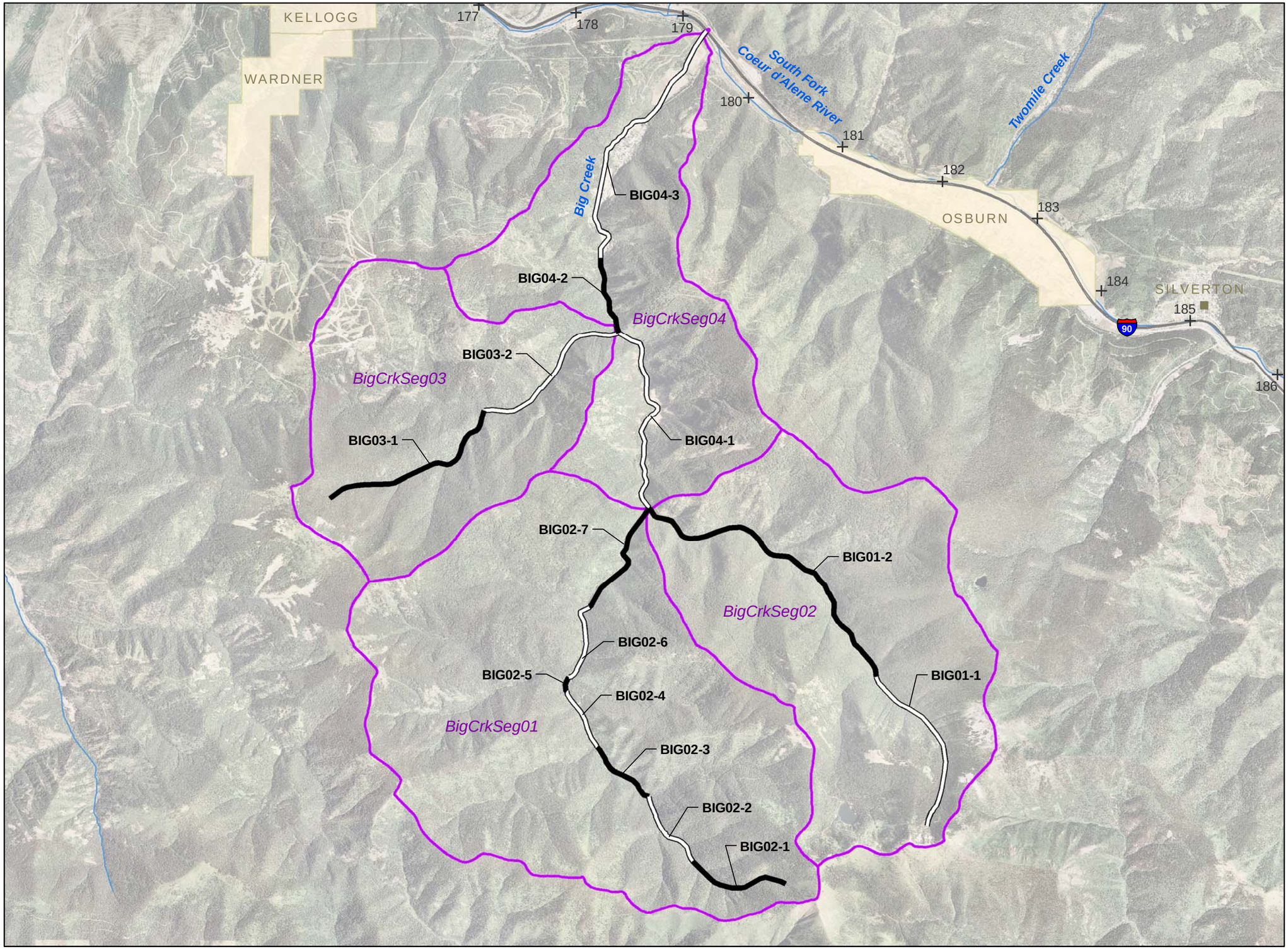
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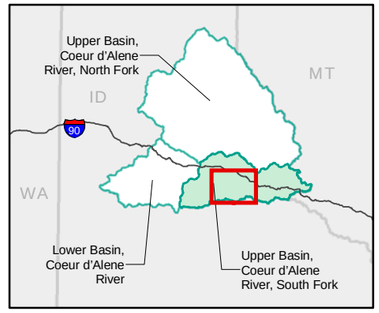
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Base Map Data:
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ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note:
The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-24
Water Treatment Approach, Ninemile Creek Watershed, Alternative 4+
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





180 River Mile

River/Creek

Stream and Riparian Reach

BIG01-1 (Stream and Riparian Reach ID)

Watershed Segment

City Limit

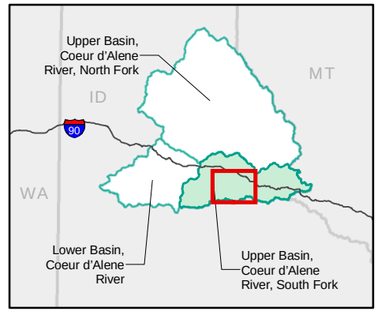
N

0 0.25 0.5 1 Miles

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Figure 6-25
Stream and Riparian Reaches, Big Creek Watershed
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





182 River Mile

River/Creek

Sites Included in FFS Alternatives 3+ and 4+

Sites Included in FFS Alternative 4+

POL063 (Site ID[1])

Watershed Segment

City Limit

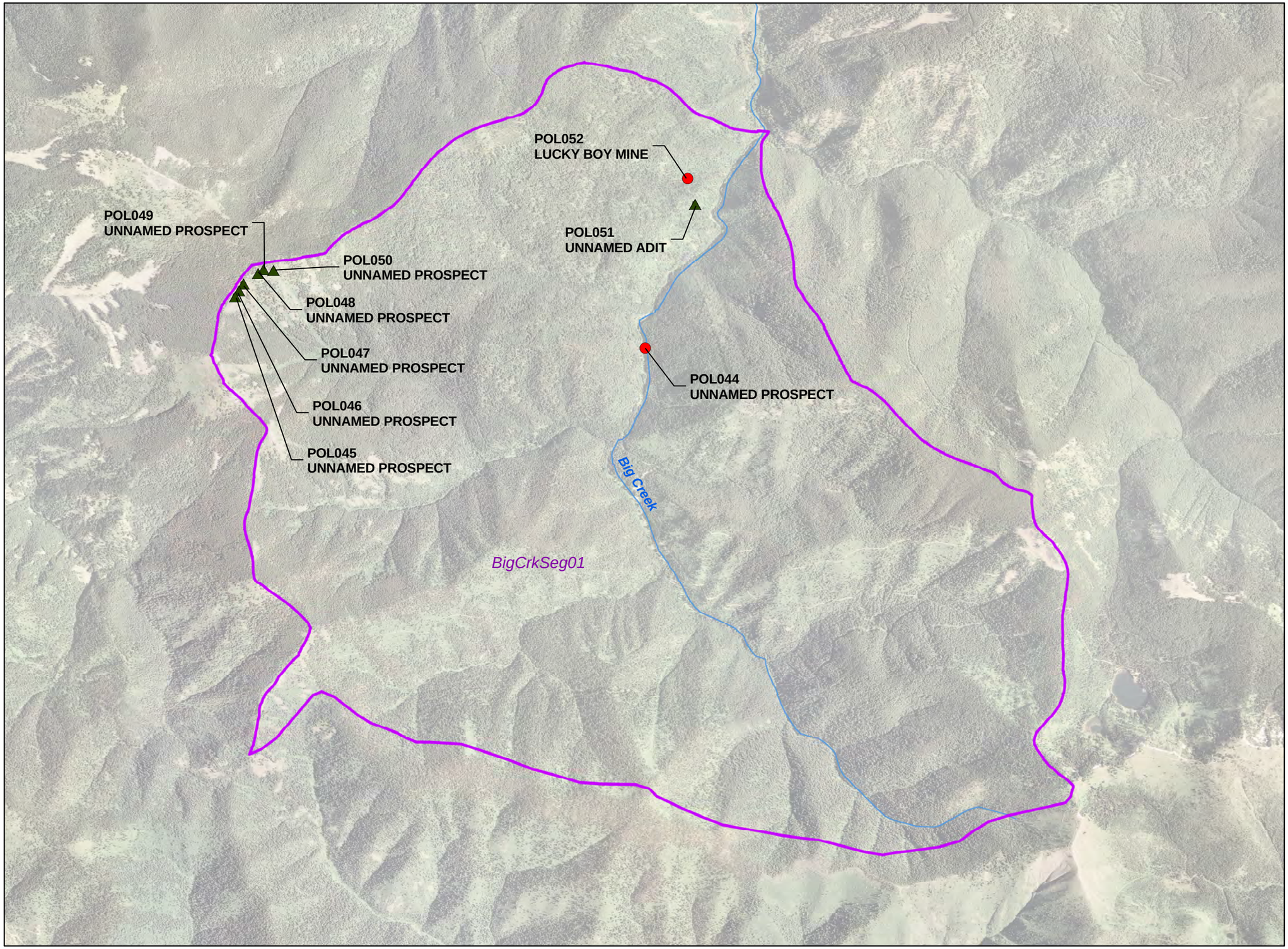
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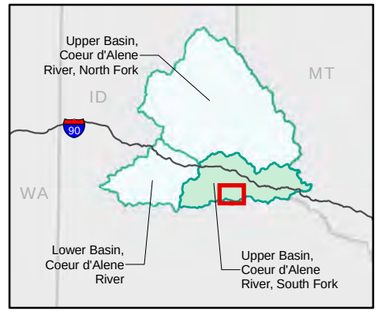
0 1,500 3,000 6,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note:
1. The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-26
Sites Included in Focused Feasibility Study, Big Creek Watershed, Overview
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





River/Creek

Sites Included in FFS Alternatives 3+ and 4+

Sites Included in FFS Alternative 4+

POL052 (Site ID)
LUCKY BOY MINE (Site Name[1])

Watershed Segment

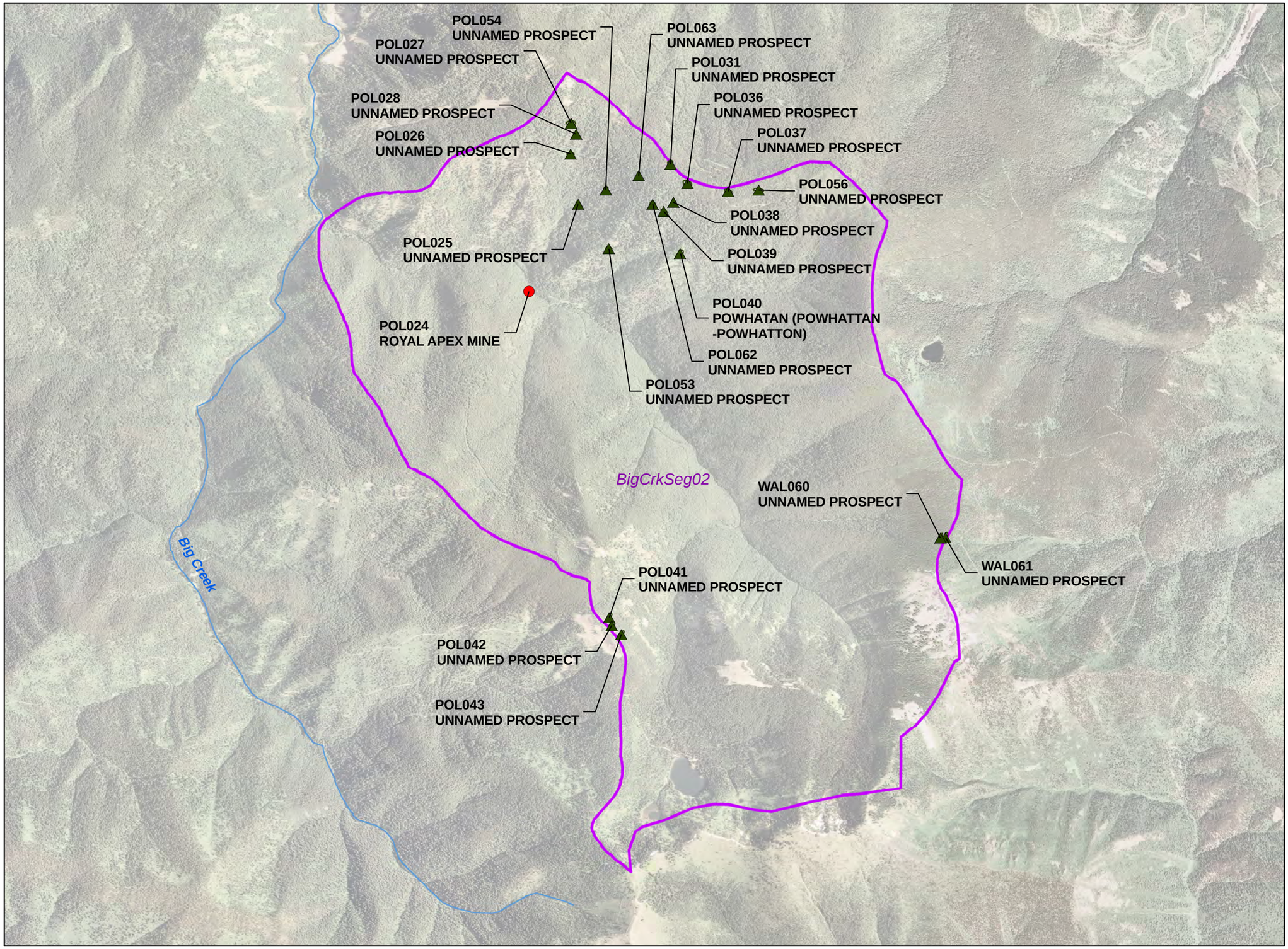
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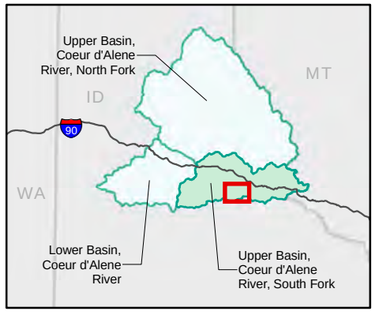
0 750 1,500 3,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note:
The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-27
Sites Included in Focused Feasibility Study, Big Creek Watershed, Segment 01
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





River/Creek

Sites Included in FFS Alternatives 3+ and 4+

Sites Included in FFS Alternative 4+

POL024 (Site ID)
ROYAL APEX MINE (Site Name[1])

Watershed Segment

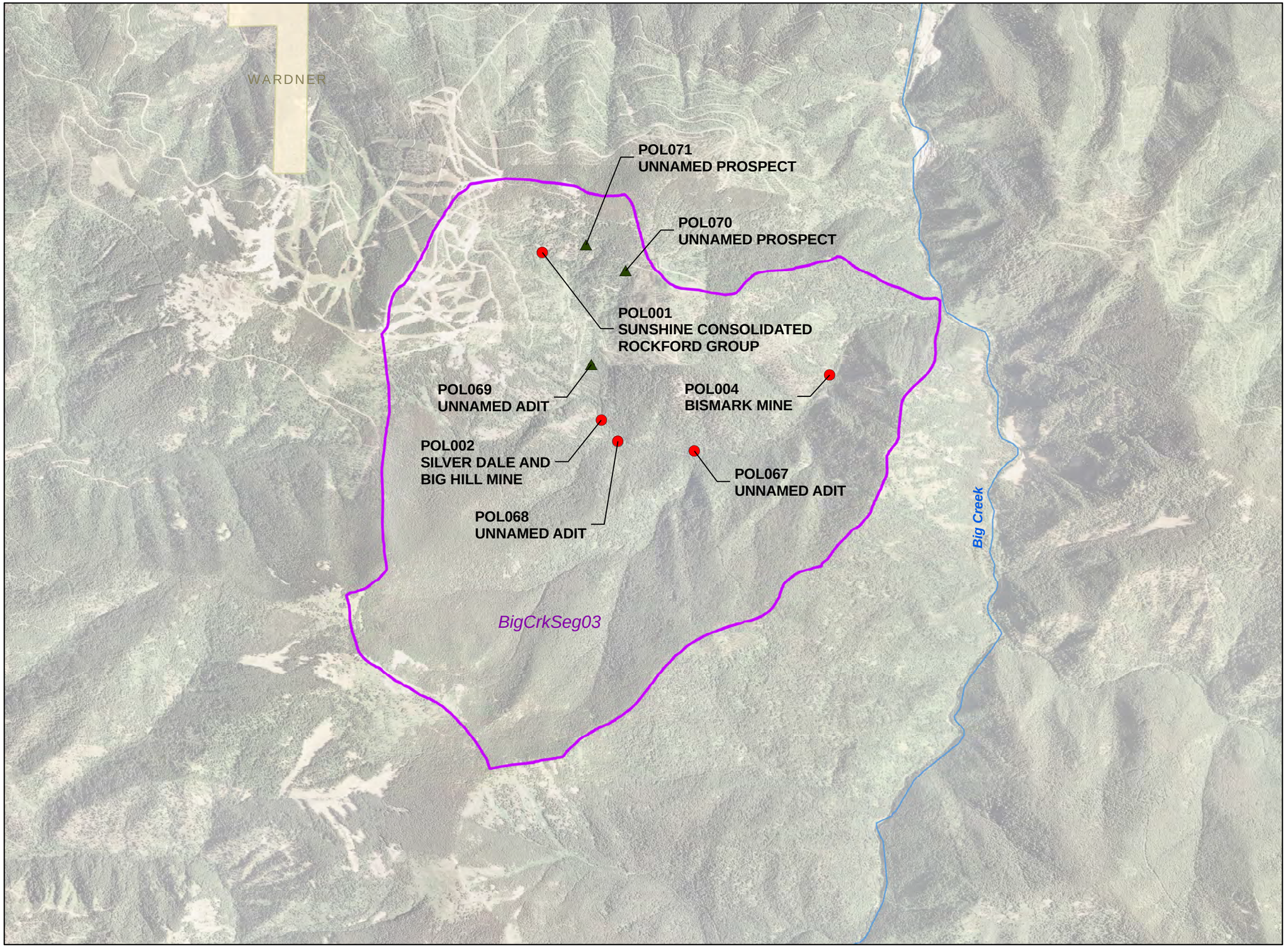
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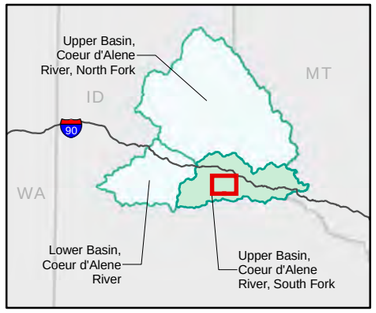
0 750 1,500 3,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note:
The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-28
Sites Included in Focused Feasibility Study, Big Creek Watershed, Segment 02
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





River/Creek

Sites Included in FFS Alternatives 3+ and 4+

Sites Included in FFS Alternative 4+

POL004 (Site ID)
BISMARK MINE (Site Name[1])

Watershed Segment

City Limit

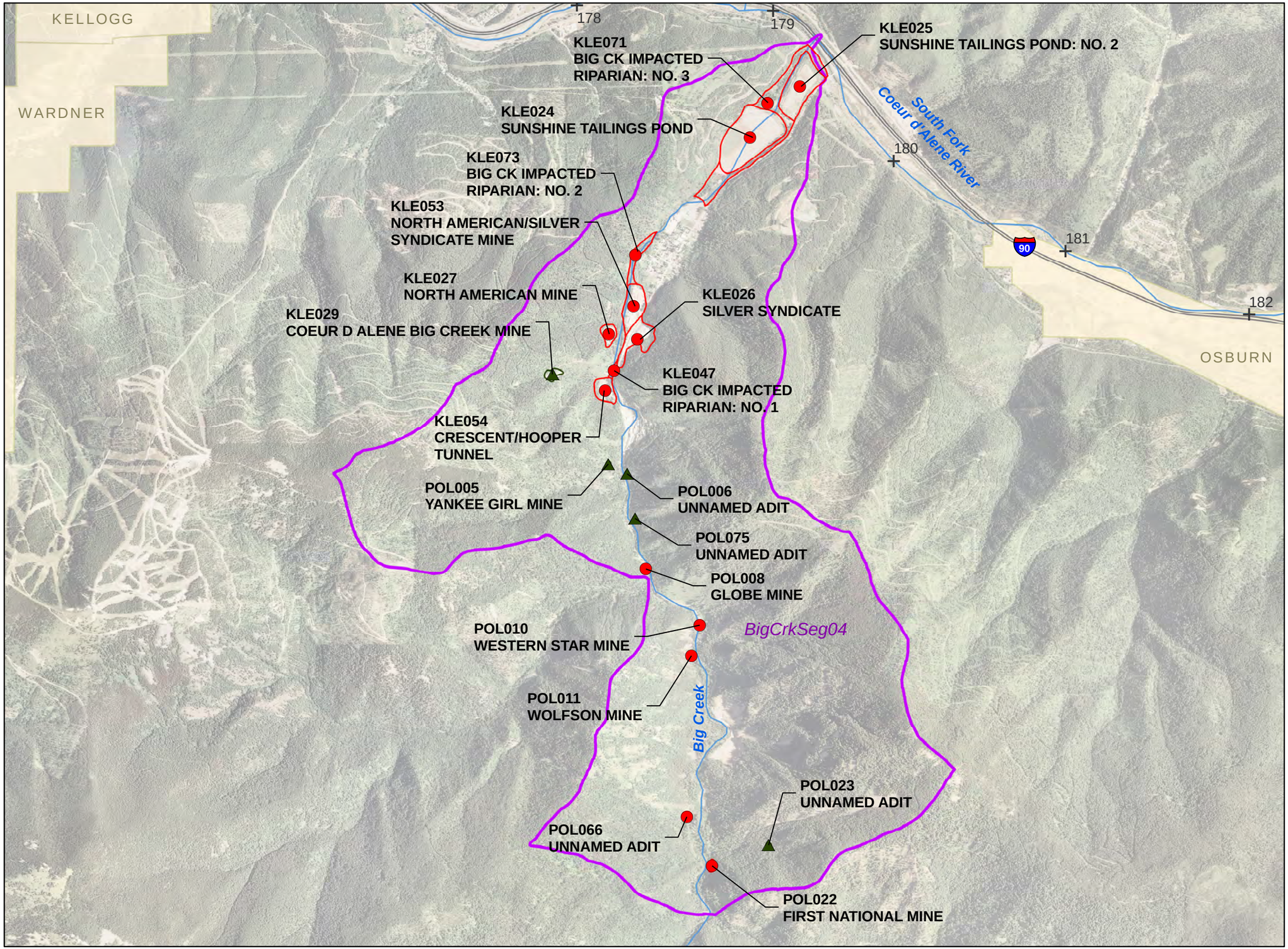
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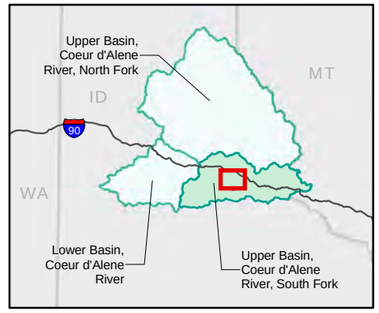
0 750 1,500 3,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note:
The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-29
Sites Included in Focused Feasibility Study, Big Creek Watershed, Segment 03
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





182 River Mile

River/Creek

Sites Included in FFS Alternatives 3+ and 4+

Sites Included in FFS Alternative 4+

POL008 (Site ID)
GLOBE MINE (Site Name[1])

Watershed Segment

City Limit

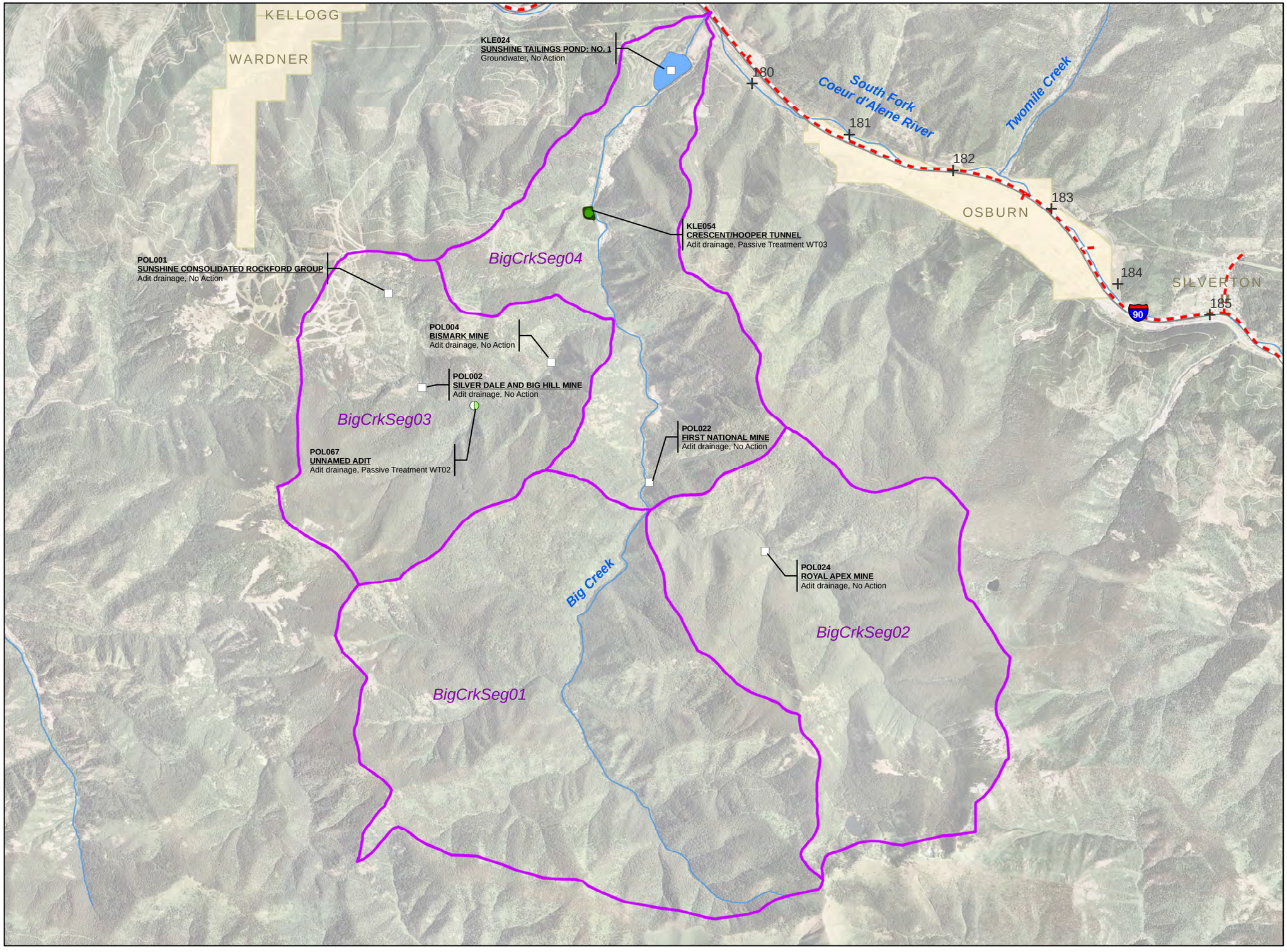
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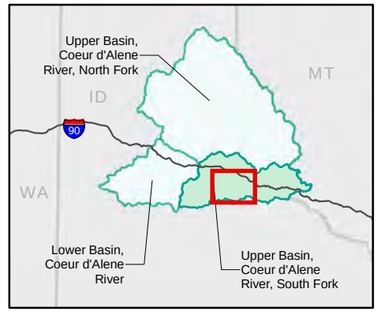
0 750 1,500 3,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note:
The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-30
Sites Included in Focused Feasibility Study, Big Creek Watershed, Segment 04
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





184 River Mile

River/Creek

Gravity Pipeline to CTP

Water Sources Considered for Treatment

No Action

Passive Treatment (WT02)

Passive Treatment (WT03)

KLE024 (Site ID)
CRESCENT/HOOPER TUNNEL (Site Name[1])
Adit drainage, Passive Treatment WT02 (Water Source Type, Water Treatment Typical Conceptual Design [TCD])

Watershed Segment

City Limit

CTP = Central Treatment Plant in Kellogg, Idaho

N

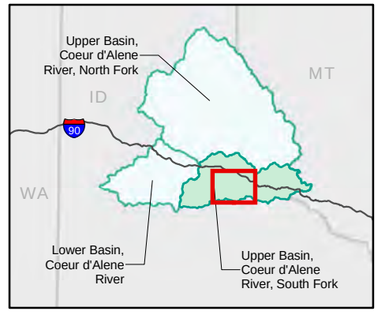
0 1,500 3,000 6,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note:
The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-31
Water Treatment Approach, Big Creek Watershed, Alternative 3+
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





184 River Mile

River/Creek

Gravity Pipeline to CTP

Water Sources Considered for Treatment

No Action

Passive Treatment (WT02)

Passive Treatment (WT03)

KLE054 (Site ID)
CRESCENT/HOOPER TUNNEL (Site Name[1])
Adit drainage, Passive Treatment WT02 (Water Source Type, Water Treatment Typical Conceptual Design [TCD])

Watershed Segment

City Limit

CTP = Central Treatment Plant in Kellogg, Idaho

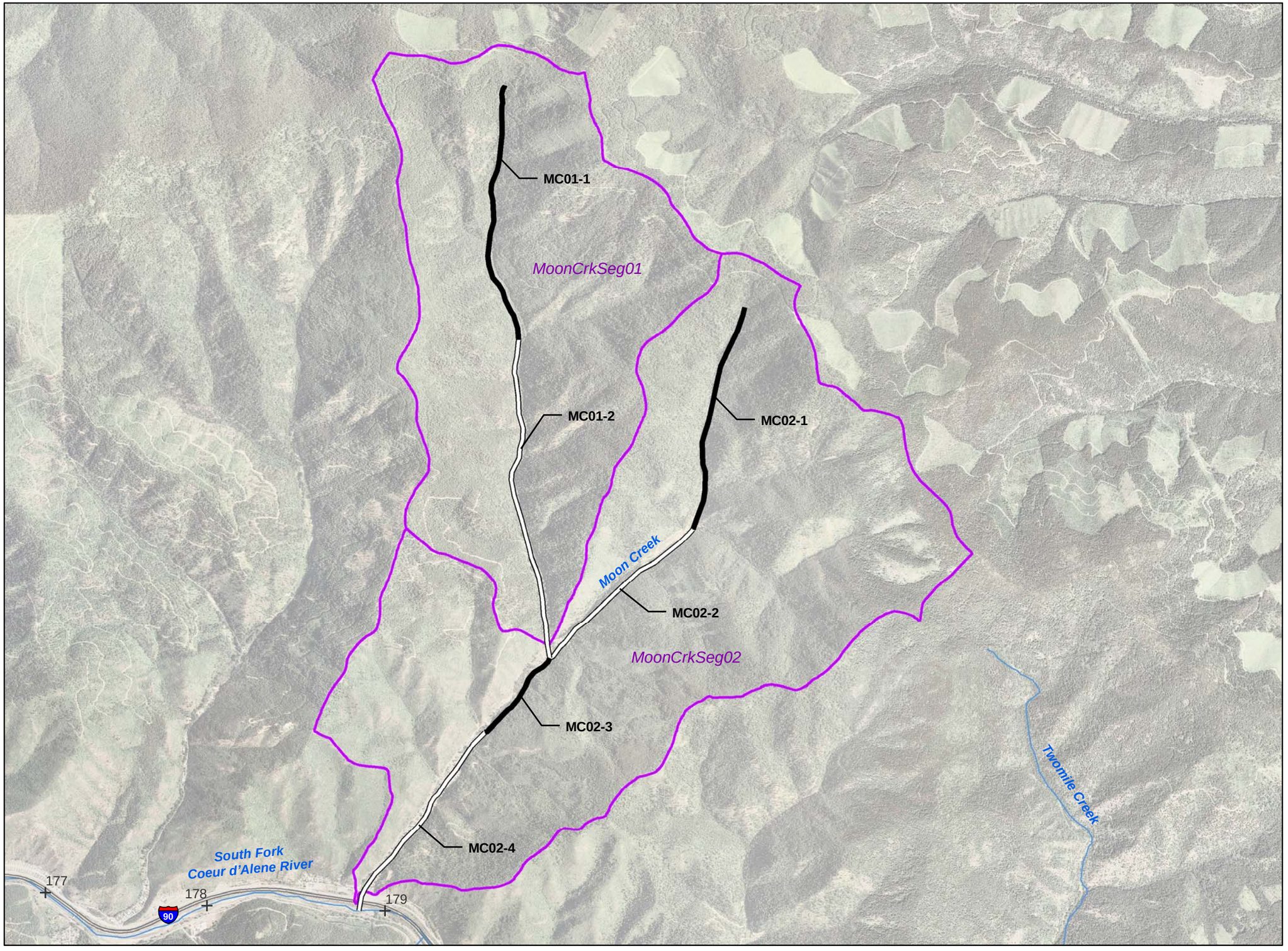
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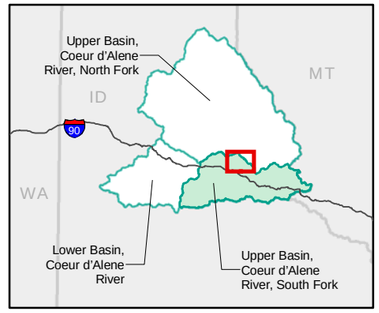
0 1,500 3,000 6,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note:
The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-32
Water Treatment Approach, Big Creek Watershed, Alternative 4+
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





179 River Mile

River/Creek

Stream and Riparian Reach

MC01-1 (Stream and Riparian Reach ID)

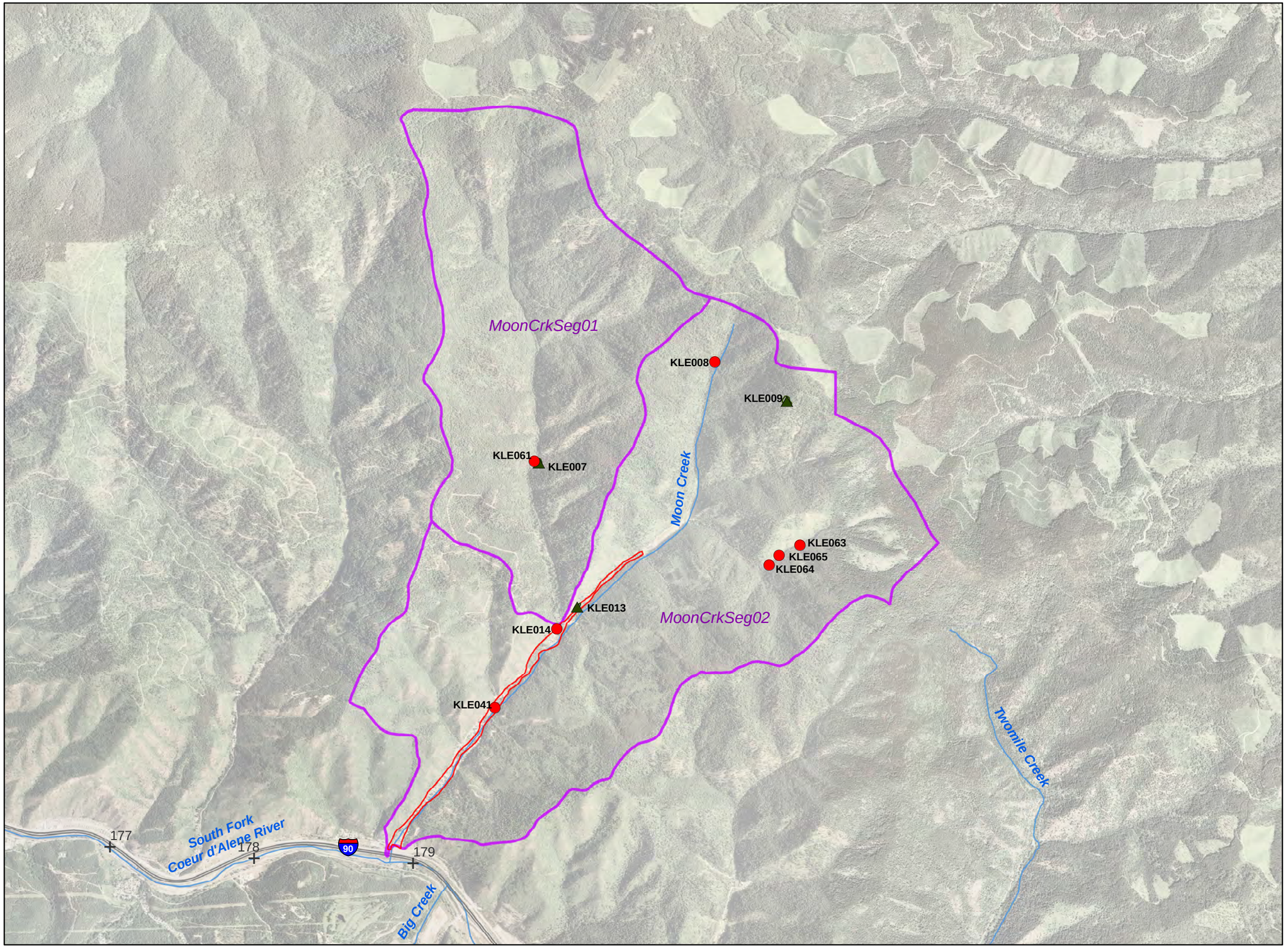
Watershed Segment

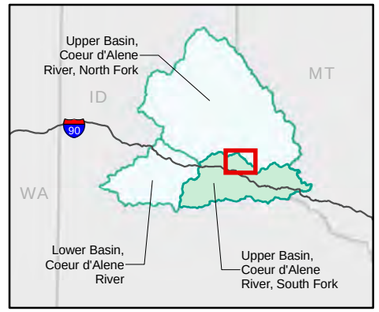
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0 0.125 0.25 0.5 Miles

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Figure 6-33
Stream and Riparian Reaches, Moon Creek Watershed
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





+179 River Mile

River/Creek

Sites Included in FFS Alternatives 3+ and 4+

Sites Included in FFS Alternative 4+

KLE063 (Site ID[1])

Watershed Segment

N

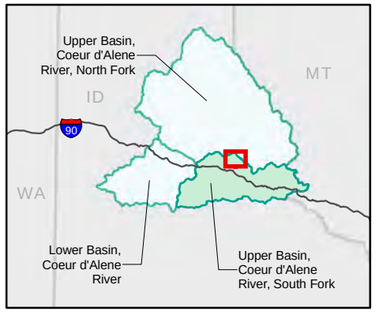
0 1,000 2,000 4,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note:
The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-34
Sites Included in Focused Feasibility Study, Moon Creek Watershed, Overview
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





River/Creek

Sites Included in FFS Alternatives 3+ and 4+

Sites Included in FFS Alternative 4+

KLE061 (Site ID)
UNNAMED TUNNEL (Site Name[1])

Watershed Segment

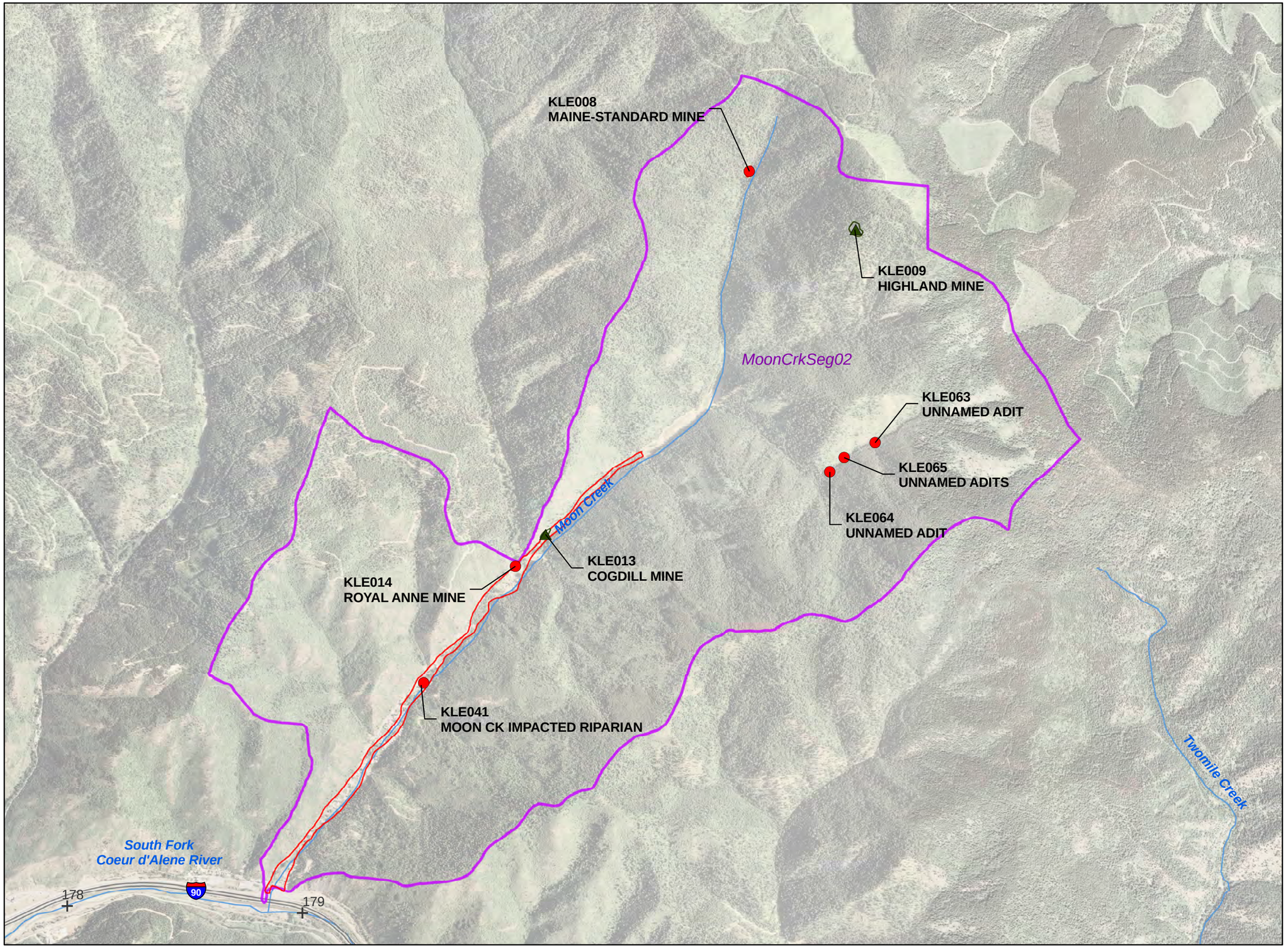
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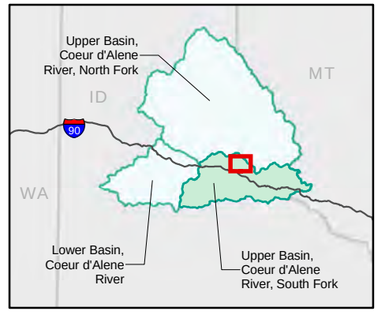
0 750 1,500 3,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note:
The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-35
Sites Included in Focused Feasibility Study, Moon Creek Watershed, Segment 01
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





+179 River Mile

River/Creek

Sites Included in FFS Alternatives 3+ and 4+

Sites Included in FFS Alternative 4+

KLE009 (Site ID)
HIGHLAND MINE (Site Name[1])

Watershed Segment

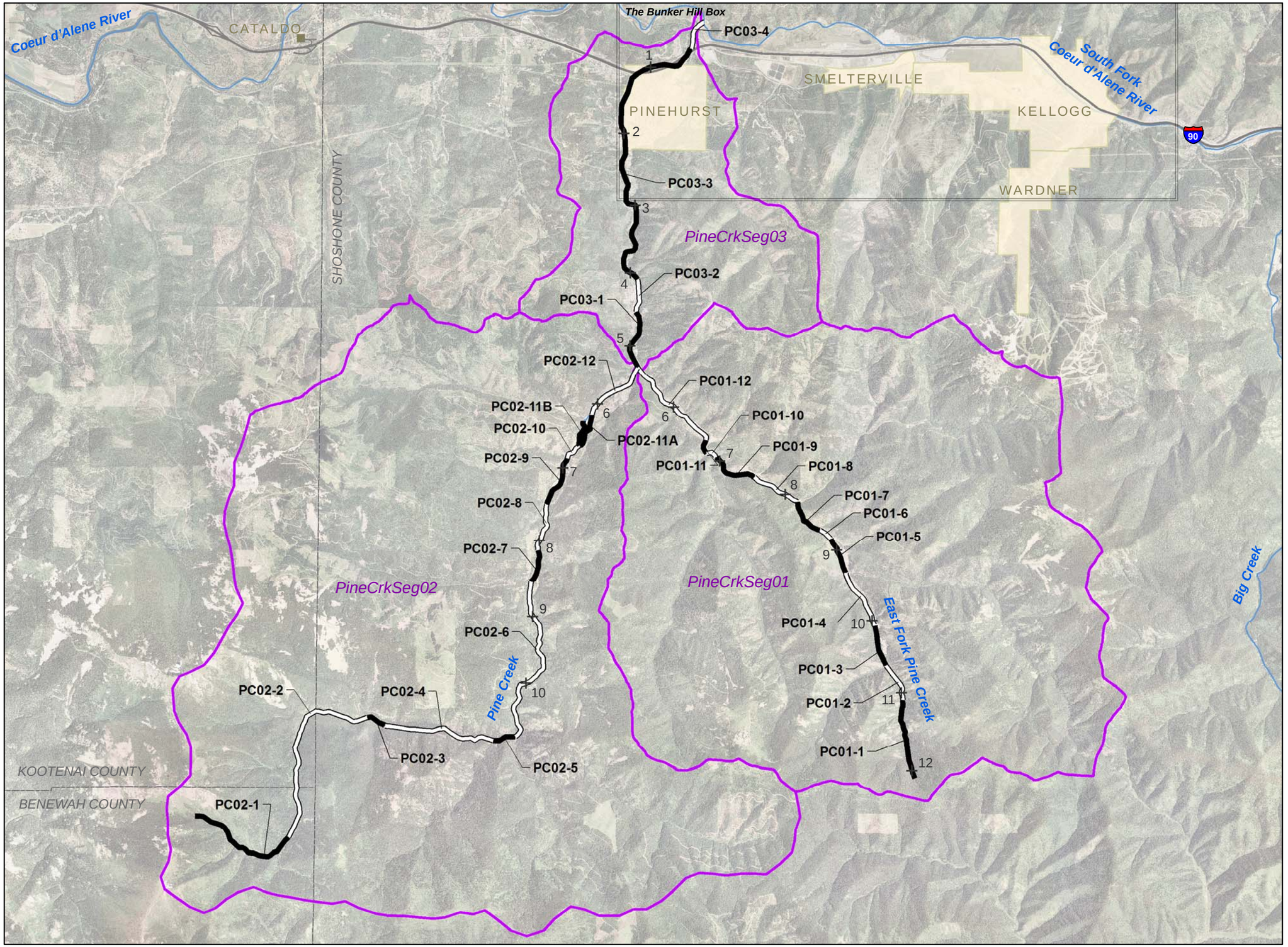
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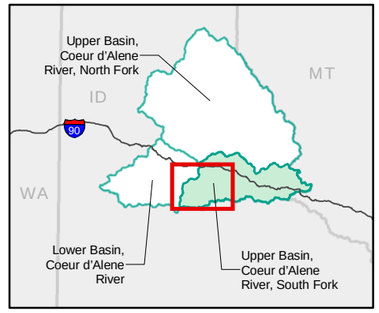
0 750 1,500 3,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note:
The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-36
Sites Included in Focused Feasibility Study, Moon Creek Watershed, Segment 02
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





4 River Mile

River/Creek

Stream and Riparian Reach

PC01-1 (Stream and Riparian Reach ID)

Watershed Segment

City Limit

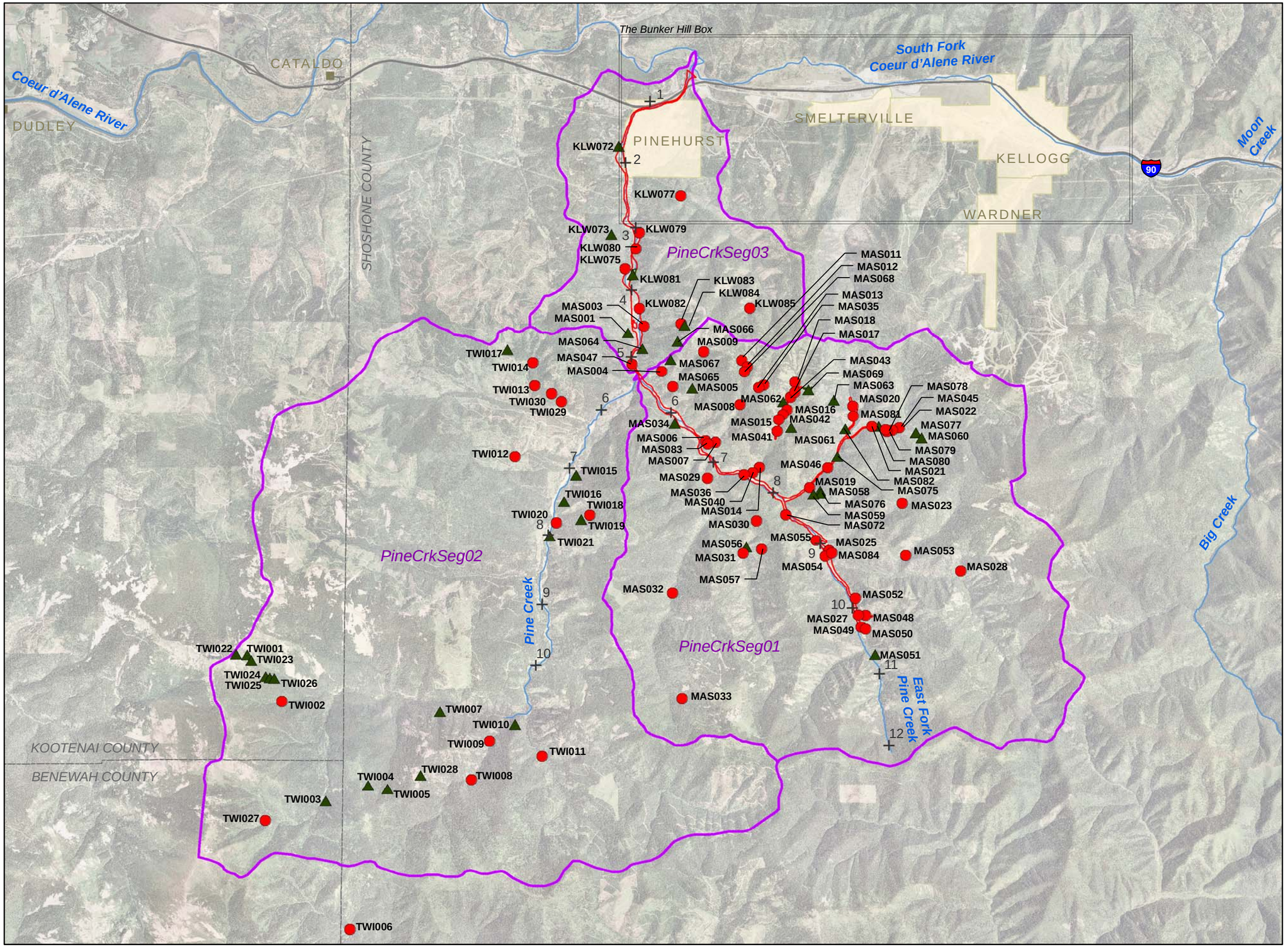
County Boundary

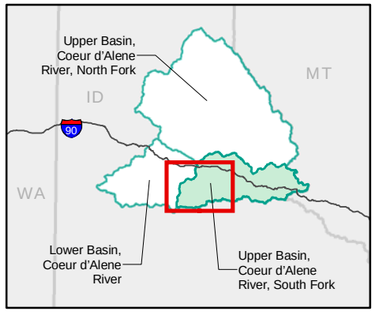
N

0 0.5 1 2 Miles

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Figure 6-37
Stream and Riparian Reaches, Pine Creek Watershed
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





+4 River Mile

River/Creek

Sites Included in FFS Alternatives 3+ and 4+

Sites Included in FFS Alternative 4+

MAS078 (Site ID[1])

Watershed Segment

City Limit

County Boundary

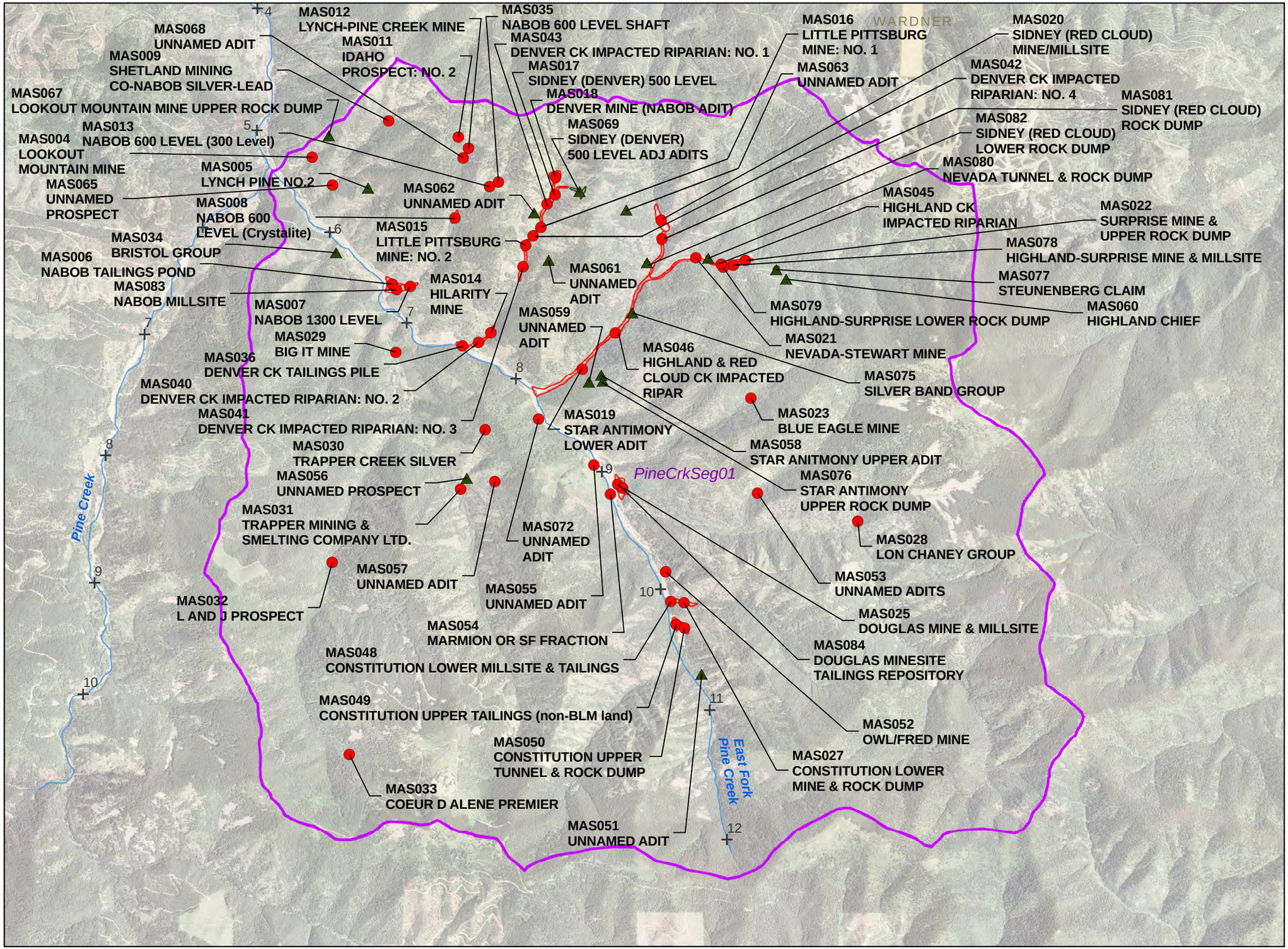
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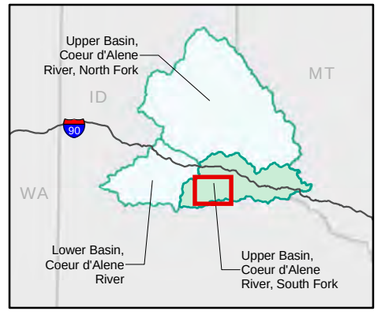
0 2,000 4,000 8,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Notes:
1. The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).
2. Site MAS025 was not included in Ecological Alternative 3 in the 2001 FS Report and sites MAS081, KLW077, KLW079, and KLW080 were not included in Ecological Alternative 3 or 4 in the 2001 FS Report.

Figure 6-38
Sites Included in Focused Feasibility Study, Pine Creek Watershed, Overview
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





8 River Mile

River/Creek

Sites Included in FFS Alternatives 3+ and 4+

Sites Included in FFS Alternative 4+

MAS023 (Site ID)
BLUE EAGLE MINE (Site Name[1])

Watershed Segment

City Limit

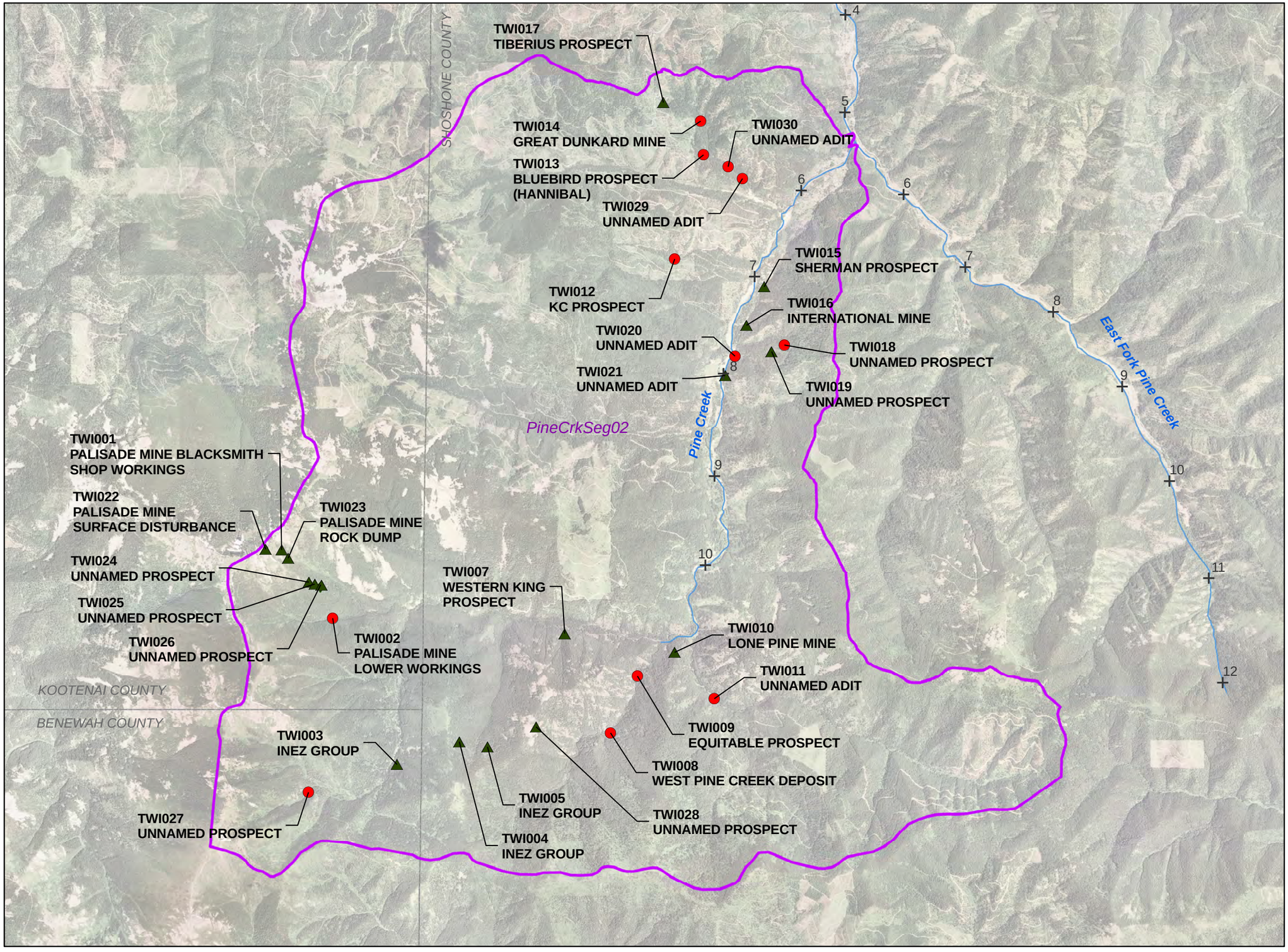
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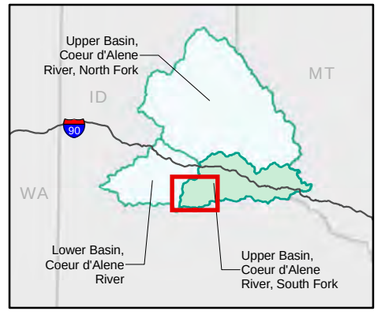
0 2,000 4,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Notes:
1. The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).
2. Site MAS025 was not included in Ecological Alternative 3 in the 2001 FS Report and site MAS081 was not included in Ecological Alternative 3 or 4 in the 2001 FS Report.

Figure 6-39
Sites Included in Focused Feasibility Study, Pine Creek Watershed, Segment 01
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





8 River Mile

River/Creek

Sites Included in FFS Alternatives 3+ and 4+

Sites Included in FFS Alternative 4+

TWI010 (Site ID)
LONE PINE MINE (Site Name[1])

Watershed Segment

County Boundary

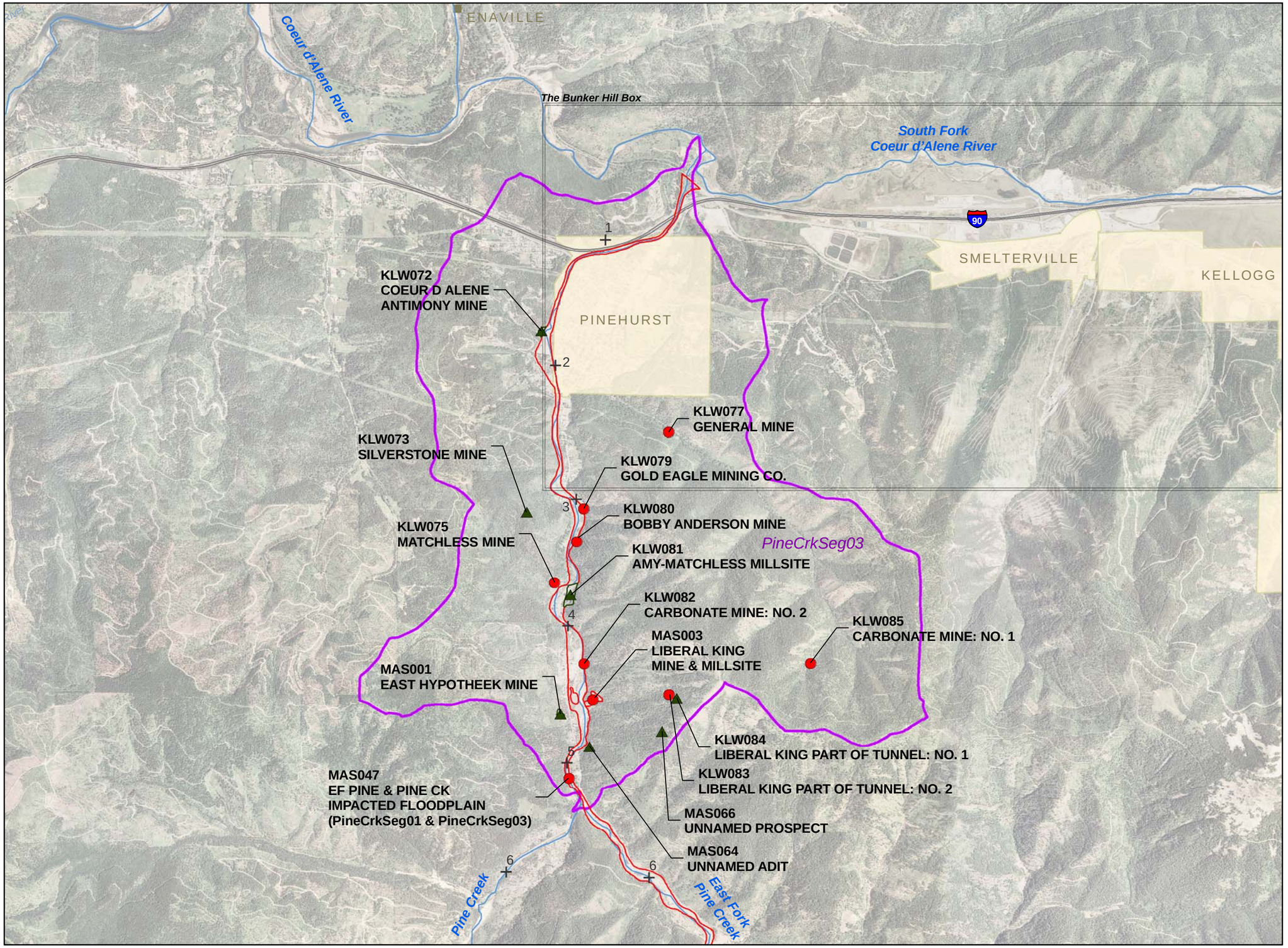
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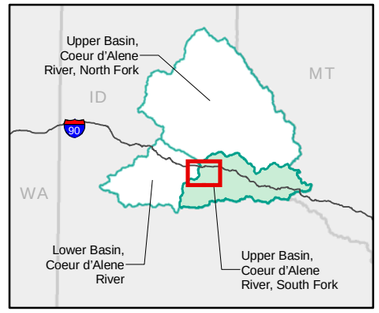
0 1,500 3,000 6,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note:
The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-40
Sites Included in Focused Feasibility Study, Pine Creek Watershed, Segment 02
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





- 4 River Mile
- River/Creek
- Sites Included in FFS Alternatives 3+ and 4+
- Sites Included in FFS Alternative 4+
- **KLE077** (Site ID) **GENERAL MINE** (Site Name[1])
- Watershed Segment
- City Limit

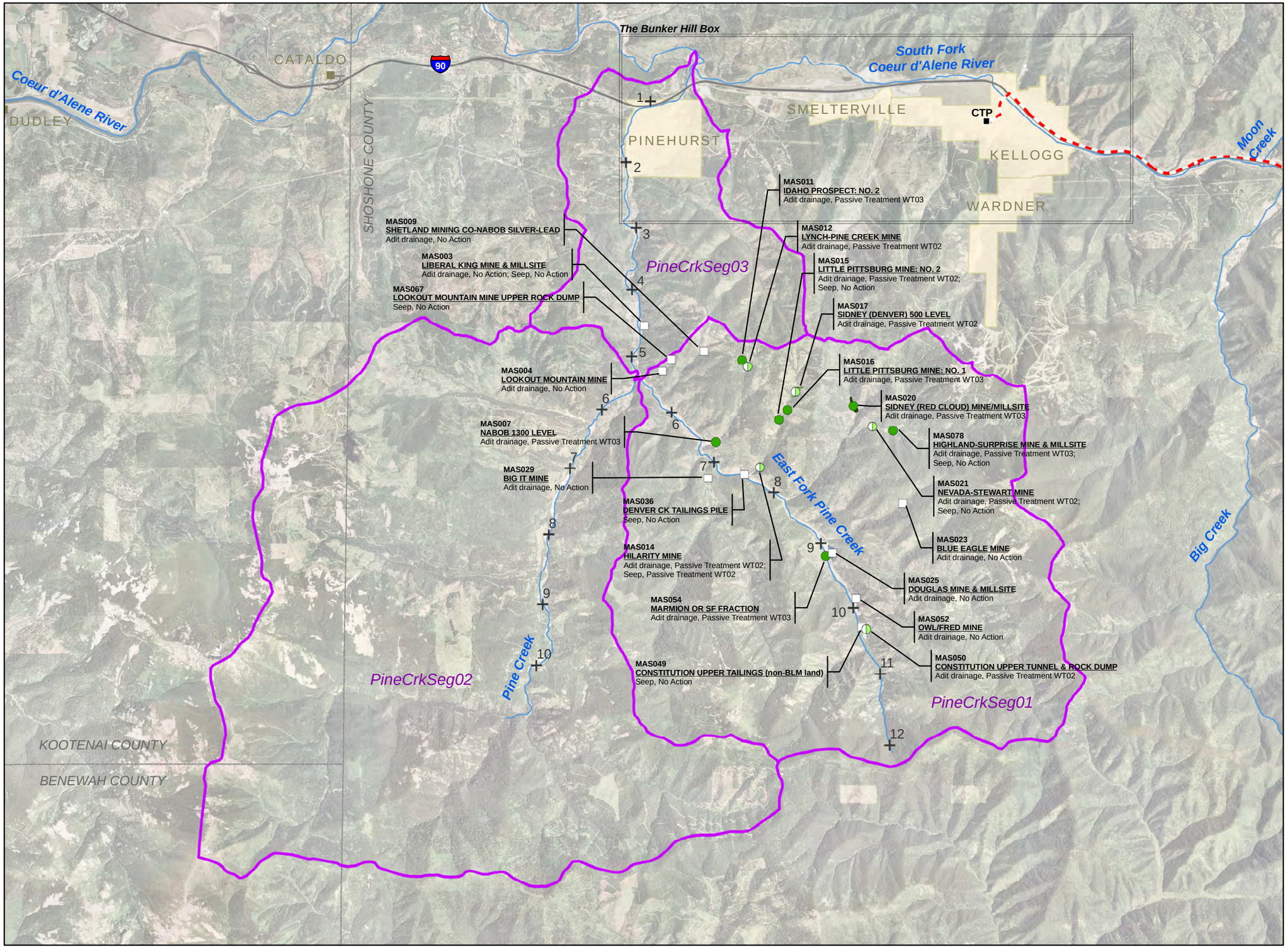
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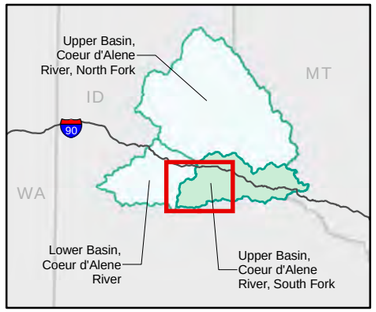
0 1,250 2,500 5,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Notes:
1. The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).
2. Sites KLW077, KLW079, and KLW080 were not included in Ecological Alternative 3 or 4 in the 2001 FS Report.

Figure 6-41
Sites Included in Focused Feasibility Study, Pine Creek Watershed, Segment 03
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





+4 River Mile

■ Central Treatment Plant (CTP) in Kellogg, Idaho

River/Creek

Gravity Pipeline to CTP

Water Sources Considered for Treatment

No Action

Passive Treatment (WT02)

Passive Treatment (WT03)

MAS012 (Site ID)
LYNCH-PINE CREEK MINE (Site Name[1])
Adit drainage, Passive Treatment WT02 (Water Source Type, Water Treatment Typical Conceptual Design [TCD])

Watershed Segment

City Limit

County Boundary

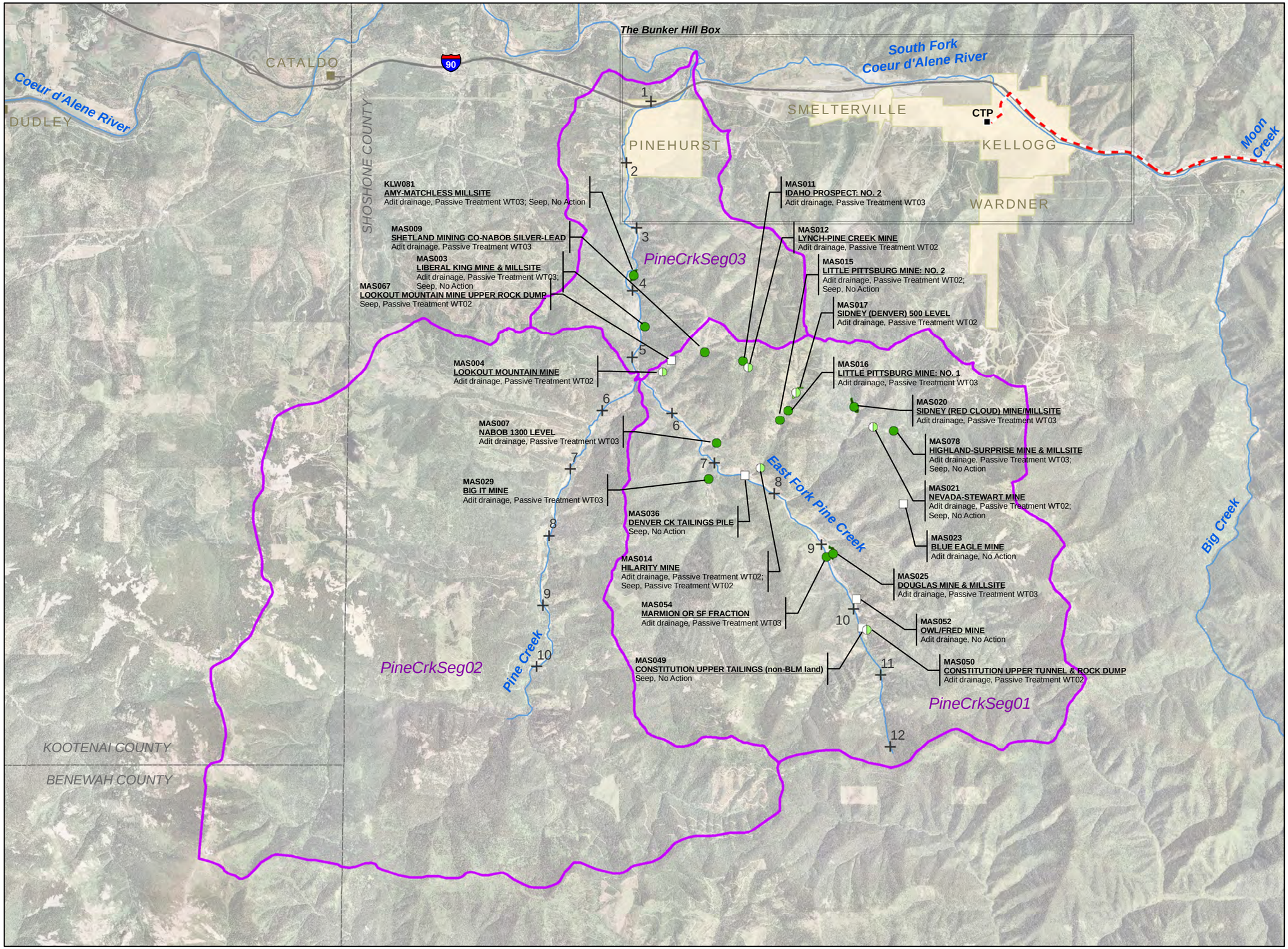
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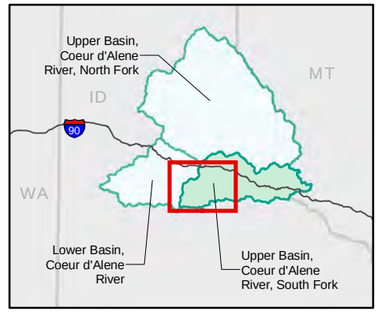
0 2,000 4,000 8,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note:
The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-42
Water Treatment Approach, Pine Creek Watershed, Alternative 3+
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





4 River Mile

Central Treatment Plant (CTP) in Kellogg, Idaho

River/Creek

Gravity Pipeline to CTP

Water Sources Considered for Treatment

No Action

Passive Treatment (WT02)

Passive Treatment (WT03)

MAS012 (Site ID)
LYNCH-PINE CREEK MINE (Site Name[1])
Adit drainage, Passive Treatment WT02 (Water Source Type, Water Treatment Typical Conceptual Design [TCD])

Watershed Segment

City Limit

County Boundary

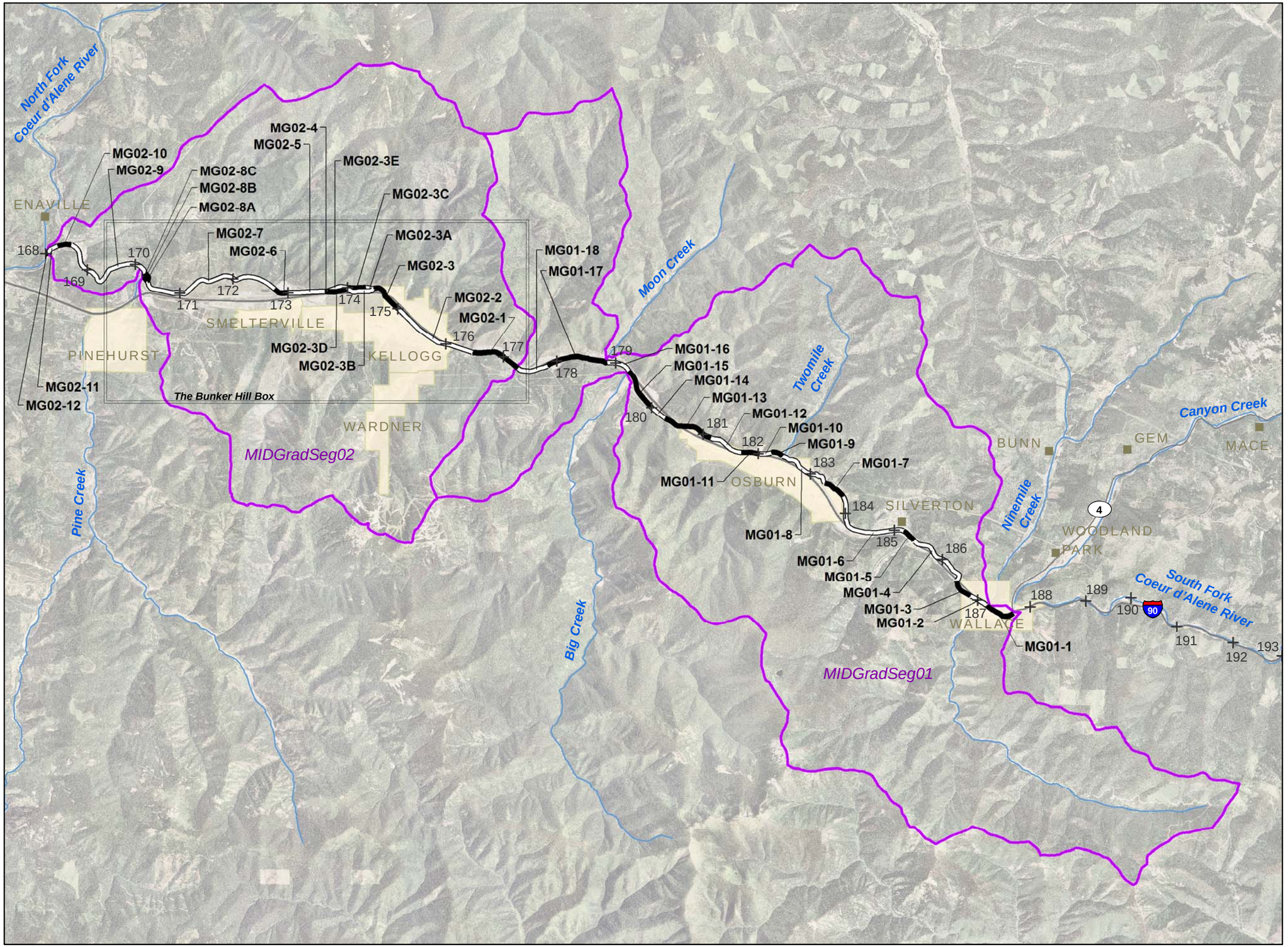
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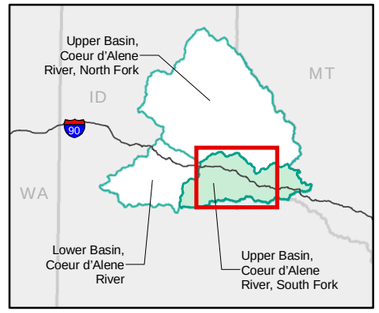
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Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note:
The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-43
Water Treatment Approach, Pine Creek Watershed, Alternative 4+
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





187 River Mile

River/Creek

Stream and Riparian Reach

MG01-1 (Stream and Riparian Reach ID)

Watershed Segment

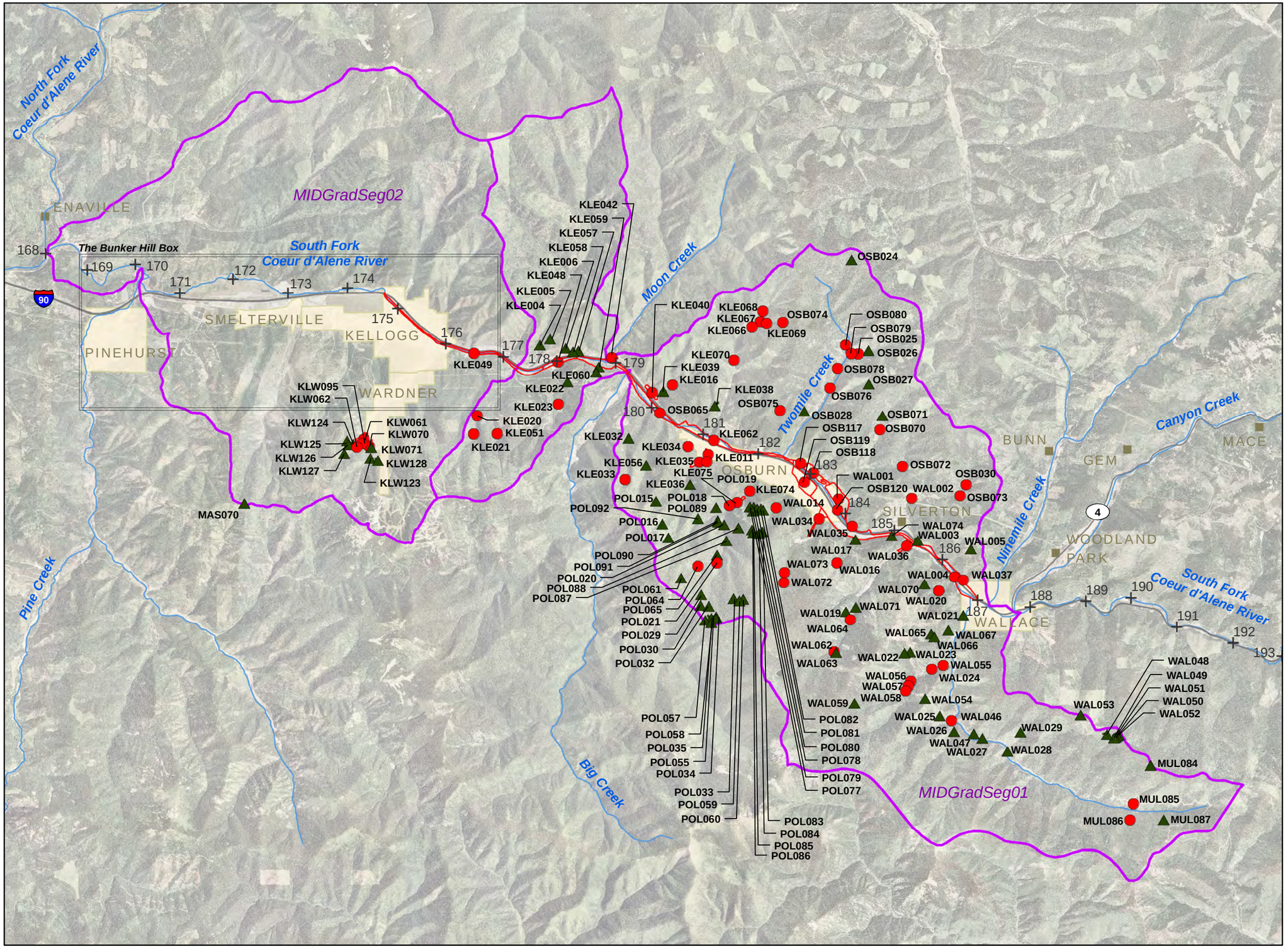
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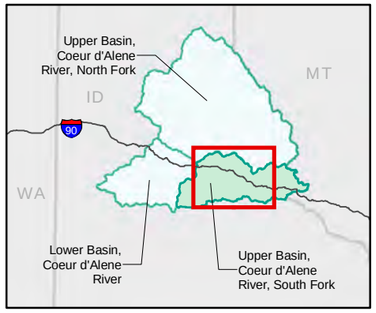
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0 0.5 1 2 Miles

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Figure 6-44
Stream and Riparian Reaches, Mainstem SFCDR Watershed
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





191 River Mile

River/Creek

Sites Included in FFS Alternatives 3+ and 4+

Sites Included in FFS Alternative 4+

OSB072 (Site ID[1])

Watershed Segment

City Limit

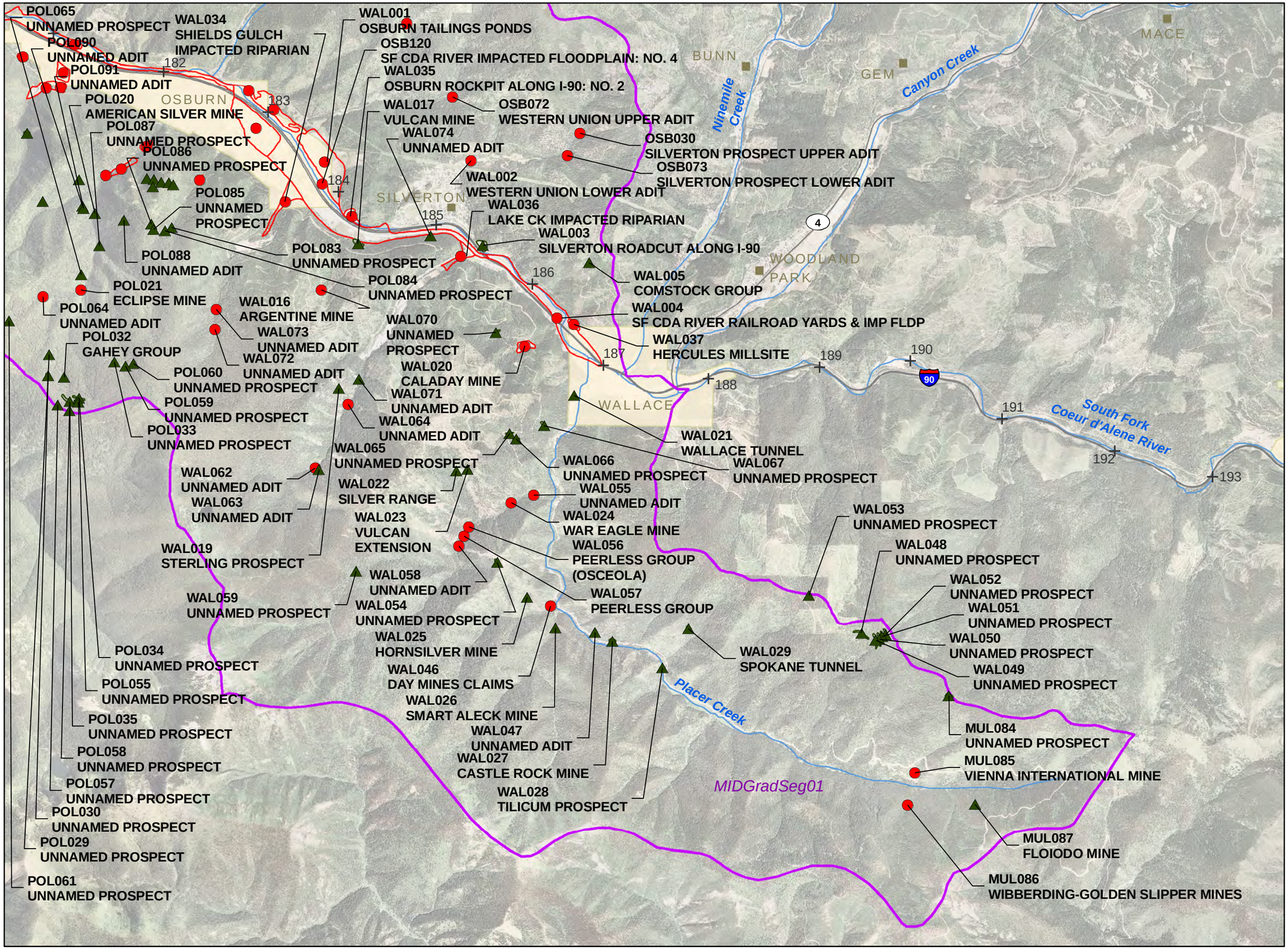
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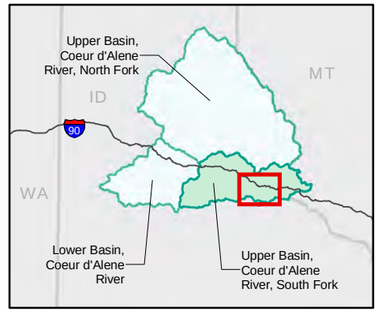
0 2,500 5,000 10,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note:
The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-45
Sites Included in Focused Feasibility Study, Mainstem SFCDR Watershed, Overview
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





186 River Mile

River/Creek

Sites Included in FFS Alternatives 3+ and 4+

Sites Included in FFS Alternative 4+

WAL005 (Site ID)
COMSTOCK GROUP (Site Name[1])

Watershed Segment

City Limit

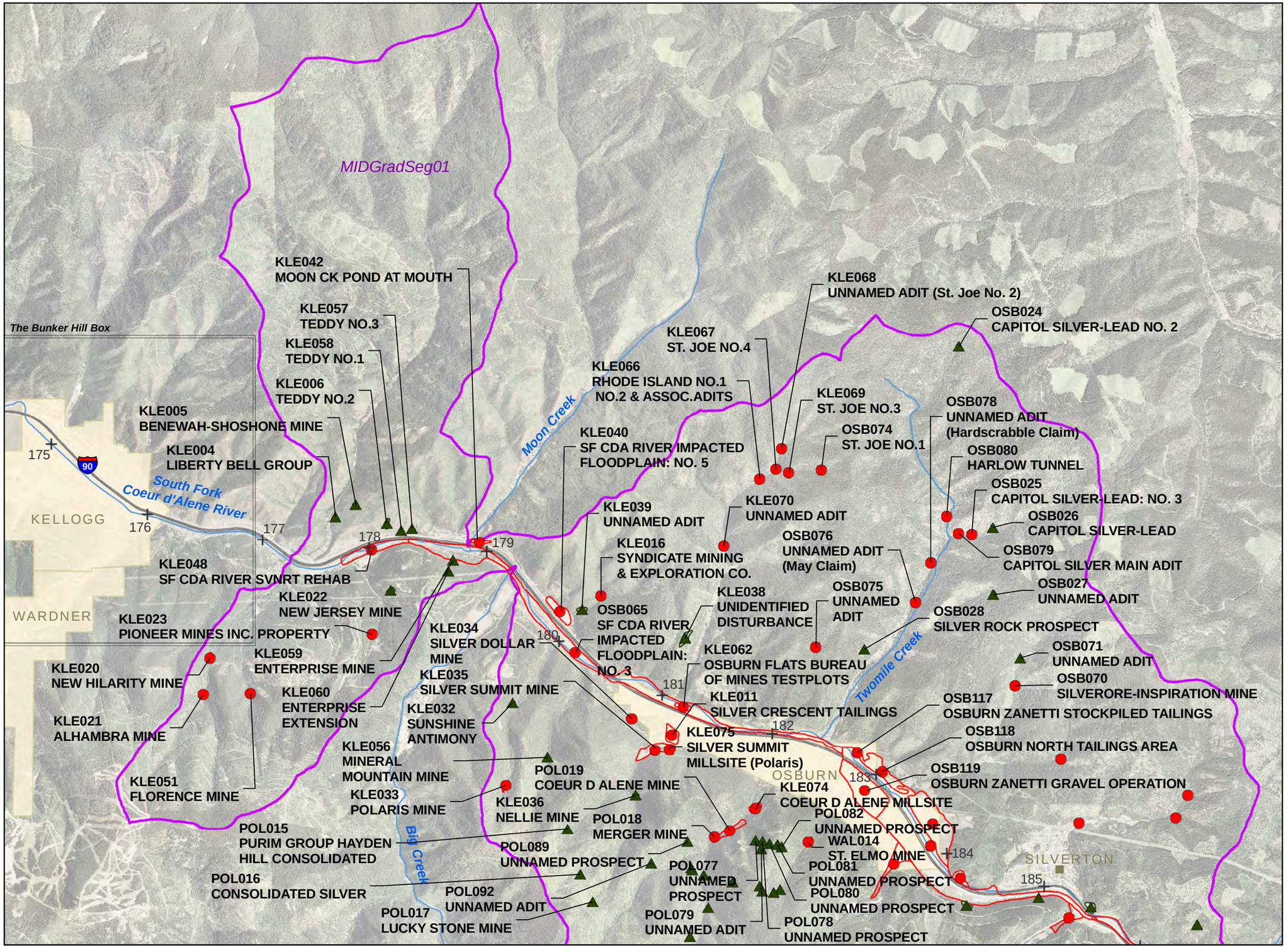
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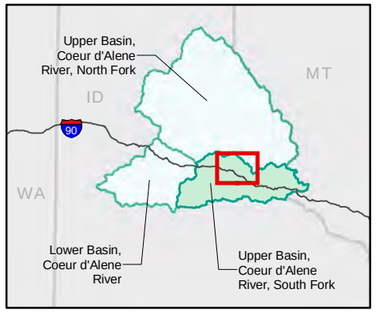
0 1,250 2,500 5,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note:
The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-46
Sites Included in Focused Feasibility Study, Mainstem SFCDR Watershed, Segment 01, Eastern Portion
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





184 River Mile

River/Creek

Sites Included in FFS Alternatives 3+ and 4+

Sites Included in FFS Alternative 4+

OSB080 (Site ID)
HARLOW TUNNEL (Site Name[1])

Watershed Segment

City Limit

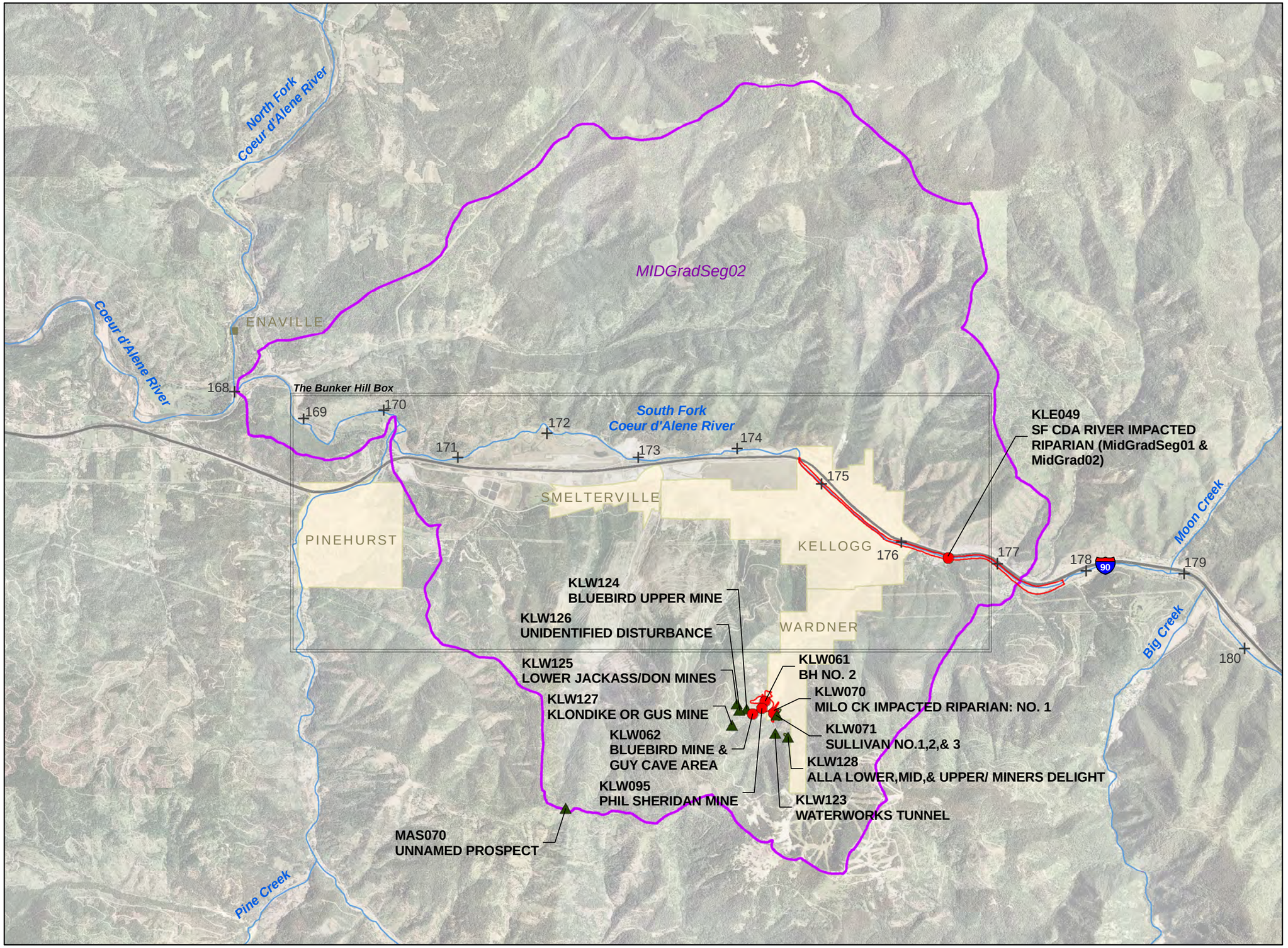
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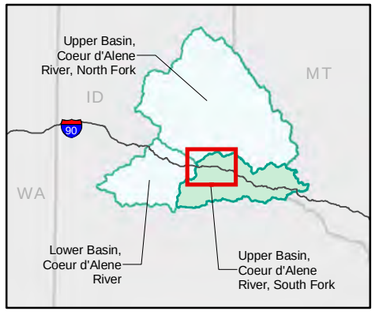
0 1,250 2,500 5,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note:
The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-47
Sites Included in Focused Feasibility Study, Mainstem SFCDR Watershed, Segment 01, Western Portion
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





179 River Mile

River/Creek

Sites Included in FFS Alternatives 3+ and 4+

Sites Included in FFS Alternative 4+

KLW124 (Site ID)
BLUEBIRD UPPER MINE (Site Name[1])

Watershed Segment

City Limit

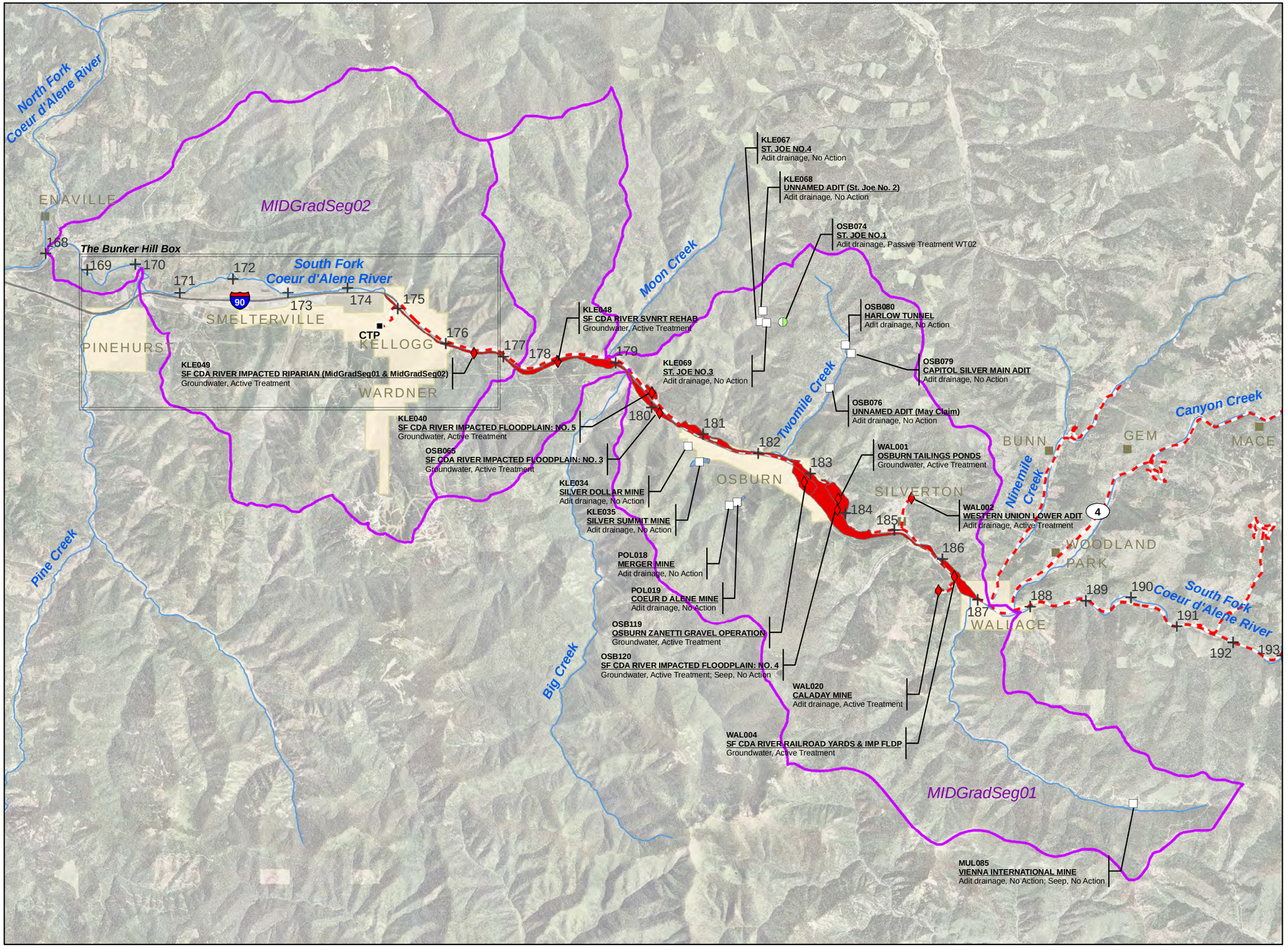
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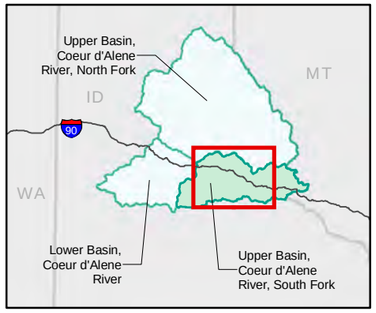
0 2,000 4,000 8,000 Feet

Base Map Data:
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IDWR (Aerial Imagery, 2006).

Note:
The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-48
Sites Included in Focused Feasibility Study, Mainstem SFCDR Watershed, Segment 02, Excluding the Bunker Hill "Box"
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





186 River Mile

Central Treatment Plant (CTP) in Kellogg, Idaho

River/Creek

Gravity Pipeline to CTP

Water Sources Considered for Treatment:

Active Treatment (WT01)

No Action

Passive Treatment (WT02)

OSB074 (Site ID)
ST. JOE NO. 1 (Site Name[1])
Adit drainage, Passive Treatment WT02 (Water Source Type, Water Treatment Typical Conceptual Design [TCD])

Watershed Segment

City Limit

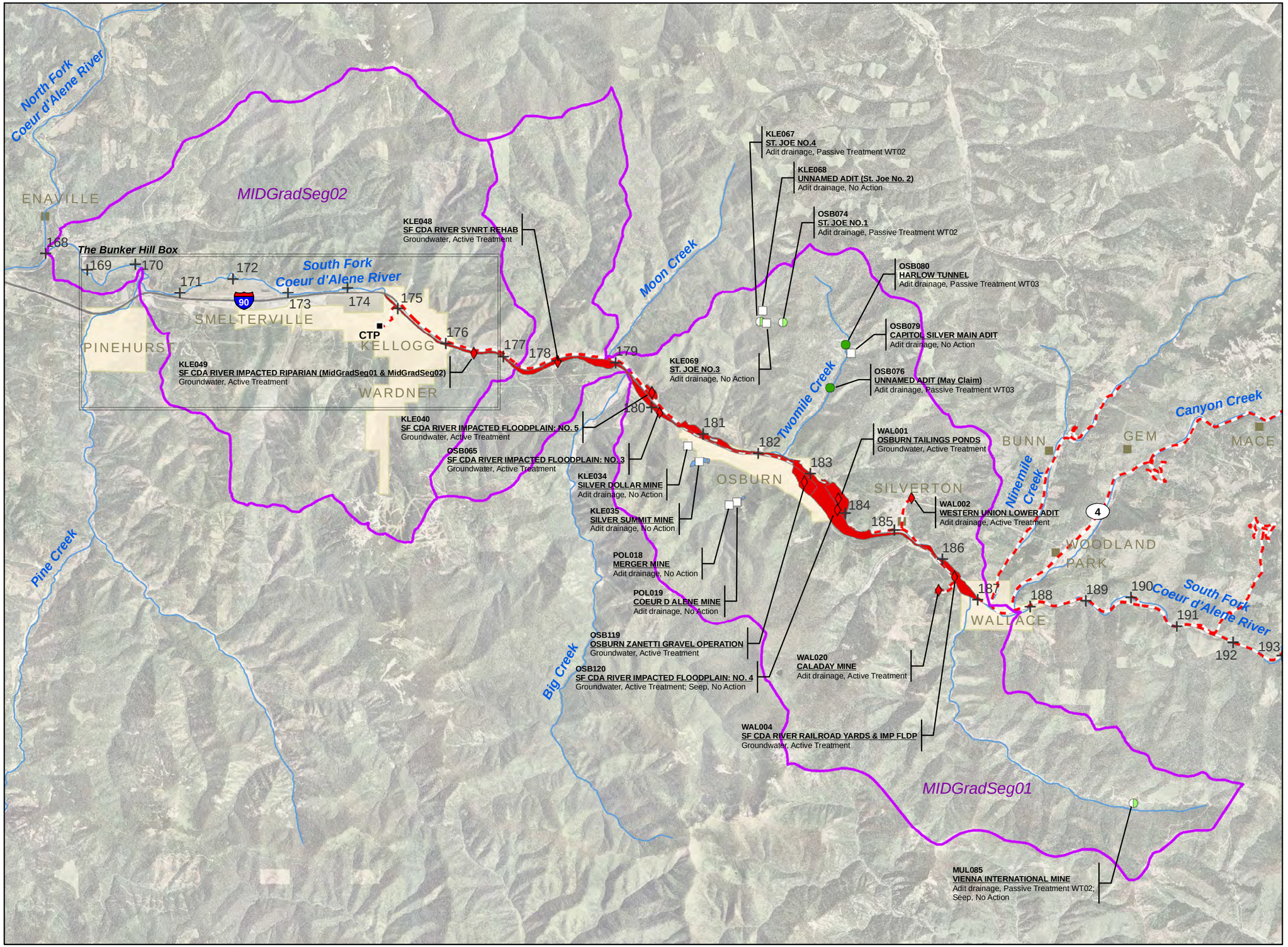
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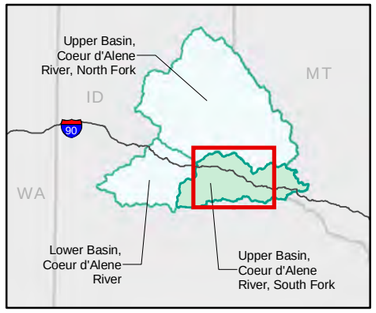
0 2,500 5,000 10,000 Feet

Base Map Data:
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ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note:
The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-49
Water Treatment Approach, Mainstem SFCDR Watershed, Alternative 3+ Excluding the Bunker Hill "Box"
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





186 River Mile

Central Treatment Plant (CTP) in Kellogg, Idaho

River/Creek

Gravity Pipeline to CTP

Water Sources Considered for Treatment

Active Treatment (WT01)

No Action

Passive Treatment (WT02)

Passive Treatment (WT03)

OSB074 (Site ID)
ST. JOE NO. 1 (Site Name[1])
Adit drainage, Passive Treatment WT02 (Water Source Type, Water Treatment Typical Conceptual Design [TCD])

Watershed Segment

City Limit

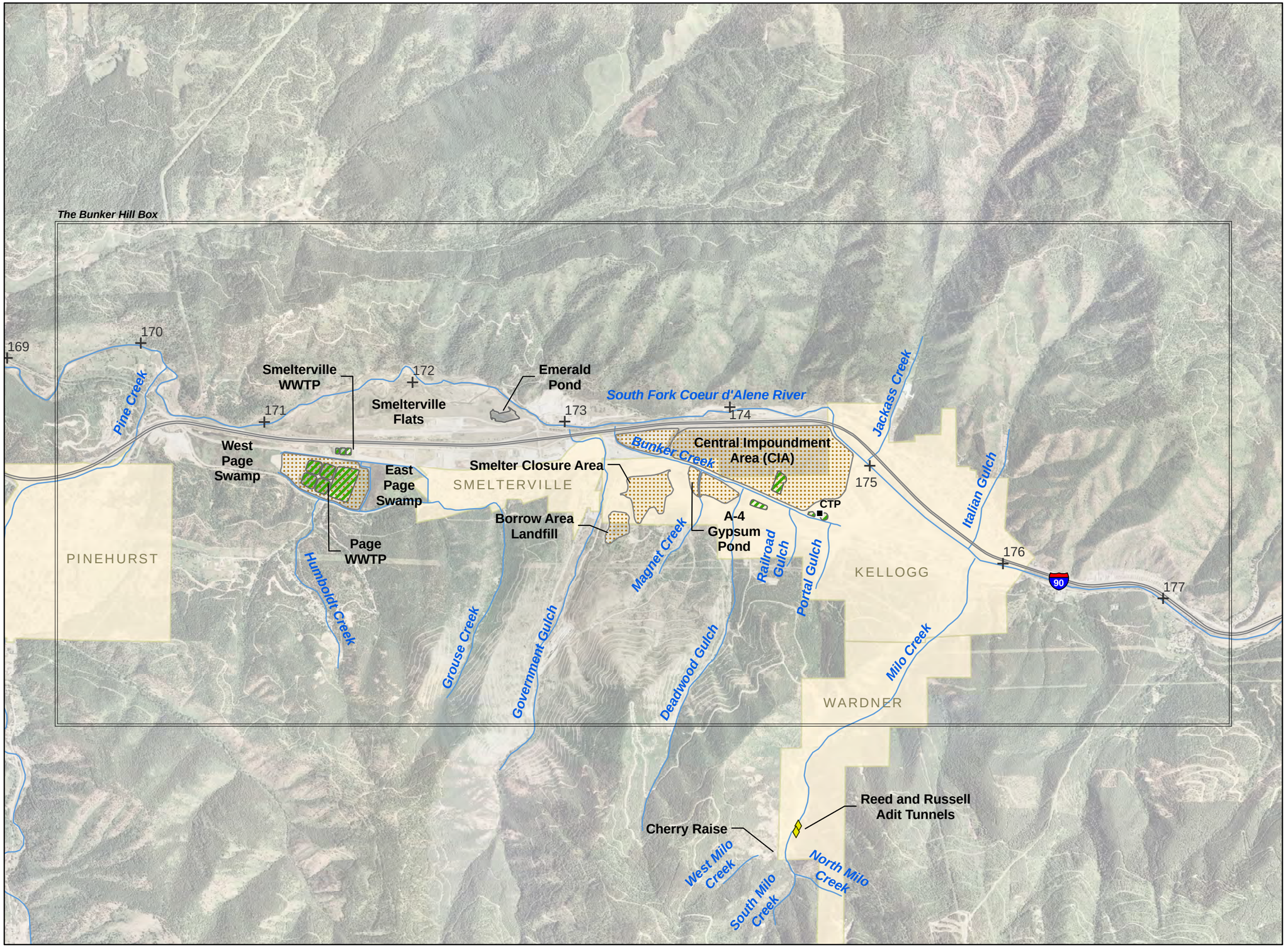
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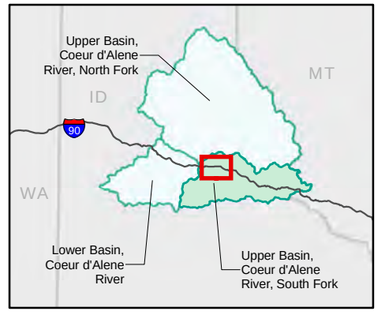
0 2,500 5,000 10,000 Feet

Base Map Data:
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ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note:
The source IDs and names are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency [USEPA], 2001c, 2001d).

Figure 6-50
Water Treatment Approach, Mainstem SFCDR Watershed, Alternative 4+ Excluding the Bunker Hill "Box"
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





177 River Mile

Adit

Central Treatment Plant (CTP) in Kellogg, Idaho

River/Creek

Industrial or Municipal Waterbody

Waste Consolidation Area

City Limit

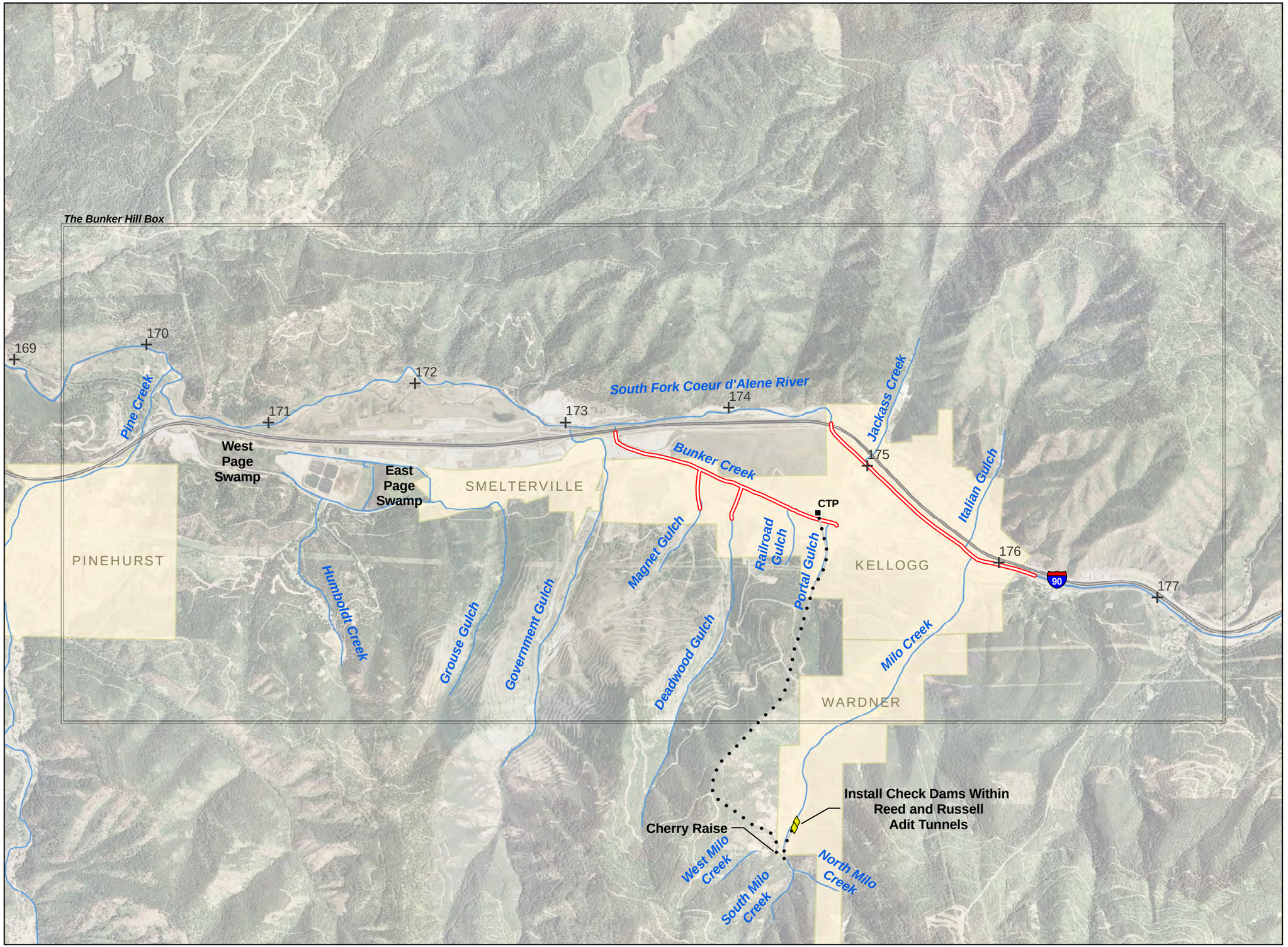
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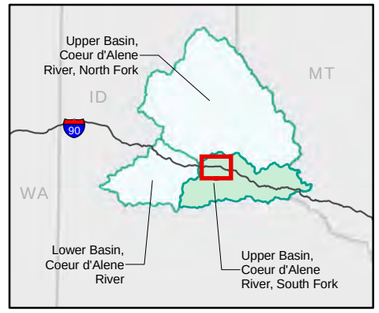
0 1,250 2,500 5,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Figure 6-51
Overview of the OU 2 Bunker Hill "Box" Area Included in the Focused Feasibility Study
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

EPA





177 River Mile

Central Treatment Plant (CTP) in Kellogg, Idaho

Adit

River/Creek

Conveyance of Reed and Russell adit discharge through the Bunker Hill Mine via the Cherry Raise and the Kellogg Tunnel to the CTP (see note below)

Stream Liner

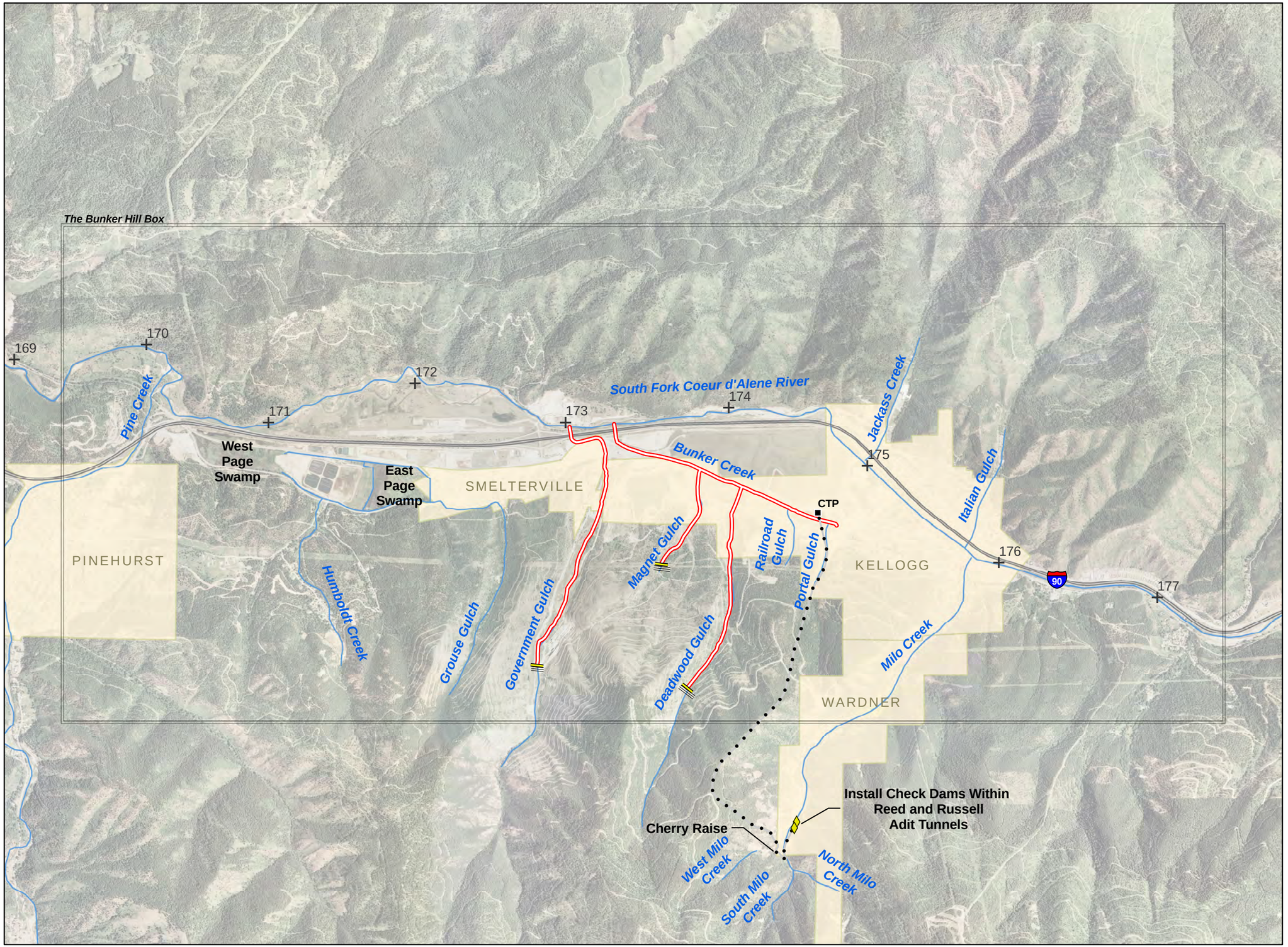
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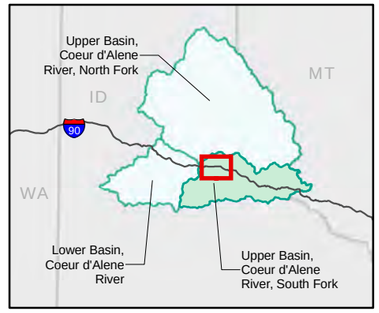
0 1,000 2,000 4,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note: Conveyance and treatment of Reed and Russell adit discharge is a contingency action that will be implemented only if check dams do not eliminate the flow of contaminated water from the adits.

Figure 6-52
OU 2 Alternative (a):
Minimal Stream Lining
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





177 River Mile

Central Treatment Plant (CTP) in Kellogg, Idaho

Adit

River/Creek

Conveyance of Reed and Russell adit discharge through the Bunker Hill Mine via the Cherry Raise and the Kellogg Tunnel to the CTP (see note below)

Extraction Wells

Slurry Wall

Stream Liner

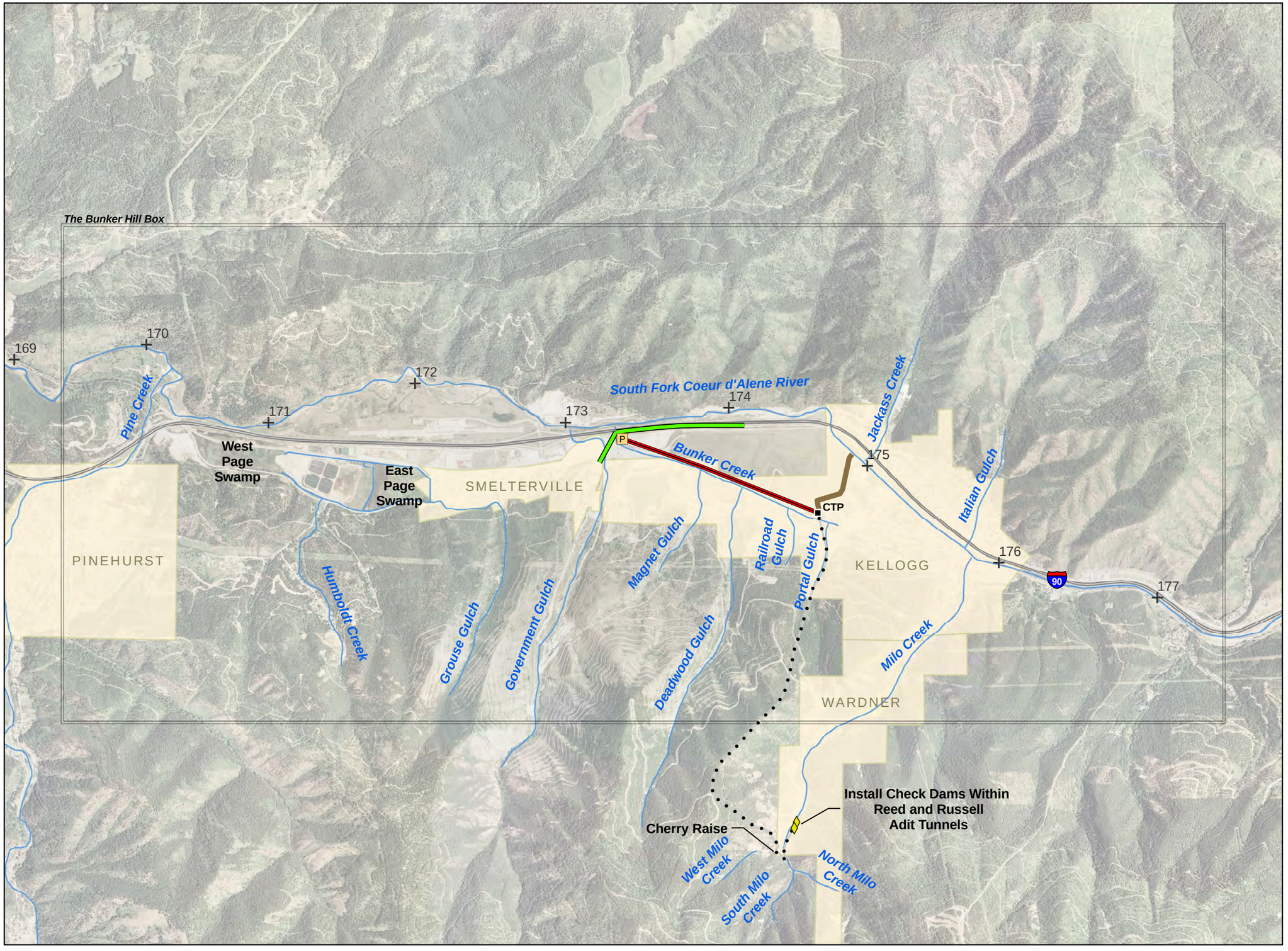
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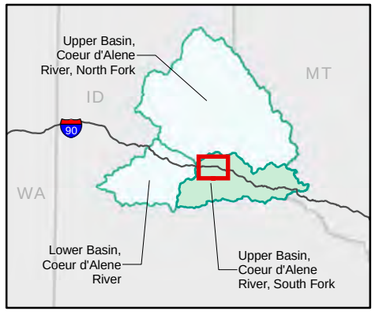
0 1,000 2,000 4,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note: Conveyance and treatment of Reed and Russell adit discharge is a contingency action that will be implemented only if check dams do not eliminate the flow of contaminated water from the adits.

Figure 6-53
OU 2 Alternative (b): Extensive Stream Lining
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





177 River Mile

Central Treatment Plant (CTP) in Kellogg, Idaho

Adit

P Pump Station

River/Creek

Conveyance of Reed and Russell adit discharge through the Bunker Hill Mine via the Cherry Raise and the Kellogg Tunnel to the CTP (see note below)

Pressurized Pipeline to CTP

French Drain

CTP Effluent Discharge Pipeline

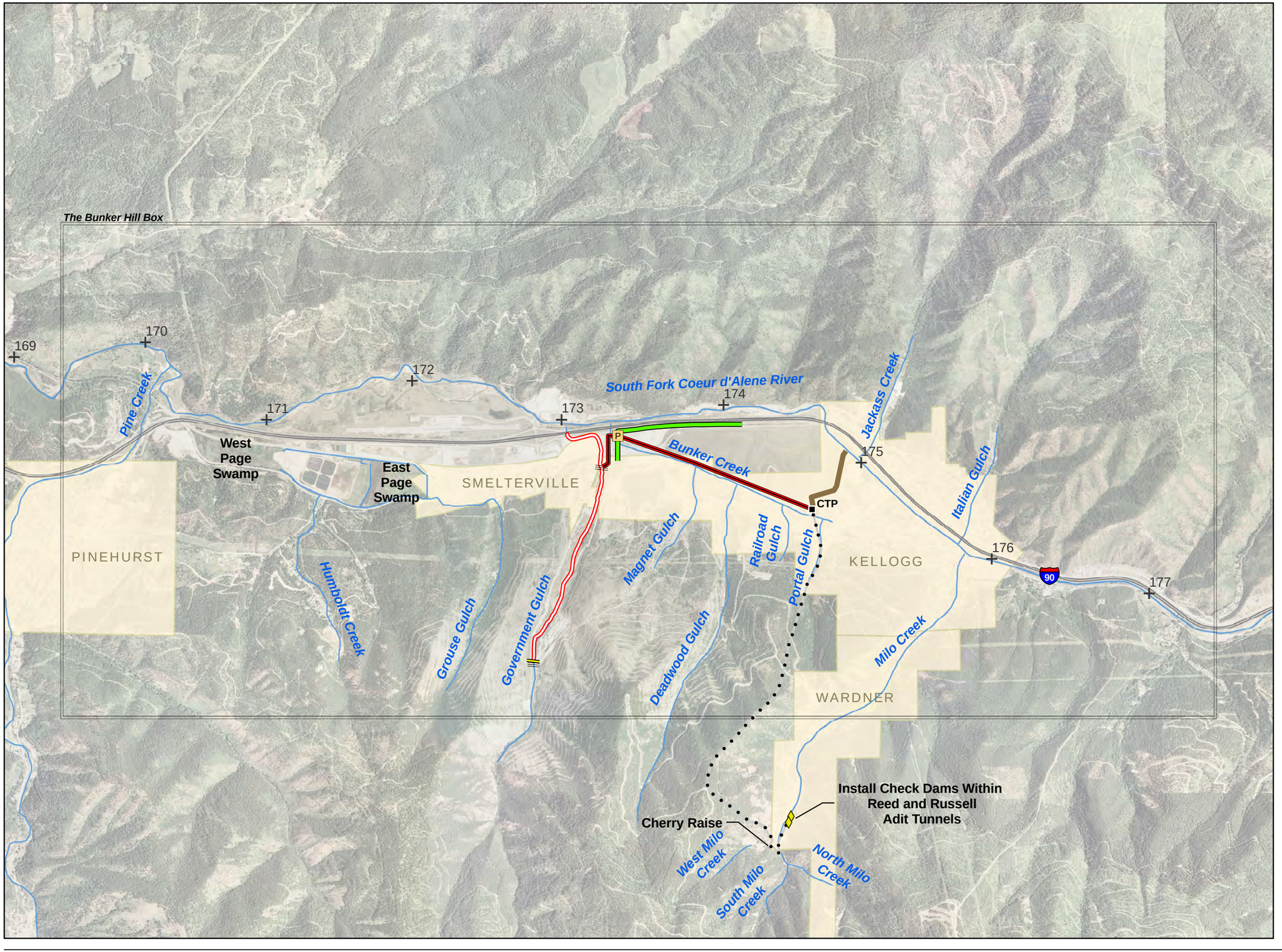
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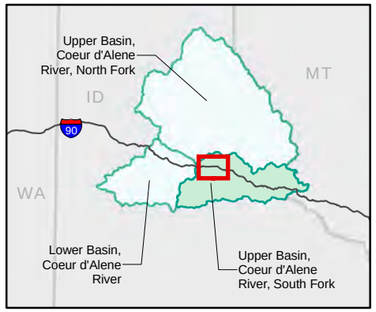
0 1,000 2,000 4,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note: Conveyance and treatment of Reed and Russell adit discharge is a contingency action that will be implemented only if check dams do not eliminate the flow of contaminated water from the adits.

Figure 6-54
OU 2 Alternative (c): French Drains
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





177 River Mile

Central Treatment Plant (CTP) in Kellogg, Idaho

Adit

P Pump Station

River/Creek

Conveyance of Reed and Russell adit discharge through the Bunker Hill Mine via the Cherry Raise and the Kellogg Tunnel to the CTP (see note below)

Pressurized Pipeline to CTP

Extraction Wells

Slurry Wall

French Drain

Stream Liner

CTP Effluent Discharge Pipeline

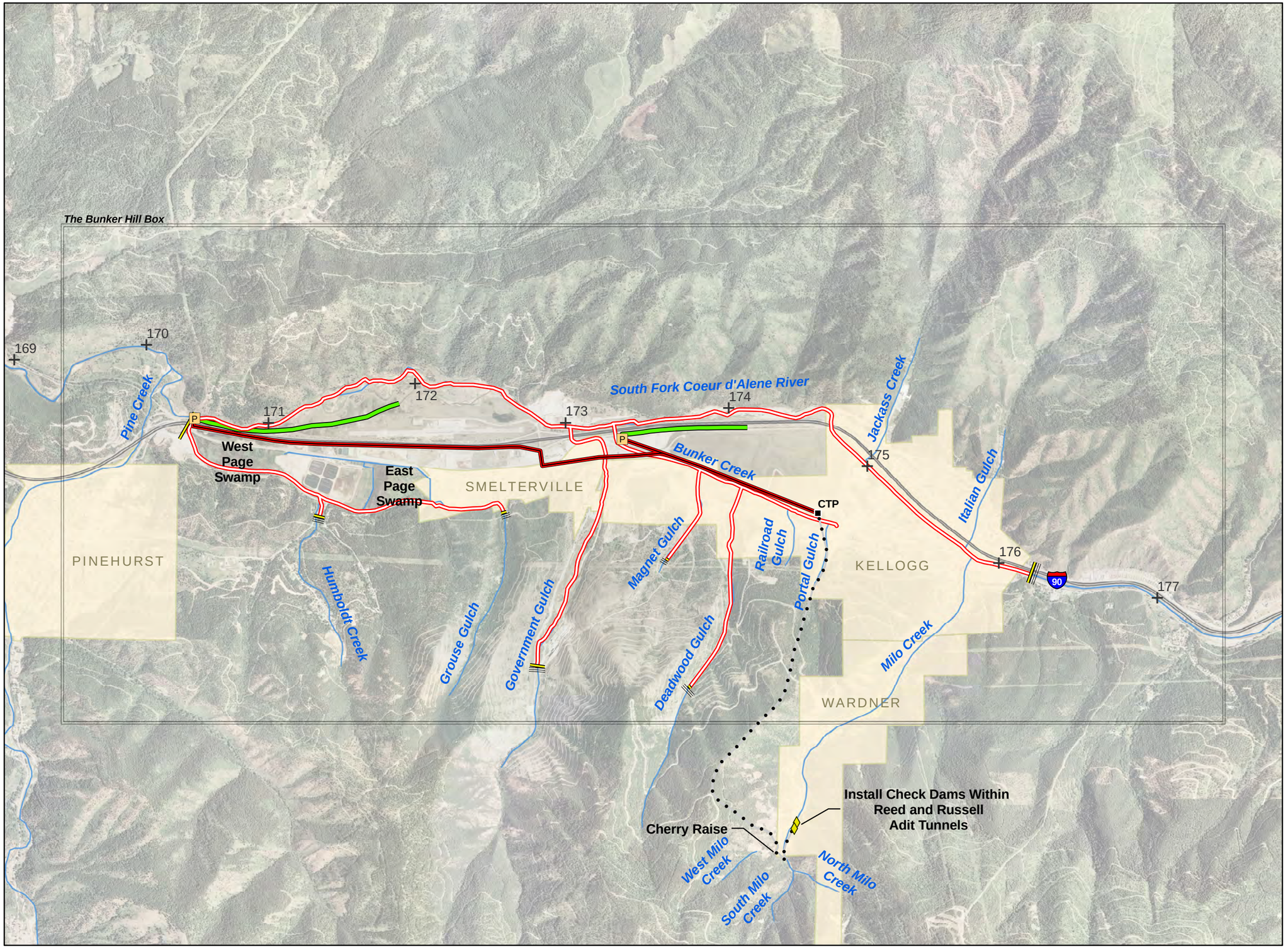
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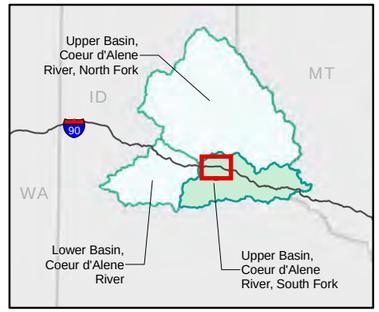
0 1,000 2,000 4,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note: Conveyance and treatment of Reed and Russell adit discharge is a contingency action that will be implemented only if check dams do not eliminate the flow of contaminated water from the adits.

Figure 6-55
OU 2 Alternative (d): Stream Lining/French Drain Combination
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





177 River Mile

Central Treatment Plant (CTP) in Kellogg, Idaho

Adit

P Pump Station

River/Creek

Conveyance of Reed and Russell adit discharge through the Bunker Hill Mine via the Cherry Raise and the Kellogg Tunnel to the CTP (see note below)

Pressurized Pipeline to CTP

Extraction Wells

Slurry Wall

French Drain

Stream Liner

N

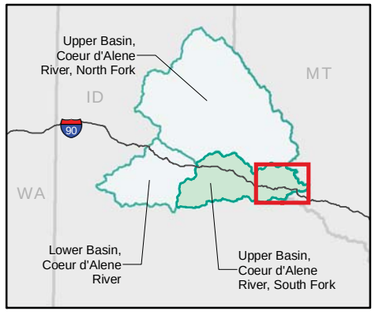
0 1,000 2,000 4,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Note: Conveyance and treatment of Reed and Russell adit discharge is a contingency action that will be implemented only if check dams do not eliminate the flow of contaminated water from the adits.

Figure 6-56
OU 2 Alternative (e): Extensive Stream Lining/French Drain Combination
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

SITE ID	SITE NAME	SITE ID	SITE NAME	SITE ID	SITE NAME
LOK001	LUCKY CALUMET NO. 1	MUL009	SILVER SHAFT	MUL045	HOMESTAKE MINE
LOK002	LUCKY CALUMET NO. 2	MUL012	STAR 1200 LEVEL	MUL047	LOTTIE L. MINE
LOK004	SNOWSHOE NO. 2	MUL013	WE LIKE MINE	MUL048	ALMA MINE
LOK005	LUCKY BOY NO. 2	MUL014	GROUSE MINE	MUL049	COPPER PLATE MINE
LOK006	LUCKY BOY NO. 1	MUL015	WEST STAR MINE	MUL051	PILOT MINE
LOK007	BUTTE & COEUR D ALENE (IDAHO SILVER)	MUL018	MULLAN METALS MINE	MUL052	COPPER KING MINE
LOK008	IDAHO SILVER	MUL019	MORNING NO.6	MUL053	NATIONAL MINE
LOK009	SNOWSTORM NO. 4	MUL020	LUCKY FRIDAY TAILINGS POND	MUL054	UNNAMED ADIT
LOK010	HASHHOUSE MINE	MUL021	INDEPENDENCE MINE	MUL056	COUGHLIN MINE
LOK011	SNOWSTORM NO. 3	MUL022	SUNSHINE PREMIER MINE	MUL057	BUTTE AND COEUR D ALENE MINE
LOK017	BEACON LIGHT	MUL023	FANNY GREMM MINE	MUL058	LUCKY FRIDAY TAILINGS POND
LOK048	SNOWSTORM APEX	MUL027	MORNING NO.4	MUL059	ROCK CREEK MINE ROCK DUMP
LOK050	DAISY GULCH TAILINGS POND	MUL028	MORNING NO.5	MUL060	ROCK CREEK MINE
LOK051	DAISY GULCH OLD LANDFILL	MUL029	NORTH FRANKLIN MINE	MUL063	GEM STATE MINE
LOK053	UNNAMED ADIT	MUL030	WALL STREET MINE	MUL065	MOE MINE
MUL001	GOLCONDA MINESITE	MUL031	CINCINNATI MINE	MUL071	ATLAS MINE
MUL002	GOLCONDA MILLSITE	MUL033	AMERICAN COMMANDER NO.2	MUL073	ATLAS MINE (CARBONATE HILL)
MUL004	UNITED LEAD ZINC MINE	MUL037	LUCKY FRIDAY TAILINGS POND	MUL081	REINDEER QUEEN MINE
MUL006	SQUARE DEAL MINE	MUL038	GOLD HUNTER NO. 6	MUL083	COPPER QUEEN MINE
MUL007	WONDER MINE	MUL042	GOLD HUNTER NO. 5	MUL103	MISSOULA MINE
MUL008	ALICE MINE	MUL043	SILVER REEF MINE	MUL119	UNNAMED ADIT
MUL120	BANNER MINE				
MUL129	ATLAS MINE ROCK DUMP				
MUL131	NATIONAL MILLSITE				
MUL132	NATIONAL MILLSITE ADJACENT TAILINGS				
MUL135	UNNAMED ADIT				
MUL136	UNNAMED ADIT				
MUL139	UNNAMED ADIT				
MUL141	MILL CK IMPACTED RIPARIAN				
MUL142	GROUSE GULCH IMPACTED RIPARIAN				
MUL145	MILL CK IMPACTED RIPARIAN				
MUL146	MORNING NO.3				
MUL149	MILL CK IMPACTED RIPARIAN				
MUL150	DEADMAN GULCH IMPACTED RIPARIAN				
MUL153	DEADMAN GULCH IMPACTED RIPARIAN				
THO020	BULL FROG MINE				
WAL013	GRANADA MINE				
WAL038	SF CDA RIVER IMPACTED FLOODPLAIN				
WAL076	MARY D CLAIM WORKINGS				
WAL077	GOLCONDA TAILINGS				



Remedial Action Types:

- Excavation/Cap
- Excavation/Cap Waste Consolidation Area
- Excavation Waste Consolidation Area
- Excavation Repository
- Excavation Repository; Impoundment Closure
- Impoundment Closure; Hydraulic Isolation
- Regrade/Consolidate/Revegetate
- 203 River Mile
- **LOK011** (Site ID)
- River/Creek
- Watershed Segment
- City Limit
- State Boundary

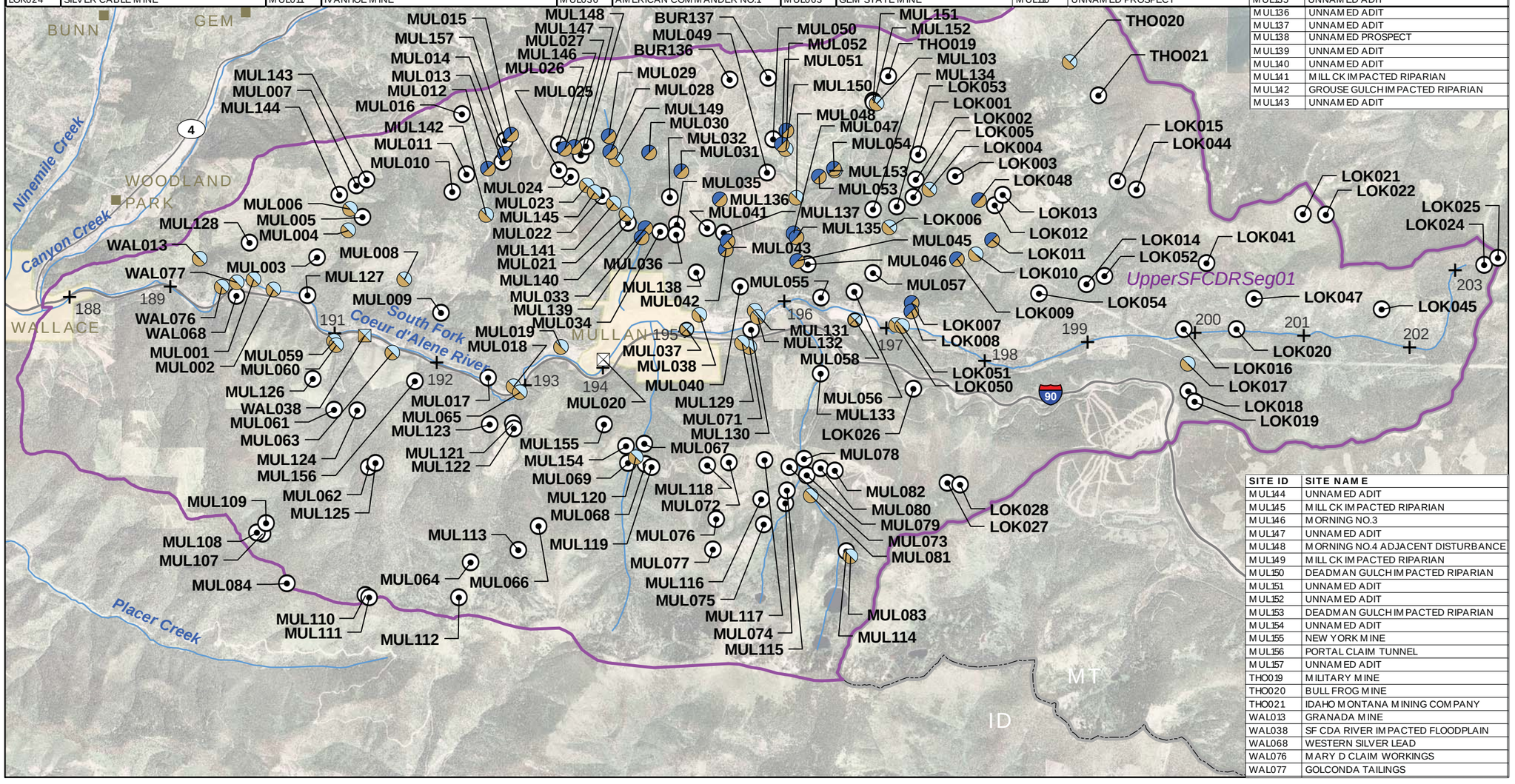
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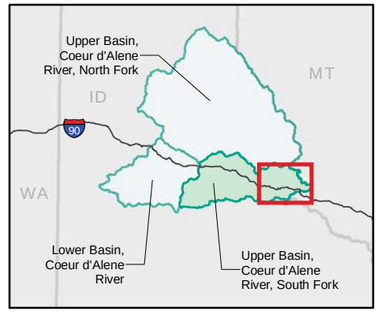
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Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Figure 7-1
Overview of Remedial Actions, Alternative 3+, Upper SFCDR Watershed
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

SITE ID	SITE NAME	SITE ID	SITE NAME	SITE ID	SITE NAME	SITE ID	SITE NAME	SITE ID	SITE NAME	SITE ID	SITE NAME
BUR136	LIQUIDATOR (EAST HECLA GROUP)	LOK025	UNNAMED PROSPECT	MUL012	STAR 1200 LEVEL	MUL037	LUCKY FRIDAY TAILINGS POND	MUL064	UNNAMED ADIT	MUL111	UNNAMED PROSPECT
BUR137	EAST HECLA GROUP	LOK026	IDAHO SILVER	MUL013	WE LIKE MINE	MUL038	GOLD HUNTER NO. 6	MUL065	MOE MINE	MUL112	UNNAMED PROSPECT
LOK001	LUCKY CALUMET NO. 1	LOK027	UNNAMED ADIT	MUL014	GROUSE MINE	MUL040	PLYMOUTH NO. 4	MUL066	BITTERROOT PROSPECT	MUL113	UNNAMED PROSPECT
LOK002	LUCKY CALUMET NO. 2	LOK028	HUNTER-SNOWSTORM LODE/UNNAMED PROSP	MUL015	WEST STAR MINE	MUL041	GOLD HUNTER COLLAPSED TUNNEL	MUL067	BOULDER CK QUARRY	MUL114	UNNAMED ADIT
LOK003	SNOWSHOE NO. 1	LOK041	IDAHO MONTANA SILVER	MUL016	UNNAMED ADIT	MUL042	GOLD HUNTER NO. 5	MUL068	CENTRAL PROSPECT	MUL115	UNNAMED ADIT
LOK004	SNOWSHOE NO. 2	LOK044	LEWIS & CLARK GROUP	MUL017	BUTCHER MINE	MUL043	SILVER REEF MINE	MUL069	BANNER MINE	MUL116	UNNAMED ADIT
LOK005	LUCKY BOY NO. 2	LOK045	COEUR D ALENE SILVER LEAD MINING CO.	MUL018	MULLAN METALS MINE	MUL045	HOMESTAKE MINE	MUL071	ATLAS MINE	MUL117	UNNAMED ADIT
LOK006	LUCKY BOY NO. 1	LOK047	TUCKER GROUP	MUL019	MORNING NO.6	MUL046	UNNAMED PROSPECT	MUL072	LOWER GIANT MINE	MUL118	UPPER GIANT PROSPECT
LOK007	BUTTE & COEUR D ALENE (IDAHO SILVER)	LOK048	SNOWSTORM APEX	MUL020	LUCKY FRIDAY TAILINGS POND	MUL047	LOTTIE L. MINE	MUL073	ATLAS MINE (CARBONATE HILL)	MUL119	UNNAMED ADIT
LOK008	IDAHO SILVER	LOK050	DAISY GULCH TAILINGS POND	MUL021	INDEPENDENCE MINE	MUL048	ALMA MINE	MUL074	IDAHO COPPER	MUL120	BANNER MINE
LOK009	SNOWSTORM NO. 4	LOK051	DAISY GULCH OLD LANDFILL	MUL022	SUNSHINE PREMIER MINE	MUL049	COPPER PLATE MINE	MUL075	ARGENTA MINE	MUL121	UNNAMED ADIT
LOK010	HASHHOUSE MINE	LOK052	UNNAMED ADIT	MUL023	FANNY GREMM MINE	MUL050	MULLAN GROUP	MUL076	NORANDA (SUPERIOR SILVER) MINE	MUL122	UNNAMED ADIT
LOK011	SNOWSTORM NO. 3	LOK053	UNNAMED ADIT	MUL024	YOU LIKE MINE	MUL051	PILOT MINE	MUL077	NONPAREIL GROUP	MUL123	UNNAMED PROSPECT
LOK012	SNOWSTORM NO. 2	LOK054	UNNAMED ADIT	MUL025	YOU LIKE MINE UPPER WORKINGS	MUL052	COPPER KING MINE	MUL078	CARNEY NO.2	MUL124	UNNAMED ADIT
LOK013	SNOWSTORM NO. 1	MUL001	GOLCONDA MINESITE	MUL026	MORNING NO.1& NO.2	MUL053	NATIONAL MINE	MUL079	CARNEY NO.3	MUL125	UNNAMED PROSPECT
LOK014	PANDORA MINE	MUL002	GOLCONDA MILLSITE	MUL027	MORNING NO.4	MUL054	UNNAMED ADIT	MUL080	CARNEY NO.1	MUL126	UNNAMED ADIT
LOK015	UNIDENTIFIED DISTURBANCE	MUL003	MAYFLOWER MINE	MUL028	MORNING NO.5	MUL055	VINDICATOR MINE	MUL081	REINDEER QUEEN MINE	MUL127	UNNAMED ADIT
LOK016	LOST BOOZE MINE	MUL004	UNITED LEAD ZINC MINE	MUL029	NORTH FRANKLIN MINE	MUL056	COUGHLIN MINE	MUL082	UNNAMED ADIT	MUL128	UNNAMED ADIT
LOK017	BEACON LIGHT	MUL005	WEST FEDERAL GROUP	MUL030	WALL STREET MINE	MUL057	BUTTE AND COEUR D ALENE MINE	MUL083	COPPER QUEEN MINE	MUL129	ATLAS MINE ROCK DUMP
LOK018	SILVER CLIFF	MUL006	SQUARE DEAL MINE	MUL031	CINCINNATI MINE	MUL058	LUCKY FRIDAY TAILINGS POND	MUL084	UNNAMED PROSPECT	MUL130	MULLAN GRAVEL PIT
LOK019	PRINCETON MAGNA MINE	MUL007	WONDER MINE	MUL032	UNNAMED PROSPECT	MUL059	ROCK CREEK MINE ROCK DUMP	MUL103	MISSOULA MINE	MUL131	NATIONAL MILLSITE
LOK020	PRINCETON MINE	MUL008	ALICE MINE	MUL033	AMERICAN COMMANDER NO.2	MUL060	ROCK CREEK MINE	MUL107	UNNAMED PROSPECT	MUL132	NATIONAL MILLSITE ADJACENT TAILINGS
LOK021	UNNAMED PROSPECT	MUL009	SILVER SHAFT	MUL034	YOLANDE PROSPECT	MUL061	BLUE JAY MINE	MUL108	UNNAMED PROSPECT	MUL133	UNNAMED ADIT
LOK022	UNNAMED PROSPECT	MUL010	NATIONAL LEAD MINING CO.	MUL035	YOLANDE PROSPECT	MUL062	UNNAMED ADIT	MUL109	UNNAMED PROSPECT	MUL134	UNNAMED ADIT
LOK024	SILVER CABLE MINE	MUL011	IVANHOE MINE	MUL036	AMERICAN COMMANDER NO.1	MUL063	GEM STATE MINE	MUL110	UNNAMED PROSPECT	MUL135	UNNAMED ADIT
										MUL136	UNNAMED ADIT
										MUL137	UNNAMED ADIT
										MUL138	UNNAMED PROSPECT
										MUL139	UNNAMED ADIT
										MUL140	UNNAMED ADIT
										MUL141	MILL CK IMPACTED RIPARIAN
										MUL142	GROUSE GULCH IMPACTED RIPARIAN
										MUL143	UNNAMED ADIT





Remedial Action Types:

- Excavation Waste Consolidation Area
- Excavation Repository
- Excavation Repository; Hydraulic Isolation
- Excavation Repository; Impoundment Closure
- Impoundment Closure; Hydraulic Isolation
- Regrade/Consolidate/Revegetate
- 203 River Mile
- **LOK011** (Site ID)
- River/Creek
- Watershed Segment
- City Limit
- State Boundary

N

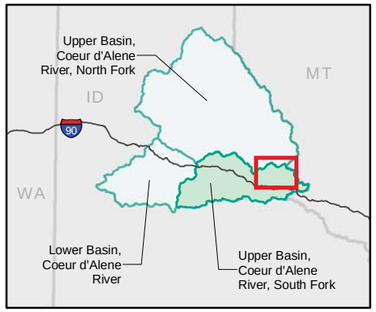
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Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006);
NRIS (Aerial Imagery, 2005).

SITE ID	SITE NAME
MUL144	UNNAMED ADIT
MUL145	MILL CK IMPACTED RIPARIAN
MUL146	MORNING NO.3
MUL147	UNNAMED ADIT
MUL148	MORNING NO.4 ADJACENT DISTURBANCE
MUL149	MILL CK IMPACTED RIPARIAN
MUL150	DEADMAN GULCH IMPACTED RIPARIAN
MUL151	UNNAMED ADIT
MUL152	UNNAMED ADIT
MUL153	DEADMAN GULCH IMPACTED RIPARIAN
MUL154	UNNAMED ADIT
MUL155	NEW YORK MINE
MUL156	PORTAL CLAIM TUNNEL
MUL157	UNNAMED ADIT
THO019	MILITARY MINE
THO020	BULL FROG MINE
THO021	IDAHO MONTANA MINING COMPANY
WAL013	GRANADA MINE
WAL038	SF CDA RIVER IMPACTED FLOODPLAIN
WAL068	WESTERN SILVER LEAD
WAL076	MARY D CLAIM WORKINGS
WAL077	GOLCONDA TAILINGS

Figure 7-2
Overview of Remedial Actions, Alternative 4+, Upper SFCDR Watershed
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

SITE ID	SITE NAME	SITE ID	SITE NAME	SITE ID	SITE NAME	SITE ID	SITE NAME
BUR066	MOONLIGHT MINE	BUR117	FRISCO MILLSITE	BUR142	GEM MILLSITE	BUR191	FRISCO NO.3
BUR067	TAMARACK NO.7 (1200 LEVEL)	BUR118	FRISCO NO.2 & NO.1	BUR143	CANYON CK IMPACTED RIPARIAN	BUR192	BLACK BEAR MILLSITE
BUR068	HEADLIGHT MINE	BUR119	BLACK BEAR NO.4	BUR144	STANDARD-MAMMOTH LOADING AREA	BUR204	UNNAMED ROCK DUMP
BUR072	STANDARD-MAMMOTH NO.4	BUR120	SILVER MOON MINE	BUR145	ONEILL GULCH UNNAMED ROCK DUMP	THO023	UNNAMED ADIT
BUR073	STANDARD-MAMMOTH CAMPBELL ADIT	BUR121	BLACK BEAR FRACTION	BUR146	GORGE GULCH IMPACTED RIPARIAN	OSB047	CANYON CK FORMOSA REACH SVNRT REHAB
BUR075	SHERMAN 1000 LEVEL (OREANO ADIT)	BUR122	FLYNN MINE	BUR149	AJAX NO.2 ADJACENT ROCK DUMP	WAL009	HECLA-STAR TAILINGS PONDS
BUR087	HERCULES NO. 3	BUR124	OMAHA MINE	BUR150	CANYON CK GARBAGE DUMP	WAL010	CANYON CK POND REACH SVNRT REHAB
BUR089	IDAHO AND EASTERN MINE	BUR125	MIDWAY SUMMIT MINE	BUR153	CANYON CK IMPACTED FLOODPLAIN	WAL011	CANYON SILVER (FORMOSA) MINE
BUR090	HERCULES NO. 4	BUR128	HECLA-STAR MINE & MILLSITE COMPLEX	BUR166	UNNAMED ADIT	WAL039	STANDARD-MAMMOTH MILLSITE
BUR094	SHERMAN 600 LEVEL	BUR129	TIGER-POORMAN MINE	BUR176	UNNAMED ADIT	WAL040	CANYON CK IMPACTED FLOODPLAIN
BUR096	ANCHOR MINE	BUR130	MARSH MINE	BUR177	JOE MATT MINE	WAL041	CANYON CK REPOSITORY REACH SVNRT REHAB
BUR097	HIDDEN TREASURE MINE	BUR132	GERTIE MINE	BUR178	WEST HECLA MINE	WAL042	CANYON CK TAILINGS REPOSITORY SVNRT
BUR098	HERCULES NO. 5	BUR133	RUSSEL MINE	BUR180	STANLEY MINE	WAL081	WALLACE OLD PRIVATE LANDFILL
BUR105	OOM PAUL NO. 2	BUR134	ALCIDES PROSPECT & IMPERIAL MINE	BUR185	WEST MAMMOTH MINE		
BUR107	AJAX NO.3	BUR135	SONORA MINE	BUR187	UNNAMED ADIT		
BUR109	OOM PAUL NO. 1	BUR141	CANYON CK IMPACTED FLOODPLAIN	BUR189	DULUTH MINE CANYON CK		



Remedial Action Types:

- Cap/Hydraulic Isolation
- Cap
- Excavation/Cap
- Excavation/Cap Waste Consolidation Area
- Excavation Waste Consolidation Area
- Excavation Repository
- Excavation Repository; Hydraulic Isolation
- Hydraulic Isolation
- Regrade/Consolidate/Revegetate
- 4 River Mile
- **BUR187** (Site ID)
- River/Creek
- Watershed Segment
- City Limit
- State Boundary

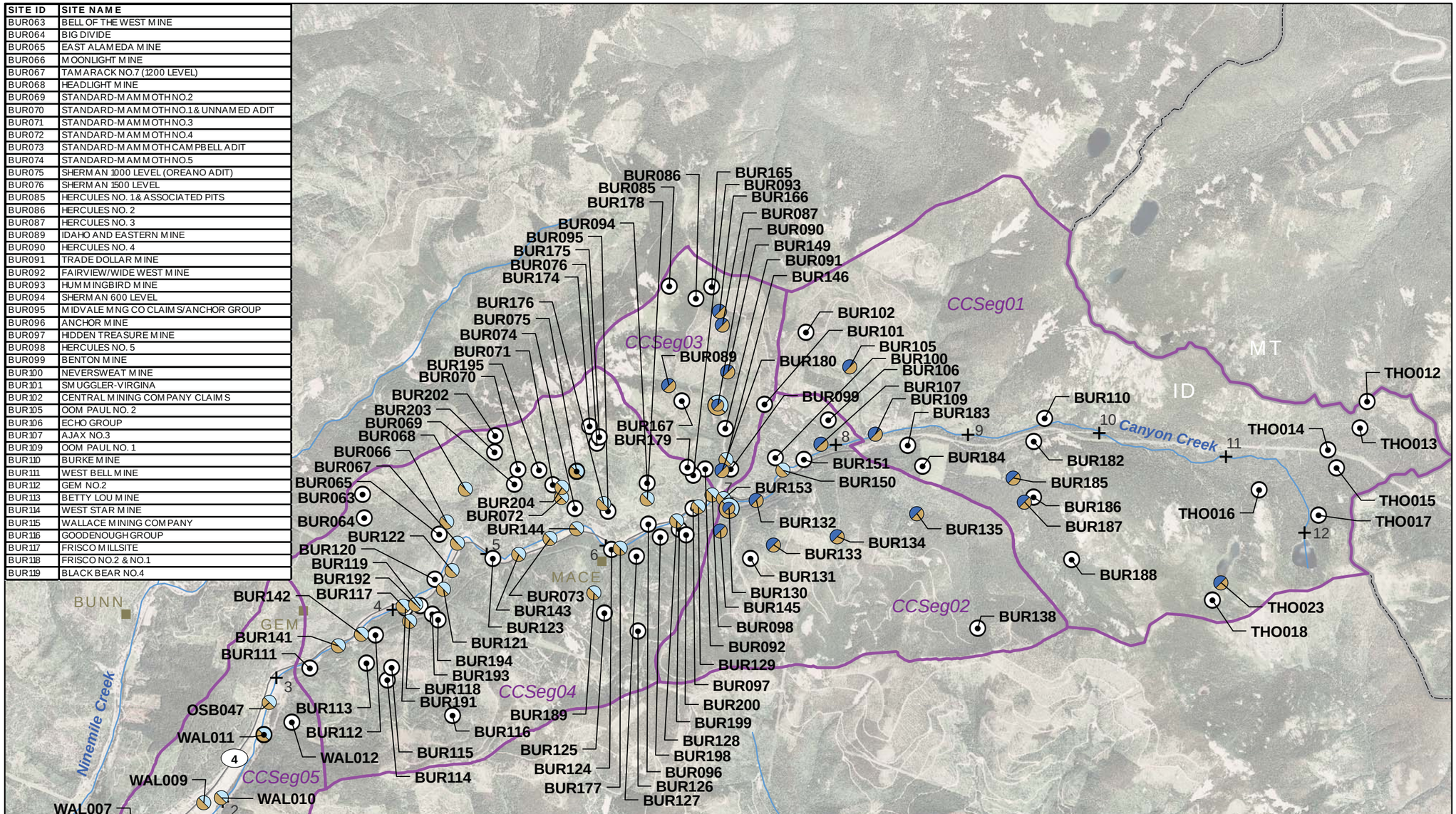
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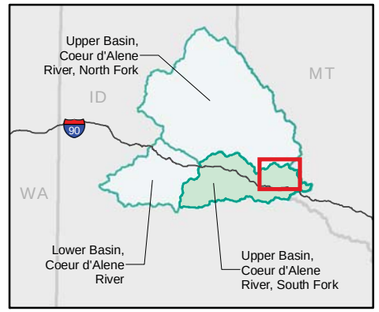
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Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Figure 7-3
Overview of Remedial Actions, Alternative 3+, Canyon Creek Watershed
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

SITE ID	SITE NAME
BUR063	BELL OF THE WEST MINE
BUR064	BIG DIVIDE
BUR065	EAST ALAMEDA MINE
BUR066	MOONLIGHT MINE
BUR067	TAMARACK NO.7 (1200 LEVEL)
BUR068	HEADLIGHT MINE
BUR069	STANDARD-MAMMOTH NO.2
BUR070	STANDARD-MAMMOTH NO.1 & UNNAMED ADIT
BUR071	STANDARD-MAMMOTH NO.3
BUR072	STANDARD-MAMMOTH NO.4
BUR073	STANDARD-MAMMOTH CAMPBELL ADIT
BUR074	STANDARD-MAMMOTH NO.5
BUR075	SHERMAN 1000 LEVEL (OREANO ADIT)
BUR076	SHERMAN 1500 LEVEL
BUR085	HERCULES NO. 1 & ASSOCIATED PITS
BUR086	HERCULES NO. 2
BUR087	HERCULES NO. 3
BUR089	IDAHO AND EASTERN MINE
BUR090	HERCULES NO. 4
BUR091	TRADE DOLLAR MINE
BUR092	FAIRVIEW/WIDE WEST MINE
BUR093	HUMMINGBIRD MINE
BUR094	SHERMAN 600 LEVEL
BUR095	MIDVALE MNG CO CLAIMS/ANCHOR GROUP
BUR096	ANCHOR MINE
BUR097	HIDDEN TREASURE MINE
BUR098	HERCULES NO. 5
BUR099	BENTON MINE
BUR100	NEVERSWEAT MINE
BUR101	SMUGGLER-VIRGINA
BUR102	CENTRAL MINING COMPANY CLAIMS
BUR105	OOM PAUL NO. 2
BUR106	ECHO GROUP
BUR107	AJAX NO.3
BUR109	OOM PAUL NO. 1
BUR110	BURKE MINE
BUR111	WEST BELL MINE
BUR112	GEM NO.2
BUR113	BETTY LOU MINE
BUR114	WEST STAR MINE
BUR115	WALLACE MINING COMPANY
BUR116	GOODENOUGH GROUP
BUR117	FRISCO MILLSITE
BUR118	FRISCO NO.2 & NO.1
BUR119	BLACK BEAR NO.4





Remedial Action Types:

- Excavation Waste Consolidation Area
- Excavation Waste Consolidation Area; Excavation Repository
- Excavation Repository
- Excavation Repository; Regrade/Consolidate/Revegetate
- Regrade/Consolidate/Revegetate
- + 4 River Mile
- **BUR187** (Site ID)
- River/Creek
- Watershed Segment
- City Limit
- State Boundary

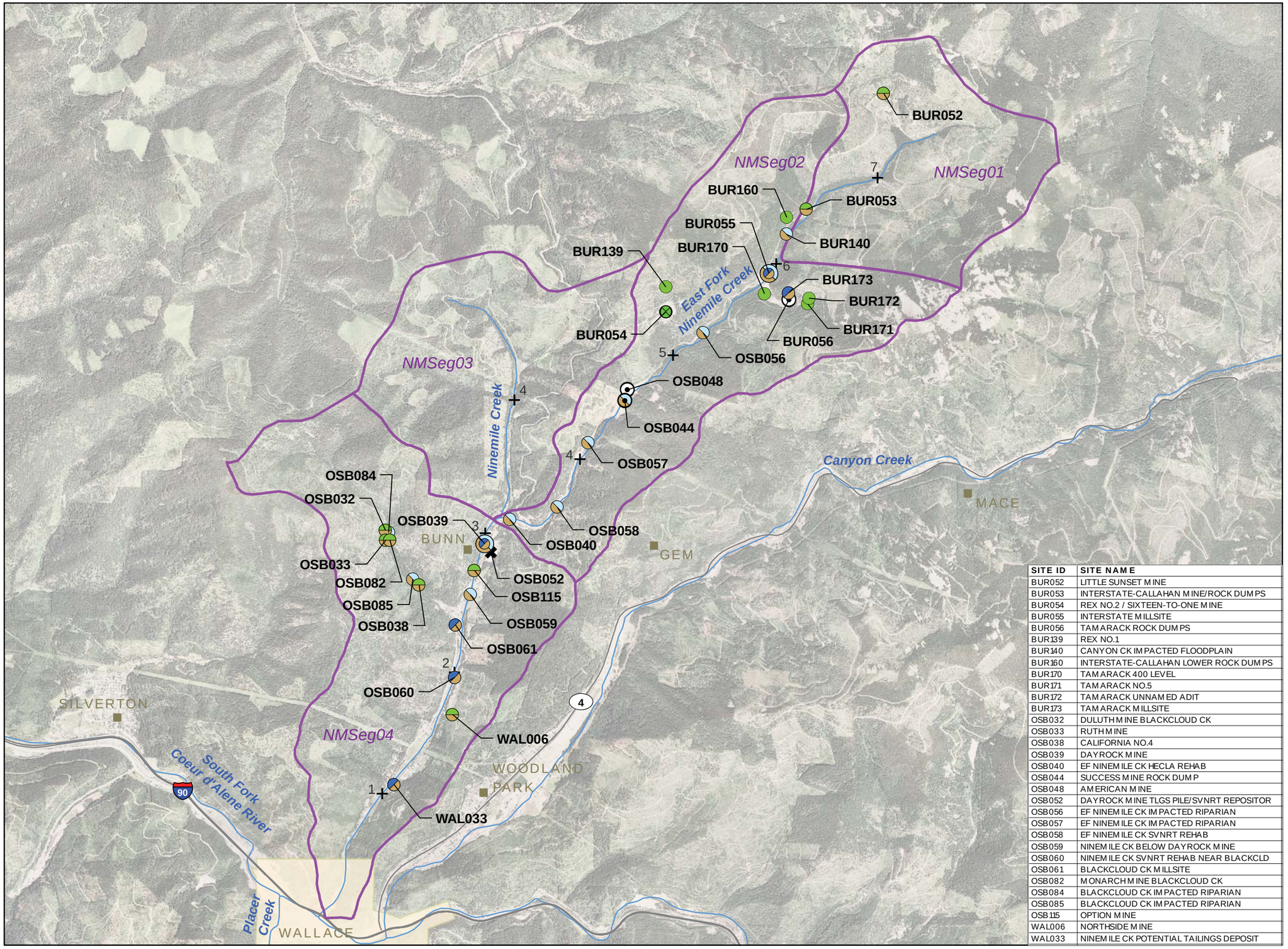
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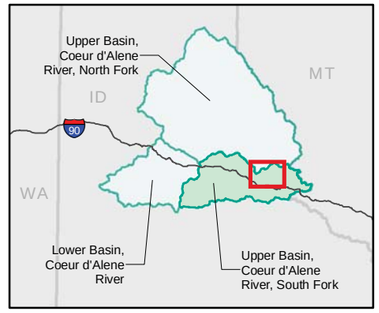
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Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

SITE ID	SITE NAME	SITE ID	SITE NAME	SITE ID	SITE NAME	SITE ID	SITE NAME
BUR120	SILVER MOON MINE	BUR143	CANYON CK IMPACTED RIPARIAN	BUR183	HOMESTAKE SILVER LEAD	THO013	UNNAMED ADIT
BUR121	BLACK BEAR FRACTION	BUR144	STANDARD-MAMMOTH LOADING AREA	BUR184	UNNAMED ADIT	THO014	ORLANDO MINE
BUR122	FLYNN MINE	BUR145	ONEILL GULCH UNNAMED ROCK DUMP	BUR185	WEST MAMMOTH MINE	THO015	UNIDENTIFIED DISTURBANCE
BUR123	GREAT EASTERN MINE	BUR146	GORGE GULCH IMPACTED RIPARIAN	BUR186	UNNAMED ADIT	THO016	IDAHO MINING COMPANY
BUR124	OMAHA MINE	BUR149	AJAX NO.2 ADJACENT ROCK DUMP	BUR187	UNNAMED ADIT	THO017	BURKE MINING COMPANY
BUR125	MIDWAY SUMMIT MINE	BUR150	CANYON CK GARBAGE DUMP	BUR188	COEUR D ALENE CHAMPION MINE	THO018	HALF MOON MINE
BUR126	ALBANY LEAD MINING COMPANY	BUR151	CANYON CK ROCKPIT	BUR189	DULUTH MINE CANYON CK	THO023	UNNAMED ADIT
BUR127	EAST STANDARD MINE	BUR153	CANYON CK IMPACTED FLOODPLAIN	BUR191	FRISCO NO.3	OSB047	CANYON CK FORMOSA REACH SVNRT REHAB
BUR128	HECLA-STAR MINE & MILLSITE COMPLEX	BUR165	HONOLULU MINE	BUR192	BLACK BEAR MILLSITE	WAL007	CANYON CK GRAVEL PIT
BUR129	TIGER-POORMAN MINE	BUR166	UNNAMED ADIT	BUR193	BLACK BEAR NO.3	WAL008	SISTERS MINE
BUR130	MARSH MINE	BUR167	UNNAMED ADIT	BUR194	BLACK BEAR NO.2	WAL009	HECLA-STAR TAILINGS PONDS
BUR131	UNIDENTIFIED DISTURBANCE	BUR174	CUSTER PEAK EXPLORATION PITS	BUR195	UNNAMED ADIT	WAL010	CANYON CK POND REACH SVNRT REHAB
BUR132	GERTIE MINE	BUR175	UNNAMED ADIT	BUR198	UNIDENTIFIED DISTURBANCE	WAL011	CANYON SILVER (FORMOSA) MINE
BUR133	RUSSEL MINE	BUR176	UNNAMED ADIT	BUR199	UNIDENTIFIED DISTURBANCE	WAL012	VERDE MAY MINE
BUR134	ALCIDES PROSPECT & IMPERIAL MINE	BUR177	JOE MATT MINE	BUR200	UNIDENTIFIED DISTURBANCE	WAL039	STANDARD-MAMMOTH MILLSITE
BUR135	SONORA MINE	BUR178	WEST HECLA MINE	BUR202	UNNAMED ROCK DUMPS	WAL040	CANYON CK IMPACTED FLOODPLAIN
BUR138	COPPER KING MINE UPPER ADIT	BUR179	UNNAMED ADIT	BUR203	GREENHILL CLEVELAND MINE	WAL041	CANYON CK REPOSITORY REACH SVNRT REHAB
BUR141	CANYON CK IMPACTED FLOODPLAIN	BUR180	STANLEY MINE	BUR204	UNNAMED ROCK DUMP	WAL042	CANYON CK TAILINGS REPOSITORY SVNRT
BUR142	GEM MILLSITE	BUR182	UNNAMED ADIT	THO012	UNNAMED ADIT	WAL081	WALLACE OLD PRIVATE LANDFILL

Figure 7-4
Overview of Remedial Actions, Alternative 4+, Canyon Creek Watershed
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





Remedial Action Types:

- Cap
- Cap; Impoundment Closure
- Excavation/Cap
- Excavation Waste Consolidation Area
- Excavation Waste Consolidation Area; Excavation Repository
- Excavation Repository
- Excavation Repository; Regrade/Consolidate/Revegetate
- Impoundment Closure
- Regrade/Consolidate/Revegetate
- River Mile
- **BUR139** (Site ID)
- River/Creek
- Watershed Segment
- City Limit

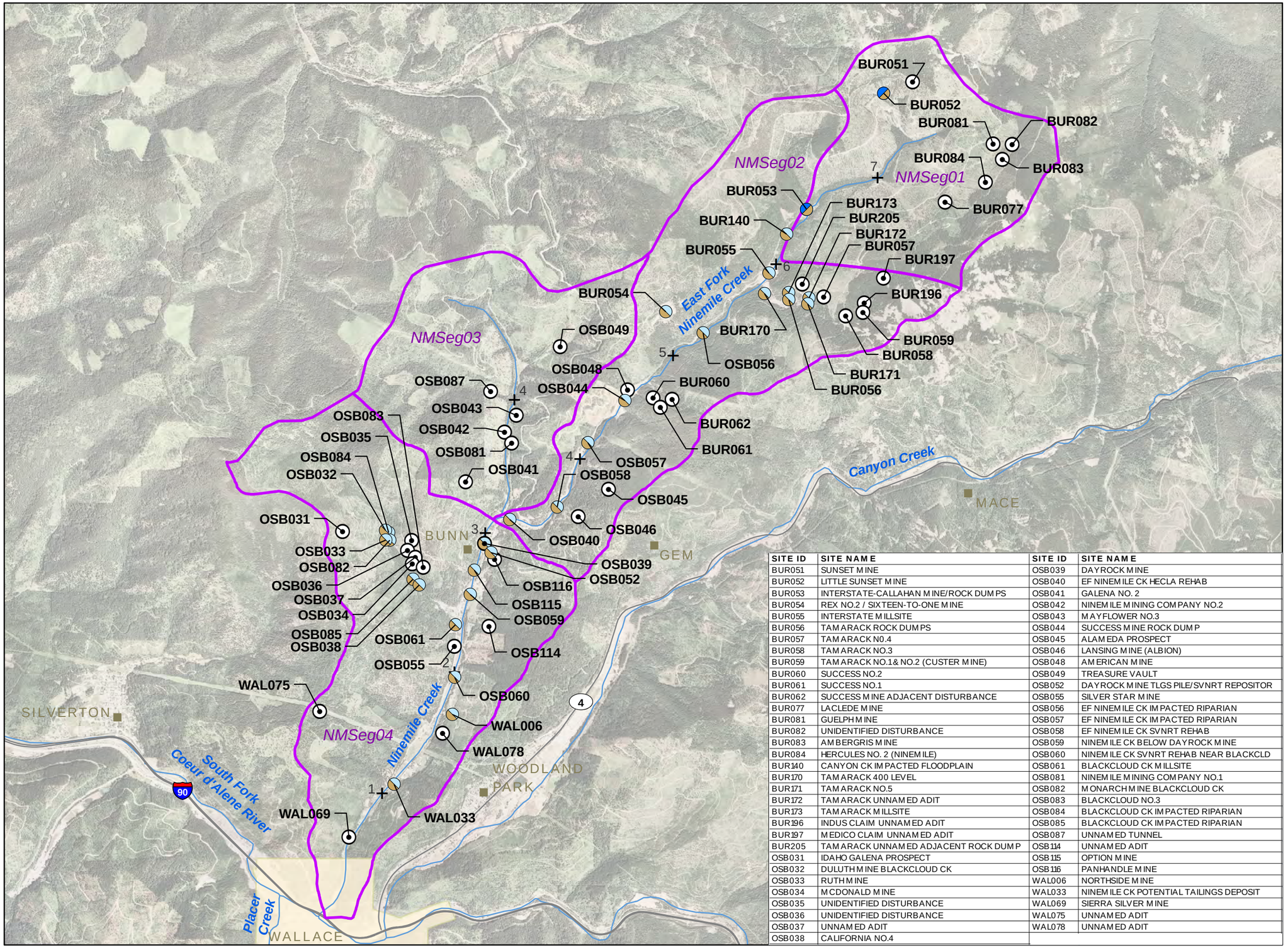
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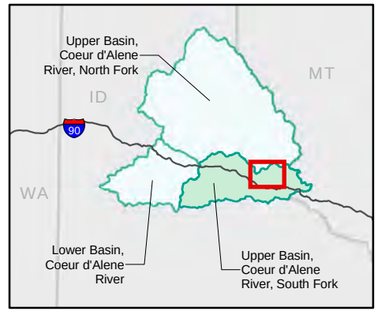
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Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

SITE ID	SITE NAME
BUR052	LITTLE SUNSET MINE
BUR053	INTERSTATE-CALLAHAN MINE/ROCK DUMPS
BUR054	REX NO.2 / SIXTEEN-TO-ONE MINE
BUR055	INTERSTATE MILLSITE
BUR056	TAMARACK ROCK DUMPS
BUR139	REX NO.1
BUR140	CANYON CK IMPACTED FLOODPLAIN
BUR160	INTERSTATE-CALLAHAN LOWER ROCK DUMPS
BUR170	TAMARACK 400 LEVEL
BUR171	TAMARACK NO.5
BUR172	TAMARACK UNNAMED ADIT
BUR173	TAMARACK MILLSITE
OSB032	DULUTH MINE BLACKCLOUD CK
OSB033	RUTH MINE
OSB038	CALIFORNIA NO.4
OSB039	DAYROCK MINE
OSB040	EF NINEMILE CK HECLA REHAB
OSB044	SUCCESS MINE ROCK DUMP
OSB048	AMERICAN MINE
OSB052	DAYROCK MINE TLGS PILE/SVNRT REPOSITOR
OSB056	EF NINEMILE CK IMPACTED RIPARIAN
OSB057	EF NINEMILE CK IMPACTED RIPARIAN
OSB058	EF NINEMILE CK SVNRT REHAB
OSB059	NINEMILE CK BELOW DAYROCK MINE
OSB060	NINEMILE CK SVNRT REHAB NEAR BLACKCLD
OSB061	BLACKCLOUD CK MILLSITE
OSB082	MONARCH MINE BLACKCLOUD CK
OSB084	BLACKCLOUD CK IMPACTED RIPARIAN
OSB085	BLACKCLOUD CK IMPACTED RIPARIAN
OSB115	OPTION MINE
WAL006	NORTHSIDE MINE
WAL033	NINEMILE CK POTENTIAL TAILINGS DEPOSIT

Figure 7-5
Overview of Remedial Actions, Alternative 3+, Ninemile Creek Watershed
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





Remedial Action Types:

- Excavation Waste Consolidation Area
- Excavation Repository
- Excavation Repository; Regrade/Consolidate/Revegetate
- Regrade/Consolidate/Revegetate
- River Mile
- **BUR139** (Site ID)
- River/Creek
- Watershed Segment
- City Limit

SITE ID	SITE NAME	SITE ID	SITE NAME
BUR051	SUNSET MINE	OSB039	DAYROCK MINE
BUR052	LITTLE SUNSET MINE	OSB040	EF NINEMILE CK HECLA REHAB
BUR053	INTERSTATE-CALLAHAN MINE/ROCK DUMPS	OSB041	GALENA NO. 2
BUR054	REX NO.2 / SIXTEEN-TO-ONE MINE	OSB042	NINEMILE MINING COMPANY NO.2
BUR055	INTERSTATE MILLSITE	OSB043	MAYFLOWER NO.3
BUR056	TAMARACK ROCK DUMPS	OSB044	SUCCESS MINE ROCK DUMP
BUR057	TAMARACK NO.4	OSB045	ALAMEDA PROSPECT
BUR058	TAMARACK NO.3	OSB046	LANSING MINE (ALBION)
BUR059	TAMARACK NO.1& NO.2 (CUSTER MINE)	OSB048	AMERICAN MINE
BUR060	SUCCESS NO.2	OSB049	TREASURE VAULT
BUR061	SUCCESS NO.1	OSB052	DAYROCK MINE TLGS PILE/SVNRT REPOSITOR
BUR062	SUCCESS MINE ADJACENT DISTURBANCE	OSB055	SILVER STAR MINE
BUR077	LACLEDE MINE	OSB056	EF NINEMILE CK IMPACTED RIPARIAN
BUR081	GUELPH MINE	OSB057	EF NINEMILE CK IMPACTED RIPARIAN
BUR082	UNIDENTIFIED DISTURBANCE	OSB058	EF NINEMILE CK SVNRT REHAB
BUR083	AMBERGRIS MINE	OSB059	NINEMILE CK BELOW DAYROCK MINE
BUR084	HERCULES NO. 2 (NINEMILE)	OSB060	NINEMILE CK SVNRT REHAB NEAR BLACKCLD
BUR140	CANYON CK IMPACTED FLOODPLAIN	OSB061	BLACKCLOUD CK MILLSITE
BUR170	TAMARACK 400 LEVEL	OSB081	NINEMILE MINING COMPANY NO.1
BUR171	TAMARACK NO.5	OSB082	MONARCH MINE BLACKCLOUD CK
BUR172	TAMARACK UNNAMED ADIT	OSB083	BLACKCLOUD NO.3
BUR173	TAMARACK MILLSITE	OSB084	BLACKCLOUD CK IMPACTED RIPARIAN
BUR196	INDUS CLAIM UNNAMED ADIT	OSB085	BLACKCLOUD CK IMPACTED RIPARIAN
BUR197	MEDICO CLAIM UNNAMED ADIT	OSB087	UNNAMED TUNNEL
BUR205	TAMARACK UNNAMED ADJACENT ROCK DUMP	OSB114	UNNAMED ADIT
OSB031	IDAHO GALENA PROSPECT	OSB115	OPTION MINE
OSB032	DULUTH MINE BLACKCLOUD CK	OSB116	PANHANDLE MINE
OSB033	RUTH MINE	WAL006	NORTHSIDE MINE
OSB034	MCDONALD MINE	WAL033	NINEMILE CK POTENTIAL TAILINGS DEPOSIT
OSB035	UNIDENTIFIED DISTURBANCE	WAL069	SIERRA SILVER MINE
OSB036	UNIDENTIFIED DISTURBANCE	WAL075	UNNAMED ADIT
OSB037	UNNAMED ADIT	WAL078	UNNAMED ADIT
OSB038	CALIFORNIA NO.4		

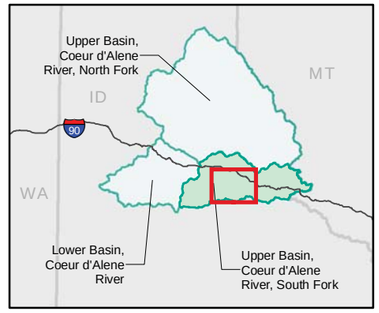
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Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Figure 7-6
Overview of Remedial Actions, Alternative 4+, Ninemile Creek Watershed
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





Remedial Action Types:

- Excavation Waste Consolidation Area
- Excavation Repository
- Impoundment Closure
- Regrade/Consolidate/Revegetate
- 184 River Mile
- **POL010** (Site ID)
- River/Creek
- Watershed Segment
- City Limit

SITE ID	SITE NAME
KLE025	SUNSHINE TAILINGS POND
KLE026	SILVER SYNDICATE
KLE027	NORTH AMERICAN MINE
KLE047	BIG CK IMPACTED RIPARIAN
KLE053	NORTH AMERICAN/SILVER SYNDICATE MINE
KLE054	CRESCENT/HOOPER TUNNEL
KLE071	BIG CK IMPACTED RIPARIAN
KLE073	BIG CK IMPACTED RIPARIAN
POL001	SUNSHINE CONSOLIDATED ROCKFORD GROUP
POL002	SILVER DALE AND BIG HILL MINE
POL008	GLOBE MINE
POL010	WESTERN STAR MINE
POL011	WOLFSON MINE
POL022	FIRST NATIONAL MINE
POL044	UNNAMED PROSPECT
POL052	LUCKY BOY MINE
POL066	UNNAMED ADIT
POL068	UNNAMED ADIT

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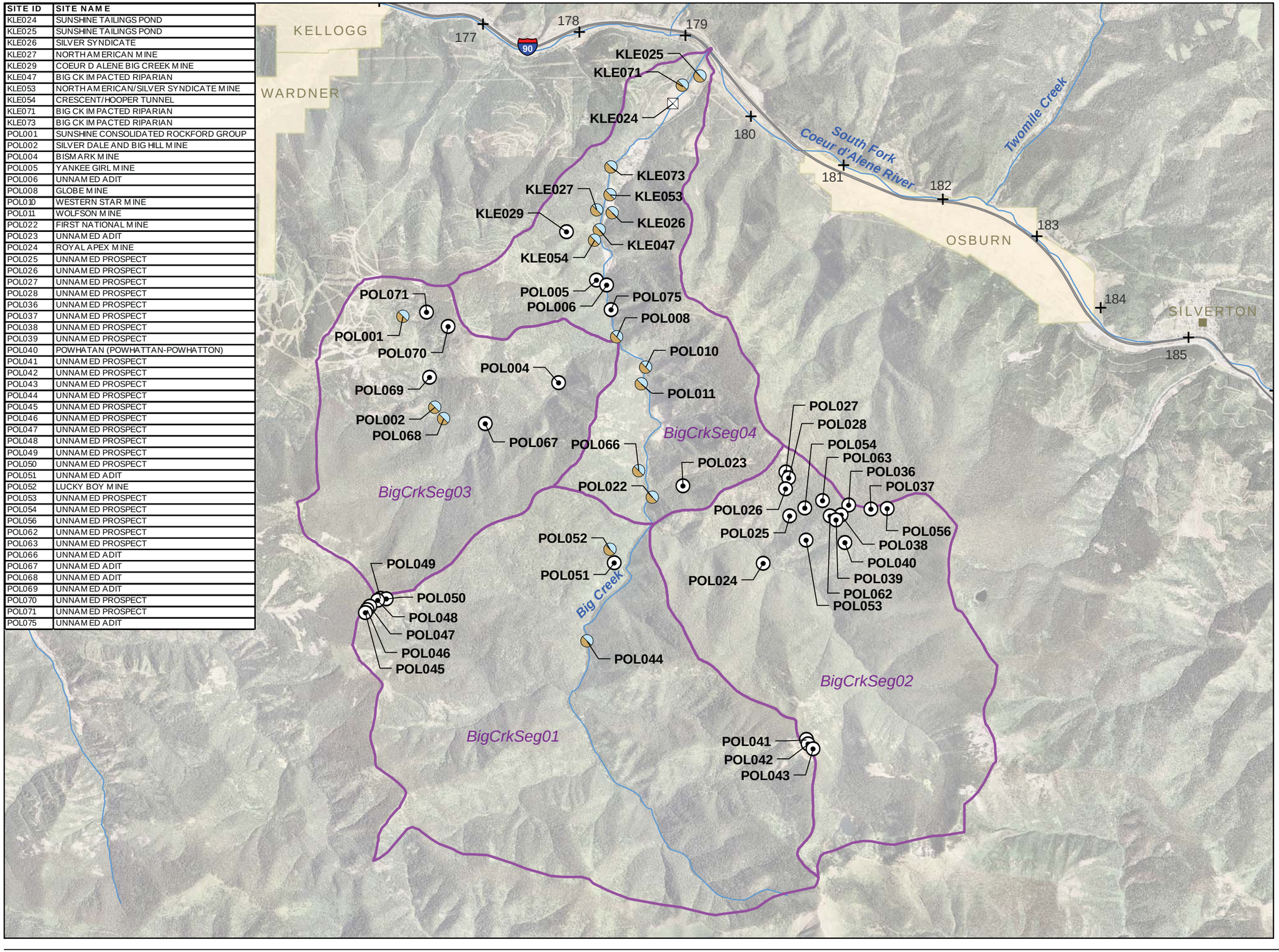
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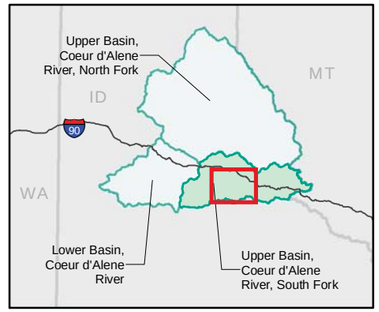
Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Figure 7-7
Overview of Remedial Actions, Alternative 3+, Big Creek Watershed
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

EPA

SITE ID	SITE NAME
KLE024	SUNSHINE TAILINGS POND
KLE025	SUNSHINE TAILINGS POND
KLE026	SILVER SYNDICATE
KLE027	NORTH AMERICAN MINE
KLE029	COEUR D ALENE BIG CREEK MINE
KLE047	BIG CK IMPACTED RIPARIAN
KLE053	NORTH AMERICAN/SILVER SYNDICATE MINE
KLE054	CRESCENT/HOOPER TUNNEL
KLE071	BIG CK IMPACTED RIPARIAN
KLE073	BIG CK IMPACTED RIPARIAN
POL001	SUNSHINE CONSOLIDATED ROCKFORD GROUP
POL002	SILVER DALE AND BIG HILL MINE
POL004	BISMARK MINE
POL005	YANKEE GIRL MINE
POL006	UNNAMED ADIT
POL008	GLOBE MINE
POL010	WESTERN STAR MINE
POL011	WOLFSON MINE
POL022	FIRST NATIONAL MINE
POL023	UNNAMED ADIT
POL024	ROYAL APEX MINE
POL025	UNNAMED PROSPECT
POL026	UNNAMED PROSPECT
POL027	UNNAMED PROSPECT
POL028	UNNAMED PROSPECT
POL036	UNNAMED PROSPECT
POL037	UNNAMED PROSPECT
POL038	UNNAMED PROSPECT
POL039	UNNAMED PROSPECT
POL040	POWHATAN (POWHATTAN-POWHATTON)
POL041	UNNAMED PROSPECT
POL042	UNNAMED PROSPECT
POL043	UNNAMED PROSPECT
POL044	UNNAMED PROSPECT
POL045	UNNAMED PROSPECT
POL046	UNNAMED PROSPECT
POL047	UNNAMED PROSPECT
POL048	UNNAMED PROSPECT
POL049	UNNAMED PROSPECT
POL050	UNNAMED PROSPECT
POL051	UNNAMED ADIT
POL052	LUCKY BOY MINE
POL053	UNNAMED PROSPECT
POL054	UNNAMED PROSPECT
POL056	UNNAMED PROSPECT
POL062	UNNAMED PROSPECT
POL063	UNNAMED PROSPECT
POL066	UNNAMED ADIT
POL067	UNNAMED ADIT
POL068	UNNAMED ADIT
POL069	UNNAMED ADIT
POL070	UNNAMED PROSPECT
POL071	UNNAMED PROSPECT
POL075	UNNAMED ADIT





Remedial Action Types:

- Excavation Repository
- Impoundment Closure; Hydraulic Isolation
- Regrade/Consolidate/Revegetate
- 184 River Mile
- **POL010** (Site ID)
- River/Creek
- Watershed Segment
- City Limit

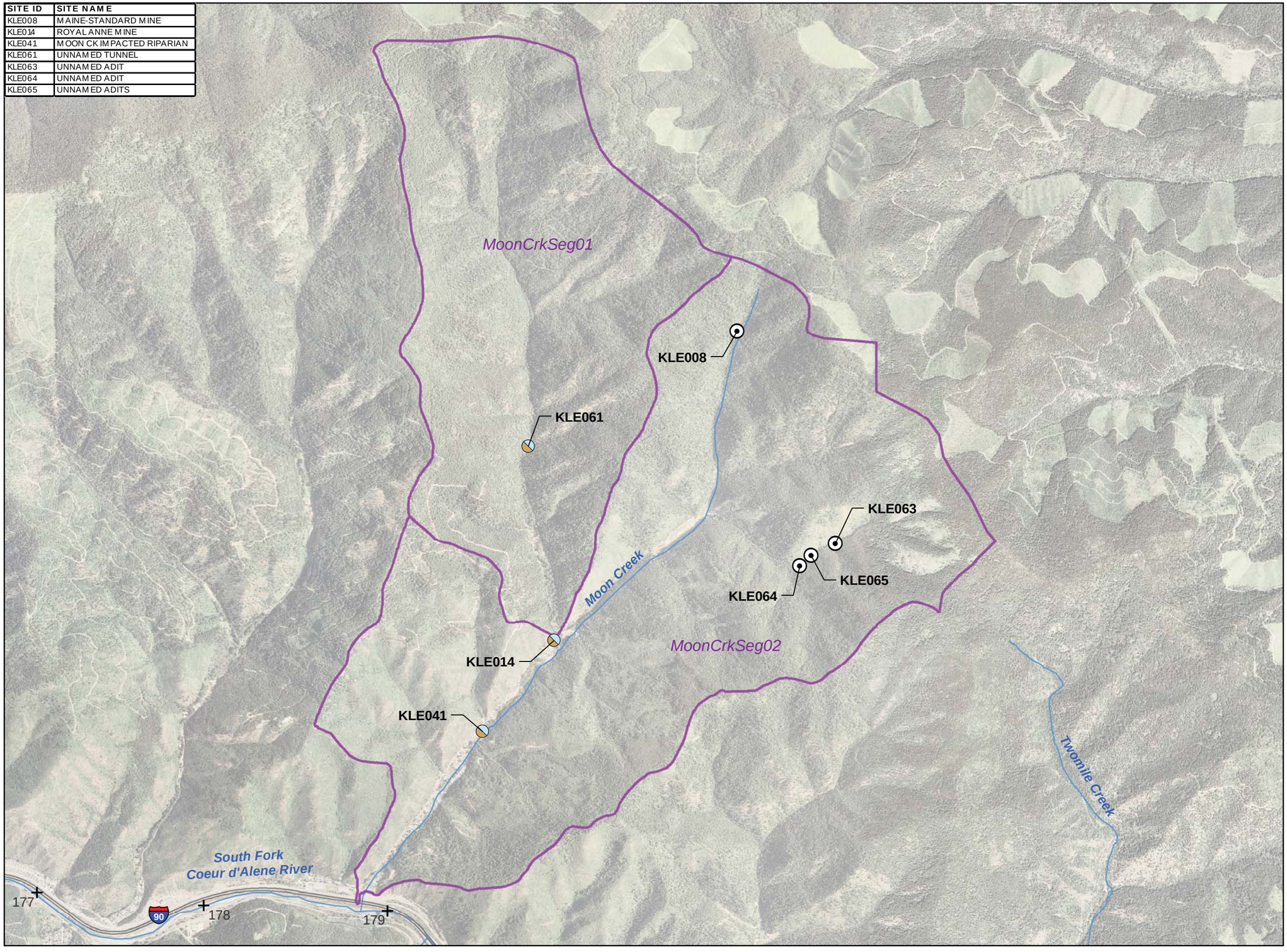
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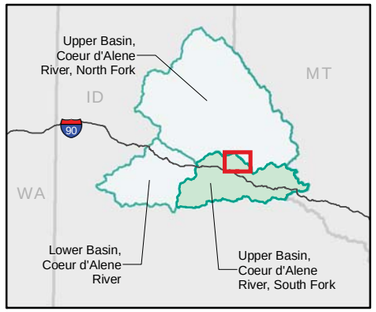
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Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Figure 7-8
Overview of Remedial Actions, Alternative 4+, Big Creek Watershed
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

SITE ID	SITE NAME
KLE008	MAINE-STANDARD MINE
KLE014	ROYAL ANNE MINE
KLE041	MOON CK IMPACTED RIPARIAN
KLE061	UNNAMED TUNNEL
KLE063	UNNAMED ADIT
KLE064	UNNAMED ADIT
KLE065	UNNAMED ADITS





Remedial Action Types:

- Excavation Repository
- Regrade/Consolidate/Revegetate
- 179 River Mile
- **KLE063** (Site ID)
- River/Creek
- Watershed Segment
- City Limit

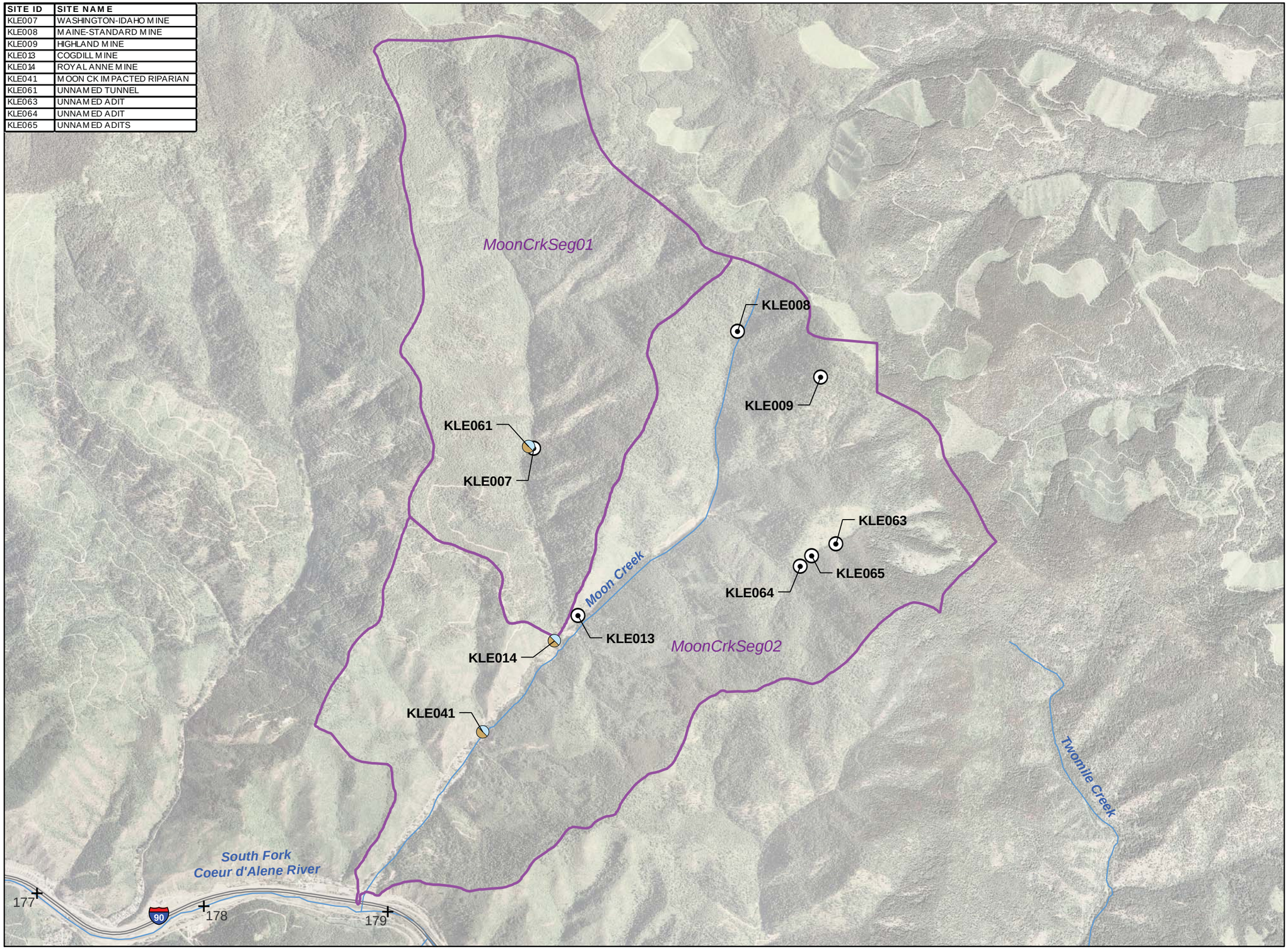
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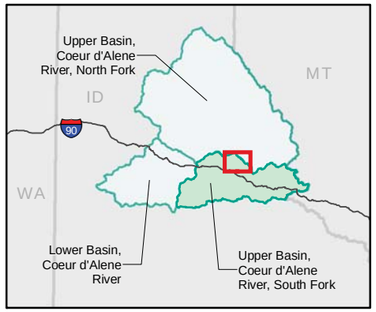
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Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Figure 7-9
Overview of Remedial Actions, Alternative 3+, Moon Creek Watershed
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

SITE ID	SITE NAME
KLE007	WASHINGTON-IDAHO MINE
KLE008	MAINE-STANDARD MINE
KLE009	HIGHLAND MINE
KLE013	COGDILL MINE
KLE014	ROYAL ANNE MINE
KLE041	MOON CK IMPACTED RIPARIAN
KLE061	UNNAMED TUNNEL
KLE063	UNNAMED ADIT
KLE064	UNNAMED ADIT
KLE065	UNNAMED ADITS





Remedial Action Types:

- Excavation Repository
- Regrade/Consolidate/Revegetate
- 179 River Mile
- **KLE063** (Site ID)
- River/Creek
- Watershed Segment
- City Limit

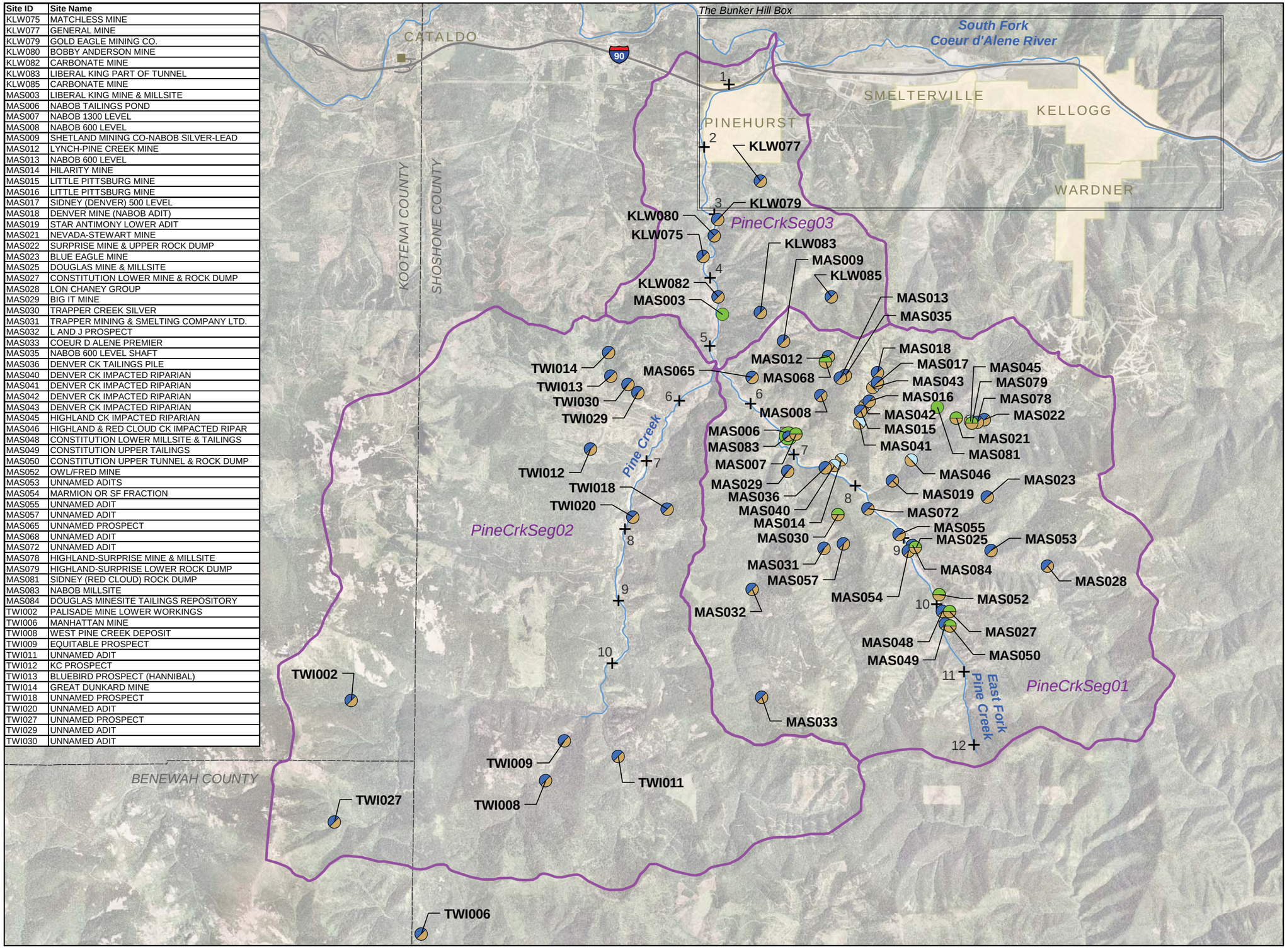
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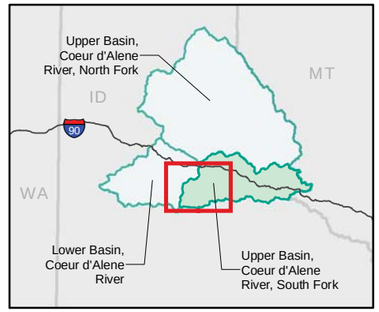
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Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Figure 7-10
Overview of Remedial Actions, Alternative 4+, Moon Creek Watershed
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

Site ID	Site Name
KLW075	MATCHLESS MINE
KLW077	GENERAL MINE
KLW079	GOLD EAGLE MINING CO.
KLW080	BOBBY ANDERSON MINE
KLW082	CARBONATE MINE
KLW083	LIBERAL KING PART OF TUNNEL
KLW085	CARBONATE MINE
MAS003	LIBERAL KING MINE & MILLSITE
MAS006	NABOB TAILINGS POND
MAS007	NABOB 1300 LEVEL
MAS008	NABOB 600 LEVEL
MAS009	SHETLAND MINING CO-NABOB SILVER-LEAD
MAS012	LYNCH-PINE CREEK MINE
MAS013	NABOB 600 LEVEL
MAS014	HILARITY MINE
MAS015	LITTLE PITTSBURG MINE
MAS016	LITTLE PITTSBURG MINE
MAS017	SIDNEY (DENVER) 500 LEVEL
MAS018	DENVER MINE (NABOB ADIT)
MAS019	STAR ANTIMONY LOWER ADIT
MAS021	NEVADA-STEWART MINE
MAS022	SURPRISE MINE & UPPER ROCK DUMP
MAS023	BLUE EAGLE MINE
MAS025	DOUGLAS MINE & MILLSITE
MAS027	CONSTITUTION LOWER MINE & ROCK DUMP
MAS028	LON CHANEY GROUP
MAS029	BIG IT MINE
MAS030	TRAPPER CREEK SILVER
MAS031	TRAPPER MINING & SMELTING COMPANY LTD.
MAS032	L AND J PROSPECT
MAS033	COEUR D ALENE PREMIER
MAS035	NABOB 600 LEVEL SHAFT
MAS036	DENVER CK TAILINGS PILE
MAS040	DENVER CK IMPACTED RIPARIAN
MAS041	DENVER CK IMPACTED RIPARIAN
MAS042	DENVER CK IMPACTED RIPARIAN
MAS043	DENVER CK IMPACTED RIPARIAN
MAS045	HIGHLAND CK IMPACTED RIPARIAN
MAS046	HIGHLAND & RED CLOUD CK IMPACTED RIPAR
MAS048	CONSTITUTION LOWER MILLSITE & TAILINGS
MAS049	CONSTITUTION UPPER TAILINGS
MAS050	CONSTITUTION UPPER TUNNEL & ROCK DUMP
MAS052	OWL/FRED MINE
MAS053	UNNAMED ADITS
MAS054	MARMION OR SF FRACTION
MAS055	UNNAMED ADIT
MAS057	UNNAMED ADIT
MAS065	UNNAMED PROSPECT
MAS068	UNNAMED ADIT
MAS072	UNNAMED ADIT
MAS078	HIGHLAND-SURPRISE MINE & MILLSITE
MAS079	HIGHLAND-SURPRISE LOWER ROCK DUMP
MAS081	SIDNEY (RED CLOUD) ROCK DUMP
MAS083	NABOB MILLSITE
MAS084	DOUGLAS MINESITE TAILINGS REPOSITORY
TWI002	PALISADE MINE LOWER WORKINGS
TWI006	MANHATTAN MINE
TWI008	WEST PINE CREEK DEPOSIT
TWI009	EQUITABLE PROSPECT
TWI011	UNNAMED ADIT
TWI012	KC PROSPECT
TWI013	BLUEBIRD PROSPECT (HANNIBAL)
TWI014	GREAT DUNKARD MINE
TWI018	UNNAMED PROSPECT
TWI020	UNNAMED ADIT
TWI027	UNNAMED PROSPECT
TWI029	UNNAMED ADIT
TWI030	UNNAMED ADIT





Remedial Action Types:

- Cap
- Excavation/Cap
- Excavation/Cap Waste Consolidation Area
- Excavation Waste Consolidation Area
- Excavation Repository
- Impoundment Closure; Hydraulic Isolation
- River Mile
- **MAS023** (Site ID)
- River/Creek
- Watershed Segment
- City Limit
- County Boundary

N

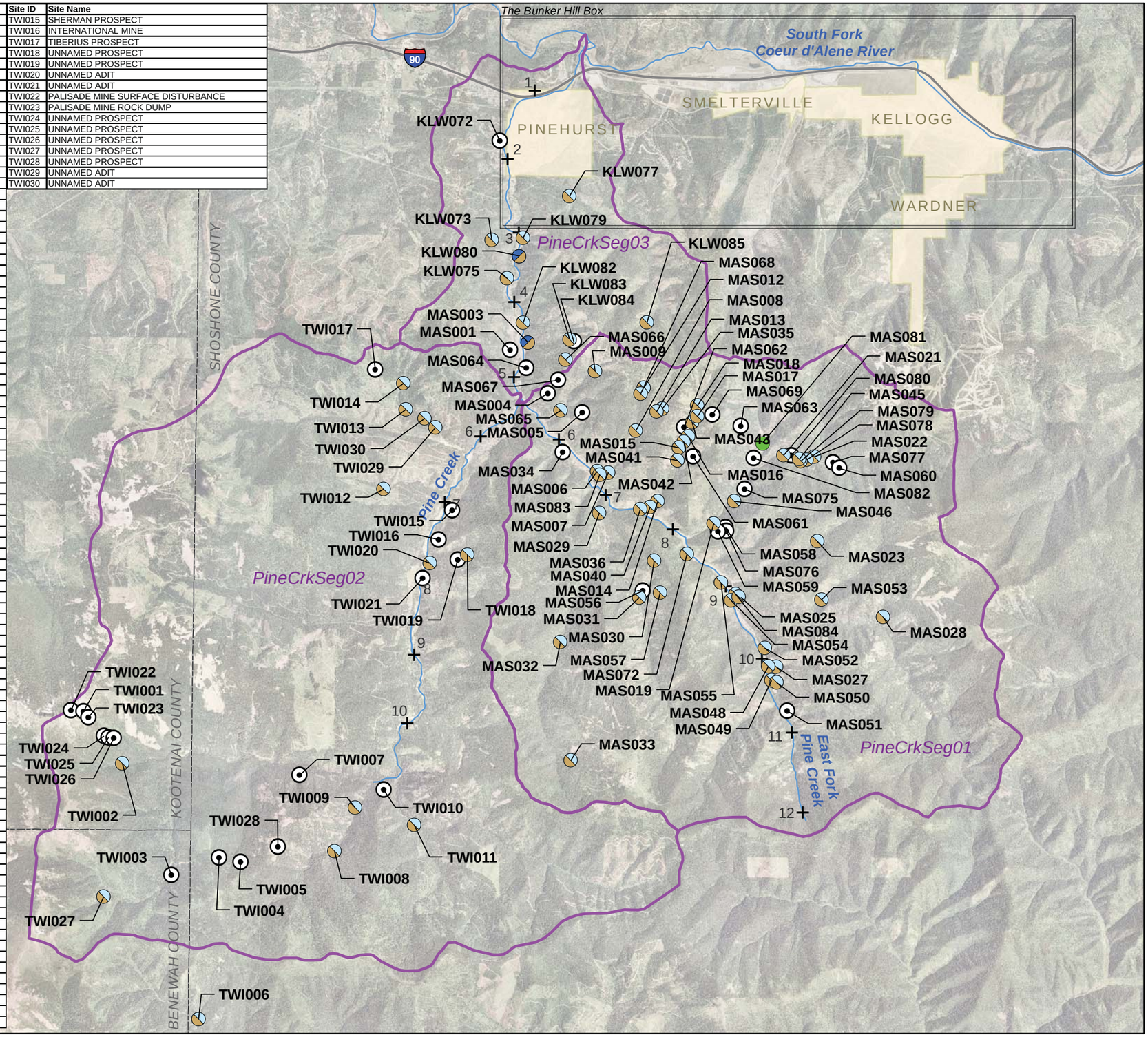
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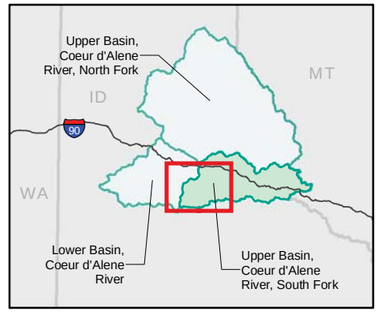
Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Figure 7-11
Overview of Remedial Actions, Alternative 3+, Pine Creek Watershed
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

Site ID	Site Name
KLW072	COEUR D ALENE ANTIMONY MINE
KLW073	SILVERSTONE MINE
KLW075	MATCHLESS MINE
KLW077	GENERAL MINE
KLW079	GOLD EAGLE MINING CO.
KLW080	BOBBY ANDERSON MINE
KLW082	CARBONATE MINE
KLW083	LIBERAL KING PART OF TUNNEL
KLW084	LIBERAL KING PART OF TUNNEL
KLW085	CARBONATE MINE
MAS001	EAST HYPOTHEEK MINE
MAS003	LIBERAL KING MINE & MILLSITE
MAS004	LOOKOUT MOUNTAIN MINE
MAS005	LYNCH PINE NO.2
MAS006	NABOB TAILINGS POND
MAS007	NABOB 1300 LEVEL
MAS008	NABOB 600 LEVEL
MAS009	SHETLAND MINING CO-NABOB SILVER-LEAD
MAS012	LYNCH-PINE CREEK MINE
MAS013	NABOB 600 LEVEL
MAS014	HILARITY MINE
MAS015	LITTLE PITTSBURG MINE
MAS016	LITTLE PITTSBURG MINE
MAS017	SIDNEY (DENVER) 500 LEVEL
MAS018	DENVER MINE (NABOB ADIT)
MAS019	STAR ANTIMONY LOWER ADIT
MAS021	NEVADA-STEWART MINE
MAS022	SURPRISE MINE & UPPER ROCK DUMP
MAS023	BLUE EAGLE MINE
MAS025	DOUGLAS MINE & MILLSITE
MAS027	CONSTITUTION LOWER MINE & ROCK DUMP
MAS028	LON CHANEY GROUP
MAS029	BIG IT MINE
MAS030	TRAPPER CREEK SILVER
MAS031	TRAPPER MINING & SMELTING COMPANY LTD.
MAS032	L AND J PROSPECT
MAS033	COEUR D ALENE PREMIER
MAS034	BRISTOL GROUP
MAS035	NABOB 600 LEVEL SHAFT
MAS036	DENVER CK TAILINGS PILE
MAS040	DENVER CK IMPACTED RIPARIAN
MAS041	DENVER CK IMPACTED RIPARIAN
MAS042	DENVER CK IMPACTED RIPARIAN
MAS043	DENVER CK IMPACTED RIPARIAN
MAS045	HIGHLAND CK IMPACTED RIPARIAN
MAS046	HIGHLAND & RED CLOUD CK IMPACTED RIPAR
MAS048	CONSTITUTION LOWER MILLSITE & TAILINGS
MAS049	CONSTITUTION UPPER TAILINGS
MAS050	CONSTITUTION UPPER TUNNEL & ROCK DUMP
MAS051	UNNAMED ADIT
MAS052	OWL/FRED MINE
MAS053	UNNAMED ADITS
MAS054	MARMION OR SF FRACTION
MAS055	UNNAMED ADIT
MAS056	UNNAMED PROSPECT
MAS057	UNNAMED ADIT
MAS058	STAR ANITMONY UPPER ADIT
MAS059	UNNAMED ADIT
MAS060	HIGHLAND CHIEF
MAS061	UNNAMED ADIT
MAS062	UNNAMED ADIT
MAS063	UNNAMED ADIT
MAS064	UNNAMED ADIT
MAS065	UNNAMED PROSPECT
MAS066	UNNAMED PROSPECT
MAS067	LOOKOUT MOUNTAIN MINE UPPER ROCK DUMP
MAS068	UNNAMED ADIT
MAS069	SIDNEY (DENVER) 500 LEVEL ADJ ADITS
MAS072	UNNAMED ADIT
MAS075	SILVER BAND GROUP
MAS076	STAR ANTIMONY UPPER ROCK DUMP
MAS077	STEUNENBERG CLAIM
MAS078	HIGHLAND-SURPRISE MINE & MILLSITE
MAS079	HIGHLAND-SURPRISE LOWER ROCK DUMP
MAS080	NEVADA TUNNEL & ROCK DUMP
MAS081	SIDNEY (RED CLOUD) ROCK DUMP
MAS082	SIDNEY (RED CLOUD) LOWER ROCK DUMP
MAS083	NABOB MILLSITE
MAS084	DOUGLAS MINESITE TAILINGS REPOSITORY
TWI001	PALISADE MINE BLACKSMITH SHOP WORKINGS
TWI002	PALISADE MINE LOWER WORKINGS
TWI003	INEZ GROUP
TWI004	INEZ GROUP
TWI005	INEZ GROUP
TWI006	MANHATTAN MINE
TWI007	WESTERN KING PROSPECT
TWI008	WEST PINE CREEK DEPOSIT
TWI009	EQUITABLE PROSPECT
TWI010	LONE PINE MINE
TWI011	UNNAMED ADIT
TWI012	KC PROSPECT
TWI013	BLUEBIRD PROSPECT (HANNIBAL)
TWI014	GREAT DUNKARD MINE

Site ID	Site Name
TWI015	SHERMAN PROSPECT
TWI016	INTERNATIONAL MINE
TWI017	TIBERIUS PROSPECT
TWI018	UNNAMED PROSPECT
TWI019	UNNAMED PROSPECT
TWI020	UNNAMED ADIT
TWI021	UNNAMED ADIT
TWI022	PALISADE MINE SURFACE DISTURBANCE
TWI023	PALISADE MINE ROCK DUMP
TWI024	UNNAMED PROSPECT
TWI025	UNNAMED PROSPECT
TWI026	UNNAMED PROSPECT
TWI027	UNNAMED PROSPECT
TWI028	UNNAMED PROSPECT
TWI029	UNNAMED ADIT
TWI030	UNNAMED ADIT





Remedial Action Types:

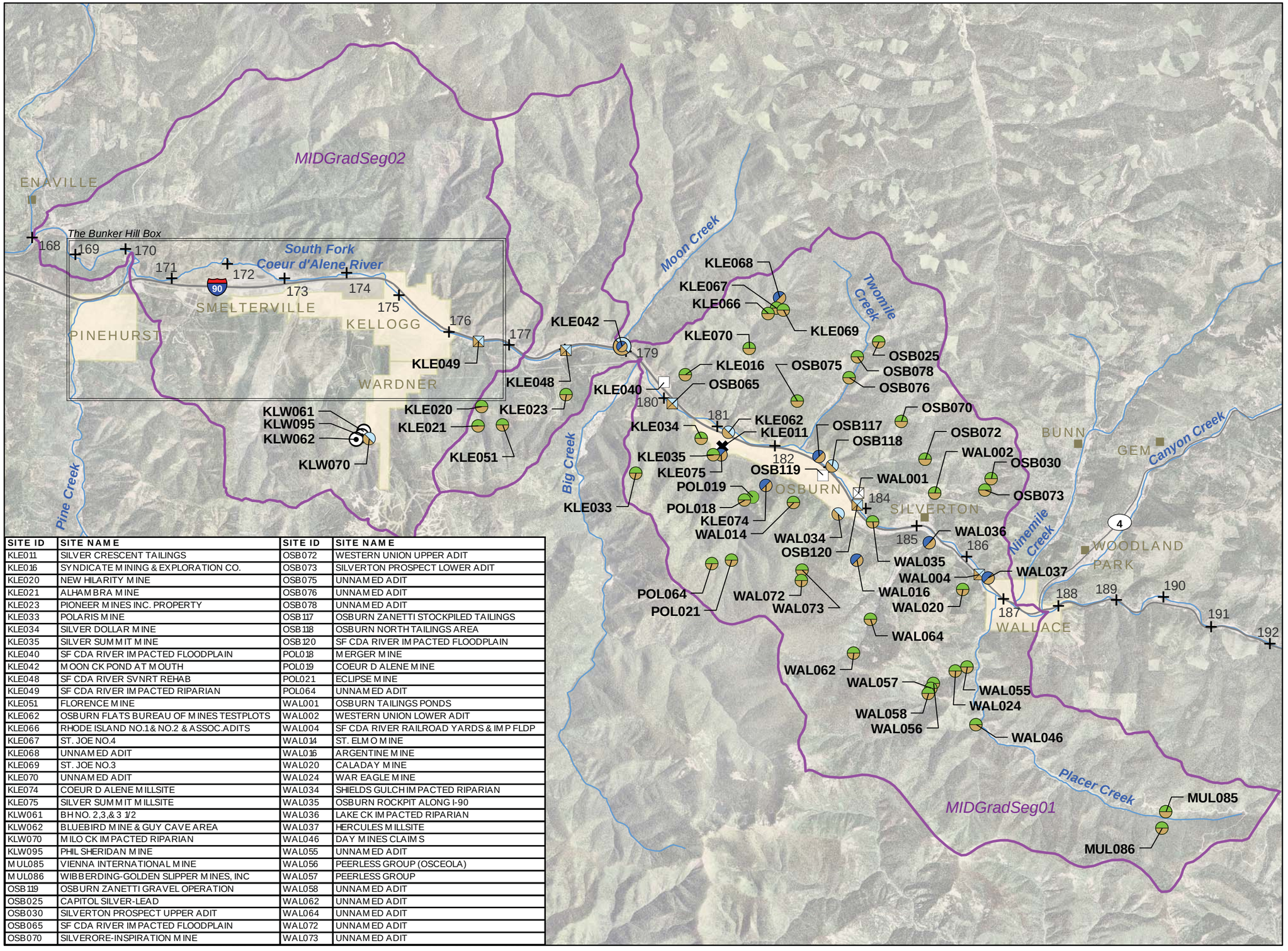
- Cap
- Excavation Waste Consolidation Area
- Excavation Repository
- Regrade/Consolidate/Revegetate
- River Mile
- **MAS023** (Site ID)
- River/Creek
- Watershed Segment
- City Limit
- County Boundary

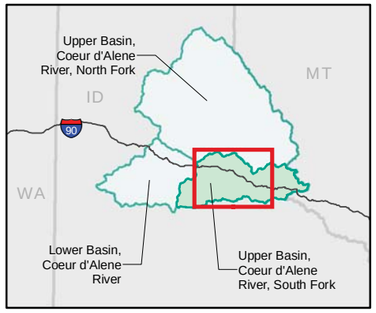
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0 2,000 4,000 8,000 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Figure 7-12
Overview of Remedial Actions, Alternative 4+, Pine Creek Watershed
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





SITE ID	SITE NAME	SITE ID	SITE NAME
KLE011	SILVER CRESCENT TAILINGS	OSB072	WESTERN UNION UPPER ADIT
KLE016	SYNDICATE MINING & EXPLORATION CO.	OSB073	SILVERTON PROSPECT LOWER ADIT
KLE020	NEW HILARITY MINE	OSB075	UNNAMED ADIT
KLE021	ALHAMBRA MINE	OSB076	UNNAMED ADIT
KLE023	PIONEER MINES INC. PROPERTY	OSB078	UNNAMED ADIT
KLE033	POLARIS MINE	OSB117	OSBURN ZANETTI STOCKPILED TAILINGS
KLE034	SILVER DOLLAR MINE	OSB118	OSBURN NORTH TAILINGS AREA
KLE035	SILVER SUMMIT MINE	OSB120	SF CDA RIVER IMPACTED FLOODPLAIN
KLE040	SF CDA RIVER IMPACTED FLOODPLAIN	POL018	MERGER MINE
KLE042	MOON CK POND AT MOUTH	POL019	COEUR D ALENE MINE
KLE048	SF CDA RIVER SVNRT REHAB	POL021	ECLIPSE MINE
KLE049	SF CDA RIVER IMPACTED RIPARIAN	POL064	UNNAMED ADIT
KLE051	FLORENCE MINE	WAL001	OSBURN TAILINGS PONDS
KLE062	OSBURN FLATS BUREAU OF MINES TESTPLOTS	WAL002	WESTERN UNION LOWER ADIT
KLE066	RHODE ISLAND NO.1& NO.2 & ASSOC.ADITS	WAL004	SF CDA RIVER RAILROAD YARDS & IMP FLDP
KLE067	ST. JOE NO.4	WAL014	ST. ELMO MINE
KLE068	UNNAMED ADIT	WAL016	ARGENTINE MINE
KLE069	ST. JOE NO.3	WAL020	CALADAY MINE
KLE070	UNNAMED ADIT	WAL024	WAR EAGLE MINE
KLE074	COEUR D ALENE MILLSITE	WAL034	SHIELDS GULCH IMPACTED RIPARIAN
KLE075	SILVER SUMMIT MILLSITE	WAL035	OSBURN ROCKPIT ALONG I-90
KLW061	BH NO. 2,3,& 3 1/2	WAL036	LAKE CK IMPACTED RIPARIAN
KLW062	BLUEBIRD MINE & GUY CAVE AREA	WAL037	HERCULES MILLSITE
KLW070	MILO CK IMPACTED RIPARIAN	WAL046	DAY MINES CLAIMS
KLW095	PHIL SHERIDAN MINE	WAL055	UNNAMED ADIT
MUL085	VIENNA INTERNATIONAL MINE	WAL056	PEERLESS GROUP (OSCEOLA)
MUL086	WIBBERDING-GOLDEN SLIPPER MINES, INC	WAL057	PEERLESS GROUP
OSB119	OSBURN ZANETTI GRAVEL OPERATION	WAL058	UNNAMED ADIT
OSB025	CAPITOL SILVER-LEAD	WAL062	UNNAMED ADIT
OSB030	SILVERTON PROSPECT UPPER ADIT	WAL064	UNNAMED ADIT
OSB065	SF CDA RIVER IMPACTED FLOODPLAIN	WAL072	UNNAMED ADIT
OSB070	SILVERORE-INSPIRATION MINE	WAL073	UNNAMED ADIT

Remedial Action Types:

- Cap
- Excavation/Cap
- Excavation Waste Consolidation Area
- Excavation Waste Consolidation Area; Excavation Repository
- Excavation Repository
- Excavation Repository; Hydraulic Isolation
- Hydraulic Isolation
- Impoundment Closure
- Impoundment Closure; Hydraulic Isolation
- Regrade/Consolidate/Revegetate
- 190 River Mile
- **MUL085** (Site ID)
- River/Creek
- Watershed Segment
- City Limit

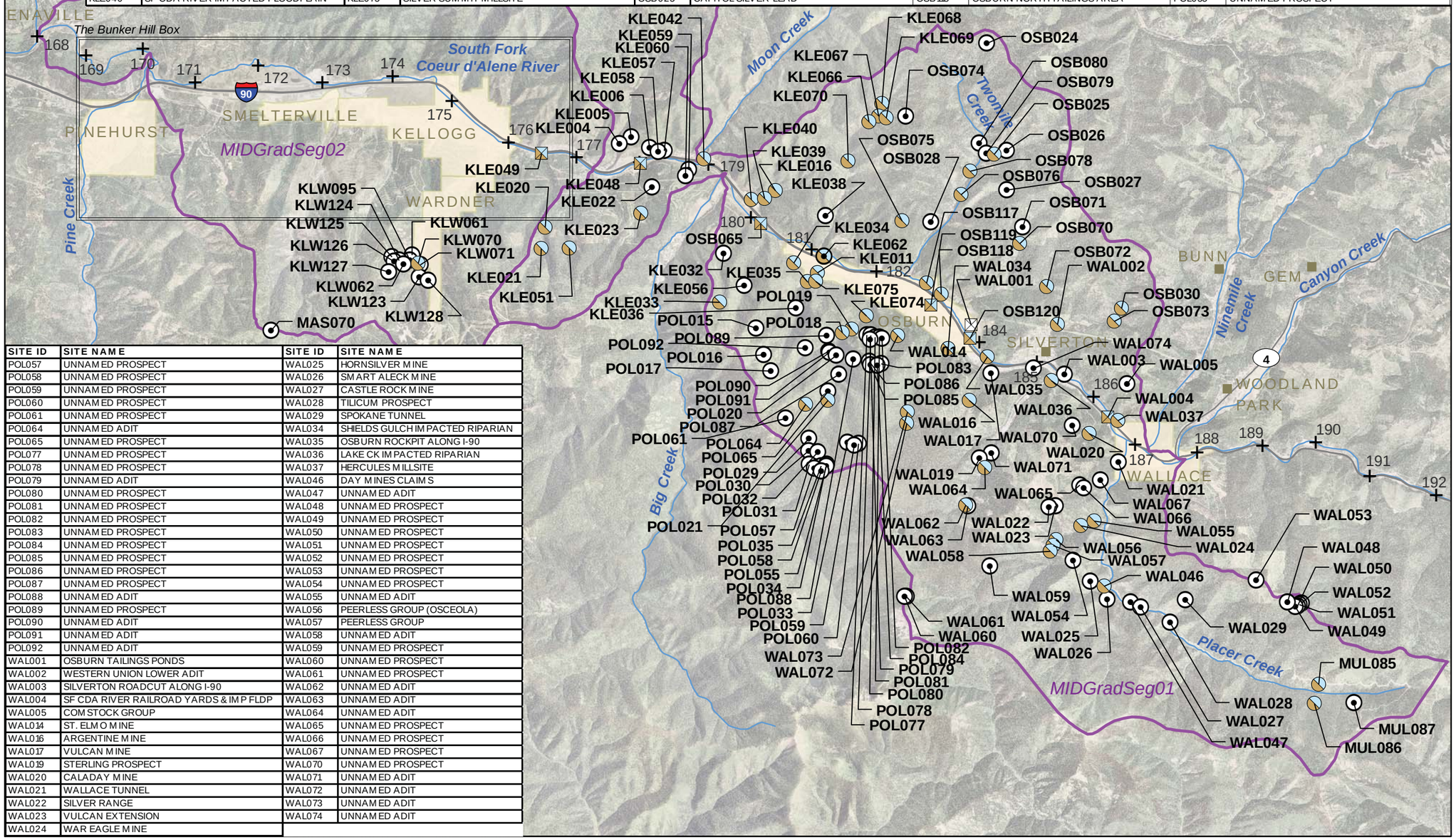
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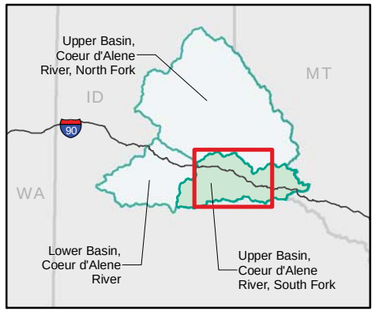
Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Figure 7-13
Overview of Remedial Actions, Alternative 3+, Mainstem SFCDR Watershed
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

SITE ID	SITE NAME	SITE ID	SITE NAME	SITE ID	SITE NAME	SITE ID	SITE NAME	SITE ID	SITE NAME
KLE004	LIBERTY BELL GROUP	KLE042	MOON CK POND AT MOUTH	KLW061	BH NO. 2,3,& 3 1/2	OSB026	CAPITOL SILVER-LEAD	OSB119	OSBURN ZANETTI GRAVEL OPERATION
KLE005	BENEWAH-SHOSHONE MINE	KLE048	SF CDA RIVER SVNRT REHAB	KLW062	BLUEBIRD MINE & GUY CAVE AREA	OSB027	UNNAMED ADIT	OSB120	SF CDA RIVER IMPACTED FLOODPLAIN
KLE006	TEDDY NO.2	KLE049	SF CDA RIVER IMPACTED RIPARIAN	KLW070	MILO CK IMPACTED RIPARIAN	OSB028	SILVER ROCK PROSPECT	POL015	PURIM GROUP HAYDEN HILL CONSOLIDATED
KLE011	SILVER CRESCENT TAILINGS	KLE051	FLORENCE MINE	KLW071	SULLIVAN NO.1,2,& 3	OSB030	SILVERTON PROSPECT UPPER ADIT	POL016	CONSOLIDATED SILVER
KLE016	SYNDICATE MINING & EXPLORATION CO.	KLE056	MINERAL MOUNTAIN MINE	KLW095	PHIL SHERIDAN MINE	OSB065	SF CDA RIVER IMPACTED FLOODPLAIN	POL017	LUCKY STONE MINE
KLE020	NEW HILARITY MINE	KLE057	TEDDY NO.3	KLW123	WATERWORKS TUNNEL	OSB070	SILVERORE-INSPIRATION MINE	POL018	MERGER MINE
KLE021	ALHAMBRA MINE	KLE058	TEDDY NO.1	KLW124	BLUEBIRD UPPER MINE	OSB071	UNNAMED ADIT	POL019	COEUR D ALENE MINE
KLE022	NEW JERSEY MINE	KLE059	ENTERPRISE MINE	KLW125	LOWER JACKASS/DON MINES	OSB072	WESTERN UNION UPPER ADIT	POL020	AMERICAN SILVER MINE
KLE023	PIONEER MINES INC. PROPERTY	KLE060	ENTERPRISE EXTENSION	KLW126	UNIDENTIFIED DISTURBANCE	OSB073	SILVERTON PROSPECT LOWER ADIT	POL021	ECLIPSE MINE
KLE032	SUNSHINE ANTIMONY	KLE062	OSBURN FLATS BUREAU OF MINES TESTPLOTS	KLW127	KLONDIKE OR GUS MINE	OSB074	ST. JOE NO.1	POL029	UNNAMED PROSPECT
KLE033	POLARIS MINE	KLE066	RHODE ISLAND NO.1& NO.2 & ASSOC.ADITS	KLW128	ALLA LOWER,MID,& UPPER/ MINERS DELIGHT	OSB075	UNNAMED ADIT	POL030	UNNAMED PROSPECT
KLE034	SILVER DOLLAR MINE	KLE067	ST. JOE NO.4	MAS070	UNNAMED PROSPECT	OSB076	UNNAMED ADIT	POL031	UNNAMED PROSPECT
KLE035	SILVER SUMMIT MINE	KLE068	UNNAMED ADIT	MUL085	VIENNA INTERNATIONAL MINE	OSB078	UNNAMED ADIT	POL032	GAHEY GROUP
KLE036	NELLIE MINE	KLE069	ST. JOE NO.3	MUL086	WIBBERDING-GOLDEN SLIPPER MINES, INC	OSB079	CAPITOL SILVER MAIN ADIT	POL033	UNNAMED PROSPECT
KLE038	UNIDENTIFIED DISTURBANCE	KLE070	UNNAMED ADIT	MUL087	FLOIODO MINE	OSB080	HARLOW TUNNEL	POL034	UNNAMED PROSPECT
KLE039	UNNAMED ADIT	KLE074	COEUR D ALENE MILLSITE	OSB024	CAPITOL SILVER-LEAD NO. 2	OSB117	OSBURN ZANETTI STOCKPILED TAILINGS	POL035	UNNAMED PROSPECT
KLE040	SF CDA RIVER IMPACTED FLOODPLAIN	KLE075	SILVER SUMMIT MILLSITE	OSB025	CAPITOL SILVER-LEAD	OSB118	OSBURN NORTH TAILINGS AREA	POL055	UNNAMED PROSPECT



SITE ID	SITE NAME	SITE ID	SITE NAME
POL057	UNNAMED PROSPECT	WAL025	HORNSILVER MINE
POL058	UNNAMED PROSPECT	WAL026	SMART ALECK MINE
POL059	UNNAMED PROSPECT	WAL027	CASTLE ROCK MINE
POL060	UNNAMED PROSPECT	WAL028	TILICUM PROSPECT
POL061	UNNAMED PROSPECT	WAL029	SPOKANE TUNNEL
POL064	UNNAMED ADIT	WAL034	SHIELDS GULCH IMPACTED RIPARIAN
POL065	UNNAMED PROSPECT	WAL035	OSBURN ROCKPIT ALONG I-90
POL077	UNNAMED PROSPECT	WAL036	LAKE CK IMPACTED RIPARIAN
POL078	UNNAMED PROSPECT	WAL037	HERCULES MILLSITE
POL079	UNNAMED ADIT	WAL046	DAY MINES CLAIMS
POL080	UNNAMED PROSPECT	WAL047	UNNAMED ADIT
POL081	UNNAMED PROSPECT	WAL048	UNNAMED PROSPECT
POL082	UNNAMED PROSPECT	WAL049	UNNAMED PROSPECT
POL083	UNNAMED PROSPECT	WAL050	UNNAMED PROSPECT
POL084	UNNAMED PROSPECT	WAL051	UNNAMED PROSPECT
POL085	UNNAMED PROSPECT	WAL052	UNNAMED PROSPECT
POL086	UNNAMED PROSPECT	WAL053	UNNAMED PROSPECT
POL087	UNNAMED PROSPECT	WAL054	UNNAMED PROSPECT
POL088	UNNAMED ADIT	WAL055	UNNAMED ADIT
POL089	UNNAMED PROSPECT	WAL056	PEERLESS GROUP (OSCEOLA)
POL090	UNNAMED ADIT	WAL057	PEERLESS GROUP
POL091	UNNAMED ADIT	WAL058	UNNAMED ADIT
POL092	UNNAMED ADIT	WAL059	UNNAMED PROSPECT
WAL001	OSBURN TAILINGS PONDS	WAL060	UNNAMED PROSPECT
WAL002	WESTERN UNION LOWER ADIT	WAL061	UNNAMED PROSPECT
WAL003	SILVERTON ROADCUT ALONG I-90	WAL062	UNNAMED ADIT
WAL004	SF CDA RIVER RAILROAD YARDS & IMP FLDP	WAL063	UNNAMED ADIT
WAL005	COMSTOCK GROUP	WAL064	UNNAMED ADIT
WAL014	ST. ELMO MINE	WAL065	UNNAMED PROSPECT
WAL016	ARGENTINE MINE	WAL066	UNNAMED PROSPECT
WAL017	VULCAN MINE	WAL067	UNNAMED PROSPECT
WAL019	STERLING PROSPECT	WAL070	UNNAMED PROSPECT
WAL020	CALADAY MINE	WAL071	UNNAMED ADIT
WAL021	WALLACE TUNNEL	WAL072	UNNAMED ADIT
WAL022	SILVER RANGE	WAL073	UNNAMED ADIT
WAL023	VULCAN EXTENSION	WAL074	UNNAMED ADIT
WAL024	WAR EAGLE MINE		



Remedial Action Types:

- Excavation Repository
- Excavation Repository; Hydraulic Isolation
- Excavation Repository; Regrade/Consolidate/Revegetate
- Impoundment Closure; Hydraulic Isolation
- Regrade/Consolidate/Revegetate
- 190 River Mile
- **MUL085** (Site ID)
- River/Creek
- Watershed Segment
- City Limit

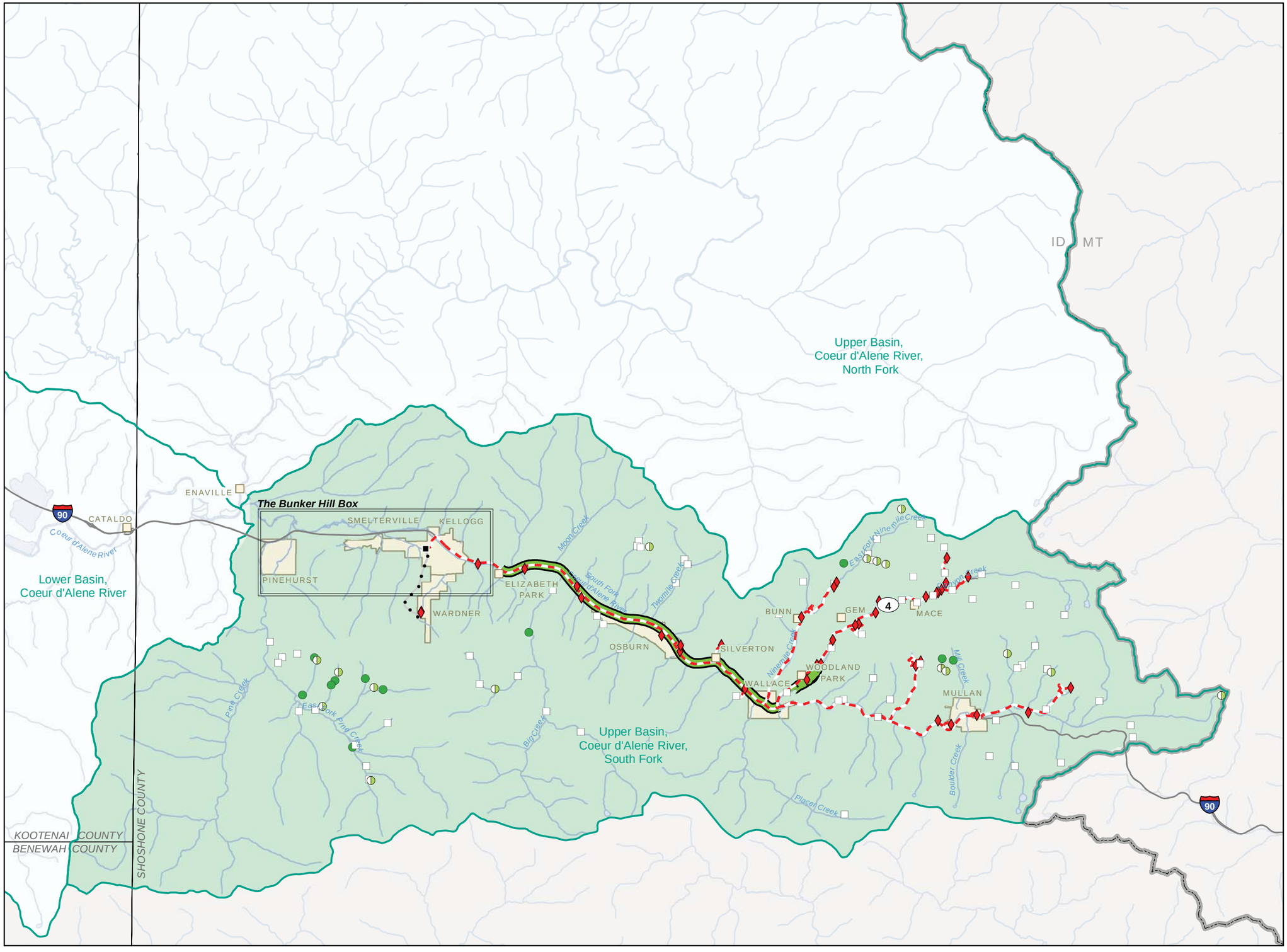
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Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Figure 7-14
Overview of Remedial Actions, Alternative 4+, Mainstem SFCDR Watershed
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





- Central Treatment Plant (CTP)

Water Sources Considered for Treatment:

- Active Treatment (WT01)
- No Action
- Passive Treatment (WT02)
- Passive Treatment (WT03)
- French Drain
- Conveyance of Reed and Russell Adit Discharge through the Bunker Hill Mine via Cherry Raise and the Kellogg Tunnel to the CTP
- Gravity Pipeline to CTP
- River/Creek
- Coeur d'Alene River Subbasin Boundary
- City Limit
- County Boundary
- State Boundary

N

0 1 2 4 Miles

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006).

Notes:
1. Operable Unit 3 is defined as all contaminated areas in the Coeur d'Alene River Basin, Coeur d'Alene Lake, and the Spokane River, outside the Box.
2. Details of the water treatment approach for each individual watershed are provided in figures in Section 6.0.

Figure 7-15
Water Treatment Approach, Alternative 3+(a)
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE



- Central Treatment Plant (CTP)

Water Sources Considered for Treatment:

- Active Treatment (WT01)
- No Action
- Passive Treatment (WT02)
- Passive Treatment (WT03)
- French Drain
- Conveyance of Reed and Russell Adit Discharge through the Bunker Hill Mine via Cherry Raise and the Kellogg Tunnel to the CTP
- Gravity Pipeline to CTP
- River/Creek
- Coeur d'Alene River Subbasin Boundary
- City Limit
- County Boundary
- State Boundary

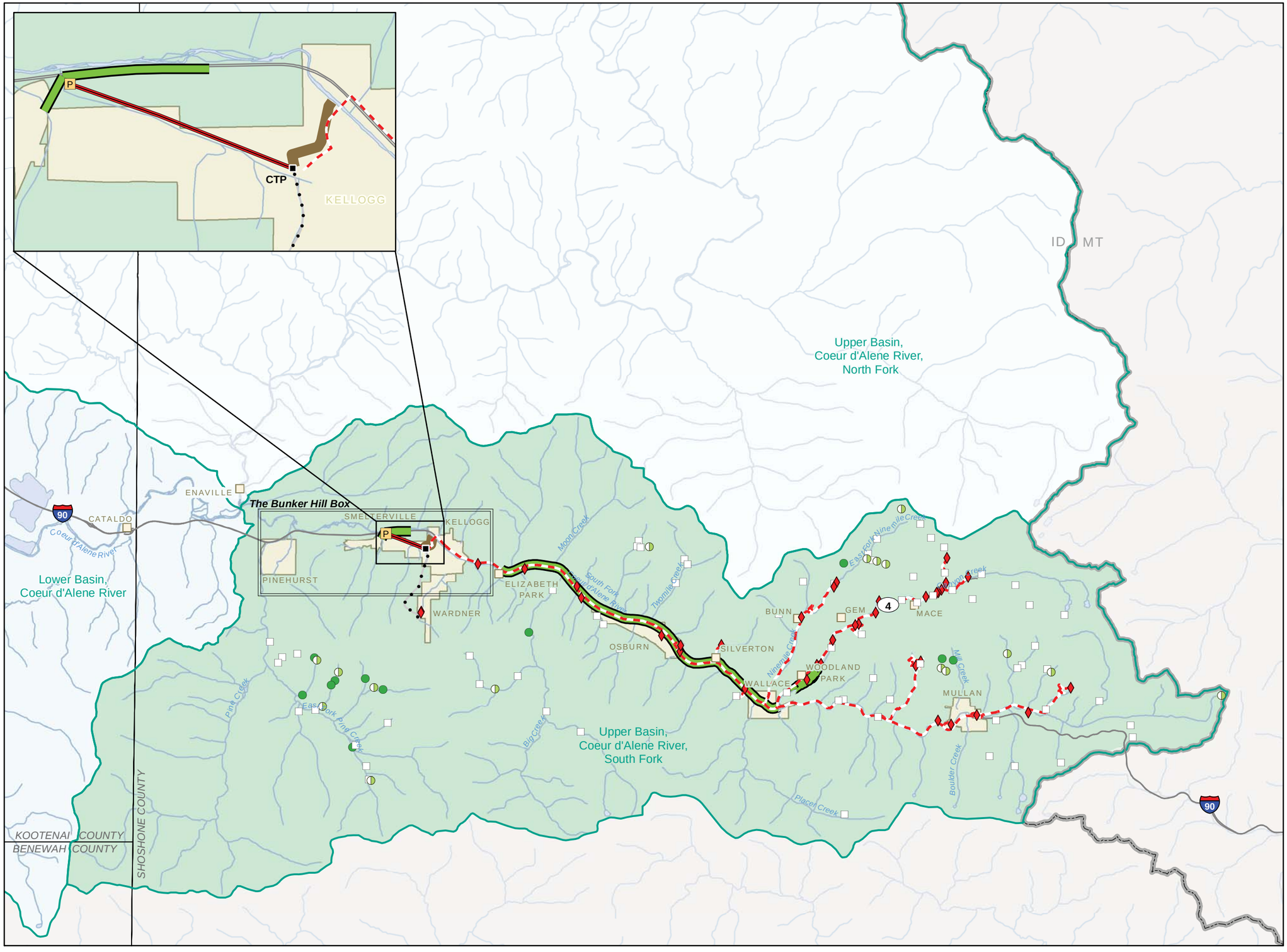
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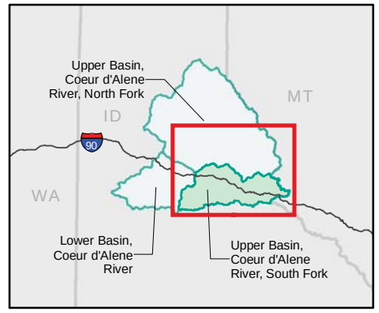
Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006)

Notes:
1. Operable Unit 3 is defined as all contaminated areas in the Coeur d'Alene River Basin, Coeur d'Alene Lake, and the Spokane River, outside the Box.
2. Details of the water treatment approach for each individual watershed are provided in figures in Section 6.0.

Figure 7-16
Water Treatment Approach, Alternative 3+(b)
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

EPA





- Central Treatment Plant (CTP)
- P — Pump Station

Water Sources Considered for Treatment:

- Active Treatment (WT01)
- No Action
- Passive Treatment (WT02)
- Passive Treatment (WT03)
- Pressurized Pipeline to CTP
- CTP Effluent Discharge Pipeline
- French Drain
- Conveyance of Reed and Russell Adit Discharge through the Bunker Hill Mine via Cherry Raise and the Kellogg Tunnel to the CTP
- Gravity Pipeline to CTP
- River/Creek
- Coeur d'Alene River Subbasin Boundary
- City Limit
- County Boundary
- State Boundary

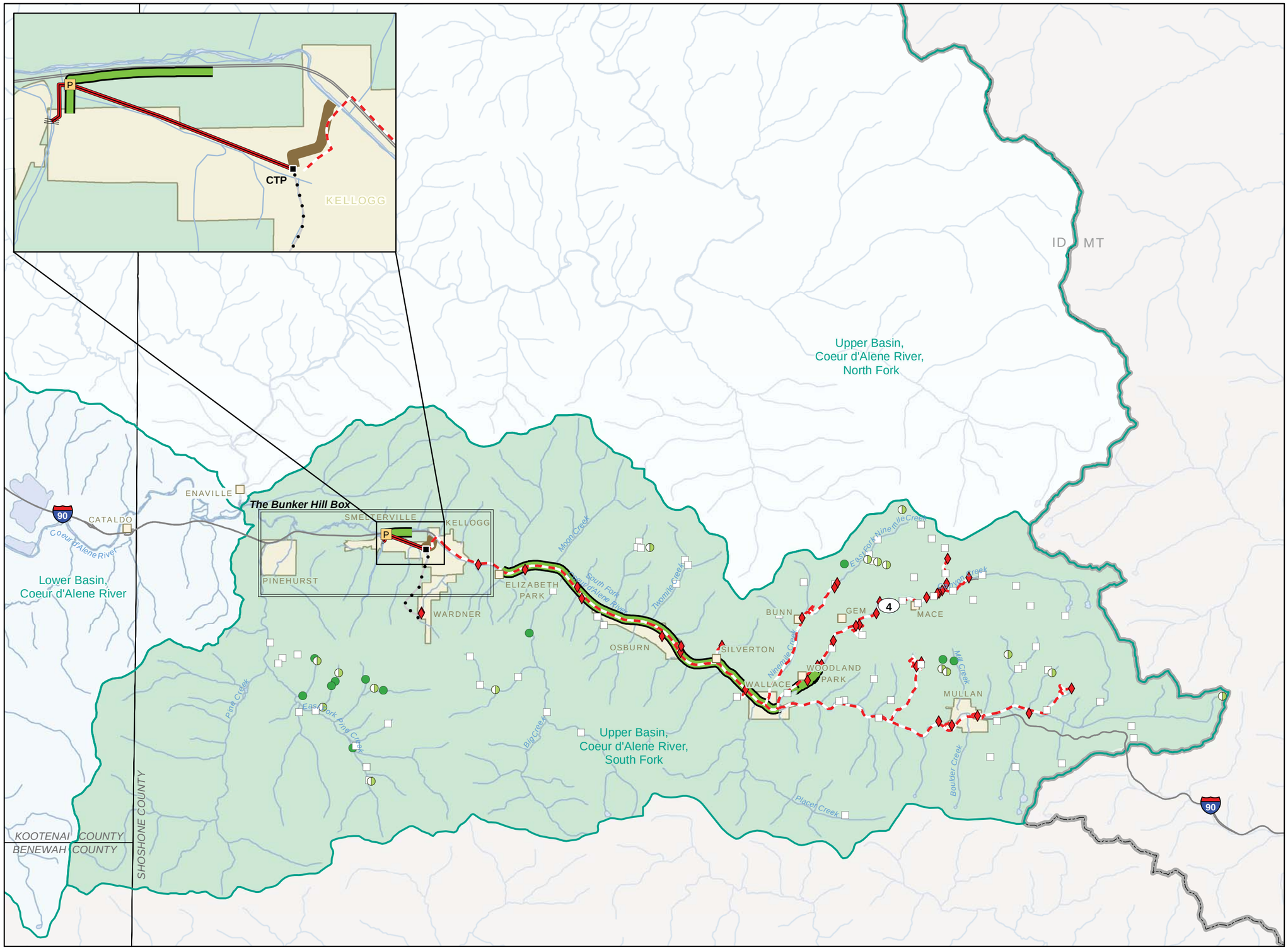
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0 1 2 4 Miles

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006)

Notes:
1. Operable Unit 3 is defined as all contaminated areas in the Coeur d'Alene River Basin, Coeur d'Alene Lake, and the Spokane River, outside the Box.
2. Details of the water treatment approach for each individual watershed are provided in figures in Section 6.0.

Figure 7-17
Water Treatment Approach, Alternative 3+(c)
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





- Central Treatment Plant (CTP)
- P — Pump Station

Water Sources Considered for Treatment:

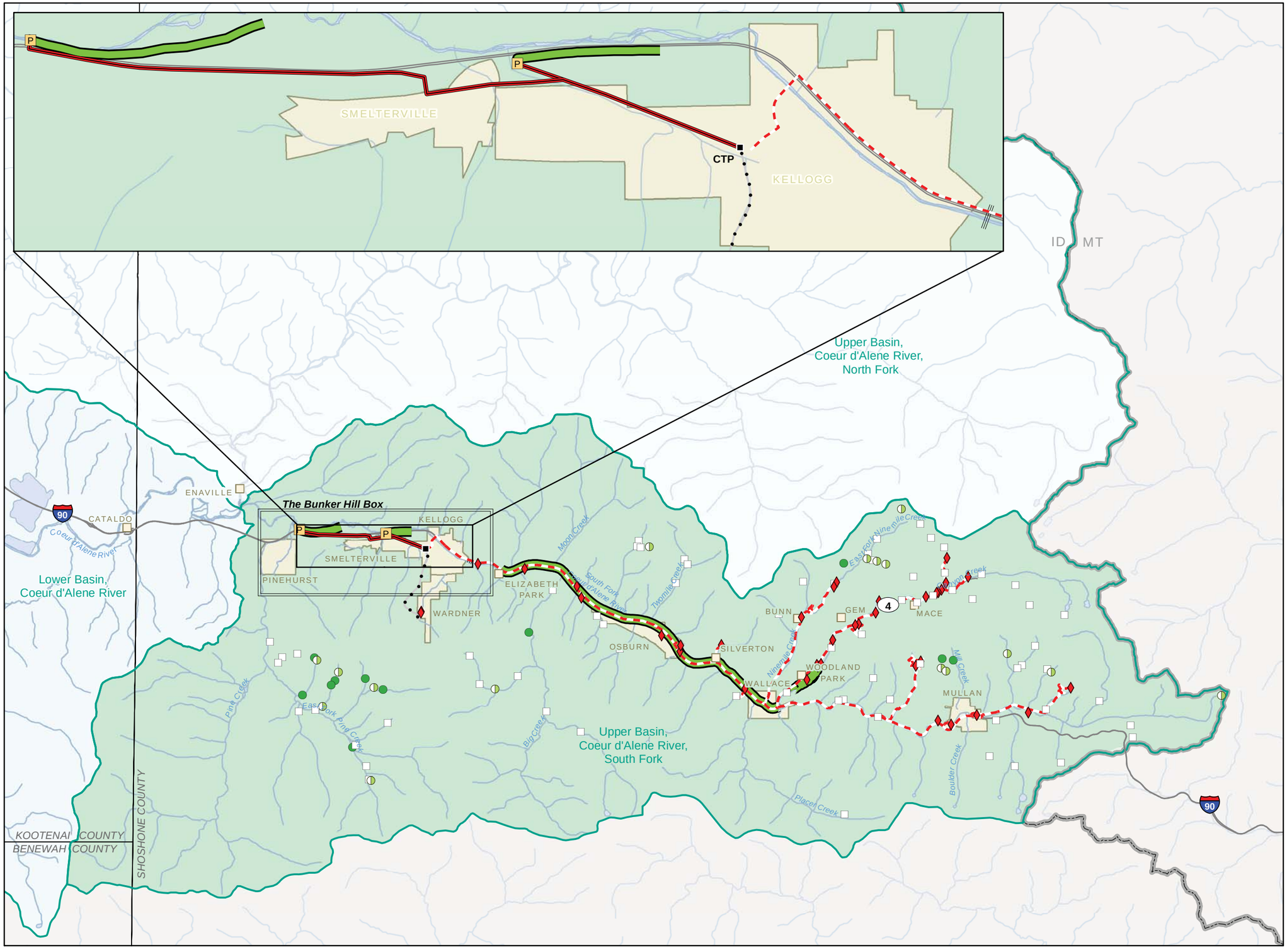
- Active Treatment (WT01)
- No Action
- Passive Treatment (WT02)
- Passive Treatment (WT03)
- Pressurized Pipeline to CTP
- Extraction Wells
- CTP Effluent Discharge Pipeline
- French Drain
- Conveyance of Reed and Russell Adit Discharge through the Bunker Hill Mine via Cherry Raise and the Kellogg Tunnel to the CTP
- Gravity Pipeline to CTP
- River/Creek
- Coeur d'Alene River Subbasin Boundary
- City Limit
- County Boundary
- State Boundary

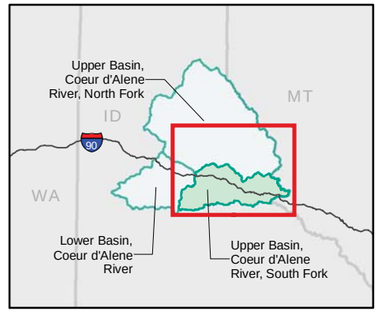
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Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006)

Notes:
1. Operable Unit 3 is defined as all contaminated areas in the Coeur d'Alene River Basin, Coeur d'Alene Lake, and the Spokane River, outside the Box.
2. Details of the water treatment approach for each individual watershed are provided in figures in Section 6.0.

Figure 7-18
Water Treatment Approach, Alternative 3+(d)
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





- Central Treatment Plant (CTP)
- P — Pump Station

Water Sources Considered for Treatment:

- Active Treatment (WT01)
- No Action
- Passive Treatment (WT02)
- Passive Treatment (WT03)
- Pressurized Pipeline to CTP
- Extraction Wells
- French Drain
- Conveyance of Reed and Russell Adit Discharge through the Bunker Hill Mine via Cherry Raise and the Kellogg Tunnel to the CTP
- Gravity Pipeline to CTP
- River/Creek
- Coeur d'Alene River Subbasin Boundary
- City Limit
- County Boundary
- State Boundary

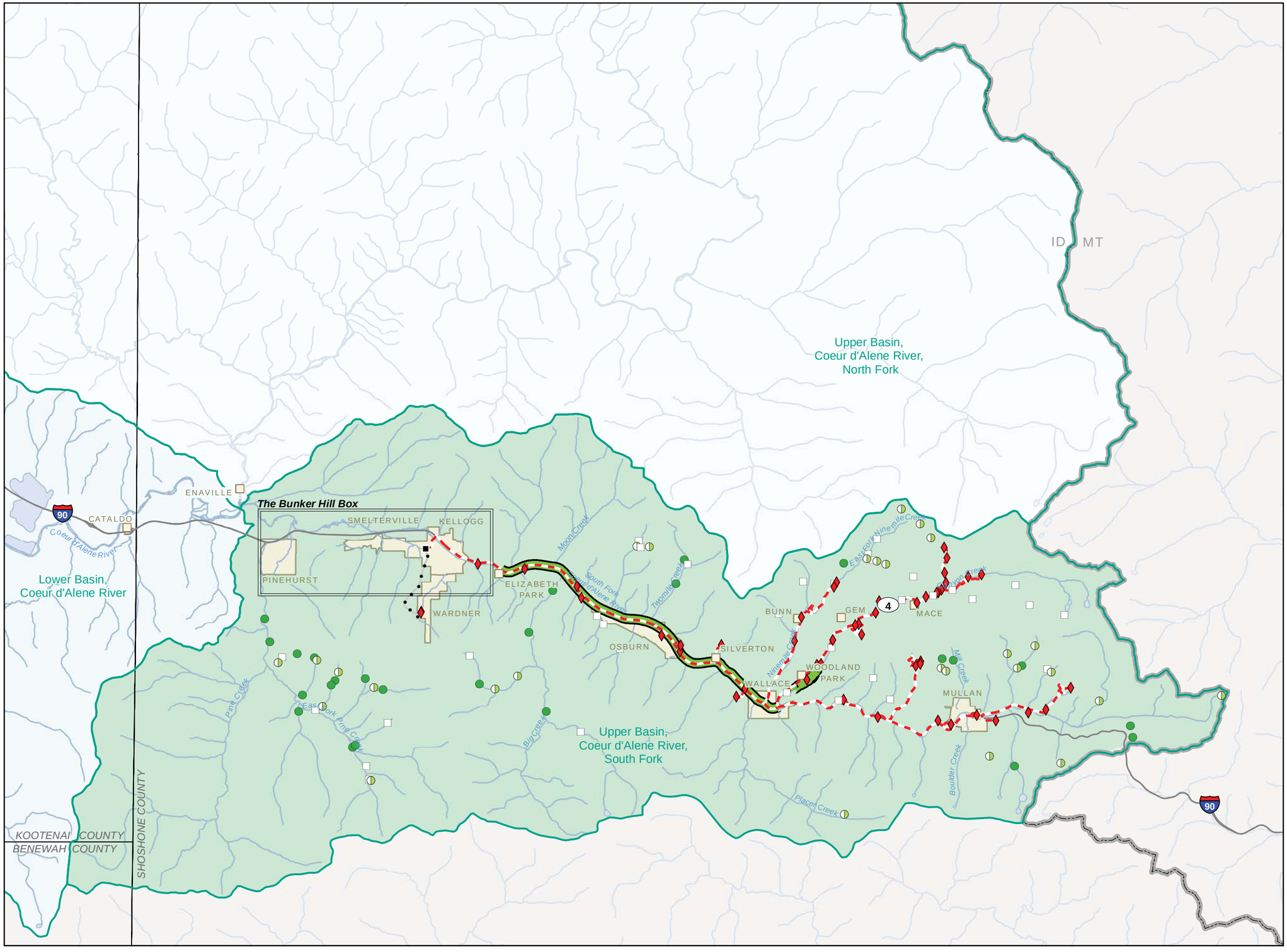
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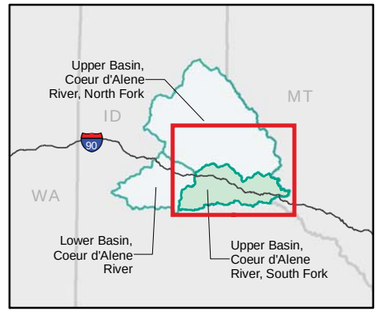
Base Map Data:
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Notes:
1. Operable Unit 3 is defined as all contaminated areas in the Coeur d'Alene River Basin, Coeur d'Alene Lake, and the Spokane River, outside the Box.
2. Details of the water treatment approach for each individual watershed are provided in figures in Section 6.0.

Figure 7-19
Water Treatment Approach, Alternative 3+(e)
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

EPA





- Central Treatment Plant (CTP)

Water Sources Considered for Treatment:

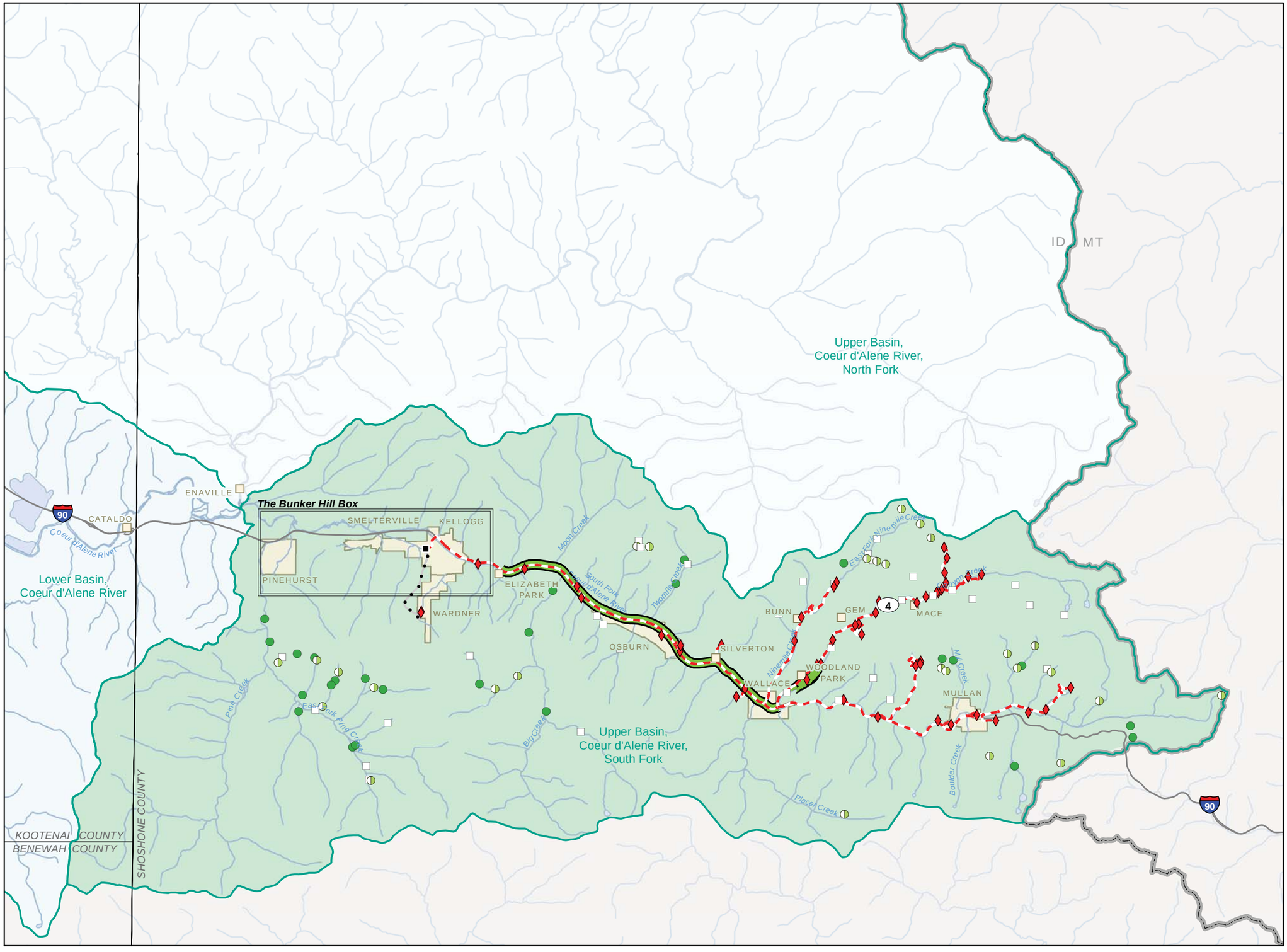
- Active Treatment (WT01)
- No Action
- Passive Treatment (WT02)
- Passive Treatment (WT03)
- French Drain
- Conveyance of Reed and Russell Adit Discharge through the Bunker Hill Mine via Cherry Raise and the Kellogg Tunnel to the CTP
- Gravity Pipeline to CTP
- River/Creek
- Coeur d'Alene River Subbasin Boundary
- City Limit
- County Boundary
- State Boundary

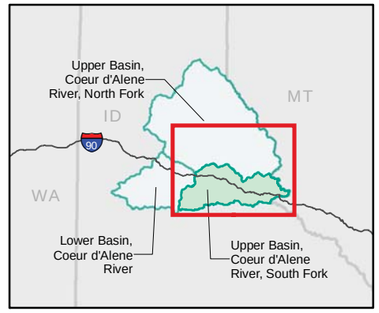
N 0 1 2 4 Miles

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006)

Notes:
1. Operable Unit 3 is defined as all contaminated areas in the Coeur d'Alene River Basin, Coeur d'Alene Lake, and the Spokane River, outside the Box.
2. Details of the water treatment approach for each individual watershed are provided in figures in Section 6.0.

Figure 7-20
Water Treatment Approach, Alternative 4+(a)
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





- Central Treatment Plant (CTP)

Water Sources Considered for Treatment:

- Active Treatment (WT01)
- No Action
- Passive Treatment (WT02)
- Passive Treatment (WT03)
- French Drain
- Conveyance of Reed and Russell Adit Discharge through the Bunker Hill Mine via Cherry Raise and the Kellogg Tunnel to the CTP
- Gravity Pipeline to CTP
- River/Creek
- Coeur d'Alene River Subbasin Boundary
- City Limit
- County Boundary
- State Boundary

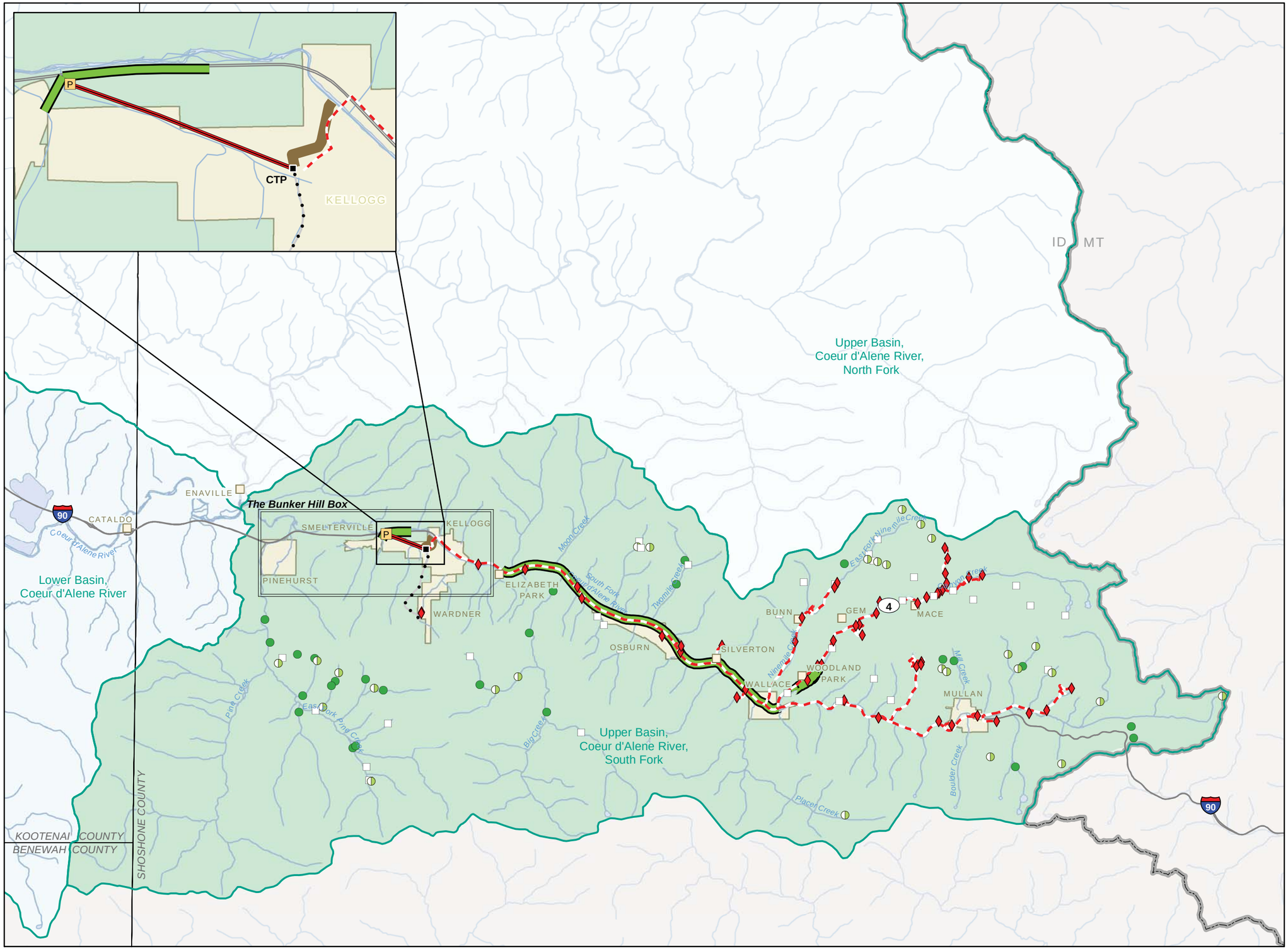
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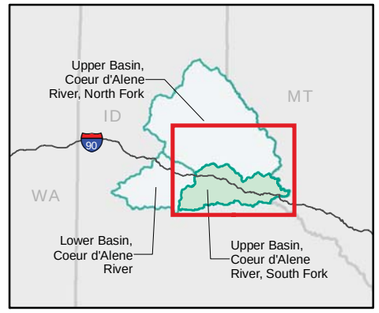
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Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006)

Notes:
1. Operable Unit 3 is defined as all contaminated areas in the Coeur d'Alene River Basin, Coeur d'Alene Lake, and the Spokane River, outside the Box.
2. Details of the water treatment approach for each individual watershed are provided in figures in Section 6.0.

Figure 7-21
Water Treatment Approach, Alternative 4+(b)
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





- Central Treatment Plant (CTP)
- P — Pump Station

Water Sources Considered for Treatment:

- Active Treatment (WT01)
- No Action
- Passive Treatment (WT02)
- Passive Treatment (WT03)
- Pressurized Pipeline to CTP
- CTP Effluent Discharge Pipeline
- French Drain
- Conveyance of Reed and Russell Adit Discharge through the Bunker Hill Mine via Cherry Raise and the Kellogg Tunnel to the CTP
- Gravity Pipeline to CTP
- River/Creek
- Coeur d'Alene River Subbasin Boundary
- City Limit
- County Boundary
- State Boundary

N 0 1 2 4 Miles

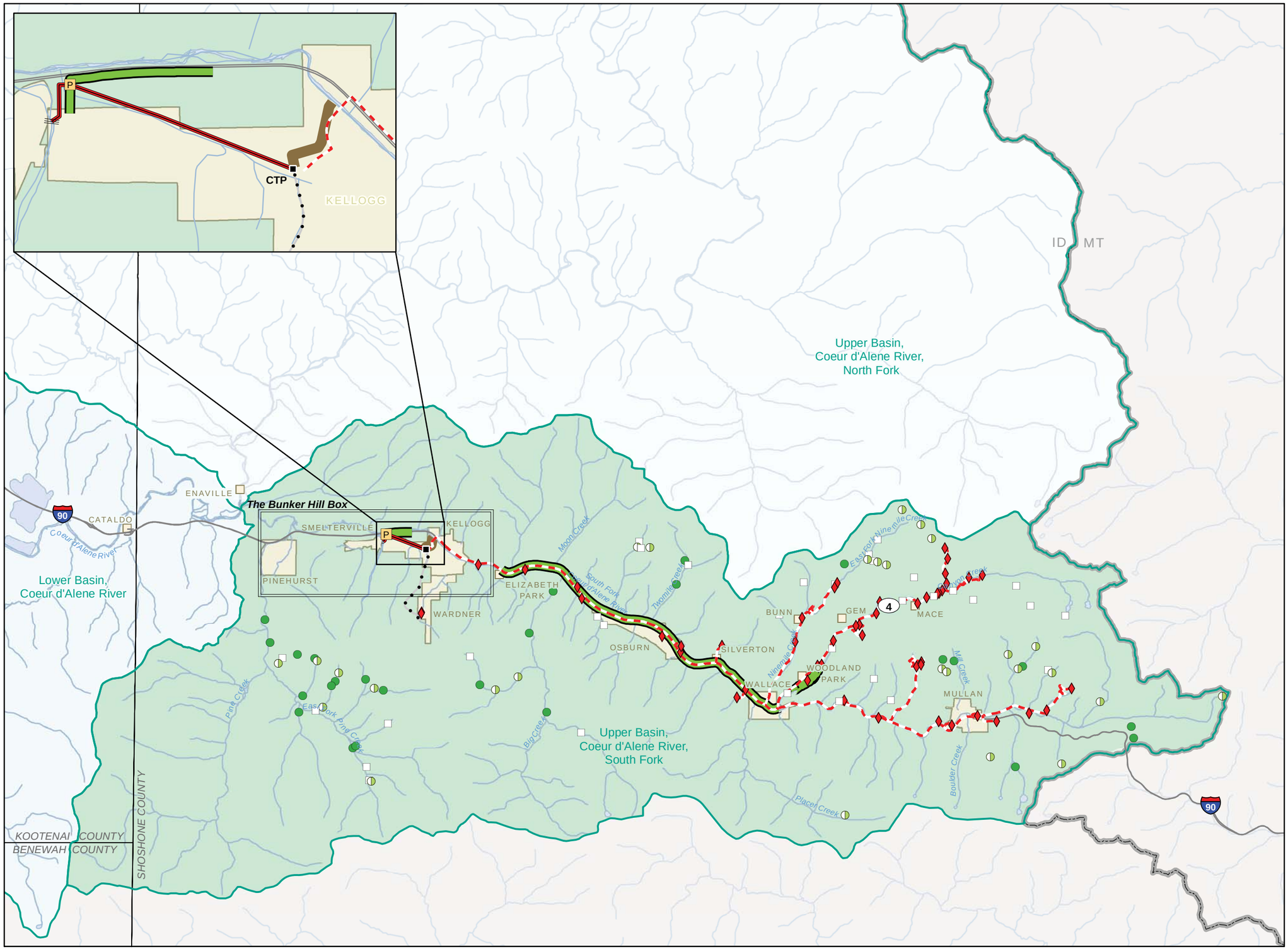
Base Map Data:
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ESRI (Roads, Jurisdictional Boundaries, 2006)

Notes:
1. Operable Unit 3 is defined as all contaminated areas in the Coeur d'Alene River Basin, Coeur d'Alene Lake, and the Spokane River, outside the Box.
2. Details of the water treatment approach for each individual watershed are provided in figures in Section 6.0.

Figure 7-22
Water Treatment Approach, Alternative 4+(c)
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

EPA

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- Central Treatment Plant (CTP)
- P — Pump Station

Water Sources Considered for Treatment:

- Active Treatment (WT01)
- No Action
- Passive Treatment (WT02)
- Passive Treatment (WT03)
- Pressurized Pipeline to CTP
- Extraction Wells
- CTP Effluent Discharge Pipeline
- French Drain
- Conveyance of Reed and Russell Adit Discharge through the Bunker Hill Mine via Cherry Raise and the Kellogg Tunnel to the CTP
- Gravity Pipeline to CTP
- River/Creek
- Coeur d'Alene River Subbasin Boundary
- City Limit
- County Boundary
- State Boundary

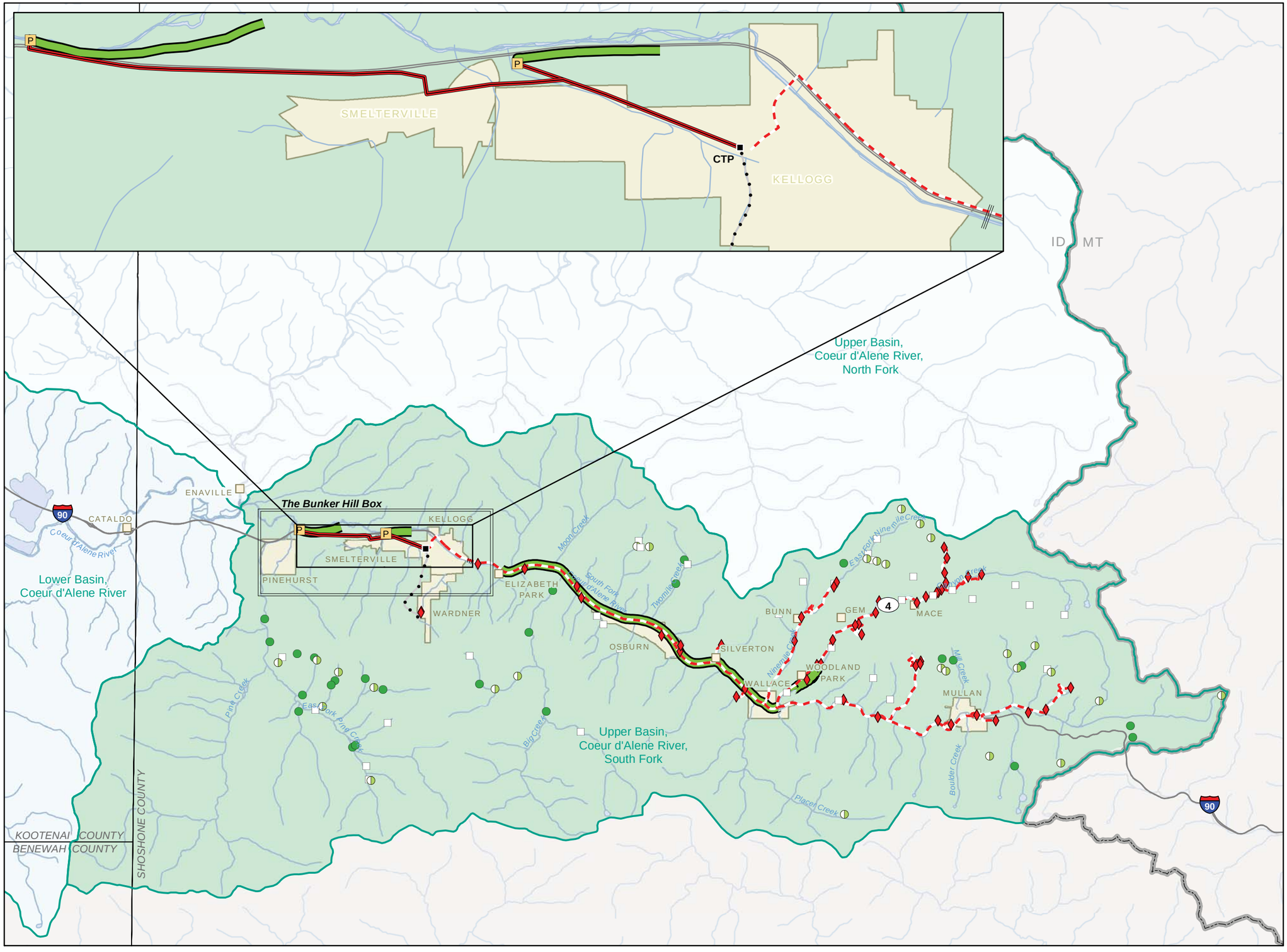
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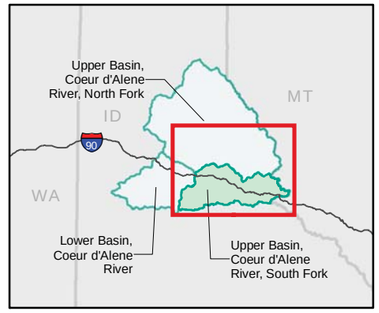
Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006)

Notes:
1. Operable Unit 3 is defined as all contaminated areas in the Coeur d'Alene River Basin, Coeur d'Alene Lake, and the Spokane River, outside the Box.
2. Details of the water treatment approach for each individual watershed are provided in figures in Section 6.0.

Figure 7-23
Water Treatment Approach, Alternative 4+(d)
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

EPA





- Central Treatment Plant (CTP)
- Pump Station

Water Sources Considered for Treatment:

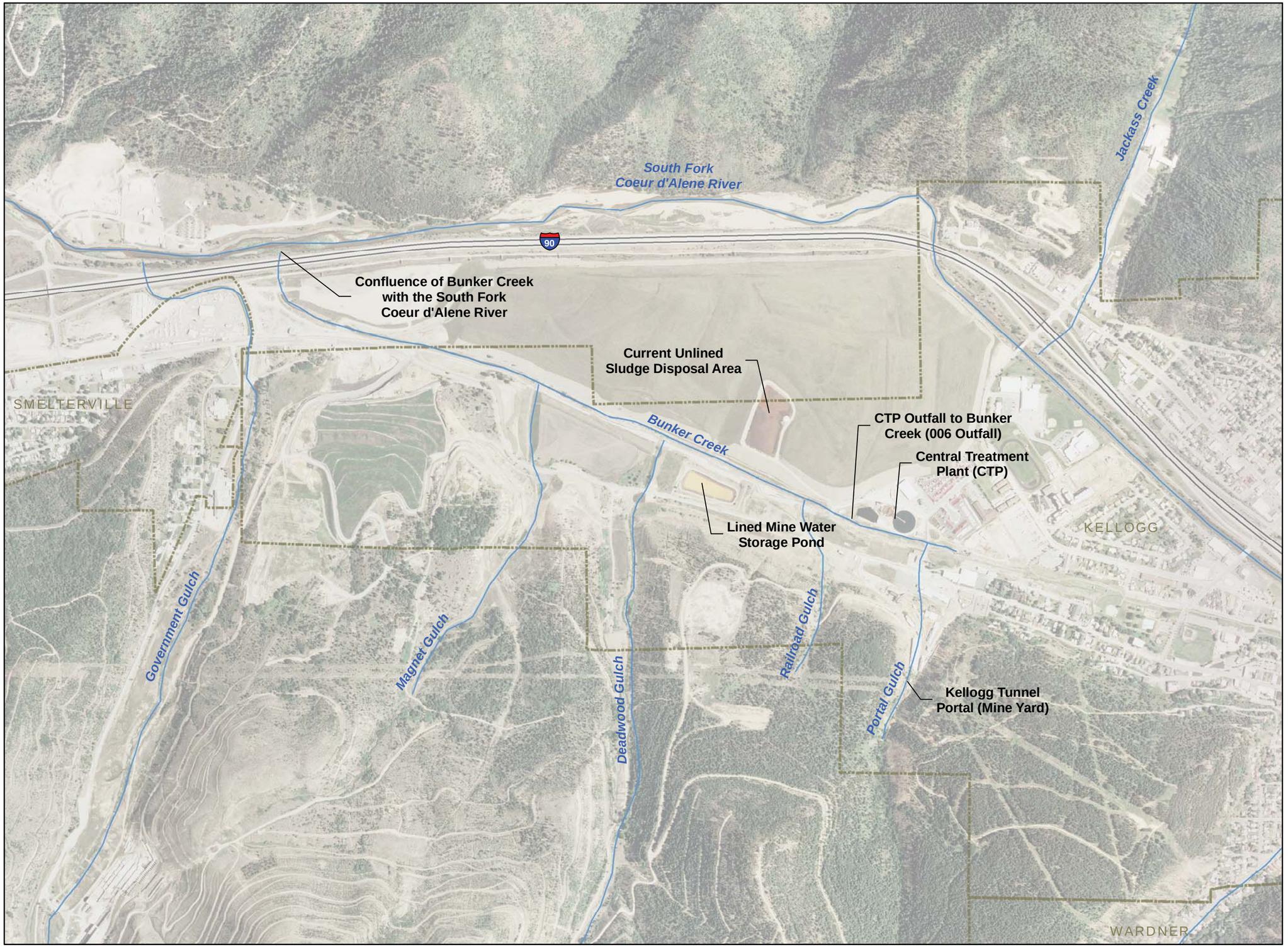
- Active Treatment (WT01)
- No Action
- Passive Treatment (WT02)
- Passive Treatment (WT03)
- Pressurized Pipeline to CTP
- Extraction Wells
- French Drain
- Conveyance of Reed and Russell Adit Discharge through the Bunker Hill Mine via Cherry Raise and the Kellogg Tunnel to the CTP
- Gravity Pipeline to CTP
- River/Creek
- Coeur d'Alene River Subbasin Boundary
- City Limit
- County Boundary
- State Boundary

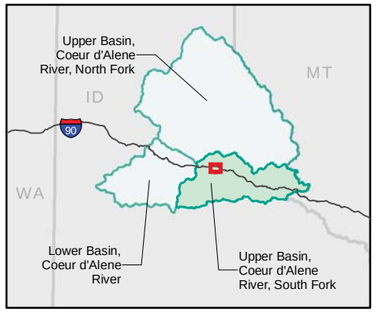
N 0 1 2 4 Miles

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006)

Notes:
1. Operable Unit 3 is defined as all contaminated areas in the Coeur d'Alene River Basin, Coeur d'Alene Lake, and the Spokane River, outside the Box.
2. Details of the water treatment approach for each individual watershed are provided in figures in Section 6.0.

Figure 7-24
Water Treatment Approach, Alternative 4+(e)
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





River/Creek

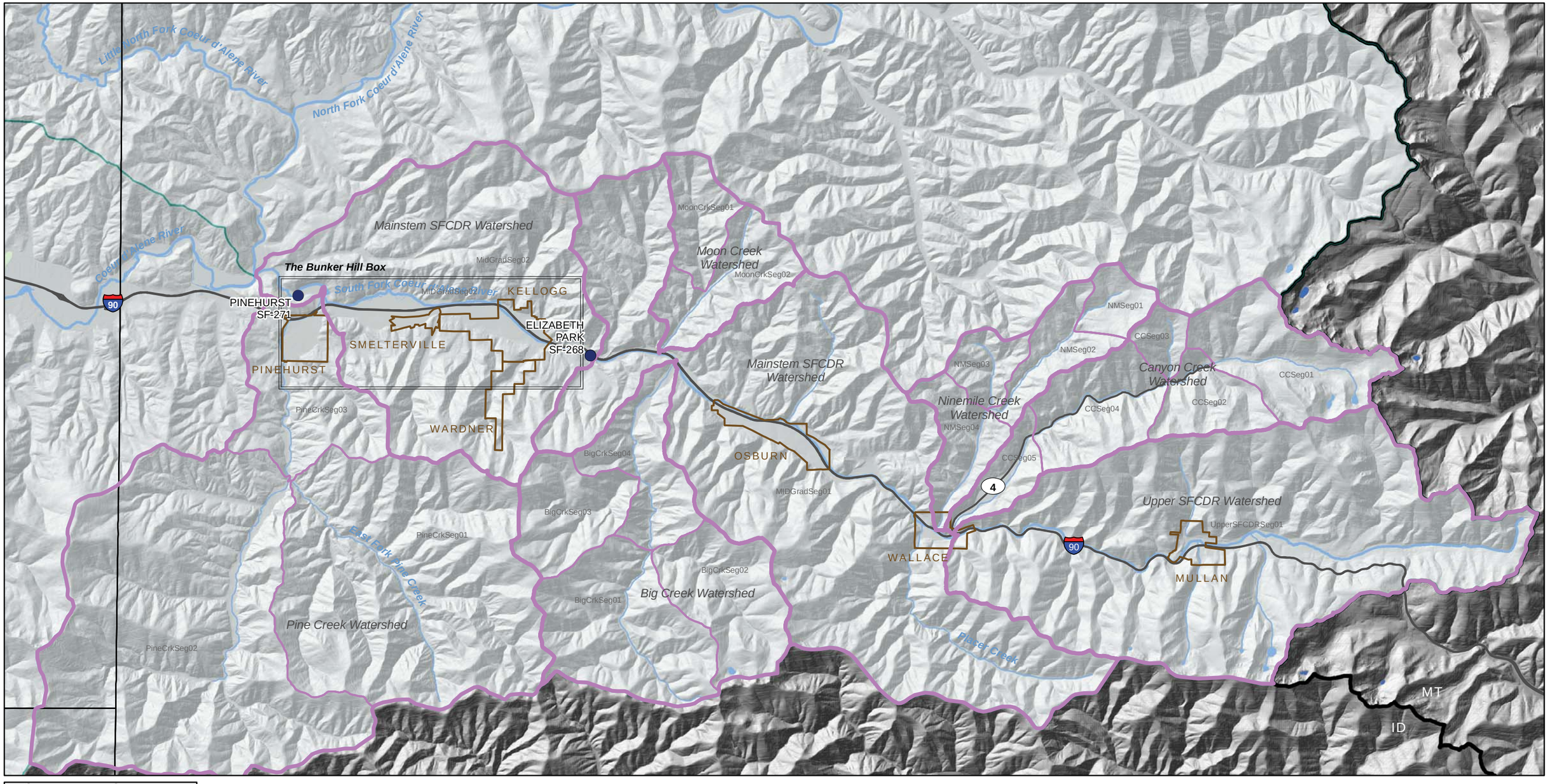
City Limit

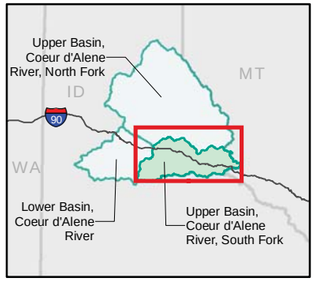
N

0 300 600 1,200 Feet

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006);
IDWR (Aerial Imagery, 2006).

Figure 7-25
Central Treatment Plant and Related Features
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





- Predictive Analysis Modeled Location
- River
- Tributary
- Coeur d'Alene Subbasin Boundary
- Watershed Boundary
- Watershed Segment
- Major Highway
- City Limit
- County Boundary
- State Boundary

Note:
The Predictive Analysis modeled the drainage from the entire Upper Basin SCFDR Watershed, including its multiple subbasins such as Canyon Creek and Ninemile Creek. The seven labeled subbasins shown here, considered to be "key" watersheds, are the subbasins in which remedial actions are proposed and evaluated using the Predictive Analysis.

N

0 1 2 4 Miles

Base Map Data:
NHDPlus (Hydrography, 2005);
ESRI (Roads, Jurisdictional Boundaries, 2006)

Figure 7-26
Predictive Analysis Modeled Locations
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

EPA

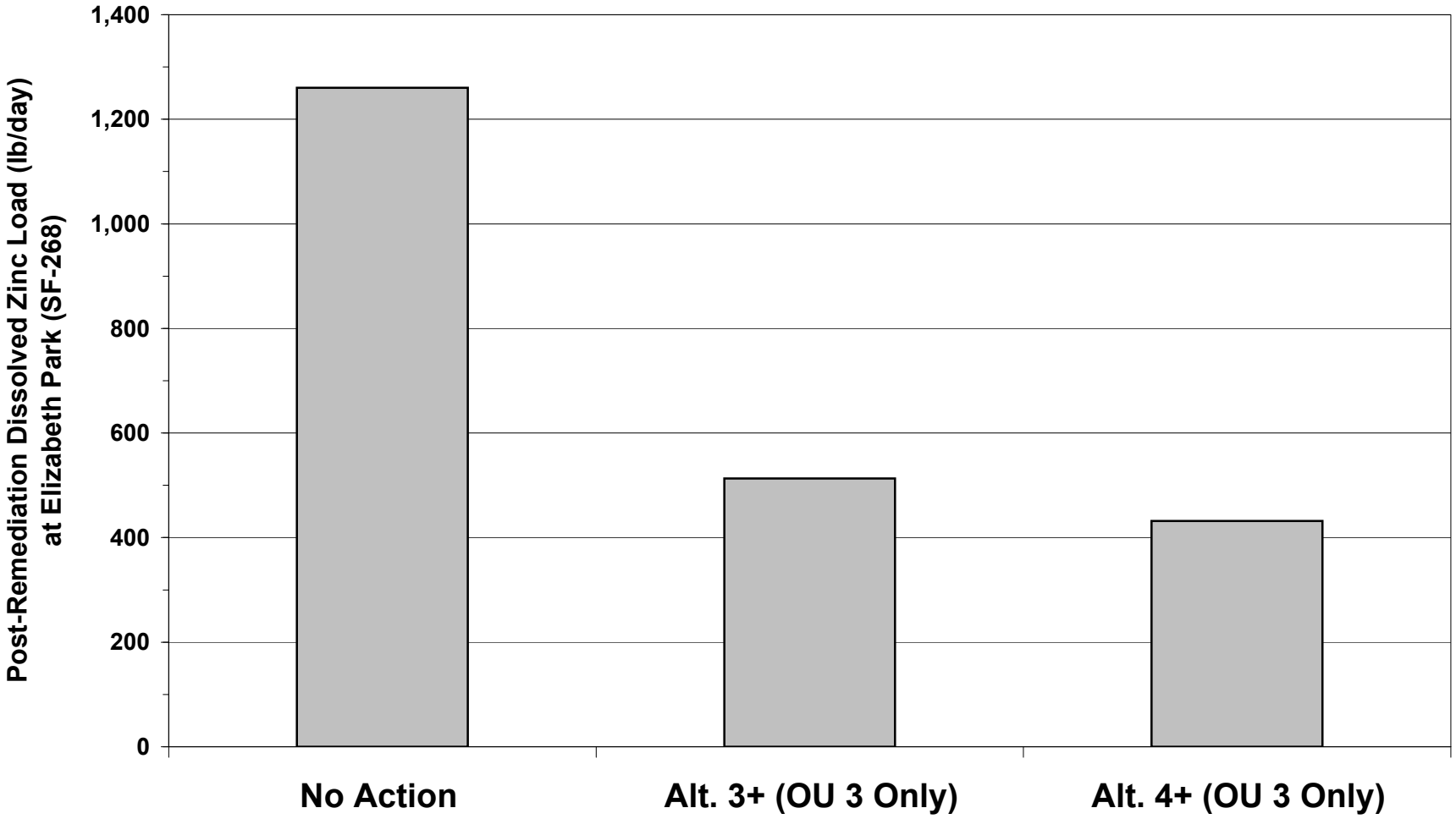


Figure 7-27
Post-Remediation Dissolved Zinc Load at Elizabeth Park as Estimated by the Predictive Analysis
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

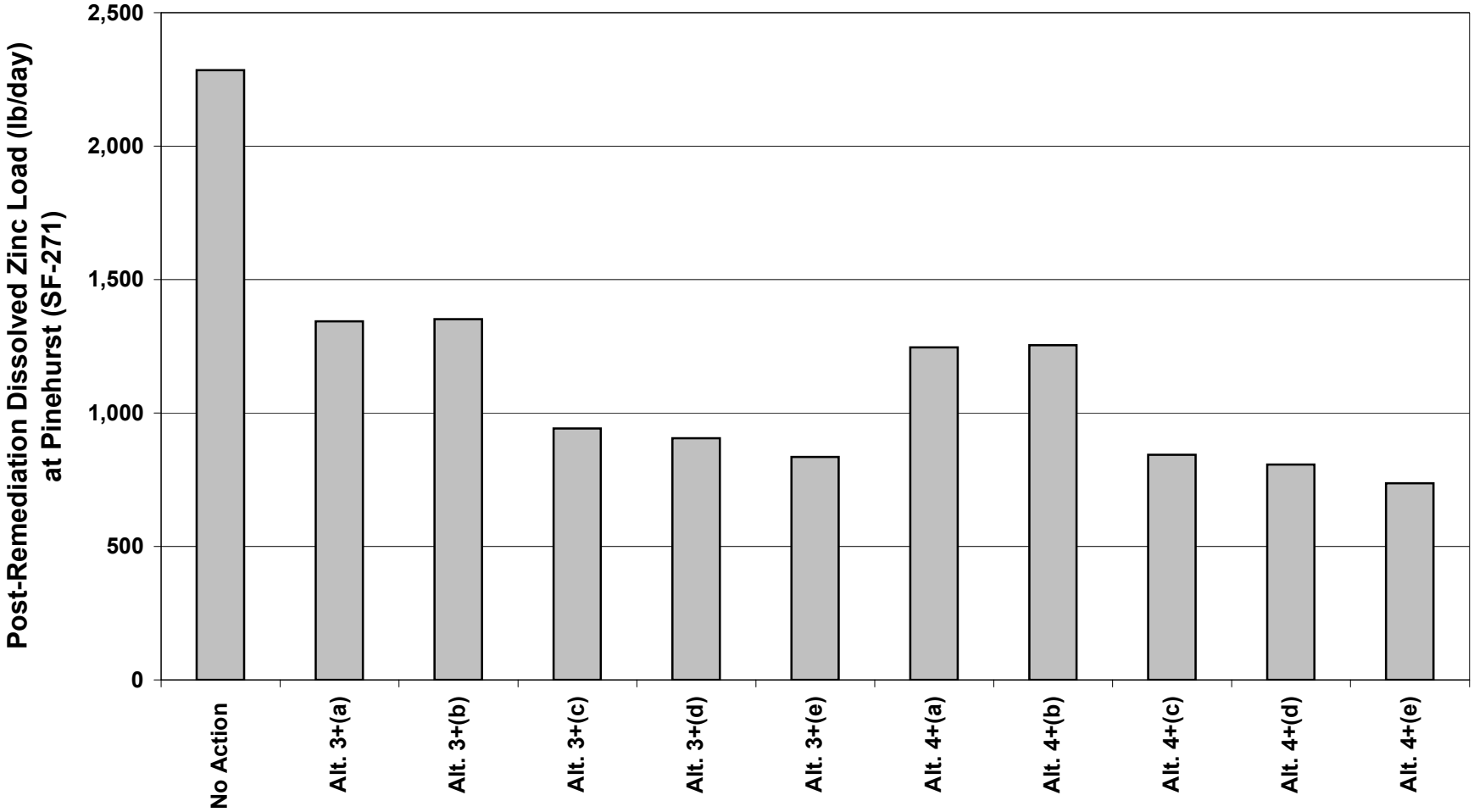


Figure 7-28
Post-Remediation Dissolved Zinc Load at Pinehurst as Estimated by the Predictive Analysis
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

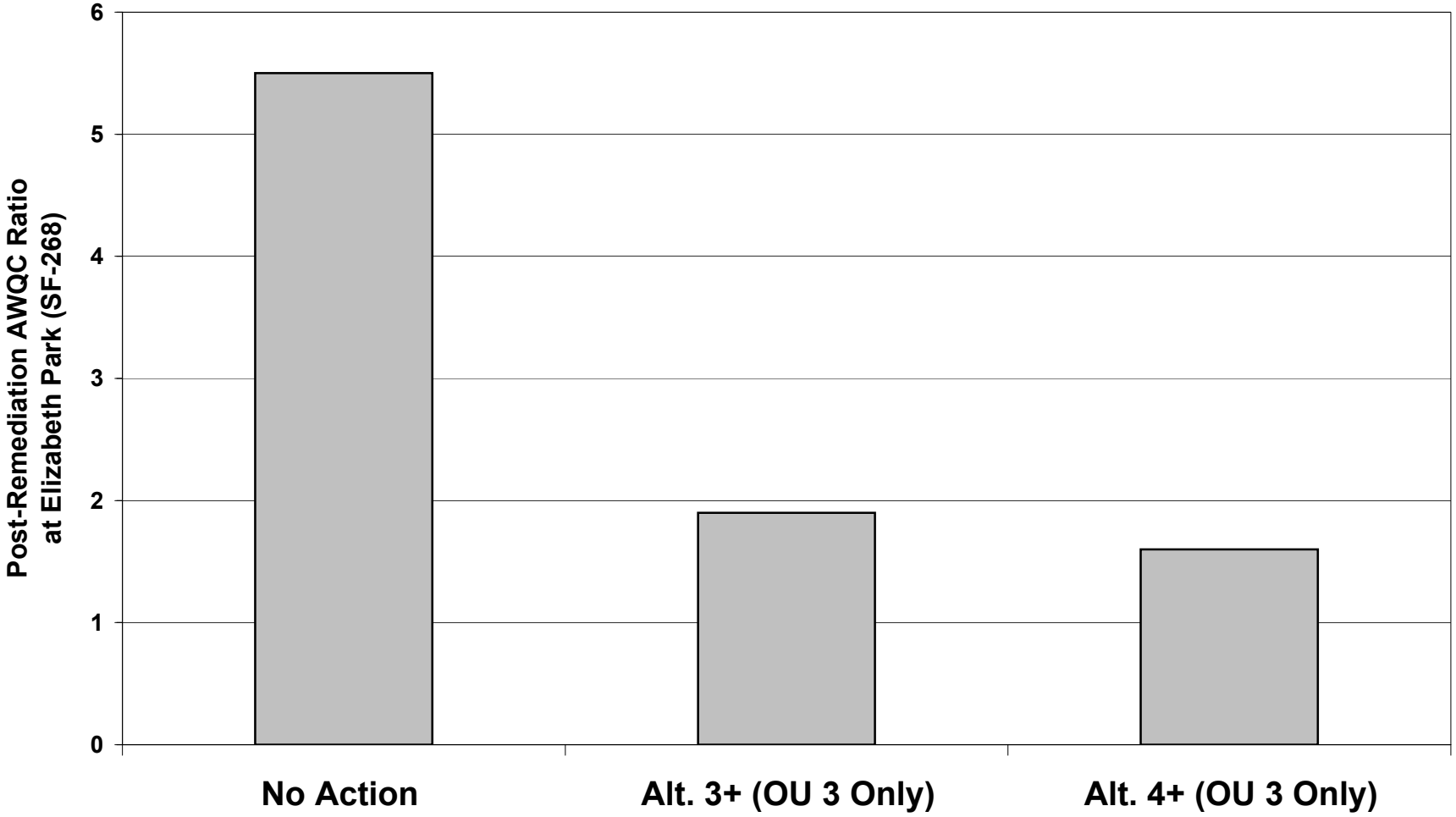


Figure 7-29
Post-Remediation AWQC Ratios at Elizabeth Park as Estimated by the Predictive Analysis
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

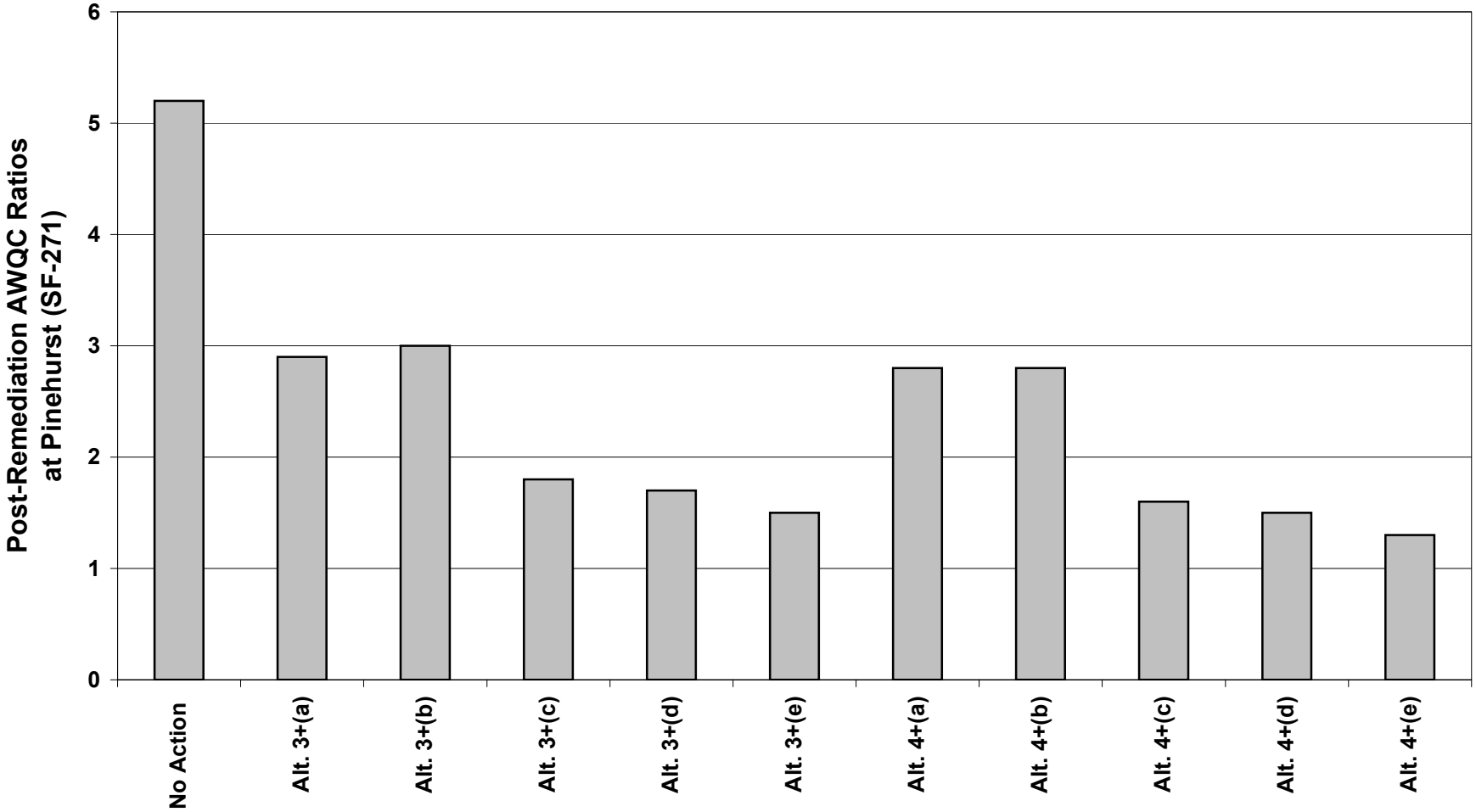
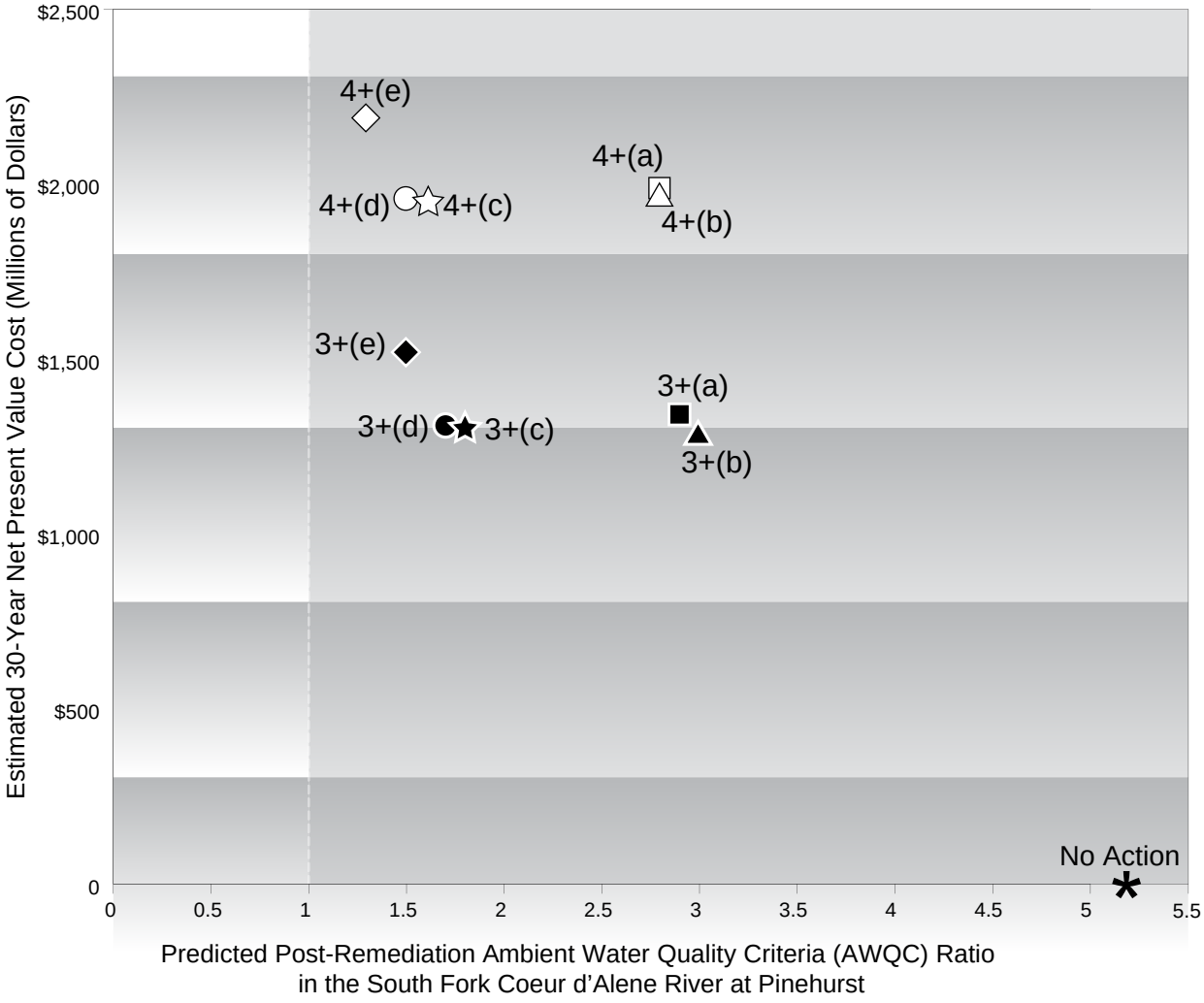


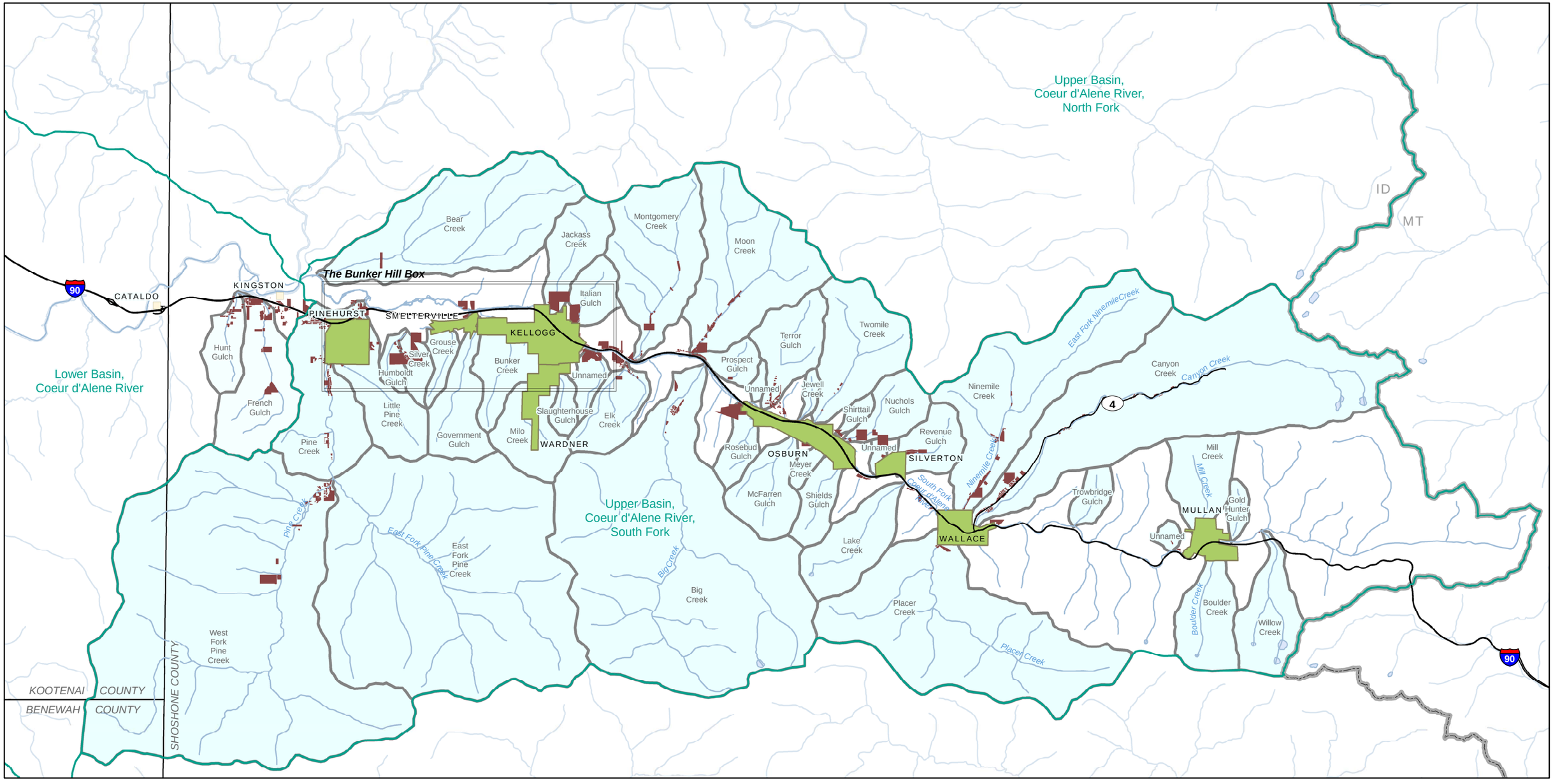
Figure 7-30
Post-Remediation AWQC Ratios at Pinehurst as Estimated by the Predictive Analysis
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

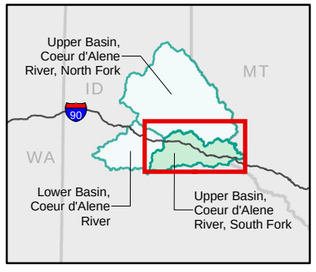


Legend

- Alternative 3+(a)
- Alternative 4+(a)
- Alternative 3+(b)
- Alternative 4+(b)
- Alternative 3+(c)
- Alternative 4+(c)
- Alternative 3+(d)
- Alternative 4+(d)
- Alternative 3+(e)
- Alternative 4+(e)

Figure 8-1
Cost Versus Predicted Post-Remediation AWQC Ratios at Pinehurst
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE





- Primary Upper Basin Community/Investigation Area
- Approximate Area of Existing Remedy in Side Gulch
- Upper Basin Tributary Watershed Considered in the Remedy Protection Analysis
- Lower Basin Tributary Watershed Considered in the Remedy Protection Analysis
- Coeur d'Alene River Subbasin Boundary
- County Boundary
- State Boundary

Note: Detailed hydrologic and hydraulic analyses were not conducted for the side gulches because of their lower densities of Selected Remedies than the eight primary communities.

N

0 1 2 4 Miles

Base Map Data: NHDPlus (Hydrography, 2005); ESRI (Roads, Jurisdictional Boundaries 2006).

Figure 9-1
Remedy Protection Investigation Areas
Focused Feasibility Study
Upper Basin of the Coeur d'Alene River
BUNKER HILL SUPERFUND SITE

EPA

Tables

TABLE 2-1

Summary of Previous Remedial Actions in the Upper Basin of the Coeur d'Alene River

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Name/ Project Name	Implementing Party	Dates	Description	Material Removed	Reference
Operable Unit 2 (OU 2)					
Hillsides	U.S. Environmental Protection Agency (USEPA), Idaho Department of Environmental Quality (IDEQ)	1990 - 2005	Hillside terracing and vegetation programs were implemented in 1990-1994 by Potentially Responsible Parties (PRPs). Government-led efforts for hillsides revegetation were initiated in 1996. From 2000-2005, revegetation of hillsides included hydroseeding, application of soil amendments, and planting of hardwood trees and shrubs. Sites are evaluated annually and monitored for performance, with maintenance performed as needed. A long-term Operation and Maintenance (O&M) Plan and performance standards were developed. Since 2005, a large portion of the Hillsides within OU 2 has been transferred to a private party for development.	No material was removed as part of this action.	Second Five-Year Review Report (USEPA, 2005b); Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Central Impoundment Area (CIA)	USEPA, IDEQ	1995 - 2000	Beginning in 1995, site removal materials and demolition debris from the Mine Operations Area began to be consolidated in the CIA. In 1999, residential soils from USEPA's yard removal program in the Basin were deposited in the CIA. In addition, some contaminated soil from State of Idaho Trustee projects were also disposed of in the CIA. From 1997 through 1999, approximately 1.2 million cubic yards (cy) of material from Smelterville Flats and additional materials from mine waste dumps and soil from gulch area removal actions were placed in the CIA. From 1999 to 2000, a geomembrane cover system was installed on the surface of the CIA with the exception of the 5-acre Central Treatment Plan (CTP) sludge disposal cell. The CIA cap does not extend down the side slopes of the CIA. The side slopes either were covered with a minimum 6-inch layer of growth media and vegetated or were rocked, depending on the steepness of the slope. In October and November 2000, perimeter fencing was installed to limit access to the CIA. Access roads were final graded, and the construction contractor was demobilized in November 2000.	No material was removed as part of this action. The CIA received approximately 2.7 million cy of material from other cleanup actions prior to closure.	Second Five-Year Review Report (USEPA, 2005b); Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d); Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Bunker Creek	USEPA, IDEQ	1996 - 1997, 2001, 2002	The majority of the Bunker Creek action was conducted in 1996 and 1997. The action consisted of the reconstruction of approximately 7,600 linear feet of creek channel, including the creation of a low-flow channel and floodplain. The low-flow channel was lined with rock to prevent erosion, and the floodplain was seeded. The reconstruction of the creek channel included source removal, revegetation, culverts for road crossings, and Institutional Controls Plan (ICP) barriers (minimum 6-inch) and hydroseeding at the surface of all disturbed areas. In 2001, riparian plantings and near channel capping were completed. Fencing was installed between the Creek and the Union Pacific Railroad (UPRR) Right of Way (ROW)/Trail in 2002. No maintenance has been required since completion of remedial action.	Approximately 77,000 cy contaminated material was removed and placed in the CIA.	Second Five-Year Review Report (USEPA, 2005b); Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d); Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Smelter Closure Area (SCA)	USEPA, IDEQ	1996 - 1998; 2005	Construction and landfilling at the SCA began in 1996 and was completed in 1998. The foundations of the Lead Smelter were used as the base of the approximately 30-acre SCA. Demolition debris from the Lead Smelter and the Phosphoric Acid and Zinc Plants, located in Government Gulch, were consolidated in the SCA. Boneyard soil and larger wood and metal debris was also deposited in the SCA. Slag and contaminated soil from various site removals were used as in-fill materials to minimize void spaces and the potential for future settlement. The Principal Threat Materials (PTM) cell was constructed within the boundary of the SCA in 1996. This geomembrane-lined mono-cell has a seep collection system that conveys seepage, if generated, to the CTP for treatment. PTMs and stabilized mercury contaminated materials were deposited in the PTM cell beginning in 1996. The PTM volume placed in the cell is approximately 80,000 to 100,000 cubic yards. The PTM cell was closed with a geomembrane cover in 1997. Contaminated soil from other site removal actions was placed on top of the PTM cell cover as needed to complete overall grading of the SCA. A shallow toe drain was constructed along a portion of the northern edge of the SCA to collect underdrain flow and convey this water to the CTP for treatment. The SCA was capped with a geomembrane liner, a drainage layer, growth media, and revegetated. A perimeter fence with locking gates was constructed around the SCA as an institutional controls measure to prevent access to the area. In 2005, a gravity collection and conveyance system for drain water was constructed to replace a pumped system.	No material was removed as part of this action. The SCA received approximately 700,000 cy of material.	Second Five-Year Review Report (USEPA, 2005b); Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d); Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Government Gulch	USEPA, IDEQ	1996 - 1998	The majority of the Government Gulch action was completed between 1996 and 1998. Nearly 400,000 cubic yards of material was removed form the gulch. The entire gulch floor received a 6-inch ICP barrier cap of clean soil typical for future industrial use. Government Creek was reconstructed from the upper reaches of the gulch to its confluence with the South Fork Coeur d'Alene River (SFCDR). Above ground structures associated with the Phosphoric Acid/Fertilizer Plant and Zinc Plant were demolished with the exception of the Zinc Plant Concentrate Handling Building and Warehouse. Salvageable material was removed and recycled and the remainder of the materials were placed in the SCA. The tall stack at the Zinc Plant was demolished and buried in place.	Approximately 400,000 cy of material was removed and placed in the SCA.	Second Five-Year Review Report (USEPA, 2005b); Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d); Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)

TABLE 2-1
Summary of Previous Remedial Actions in the Upper Basin of the Coeur d'Alene River
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Name/ Project Name	Implementing Party	Dates	Description	Material Removed	Reference
			In 2001, riparian corridor planting was conducted at applicable portions of Government Creek. In the spring of 2003, a section of upper Government Creek required maintenance and channel rebuilding after runoff and creek flows eroded the channel. In 2005, sewer and water lines extending from the mouth of the gulch to the Zinc Plant were installed to support future development within the gulch. Fill material from the hillsides behind the Zinc Plant was placed on the gulch floor near the former location of the cobalt storage bins to support buildings used for a public gun range. In 2007, the developer of the golf course property located east of the gulch began diverting water from Government Creek to the golf course property.		
Lower Government Gulch	USEPA	2001 - 2002	Vacant portions in lower Government Gulch were capped with 6 inches of gravel, including the area just south and west of the McKinley Avenue intersection with Government Gulch up to the Silver Valley Lab and east of the hillside, the area between the Enyeart Lumber Yard and Bunker Creek, and the area between the Enyeart Lumber Yard and the I-90 interchange in Smelterville. The Enyeart Lumber Yard was capped with asphalt and graded to drain to a newly installed storm drain system.	No materials were removed as part of this action.	Second Five-Year Review Report (USEPA 2005b); Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Smelterville Flats – North of I-90	USEPA	1997 - 2004	Source removal action, capping, revegetation, and stream bank stabilization were conducted in 1997-1998. Later actions included riparian plantings of trees and shrubs. In addition, noxious weed control programs were conducted periodically from 2001 through 2004 by the U.S. Army Corps of Engineers (USACE). The S&P Truck Stop area was re-capped by PRPs in 2001, and was re-remediated by USACE later in 2001. The City/Gun Range Road east of the S&P Truck Stop was capped in 2004.	Approximately 1.2 million cy of tailings were removed from Smelterville Flats and placed in the CIA.	Second Five-Year Review Report (USEPA, 2005b); Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d); Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Smelterville Flats – South of I-90	USEPA	1997 - 2001	In 1997-1998, source removal action included re-grading, capping, and surface water management. Improvements to surface water runoff control were implemented in 2001, consisting of a vegetated swale and storm drain pipe. The North Idaho Recycle Yard was also recapped in 2001. No maintenance has been required since completion of the remedial action.	Materials removed are included above in North of I-90 description.	Second Five-Year Review Report (USEPA, 2005b); Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d); Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Central Treatment Plant (CTP)	USEPA	1994 - 2006	From 1994-1995, the Lined Pond was constructed adjacent to McKinley Avenue. From 1996-1997, studies to prioritize maintenance needs and to optimize operation of CTP were performed. In 1997, miscellaneous O&M, construction of direct discharge line from mine to the Lined Pond, and ICP capping on CTP property was conducted. In 2001-2002, a new direct feed mine water pipeline was constructed from the Kellogg Portal to the CTP aeration basin. Emergency repairs and upgrades to the CTP and Lined Pond were completed from 2004-2007, including a new lime storage, make-up, and feed system consisting of two 14-foot-diameter, 100-ton silo assemblies and other equipment.	No material was removed as part of this action.	Second Five-Year Review Report (USEPA, 2005b); Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Milo Gulch and Reed Landing	IDEQ, USEPA	1995 - Ongoing	Beginning in 1995 and extending through 2000, source removal and disposal at Guy Caves was conducted and a water diversion dam and pipeline on the main stem of Milo Creek were installed. In 1997 and 1998, the underground Milo Creek conveyance system was reconstructed following a major flood event. A permanent concrete sediment basin was installed and connected to a new high-density polyethylene (HDPE) conveyance system. Remedial action of lower Milo Gulch was essentially complete in 2000. At Reed Landing, re-grading to stable slope, disposal of materials at the CIA and Guy Caves, and construction of a reinforced concrete emergency overflow channel were performed. The Upper Milo Basin requires additional remediation, which is currently pending, in accordance with the 2001 Record of Decision (ROD) Amendment for OU 2. Routine maintenance is ongoing.	Approximately 30,000 cy of material were removed from Milo Gulch.	Second Five-Year Review Report (USEPA, 2005b); Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Railroad Gulch	USEPA	1997	In 1997, reconstruction of the portion of the gulch drainage channel that extends across the eastern end of the Boulevard Area, crosses under McKinley Avenue, and then connects to Bunker Creek, was conducted. The channel was lined with riprap and a sedimentation basin was constructed on the south side of McKinley Avenue. Adjacent areas were capped and revegetated. No maintenance has been required since completion of the remedial action in 1997.	No material was removed as part of this action.	Second Five-Year Review Report (USEPA, 2005b); Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d); Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)

TABLE 2-1
Summary of Previous Remedial Actions in the Upper Basin of the Coeur d'Alene River
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Name/ Project Name	Implementing Party	Dates	Description	Material Removed	Reference
Mine Operations and Boulevard Areas	USEPA	1995, 1997	Demolition of structures, source removal actions, site grading, capping, and revegetation were conducted in the Mine Operations Area in 1995. In 1997 in the Boulevard Area, source removal action, replacement with clean soil, re-grading, surface water management, and revegetation was conducted. No further remedial work has been conducted. No maintenance has been required since completion of these remedial actions.	Approximately 10,000 cy were removed from the Mine Operations Area and approximately 40,000 cy from the Boulevard Area, then placed in the CIA and SCA.	Second Five-Year Review Report (USEPA, 2005b); Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d); Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Deadwood Gulch	USEPA	1995 - 1998; 2001	A source removal action (Arizona and Sierra Nevada Mine dumps) was conducted in 1995-1998, in addition to stabilization and reconstruction of the creek channel and revegetation. Riparian corridor planting of Deadwood Creek was conducted in 2001. No maintenance has been required since completion of the majority of the remedial action in 1998.	Approximately 500,000 cy of contaminated material was removed from Deadwood Gulch and placed in the CIA.	Second Five-Year Review Report (USEPA, 2005b); Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d); Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Lower Deadwood Gulch and Miscellaneous Adjacent Areas	USEPA	2002	The mouth of Deadwood Gulch was capped with 6 inches of gravel during an effort to open McKinley Avenue to the public. Other areas capped included the parking lot west of the A-4 Gypsum Pond, the snow storage area east of the A-4 area lined pond, McKinley ROW shoulders, the southwest side of the old Slag Pile Area, and the east security gate. Capping was also conducted for the direct feed mine water line project in the CTP area and along the slopes from McKinley north to the UPRR trail.	No material was removed as part of this action.	Second Five-Year Review Report (USEPA, 2005b); Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d); Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Upper Magnet Gulch	USEPA, Gulf Resources	1992 - 1999, 2006	In 1992, Gulf Resources removed the copper dross flue dust pile from upper Magnet Gulch to a temporary location within the Lead Smelter Area. A source removal action was conducted in 1995-1999 by USEPA. It included removal of the A-1 Gypsum Pond, reconstruction of the creek channel, and revegetation. No maintenance has been required since completion of the removal action in 1999. Following transfer of the property from the State of Idaho to Galena Ridge in 2006, a gabion structure was installed in Magnet Gulch to provide road access to the golf course development. Magnet Creek passes through the gabion structure in an approximately 6-foot by 6-foot culvert.	Approximately 200,000 cy of contaminated material was removed from Upper Magnet Gulch and placed in the SCA.	Second Five-Year Review Report (USEPA, 2005b); Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d); Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
A-4 Gypsum Pond	Potentially Responsible Party (PRP): SMC	1996 - Present	The following actions were performed in 1996-2000: construction of run-on ditches along the up-gradient perimeter, removal of the upper portion of an existing north perimeter embankment and re-grading of the downstream face of the embankment, rerouting of Magnet Creek over the A-4 Gypsum Pond and then excavation and lowering of the Magnet Gulch channel down to the native soil at the floor of the Gypsum Pond, and installation of a seepage barrier along the north perimeter of McKinley Pond and a new sealed culvert under McKinley Avenue from McKinley Pond. Later actions included installation of a French drain along the toe of the north dike, construction of lined drainage channel and outfall works around the pond near the eastern perimeter to convey drainage from Deadwood Gulch to Bunker Cree, and completion of construction of a primary drainage channel and associated outfall works at the extreme west side of the A-4 closure area to convey perennial and seasonal flows that originate from the upper reaches of Magnet Gulch. In addition, numerous controls were installed to intercept and divert localized runoff to Magnet Gulch or Deadwood Gulch. Cover soil was placed on the A-4 complex at numerous times following remediation work, and in 2002 soil was applied to the west end of the A-4 in association with the completion of the Magnet Gulch channel. In 2003 SMC applied cover soil over 75 percent of the A-4 area to replace re-contaminated cover soil, and vegetation was established onsite following soil placement in 1996. The goal at that time was to minimize water infiltration into the soil cap by increasing evapotranspiration. Vegetation in much of the area was eliminated when the cover soil was replaced in 2003. Final seedin	Approximately 100,000 cy of material was removed and placed in the CIA.	Second Five-Year Review Report (USEPA, 2005b); Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d); Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)

TABLE 2-1
Summary of Previous Remedial Actions in the Upper Basin of the Coeur d'Alene River
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Name/ Project Name	Implementing Party	Dates	Description	Material Removed	Reference
Grouse Gulch	PRPs	1997	The Bunker Limited Partnership (BLP) removed approximately 1,200 cy of tailings above the uppermost gabion structure from locations closest to the creek and disposed it in the CIA. A new gabion dam was constructed in the lower reaches. Access roads were improved to enable access to gabion structures. The Wyoming Mine dump located near the creek was buttressed at its base to minimize the potential for erosion. Approximately 2,000 cy of material was removed and disposed in the CIA. Remedial action has not required maintenance since its completion in 1997. Shoshone County is responsible for cleaning out Grouse Gulch sediment basins to help control flooding associated with Grouse Creek in Smelterville.	Approximately 3,200 cy of material was removed and disposed of in the CIA.	Second Five-Year Review Report (USEPA, 2005b); Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Miscellaneous OU 2 Projects					
Borrow Area Landfill	IDEQ, USEPA	1997 - 2005	The Borrow Area Landfill (BAL), located to the west of the Smelter Closure Area, was constructed in 1997 and 1998 to provide clean fill for site remediation work. In 2000, the remaining portion of the Upper Industrial Landfill was removed from Railroad Gulch and consolidated at the BAL. The BAL then received other miscellaneous site waste below the Principal Threat Materials (PTM) action level. In 2002-2005, the landfill was closed and the following activities performed: grading, surface water management, soil cover, revegetation, and settlement monitoring points. No maintenance has been required since closure of the BAL.	In 2000 and 2001, approximately 190,000 cy of material was placed in the BAL.	Second Five-Year Review Report (USEPA, 2005b); Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d); Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Area 14	USEPA	1997 - 1998, 2006	Two sedimentation ponds (Gilges Pond and Sweeney Pond) were excavated and backfilled in 1997 and 1998, respectively. In 2006, the former Sweeney Mill site and the area leased to Avista Utilities (both in the western portion of Area 14) were capped with a clean soil cap. Phased remedial action has been initiated.	The volume removed was not recorded but was less than 1,000 cy. Materials were placed in the SCA.	Second Five-Year Review Report (USEPA, 2005b); Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d); Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Union Pacific Railroad (UPRR) ROW in the Box	PRP (UPRR), USEPA	1995 - Present	The following actions were performed in accordance with 1995 Consent Decree: source removals, reuse of decontaminated materials, and capping with clean barriers. Portions of the UPRR ROW adjacent to the CIA haul road were remediated, and verification sampling was performed (2000). Certification of the UPRR remedial action and incorporation of the ROW into the ICP was conducted (2001). Remaining pieces of government response areas were remediated, and the old fuel bulk plant on the UPRR ROW in Kellogg was removed and remediated (2002-2004). Portions of the UPRR ROW were paved with an asphalt path. In 2005, USEPA remediated several discrete areas: one area east of Ross Ranch, and one haul road shoulder south of the TCI building. Inspection/monitoring and O&M activities are ongoing.	Approximately 50, 000 cy of material was removed and placed in the CIA.	Second Five-Year Review Report (USEPA, 2005b); Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d); Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
UPRR ROW in the Box	USEPA	2002 - 2003	"Orphan" areas along UPRR ROW in the Box were capped with 6 to 12 inches of gravel. These caps covered exposed sections of tailings or ballast. The work was completed from where the trail crosses under I-90 at Pinehurst Narrows, up to the east fence of the government property near the CTP.	No material was removed as part of this action.	Second Five-Year Review Report (USEPA, 2005b); Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
South Fork Coeur d'Alene River Removal and Stabilization Project	IDEQ , USEPA	1999 - 2004	In 1999, the north bank of the SFCDR between Theatre Bridge and the east end of the Kellogg Gun Range property was stabilized. Contaminated floodplain sediments were removed in 1999, 2000, and 2001. In 2002, the eastern half of the river reach was reconstructed, and, in 2003, the western half of the reach was reconstructed. Revegetation at the reconstructed river reaches was conducted in 2003 and 2004.	88,970 cy of contaminated material was removed and placed in the CIA.	Second Five-Year Review Report (USEPA, 2005b); Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d); Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Page Pond	PRP (Upstream Mining Group [UMG])	1997 - 2000	West Beach tailings were removed in the West Page Swamp. Tailings removal, capping, revegetation, and surface water controls were implemented. Limited monitoring and O&M activities are ongoing, but no additional remedial actions have been conducted in Page Pond since 2000. Page Pond is currently in use as the OU 2 ICP Repository.	Approximately 40,000 cy of material were removed.	Second Five-Year Review Report (USEPA, 2005b); Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)

TABLE 2-1
Summary of Previous Remedial Actions in the Upper Basin of the Coeur d'Alene River
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Name/ Project Name	Implementing Party	Dates	Description	Material Removed	Reference
Small-Scale OU 2 Remedial Actions					
Miscellaneous Box Projects	IDEQ, USEPA	1998 - Present	Various miscellaneous projects were performed in support of larger remedial actions in OU 2, including City of Smelterville fencing and road and shoulder paving; remediation of Airport Road shoulders and airport area residences and airport property; development of clean water supply to users of Hangaard Arena; McKinley Avenue capping; obtaining 5,000 cy of topsoil from Hayden Jail Facility for remediation; remediation of the Pinehurst Golf Course parking lot, surrounding areas of the Kellogg Project Office, Avista Substation, east Smelterville private properties, residential properties, and ROWs adjacent to UMG-responsible properties; and establishment of a number of access controls in the Bunker Hill Box. In 2004, areas around the Kellogg Project Office were capped with 12 inches of gravel, and eco blocks were placed to stabilize the hillside. In 2005, a pilot study of sufficient capping thicknesses was performed on alleys in Kellogg. Also in 2005, a 6-inch gravel cap was placed on four discrete areas east of Smelterville Ponds.	No material was removed for the majority of these projects; 5,000 cy of clean topsoil was obtained from Hayden Jail Facility for remediation of other sites.	Second Five-Year Review Report (USEPA, 2005b)
UPRR ROW	IDEQ, USEPA	2005 - 2006	In 2005, removal of debris and placement of a 6-inch gravel cap was conducted on a haul road shoulder south of I-90 and south of the current TCI building along the UPRR ROW. Also in 2005 or early 2006, 6 inches of gravel was placed on bare patches along UPRR ROW between the meandering trail and the fence.	Included in UPRR ROW in the Box.	Second Five-Year Review Report (USEPA, 2005b)
Trail of the Coeur d'Alenes, East of Ross Ranch	USEPA	2005	Removal of overgrown vegetation and placement of 6-inch gravel cap was performed on a strip along the Trail of the Coeur d'Alenes.	Included in UPRR ROW in the Box.	Second Five-Year Review Report (USEPA, 2005b)
Slip-Lining Sloughline near UPRR ROW	USEPA	2003	A sloughline was repaired to eliminate flooding and recontamination near the UPRR ROW. The sloughline is a high-water-volume line with significant pressure. The pipe was on the verge of failure, which would have caused erosion and destruction of remediation barriers.	No material was removed as part of this action.	Second Five-Year Review Report (USEPA, 2005b)
Kellogg Storm Sewer Pipe	IDEQ, City of Kellogg	2001	New piping was installed for the storm drain project near Kellogg City Park and Greenbelt. The new sewer pipe has prevented the continuing recontamination, caused by flooding, of the remediated soil in this area.	No material was removed as part of this action.	Second Five-Year Review Report (USEPA, 2005b)
Pine Creek at Pinehurst	USEPA	2001	Removal of contaminated bed load from Pine Creek in Pinehurst was conducted to help reduce the potential for flooding that would recontaminate remediated areas in Pinehurst.	Volume removed was not recorded.	Second Five-Year Review Report (USEPA, 2005b)
West Gate Contractor Staging Area	USEPA	2001 - 2002	This project is considered an extension of the Government Gulch and the south of I-90 Smelterville Flats remedial actions. It consisted of grading and capping the old "MK Town" area with 6 inches of gravel, and established a trailer court area for contractor use for overseeing remedial action in the area.	No material was removed as part of this action.	Second Five-Year Review Report (USEPA, 2005b)
Operable Unit 3 (OU 3)					
Schlepp Agriculture to Wetland Conversion Project	USEPA, IDEQ	2006 - Present	USEPA is working collaboratively with a willing property owner, USFWS, and Ducks Unlimited to establish nearly 400 acres of clean feeding habitat for migratory and resident swans, ducks, and other wetland bird species. Significant numbers of waterfowl deaths have been recorded in the Basin for decades due to the lead contaminated sediment; this project will reduce waterfowl exposure to these contaminants by providing a safe wetland feeding area. Under the 2002 Interim ROD, using settlement monies EPA purchased a conservation easement from the property owner and is converting farmland to healthy wetland habitat. The project includes remediation of elevated soil metals, installation of water control structures and creation of drainage channels. After the cleanup is complete in 2010, the Coeur d'Alene Basin Natural Resource Trustees, led by the USFWS in coordination with Ducks Unlimited, will begin wetland restoration. The restoration will include control of exotic plants, planting native vegetation, and managing water levels to restore wetland habitat.	The volume removed is not yet available.	Schlepp Agriculture to Wetland Conversion: East Field Soil Lead Concentrations Technical Memorandum (CH2M HILL, 2006d); Post-Remediation Subunit 7 Average Soil Lead Concentration: Schlepp Agriculture to Wetland Conversion, East Field Technical Memorandum (CH2M HILL, 2007f); Schlepp Agriculture to Wetland Conversion: West Field Soil Lead Concentrations and Remedial Alternatives Technical Memorandum (CH2M HILL, 2008b)
Residential and Common Use Areas (Residential Yards) Remedial Actions	IDEQ, USEPA, UMG	1997 - Present	In 1997-2002, actions were completed at 119 residential yards. These actions included the partial removal of lead-contaminated soil and their replacement with clean soil or other protective barriers (e.g., clean gravel).	Volume removed was not recorded. Materials were placed in the Page Repository.	Second Five-Year Review Report (USEPA, 2005b)

TABLE 2-1
Summary of Previous Remedial Actions in the Upper Basin of the Coeur d'Alene River
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Name/ Project Name	Implementing Party	Dates	Description	Material Removed	Reference
Residential and Common Use Areas (Schools/Daycare Centers)	USEPA	1997 - 2001	Actions were completed at seven schools and daycares. The Silver Hills Middle School was started in 1997, and additional work was completed in 1998, 2001, and 2002 due to the extremely large property size. These actions included the partial removal of lead-contaminated soil and replacement with clean soil or other protective barriers (e.g., clean gravel).	Volume removed was not recorded. Materials were placed in the Page Repository.	Second Five-Year Review Report (USEPA, 2005b)
Residential and Common Use Areas (Private Drinking Water)	USEPA	1997 - 2002	Alternative water supplies were provided to 28 residences on contaminated private wells. Alternative supplies included bottled water for 11 homes, end-of-tap water treatment (water filters) for 5 homes, and municipal water hookup for 12 homes.	No material was removed as part of this action.	Second Five-Year Review Report (USEPA, 2005b)
South Fork Coeur d'Alene River					
South Fork Floodplain Removals	Silver Valley Natural Resources Trust (SVNRT)	1998	Non-time-critical removals were performed at several areas in the floodplain totaling about 128,000 cy of tailings and contaminated soil.	Approximately 128,000 cy of materials was removed.	Second Five-Year Review Report (USEPA, 2005b)
Elizabeth Park Stream Bank Stabilization	SVNRT	1994 - 1995; 1999	This project removed 13,585 cy of tailings from the river and used the material to construct a compacted levee over 2,100 feet long on the south riverbank. In addition, 8,027 tons of riprap were placed on the riverbanks to protect them from further erosion. The project also installed in-channel stabilization, aquatic habitat features, and riparian zone enhancements. Work on the project was initiated in September 1994 and completed in May 1995. In 1999, additional river barbs were installed to enhance aquatic life.	13,585 cy of tailings were removed and used to construct a compacted levee.	Second Five-Year Review Report (USEPA, 2005b)
Trail of the Coeur d'Alenes					
Trail of the Coeur d'Alenes (UPRR Wallace-Mullan Branch ROW Removal Actions)	UPRR	2000 - 2004	UPRR conducted a removal action and established a recreational trail on the UPRR ROW in OU 3.	Removed and disposed of approximately 175,000 cy of mine-waste-contaminated materials.	Second Five-Year Review Report (USEPA, 2005b)
Big Creek					
Big Creek Repository	IDEQ, USEPA	2002 - Present	This project established a repository on a former Sunshine Mining Co. tailings pond for contaminated soil and other materials removed during implementation of the human health and ecological remedial actions.	No material was removed as part of this action. Approximately 106,000 cy of material had been placed in the BCR by 2004.	Second Five-Year Review Report (USEPA, 2005b); Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d)
Canyon Creek					
Canyon Creek (Standard Mammoth Facility)	Asarco	1997 - 1998	Removal of tailings with disposal at Woodland Park Repository was conducted. The site was also re-graded, stabilized, and capped, and the waste rock pile was revegetated. The railroad grade and crossing were removed.	The volume removed was not recorded.	Second Five-Year Review Report (USEPA, 2005b)
Canyon Creek from Tamarack to below Gem	SVNRT	1997 - 1998	At this site, the time-critical removal of ~127,000 cy of tailings and contaminated sediment, with disposal at the Woodland Park Repository, was conducted. Soil at removal areas was amended with organic materials and then revegetated. The stream channel of Canyon Creek was stabilized with bioengineering techniques.	Approximately 127,000 cy of material was removed and placed in Woodland Park Repository.	Second Five-Year Review Report (USEPA, 2005b)

TABLE 2-1
Summary of Previous Remedial Actions in the Upper Basin of the Coeur d'Alene River
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Name/ Project Name	Implementing Party	Dates	Description	Material Removed	Reference
Lower Canyon Creek Floodplain	SVNRT	1997 - 1998	Time-critical removal of 472,000 cy of tailings and contaminated materials was performed, with disposal at the Woodland Park Repository. Soil at removal areas was amended with organic materials and then revegetated. The stream channel of Canyon Creek was stabilized with bioengineering techniques.	Approximately 472,000 cy of material was removed and placed in Woodland Park Repository.	Second Five-Year Review Report (USEPA, 2005b)
Woodland Park Repository	SVNRT	1997 - 1998	An unlined repository for disposal/consolidation of removals along Canyon Creek was constructed. The repository contains approximately 600,000 cy of contaminated materials. The repository was capped with native soil and revegetated.	No material was removed as part of this action. The WPR received approximately 600,000 cy of material.	Second Five-Year Review Report (USEPA, 2005b)
Gem Portal Pilot	Bureau of Land Management (BLM), SVNRT, USEPA	2000 - 2008	A pilot system was created by ASARCO (10 gallons per minute) for treatment of drainage from the Gem Portal. Evaluation of the Gem Portal Pilot Water Treatment System in the context of Canyon Creek water treatment continued until BLM removed the pilot system in 2008.	No material was removed as part of this action.	Second Five-Year Review Report (USEPA, 2005b)
Sisters Mine					
Sisters Mine	IDEQ, USEPA	2004 - 2005	In 2004, USEPA initiated the remedial design for this site for implementation by the State of Idaho during the summer of 2005. Remediation was completed in 2005.	No material was removed as part of this action.	Second Five-Year Review Report (USEPA, 2005b)
Coeur d'Alene Mill					
Coeur d'Alene Mill	Coeur Silver Valley	2001 - Present	In 2001, the mill, located in McFerran Gulch, was demolished. Prior to demolition, all salvageable metal materials were removed, decontaminated, and taken offsite. The mill building was pulled apart using an excavator. A few large timbers were decontaminated and saved. The remainder of the demolition materials, primarily wood, was fed into a chipper, which reduced volume by 90 percent. Once the mill building was removed, the foundation and ore bins were cleaned. Fencing at the site was repaired and improved. Large boulders were placed at selected potential access points. Signs were placed at appropriate locations.	Approximately 1,130 cy of contaminated soil was removed. Contaminated materials were disposed at the Osburn Tailings Pond mine-waste repository.	Second Five-Year Review Report (USEPA, 2005b)
Grouse Creek					
Grouse Creek: We Like Mine	BLM	2001 - Present	The We Like Mine is in the upper part of Grouse Creek, just above the original Star Mine Rock Dump area. In 2001, the BLM started mine water investigations. In 2003, a pilot bioreactor tank water treatment system was installed and continues to operate.	No material was removed as part of this action.	Second Five-Year Review Report (USEPA, 2005b)
Moon Creek					
Silver Crescent and Charles Dickens Mines	U.S. Forest Service (USFS)	1998 - 2000	Non-time-critical removal of ~130,000 cy of tailings, waste rock, contaminated soil, and mill structures, with disposal at an onsite repository was performed. Four adits were closed. Stream relocation, revegetation, and structural rehabilitation were performed along approximately 3,300 feet of Moon Creek, in addition to 10 acres of riparian revegetation.	Approximately 130,000 cy of material was removed and placed in an onsite repository.	Second Five-Year Review Report (USEPA, 2005b)
Elk Creek Pond at Mouth of Moon Creek	SVNRT, USEPA	1994; 2000	Limited tailings removal was conducted in 1994. Clean sand was imported for a recreational beach at this swimming hole. Time-critical removal of 28,000 cy of contaminated sediments and tailings was conducted in 2000.	Approximately 28,000 cy of contaminated material was removed.	Second Five-Year Review Report (USEPA, 2005b)

TABLE 2-1
Summary of Previous Remedial Actions in the Upper Basin of the Coeur d'Alene River
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Name/ Project Name	Implementing Party	Dates	Description	Material Removed	Reference
Ninemile Creek					
Ninemile Creek Success Mine Site Passive Treatment	IDEQ, SVNRT, USEPA	2000 - Present	Contaminated groundwater was diverted by a subsurface grout wall (approximately 1,350 feet in length) to a treatment vault. Groundwater was treated using apatite. The pilot-scale apatite barrier system at Success Mine on the East Fork Ninemile Creek (EFNC, a drainage adjacent to Canyon Creek) has experienced considerable operational problems with plugging and low permeability, although concentrations of zinc and other metals have been low in the limited throughput achieved. The treatment system is currently not in operation.	No material was removed as part of this action.	Second Five-Year Review Report (USEPA, 2005b); Project Report for Success Mine Apatite Barrier Modification and Evaluation (Yancy, 2006).
Rex Mine and Mill	BLM, USEPA	2002 - 2007	Stabilization of a waste rock dump and a stream bypass around tailings were implemented by BLM. In 2004, USEPA initiated the remedial design for this site, which included the collection of pre-design data. In 2006 and 2007, remedial actions included removal of onsite debris, re-alignment of Rex Creek channel and lining with rip-rap, consolidation of source materials onsite and capping with clean materials, and regrading the surface to promote surface water runoff.	The volume removed was not recorded.	Second Five-Year Review Report (USEPA, 2005b); Draft Data Summary Report for the Coeur d'Alene Basin Remedial Action Monitoring Program (CH2M HILL, 2009m)
Interstate Tailings Removal	Hecla	1992 - 1993	Tailings were removed adjacent to EFNC, with consolidation to a nearby uphill area. Straw bales were installed along the perimeter of tailings for erosion control.	The volume removed was not recorded.	Second Five-Year Review Report (USEPA, 2005b)
Interstate Mill Site	IDEQ, SVNRT	1998	Non-time-critical removal of ~60,000 cy of tailings, mill debris, and contaminated sediments was performed from the mill site and from EFNC for 1,000 feet downstream. They were disposed of at an onsite repository. EFNC was stabilized with bioengineering structures in removal areas.	Approximately 60,000 cy of contaminated material was removed and disposed of onsite.	Second Five-Year Review Report (USEPA, 2005b)
Success Mine/Mill Tailings and Waste Rock	Hecla	1993	Time-critical removal action included relocation and riprap armoring for ~1,600 feet of EFNC channel, relocation of streamside tailings, placement of in-stream structures for energy dissipation, capping of tailings pile with 1-foot-thick overburden rock, and installation of upgradient groundwater and surface water diversions.	The volume removed was not recorded.	Second Five-Year Review Report (USEPA, 2005b)
East Fork Ninemile Creek Floodplain	IDEQ, SVNRT	1994	Time-critical removal was performed for ~50,000 cy of floodplain tailings and contaminated sediments, with disposal at the Day Rock Repository. In addition, stream reconstruction, riparian stabilization, and revegetation were conducted.	Approximately 50,000 cy of material was removed and placed in the Day Rock Repository.	Second Five-Year Review Report (USEPA, 2005b)
Ninemile Creek Floodplain near Blackcloud	Hecla, IDEQ	1994	Remedial actions included the time-critical removal of ~44,000 cy of floodplain tailings and contaminated sediments, with disposal at the Day Rock Repository. Then stream reconstruction, riparian stabilization, and revegetation were performed.	Approximately 44,000 cy of material was removed and placed in the Day Rock Repository.	Second Five-Year Review Report (USEPA, 2005b)
Day Rock Repository	Hecla, IDEQ, SVNRT	1994	Approximately 94,000 cy of material from the floodplain removals was placed on top of the existing Day Rock Repository and capped with native soil and growth media.	No material was removed as part of this action. Approximately 94,000 cy of material from removal actions was placed in the Day Rock Repository.	Second Five-Year Review Report (USEPA, 2005b)

TABLE 2-1
Summary of Previous Remedial Actions in the Upper Basin of the Coeur d'Alene River
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Name/ Project Name	Implementing Party	Dates	Description	Material Removed	Reference
Pine Creek					
Pine Creek Constitution Mine and Mill Site	BLM	1998 - Present	Non-time-critical removal actions included the removal of contaminated soil around the mill, with disposal at the CIA, and realignment of East Fork Pine Creek away from the toe of the tailings pile. Most of the tailings and waste rock dump are on private land and have not been addressed to date. In 2002 at the Upper Constitution Site, the BLM installed a pilot mine water treatment bioreactor unit and a groundwater drain above the upper tailings pile. In 2003, the BLM modified the system and installed a groundwater drain above the bioreactor.	The volume removed was not recorded.	Second Five-Year Review Report (USEPA, 2005b)
Pine Creek Constitution Mine and Mill Site	USEPA	2006	Source materials from the lower segment were relocated and consolidated to the upper segment. Both upper and lower segments were hydro-seeded and revegetated. Surface water controls were installed to control onsite runoff and erosion to East Fork Pine Creek.	The volume removed was not recorded.	Draft Data Summary Report for the Coeur d'Alene Basin Remedial Action Monitoring Program (CH2M HILL, 2009m)
Denver Creek (includes Little Pittsburg, Hilarity, Denver, and Sydney Mine)	BLM	1996 - 2000, 2002	Time-critical removal was performed for ~5,200 cy of tailings and contaminated soil associated with the Little Pittsburg Mill. No actions have been conducted on the private portion of the pile. The mouth of Denver Creek has been undergoing stabilization and revegetation by the BLM. Re-grading at the Sydney Mine was performed by the mine owner, Mascot Mining, in 2002.	Approximately 5,200 cy of contaminated material was removed.	Second Five-Year Review Report (USEPA, 2005b)
Douglas Mine and Mill Site	USEPA	1996 - 1997	This effort included the time-critical removal of two existing tailings impoundments from the floodplain of East Fork Pine Creek. 25,000 cy of contaminated material was removed and placed into a temporary repository constructed east of Pine Creek Road near the mine.	Approximately 25,000 cy of contaminated material was removed.	Second Five-Year Review Report (USEPA, 2005b)
Highland Creek Floodplain	BLM	1999	Time-critical removal of 8,100 cy of major discrete tailings deposits was performed along Highland Creek on public lands.	Removed approximately 8,100 cy of contaminated material.	Second Five-Year Review Report (USEPA, 2005b)
Highland-Surprise Mine/Mill Site (Includes Nevada Stewart Mine)	BLM	1999	Highland Creek was diverted to reduce erosion of the lower waste rock dump. Most of the facilities at this site are on private land, thus no other actions have been taken to date. In 2001 and 2002, the BLM regraded the upper and lower rock dumps at Highland Surprise. Along with that effort in 2002, the BLM also regraded the Nevada Stewart rock dump.	No material was removed as part of this action.	Second Five-Year Review Report (USEPA, 2005b)
Pine Creek Sidney (Red Cloud) Mine/Mill Site	BLM	1997 - Present	Activities performed include non-time-critical removal of contaminated soil around the mill foundations, with disposal at the CIA; run-on and runoff controls; and improvements to the upstream culvert on Red Cloud Creek to control flow through the site and reduce downstream erosion. Passive treatment of adit drainage with inflow prevention at the Sidney Shaft in Denver Creek was conducted. The rock dump was re-graded and hydroseeded in 2000 to minimize erosion. Additional stream channel work at the toe of the dump was performed in 2002. In 2001, the BLM started pilot water treatment efforts with the Sidney Red Cloud tunnel mine discharge. In 2003, a pilot bioreactor water treatment system was installed and continues to be operated and monitored.	The volume removed was not recorded.	Second Five-Year Review Report (USEPA, 2005b)
Amy-Matchless Mill Site	BLM	1996 - 2000	Time-critical removal of ~9,600 cy of tailings and contaminated soil was conducted in 1996 and 1997. In 1998, a non-time-critical removal action removed an additional 420 cy of residual tailings. The disturbed area was covered with soil and revegetated. The mine adit was closed by backfilling. In addition, the waste rock dump was regraded and revegetated.	Approximately 10,020 cy of contaminated material was removed.	Second Five-Year Review Report (USEPA, 2005b)
Liberal King Mine/Mill Site	BLM	1996 - 2000	This effort included the time-critical removal of ~9,400 cy of tailings and contaminated soil. In 1998, 99 cy of mill site tailings and mill wastes were removed from the mill area. In 1999, non-time-critical removal was performed for an additional 1,800 cy of tailings, followed by regrading backfill of a dry adit, import of growth medium, and revegetation. The 2000 actions included extensive grading and planting of riparian vegetation. There are continuing efforts to further revegetate and stabilize the stream reach with additional stream work and plantings of shrubs and trees.	Approximately 11,300 cy of contaminated material was removed.	Second Five-Year Review Report (USEPA, 2005b)
Nabob Mine/Mill Site	BLM	1994 - 2000, 2001	This remedial action included soil cover installed to limit access to the mill site and tailings, and channel improvements along Nabob Creek to stabilize the channel and prevent erosion of the tailings pile embankment. In 1995, the mine operator seeded and placed soil cover materials over the tailings, but the success of the revegetation is limited. In 2000 the BLM started an investigation at the site, drilling 20 wells around the pile and mill. Also in 2000, the BLM installed a groundwater cutoff drain above and along the side of the tailings pile. In 2001, the BLM regraded the Nabob mid-level rock dump.	No material was removed as part of this action.	Second Five-Year Review Report (USEPA, 2005b)

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Summary of Previous Remedial Actions in the Upper Basin of the Coeur d'Alene River
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Name/ Project Name	Implementing Party	Dates	Description	Material Removed	Reference
Upper South Fork Coeur d'Alene River					
Morning Mine No. 6	Hecla	1989; 2000	Adit drainage was directed to subsurface flow with a rock-bed filter treatment system. Slaughterhouse Gulch was lined to reduce infiltration through the waste rock pile.	No material was removed as part of this action.	Second Five-Year Review Report (USEPA, 2005b)
Osburn Flats	SVNRT	1997 - 1998	This project included the removal of 133,000 cy of tailings and contaminated soil. The project also tested the application of various in situ treatments to tie up metals.	Approximately 133,000 cy of contaminated material was removed.	Second Five-Year Review Report (USEPA, 2005b)
Golconda Site	IDEQ, USEPA	2004 - 2007	In 2004, USEPA initiated the remedial design for this site for implementation of an interim action by the State of Idaho during the summer of 2005. In 2006, design and construction were completed for a water diversion structure to route water through pipes from the site and mine adit (away from existing tailings) and route them to the South Fork Coeur d'Alene River (SCFDR). In 2007, source materials nearest the SFCDR were moved to an upland area, capped with clean materials, and re-seeded. Armoring was placed along the base of the waste rock pile and along the SFCDR.	The volume removed was not recorded.	Second Five-Year Review Report (USEPA, 2005b)
Lower Coeur d'Alene River					
Cataldo Mission	Coeur d'Alene Tribe	1995	Approximately 700 cy of tailings and contaminated soils were removed from traditional campground areas in the vicinity of the Cataldo Mission.	Approximately 700 cy of contaminated material were removed.	Second Five-Year Review Report (USEPA, 2005b)
Cataldo Boat Ramp	IDEQ	1996 - 1997	Placement of cabled-log bank protection and brush wattling was conducted to reduce erosion, and planting of bushes in the vicinity of contaminated soils was performed to discourage human contact with the soils.	No material was removed as part of this action.	Second Five-Year Review Report (USEPA, 2005b)
Black Rock Slough Trailhead/Highway 3 Crossing	USEPA	2001 - 2002	This project graded and capped access road and parking area for a trail providing access to Trail of the Coeur d'Alenes, and conducted stabilization of 125 feet of eroding river bank.	No material was removed as part of this action.	Second Five-Year Review Report (USEPA, 2005b)
Killarney Lake Boat Launch	BLM	1991 - 1998	The project covered contaminated shoreline with geotextile fabric overlain with 12-inch rock, paved the floodplain area and road, covered edge areas with topsoil and sodded grass, rebuilt a concrete plank boat launch and provided drinking well and vaulted toilets at the site.	No material was removed as part of this action.	Second Five-Year Review Report (USEPA, 2005b)
Dudley Bank Stabilization	SVNRT	1999	This was a pilot bank erosion project to evaluate effectiveness of rock berms in reducing bank erosion caused by piping or by undercutting from boat wakes. The project berms were constructed along 625 feet of the south bank and 720 feet of the north bank of the Lower Coeur d'Alene River, upstream from the Dudley Landing. The berms were constructed with large rocks placed on a geotextile fabric to prevent fine-grained soil from being washed out and undermining the berms. The berms were about 2 feet wide and were placed from 7 to 30 feet from the top of the riverbank. Monitoring in late 2000 found that very little bank erosion had occurred and the berms have remained stable.	No material was removed as part of this action.	Second Five-Year Review Report (USEPA, 2005b)
Medimont Bank Stabilization	SVNRT	1999	Four types of bank erosion control were placed, two with hay bales and two with riprap. Subsequent monitoring indicated that the hay-bale methods were not effective in this portion of the river.	No material was removed as part of this action.	Second Five-Year Review Report (USEPA, 2005b)
Highway 3/Trail of the Coeur d'Alenes Crossing	USEPA	2003 - 2004	This project capped contaminated soil adjacent to a previously remediated parking area with a combination of pavement and a topsoil/fabric/grass to block exposure to contaminated soil and create a safe picnic area for trail users.	No material was removed as part of this action.	Second Five-Year Review Report (USEPA, 2005b)
Medimont and Rainy Hill Boat Launches	ASARCO, Hecla	1999	Approximately 1,000 cy of clean aggregate capped contaminated parking and access areas, 3- to 6-inch rock was placed in shallow areas to discourage children from playing in contaminated sediments, and boulders were placed to control traffic.	No material was removed as part of this action.	Second Five-Year Review Report (USEPA, 2005b)

TABLE 2-1
Summary of Previous Remedial Actions in the Upper Basin of the Coeur d'Alene River
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Name/ Project Name	Implementing Party	Dates	Description	Material Removed	Reference
Thompson Lake Boat Launch	USEPA	1999 - 2000	Contaminated sediment was removed from the shoreline, and geotextile fabric was placed against the bank and overlain with 12-inch rock. An existing unpaved parking lot was rebuilt and capped with asphalt; concrete planks were installed to provide a boat launch.	The volume removed was not recorded.	Second Five-Year Review Report (USEPA, 2005b)
Anderson Lake Boat Launch	USEPA	1999	Contaminated sediment was removed from the shoreline, and geotextile fabric was placed against the bank and overlain with 12-inch rock. An existing unpaved parking lot was rebuilt and capped with asphalt; concrete planks were installed to provide a boat launch.	The volume removed was not recorded.	Second Five-Year Review Report (USEPA, 2005b)
East of Rose Lake Boat Launch	USEPA, USFS	2003 - 2004	This project placed a cap on a contaminated soil parking lot, performed bank stabilization near a boat launch, closed off previous access road and replaced it with a safer access road, revegetated, and installed protective fencing around a historic building on the property.	No material was removed as part of this action.	Second Five-Year Review Report (USEPA, 2005b)
Silver Dollar Growth Media Project					
Silver Dollar Growth Media Project	IDEQ	2002 - Present	Evaluation of the Growth Media Pilot Project is ongoing.	No material was removed as part of this action.	Second Five-Year Review Report (USEPA, 2005b)
Silver Summit Mill					
Silver Summit Mill	Sunshine Mining Company	2001	The Sunshine Mining Company labeled and removed all containers of solvents, lubricants, processing chemicals, paint, and trash. A polychlorinated biphenyls (PCBs) investigation was conducted for all transformers and oil switches located throughout the site, and none were found. Access controls were established.	No material was excavated during this action. Containerized materials were removed from the site.	Second Five-Year Review Report (USEPA, 2005b)

TABLE 2-2
Summary of Previous Studies in the Upper Basin of the Coeur d'Alene River, 2001 to 2008
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Name	Study Name	Responsible Party	Dates	Description	Key Conclusions	Reference
Bunker Creek						
Bunker Creek	Bunker Creek Pilot Study	U.S. Environmental Protection Agency (USEPA)	2008	The purposes of the Bunker Creek Pilot Study were to collect data required (1) to evaluate the effectiveness of a potential Phase II remedial action (i.e., lining Bunker Creek) towards improving water quality, and (2) for Bunker Creek remedial design. The Bunker Creek Pilot Study focused on simulating conditions in the Bunker Creek area that would be anticipated to occur if the Bunker Creek channel were lined.	During the study, it became apparent that it would not be possible to conduct the pilot study for a sufficient amount of time for the relatively large hydrologic system in the area to reach steady-state conditions. Therefore, the purpose became collecting the data necessary to evaluate the effectiveness of the remedial action (i.e., lining Bunker Creek) using a transient numerical groundwater flow model to estimate conditions at steady state. A more in-depth evaluation of the potential water quantity and quality impacts resulting from lining the Bunker Creek channel will be presented in future documents that will detail the groundwater modeling results, predicted water quality impacts, and remedial action alternatives analyses. Key findings of data collection: • The diversion of the Central Treatment Plant (CTP) effluent from Bunker Creek resulted in no discharge being present in Bunker Creek from the CTP outfall downgradient to approximately 500 feet above the confluence with Magnet Gulch. The discharge measured in Bunker Creek below Magnet Gulch was predominantly from the A-4 Gypsum Pond French drain in Magnet Gulch. • Elevated metals detected in Bunker Creek channel sediments likely serve as the source of dissolved metals contamination to the underlying alluvial aquifer when infiltration of surface water occurs. • Dissolved metals concentrations significantly increased from Monitoring Station BH-MG-0001 to the mouth of Magnet Gulch at Bunker Creek, likely from contaminated groundwater from the French drain at the toe of the A-4 Gypsum Pond. Dissolved metals from Magnet Gulch may be the largest source of dissolved metals in Bunker Creek surface water under low-flow conditions. • The simulated lining of Bunker Creek did not hydrologically affect the shallow alluvial aquifer. • The simulated lining of Bunker Creek did not appear to affect dissolved metals concentrations in groundwater. • Hardness declined in groundwater in the Bunker Creek corridor, potentially indicating (1) the losing sections of Bunker Creek and (2) groundwater flow pathways from the Bunker Creek corridor to the South Fork Coeur d'Alene Basin (SFCDR). The change in hardness may also be indicative of large-scale processes within the aquifer. • Dissolved cadmium and dissolved zinc concentrations measured from the three SFCDR monitoring stations appeared unaffected by the Bunker Creek lining simulation, while dissolved lead concentrations declined.	Bunker Creek Pilot Study Summary Tech. Memo. (CH2M HILL, 2009b)
Canyon Creek						
Canyon Creek	Canyon Creek Hydrologic Study	USEPA	2006	This study was designed to gain a better understanding of the hydrologic system within Canyon Creek from 2006-2007. The study encompassed stream stage installation, aquifer testing, groundwater sampling, groundwater flow modeling, and remedial action strategy evaluations.	To improve the understanding of the hydrogeologic conditions of the Canyon Creek area, additional monitoring wells and stream stage gauging devices were installed to collect information regarding groundwater levels, aquifer properties, horizontal and vertical hydraulic gradients, the extent of surface water/groundwater interaction, and the spatial distribution of groundwater quality. From this information, a groundwater modeling tool was developed for the site and used to evaluate the reduction in metals loading to Canyon Creek that would be achieved by implementation of various water management options. These treatment options generally fell into three categories: passive water collection, active water collection, and passive water collection with stream lining. Fifteen simulations with different treatment options were made. Those that resulted in the greatest simulated reduction to the zinc loading of Canyon Creek were Creek Lining A1-A6; French Drain A1-A6 with A1 & A6 Cut-offs (High Flow); French Drain A1-A6 with A6 Cut-off (High Flow); and French Drain A2-A6 with A6 Cut-off (High Flow).	Canyon Creek Hydrologic Study Report (CH2M HILL, 2007a)

TABLE 2-2
Summary of Previous Studies in the Upper Basin of the Coeur d'Alene River, 2001 to 2008
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Name	Study Name	Responsible Party	Dates	Description	Key Conclusions	Reference
Canyon Creek	Canyon Creek Water Treatment Technology Evaluation	USEPA	2005	This memorandum summarizes water treatment work to date for Canyon Creek and provides recommendations for future treatability testing.	Only technologies appropriate for the low-flow/high-concentration scenario are recommended for evaluation in the Phase II Treatability Study, because this scenario represents the most promising approach for achieving the Record of Decision (ROD) benchmark in the most cost-effective manner. Technologies proposed for testing as part of the Phase II Treatability Study include *ex situ* reactive media (limestone, dolomite, brucite, periclase, di-calcium silicate, and possibly others), an *ex situ* sulfate-reducing bioreactor (SRB), and the high-density sludge (HDS) process. Data gaps related to surface water/groundwater interactions at the site remain, and there is some uncertainty as to the corresponding reduction in dissolved metals concentrations in surface water that would be achieved by treating nearby groundwater.	Canyon Creek Water Treatment Technology Evaluation Tech. Memo. (CH2M HILL, 2005)
Canyon Creek	Canyon Creek Groundwater Metal Source Characterization	Idaho National Laboratory (INL)	2006	This document presents the findings of the metal speciation study conducted in Canyon Creek. The purpose of this study was to develop the capability to predict leaching rates from Canyon Creek alluvium.	This project was designed as a preliminary study of metal speciation in and metal releases from Canyon Creek sediments in an effort to help understand the factors that affect metal mobility (with focus on zinc, cadmium, and lead). Three groups of experiments were conducted: (1) sequential extraction tests to determine the operational speciation of the metals in the sediment, (2) leaching tests to determine the rate of release of metals under various chemical conditions, and (3) column leaching tests to provide insight into the time scales for removal of the metals from the sediments. • Results of the sequential extraction tests showed that approximately 40 percent of the Zn, Cd, and Pb removed during the sequential extractions came from fractions considered easily leached, 20 percent from fractions considered very difficult to leach, and the remaining 40 percent from fractions for which leachability depends on the pH of the system. • Leaching tests were conducted to determine how ionic strength and pH affected the rates of leaching and the concentration of leached metals. The concentrations of Zn, Cd, and Pb were fairly constant during the time period of the extraction experiments. The leaching rate of Pb and Zn appeared to decrease over time, while Cd appeared to increase over time. • The column was operated for 41 days, over which time the concentrations of Zn, Cd, and Pb declined monotonically by more than a factor of 10. Study recommendations are to (1) determine the spatial variability of metal fractions in the alluvium, (2) develop better measurements and models for groundwater/surface water interactions, and (3) establish a sound conceptual/quantitative model for the groundwater hydrology.	Canyon Creek Groundwater Metal Source Characterization (INL, 2007)
Canyon Creek	Canyon Creek Lime Neutralization Pilot Study	Rust	2003 - 2006	Rust's August 2003 memo described treatment of Canyon Creek water by conventional lime neutralization followed by settling ponds. Clean Water Act (CWA) funding was obtained to prepare the design of a pilot-scale system.	Pioneer Technical Services (Pioneer) has been contracted to prepare a pilot-scale design of the system. The design is composed of three treatment cells, the first two with 2 days of retention time, and the third with 3 days of retention time. The design flow rate to the system is 300 gallons per minute (gpm). The total pilot system area is 15 acres. System effluent is discharged through infiltration. Due to funding uncertainties, the schedule for this study is not known at this time.	Canyon Creek Water Treatment Memorandum (Rust, 2003); Canyon Creek Pilot-Scale Lime Lagoon Treatment System Presentation (Pioneer, 2006); 100% Conceptual Design for the Canyon Creek Pilot-Scale Lime Lagoon Treatment System (Pioneer, 2007).

TABLE 2-2
Summary of Previous Studies in the Upper Basin of the Coeur d'Alene River, 2001 to 2008
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Name	Study Name	Responsible Party	Dates	Description	Key Conclusions	Reference
Canyon Creek	Canyon Creek Preliminary Design Data Review	USEPA	2006	This memorandum summarizes historical analytical data collected from the lower Canyon Creek drainage area and outlines pertinent aspects of the data set. Collected data have been categorized and incorporated into a database and will be used to support the development of the remedial design for Canyon Creek.	This memorandum summarizes the data sources available for the following matrices: groundwater; surface water; surface soil; subsurface soil; sediment; and rock, gravel, and cobbles.	Canyon Creek Preliminary Design Data Review Tech. Memo. (CH2M HILL, 2006d)
Canyon Creek Gem Portal Pilot	Gem Portal Pilot Study	Bureau of Land Management (BLM), Silver Valley Natural Resources Trust (SVNRT), USEPA	2000 - 2008	A pilot system was created by Asarco (10 gpm) for treatment of drainage from the Gem Portal. Evaluation of the Gem Portal Pilot Water Treatment System in the context of Canyon Creek water treatment continued until BLM removed the pilot system in 2008. This report presents the findings of pilot-and bench-scale water treatment tests conducted at the Gem Portal drainage. The treatment systems included a pilot-scale anaerobic biological treatment system, a bench-scale lime precipitation system, and a pilot-scale floating sand filter.	The treatment systems tested did not achieve the degree of metals removal needed to meet water quality discharge objectives in the effluent.	Engineering Evaluation/Cost Analysis for the Gem Portal Drainage (Asarco, 2004)
Canyon Creek Water Treatment Pilot Study	Phase I Pilot Test	USEPA	2004	Bench-scale testing was conducted to evaluate the effectiveness of lime addition for metal precipitation in various combinations with pH adjustment and addition of iron coagulants for iron co-precipitation. Solids/liquid separation testing was also conducted on the resulting solution using flocculants and ballasted microsand.	The results of the study confirmed that lime addition is effective for precipitation of metals.	Canyon Creek Treatability Study Phase I Report (URS, 2005)
Canyon Creek Water Treatment Pilot Study	Canyon Creek Phase II Water Treatment Pilot Test	USEPA	2005 - 2006	The Canyon Creek Phase II treatability study consisted of two main components. The first component was a laboratory screening of reactive media bed (RMB) and SRB treatment of Canyon Creek groundwater. The second component was a field pilot test of HDS treatment of Canyon Creek Groundwater, HDS treatment of Canyon Creek groundwater combined with Bunker Hill Mine water, and SRB treatment of Canyon Creek groundwater (using two different SRB media mixtures). The laboratory screening indicated that the RMB technology did not produce favorable results. The SRB results were favorable, and continued in the pilot study. The pilot test resulted in favorable results using the HDS treatment. Based on pilot test results, larger, longer-term pilot testing of the SRB treatment is recommended.	The HDS-A1 pilot plant, treating Canyon Creek groundwater only, developed a moderately dense sludge, but the percent solids concentration was limited by the relatively low concentrations of influent metals (compared to other HDS systems). The system reached an equilibrium sludge concentration of 10 to 12 percent solids at final dilution within about 2 weeks of operation. While this percent solids level is low compared to other HDS plants, it is considerably higher than in conventional lime neutralization systems (typically ~1 to 3 percent solids) and, therefore, represents a marked reduction in waste sludge volumes generated compared to that type of process. The modest difference between the percent solids of thickener underflow and sludge at final dilution, as well as the major amount of amorphous material found by x-ray diffraction (XRD) analysis, suggest that the HDS-A1 sludge was only partially characteristic of true high-density sludge.	Canyon Creek Phase II Treatability Study Draft Report (CH2M HILL, 2006c)

TABLE 2-2
Summary of Previous Studies in the Upper Basin of the Coeur d'Alene River, 2001 to 2008
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Name	Study Name	Responsible Party	Dates	Description	Key Conclusions	Reference
					The HDS-B pilot plant, treating a combination of Canyon Creek groundwater and Bunker hill AMD (in a 2:1 volume ratio), developed dense sludge within 1 week of operation. The equilibrium sludge solids was about 25 percent at final dilution. The relatively large difference between the percent solids of thickener underflow and at final dilution indicates the more free-draining nature typical of high density sludge. The major amount of poorly crystalline material found via XRD analysis of HDS B sludge provided additional evidence of high density sludge characteristics. Both HDS-A1 and HDS-B achieved high removal efficiencies for dissolved Zn and Cd (>99 percent). The HDS-B pilot results indicate that treatment of Canyon Creek groudwater in conjunction with Bunker hill AMD at the CTP is feasible.	
Operable Unit 2						
OU 2	OU 2 Direct Push Field Investigation	USEPA	2008	This study is a summary of the installation of piezometers and metals concentration data in soil within OU 2.	During the OU 2 Direct-Push Investigation, 315 soil samples were collected from 38 soil borings advanced into the upper alluvium of OU 2. These samples were submitted for laboratory analysis for Contract Laboratory Program (CLP) Target Analyte List (TAL) metals. Continuous composite samples for laboratory analysis were collected from each boring that was converted to a temporary piezometer. Conclusions from this sampling include: • The highest cadmium concentrations generally coincided with the tailings-affected soils in the areas from the Silver Mountain Resort parking lot west through the Bunker Creek corridor. The vertical extent of elevated cadmium concentrations was also consistent with lithologic observations of disturbed soils as described previously. Elevated cadmium concentrations were observed in all areas investigated in OU 2. • Lead concentrations exceeded the principal threat material threshold of 84,600 mg/kg in two soil borings located near the CTP and along the lower portion of Bunker Creek. The highest lead concentrations present in subsurface soils coincided with the observed tailings-impacted soils, which are primarily located between the Silver Mountain Resort parking lot west through the Bunker Creek corridor. Elevated lead concentrations were observed in most areas investigated in OU 2. • Elevated zinc concentrations were observed in soil from most soil borings advanced in OU 2. The highest zinc concentrations were observed in soil borings in the lower portion of Bunker Creek and in the Slag Pile area. These concentrations coincide with lithologic observations of tailings-affected soils in this area. Other significant zinc concentrations were measured in the eastern portion of the City of Kellogg, the West End Natural Infiltration (WENI) area, and near the Page wastewater treatment ponds.	OU 2 Direct-Push Field Investigation Summary Tech. Memo. (CH2M HILL, 2009a)
Operable Unit 3, Upper Basin						
OU 3	OU 3 Remedial Investigation	USEPA	2001	The Remedial Investigation (RI) Report provides detailed discussion of geologic and hydrogeologic conditions, the nature and extent of contamination, and fate and transport processes. The probabilistic model is introduced and used to estimate discharges of metals from tributaries to the SFCDR. An initial conceptual site model (CSM) for the watershed was developed from the RI. Source areas are identified and characterized.	Beginning in 1997, USEPA collected samples of soil, sediment, groundwater, surface water, and other environmental media (e.g., indoor dust, lead-based paint, and garden produce) as part of the RI. To guide field sampling efforts, a generic Field Sampling Plan and Quality Assurance Project Plan were prepared that included descriptions of methods that would be used to collect and analyze samples, conduct field measurements, and manage data. More than 10,000 samples were collected to support the RI. These samples, combined with the 7,000 additional samples collected independently by The Idaho Department of Environmental Quality (IDEQ), the U.S. Geological Survey (USGS), the mining companies, USEPA under other regulatory programs (e.g., the National Pollutant Discharge Elimination System [NPDES] program, and others, provide a solid basis to support informed risk management decisions for Coeur d'Alene Basin mining waste contamination. However, the large geographic area of the Basin made it impractical to collect sufficient data to fully characterize each source area or watershed. Further data collection will be necessary to support remedial design for areas identified as requiring cleanup.	Remedial Investigation Report, Coeur d'Alene Basin Remedial Investigation/Feasibility Study (USEPA, 2001c)

TABLE 2-2
Summary of Previous Studies in the Upper Basin of the Coeur d'Alene River, 2001 to 2008
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Name	Study Name	Responsible Party	Dates	Description	Key Conclusions	Reference
OU 3	OU 3 Feasibility Study	USEPA	2001	The Feasibility Study (FS) Report identifies and screens remedial alternatives based on criteria from the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). A description of how each alternative would be implemented is provided. The FS also provides estimates of pre- and post-remediation mass loadings from watersheds within the Upper Basin that were developed using the probabilistic model.	Human health alternatives were developed for residential and community areas of the Upper and Lower Basins. Sets of alternatives were developed for each of the primary potential exposure medium: • Soil: (1) No Action, (2) Information and Intervention, (3) Information and Intervention and Access Modifications, (4) Information and Intervention and Partial Removal and Barriers, and (5) Information and Intervention and Complete Removal. • Drinking Water: (1) No Action, (2) Public Information, (3) Public Information and Residential Treatment, (4) Public Information and Alternative Source, (5) Public Information and Alternative Source, Groundwater, and (6) Public Information and Multiple Alternative Sources. • House Dust: (1) No Action, (2) Information and Intervention and Vacuum Loan Program/Dust Mats, and (3) Information and Intervention, Vacuum Loan Program/Dust Mats, Interior Source Removal, and Capping/More Extensive Cleaning. • Aquatic Food Sources: (1) No Action, (2) Information and Intervention, and (3) Information and Intervention and Monitoring. For the development of ecological alternatives, the affected media retained are soil, sediment, and surface water. Groundwater is not a medium for direct exposure to ecological receptors; however, it is an important pathway for the migration of metals from soil and sediment to surface water, and was retained as a pathway throughout the FS analysis. Six ecological alternatives were developed for remediation of the Upper and Lower Basins: • Alternative 1: No Action • Alternative 2: Contain/Stabilize with Limited Removal and Treatment • Alternative 3: More Extensive Removal, Disposal, and Treatment • Alternative 4: Maximum Removal, Disposal, and Treatment • Alternative 5: State of Idaho Cleanup Plan • Alternative 6: Mining Companies Cleanup Plan	Feasibility Study Report, Coeur d'Alene Basin Remedial Investigation/Feasibility Study (USEPA, 2001d)
OU 3	Dissolved Cadmium, Zinc and Lead Loads from Ground-Water Seepage into the South Fork Coeur d'Alene River System	U.S. Geological Survey (USGS)	1999	The seepage study described and quantified changes in stream flow and metals loading from groundwater in the drainages of the SFCDR. This study provides key hydrogeologic information for watersheds within the Upper Basin.	The Barton study described and quantified changes in stream flow and metals loading from groundwater in the South Fork Coeur d'Alene River system. This study provides key hydrogeologic information, including identification of gaining and losing reaches, for lower Canyon Creek and the SFCDR near Osburn, and quantification of the mass loading associated with each. The study focused on three stream reaches: a 3.3-mile reach of Canyon Creek near Woodland Park, a 4.8-mile reach of the SFCDR near Osburn, and a 6.5-mile reach of the SFCDR near Kellogg. During the July, September, and October seepage studies, gains in zinc and cadmium loads to the three reaches were predominantly from groundwater seepage. Following are additional conclusions: • The overall average gain in dissolved zinc from groundwater seepage to the SFCDR near Kellogg was 730 pounds per day (lb/day). • The net gains in dissolved zinc from groundwater seepage to Canyon Creek near Woodland Park and the SFCDR near Osburn were 150 and 218 lb/day, respectively. • The gain in dissolved cadmium load into the three reaches from groundwater seepage was about two orders of magnitude less than the increase in dissolved zinc. • Canyon Creek at Woodland Park was the only study reach where groundwater seepage contributed to dissolved lead load (a gain of 1.5 lb/day). Dissolved zinc concentration and stream discharge data collected during this study were downloaded from the U.S. Geological Survey website and incorporated into the Upper Basin database.	Dissolved Cadmium, Zinc, and Lead Loads from Ground-Water Seepage into the South Fork Coeur d'Alene River System, 1999 (Barton, 2002)

TABLE 2-2
Summary of Previous Studies in the Upper Basin of the Coeur d'Alene River, 2001 to 2008
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Name	Study Name	Responsible Party	Dates	Description	Key Conclusions	Reference
OU 3	Soil Amendment Study	IDEQ, USEPA, U.S. Fish and Wildlife Service (USFWS)	2001 - 2004	This is a two-pronged collaborative study using both laboratory and field studies to evaluate effectiveness of phosphate-based soil amendments to reduce the bioavailability and leachability of heavy metals.	The field leachability study was implemented by IDEQ. In the study, four 20-foot by 20-foot plots were established at both Black Rock Slough and Bull Run Lake. The plots at each site were subjected to the following applications: amendment with fishbone apatite (ground fish bone); amendment with liquid phosphate fertilizer (phosphoric acid), calcium carbonate, and potassium chloride; amendment with calcium carbonate/lime; and an unaltered control. The soil and pore water or shallow groundwater was sampled by IDEQ for 16 months to assess how the amendments affected the soil and pore water chemistry under field conditions. The pore water analyses and soil leaching data indicate the following chemical changes: • Phosphate amendments reduce the leaching of lead from soil using the toxicity characteristic leaching procedure (TCLP) extraction method; • Because the lime did not completely neutralize the acidity of the phosphate amendment, a short-term increase in soluble cadmium and zinc pore water concentrations was observed; • The amendments caused a short-term increase in soluble arsenic in the treated soils, while arsenic concentrations in pore water returned to pretreatment levels; and • Soluble phosphorus did not increase in soils treated with fishbone apatite but did show an increase in soils treated with liquid phosphate fertilizer, which appears to be decreasing with time. This may be related to the form in which the phosphate was added (e.g., liquid vs. solid). Further study is needed to resolve questions concerning optimal application rates, long-term stability, ecological impacts, and potential seasonal effects. Evaluate findings of follow-up study and, as appropriate, conduct further evaluations of technical feasibility of soil amendments.	Second Five-Year Review Report (USEPA, 2005b)
OU 3	OU 3 Direct Push Field Investigation	USEPA	2008	This study is a summary of field investigations, including the installation of piezometers and analysis of metals concentration data in soil.	The OU 3 Direct Push Investigation was implemented as planned and has provided needed data, which will be used to design follow-on studies and in the development of the groundwater conceptual model for the Osburn Flats area. The lithologic data collected will also be used in the development of the numerical groundwater flow model for the SFCDR watershed, which will be used to evaluate remedial options throughout the basin. Conclusions from this investigation are: • Cadmium concentrations in Osburn Flats area soils ranged from nondetect to 144 milligrams per kilogram (mg/kg). The highest cadmium concentrations were typically identified between 0 and 10 feet below ground surface (bgs). • Lead concentrations ranged from 8.9 mg/kg to 24,300 mg/kg, with the highest lead concentrations typically between ground surface and 10 feet bgs. • Zinc concentrations ranged from 27 mg/kg to 25,200 mg/kg; likewise, the highest concentrations were between ground surface and 10 feet bgs.	OU 3 Direct-Push Field Investigation Summary Tech. Memo. (CH2M HILL, 2009i)

TABLE 2-2
Summary of Previous Studies in the Upper Basin of the Coeur d'Alene River, 2001 to 2008
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Name	Study Name	Responsible Party	Dates	Description	Key Conclusions	Reference
South Fork Coeur d'Alene River						
SFCDR (and Tributaries)	2008 High-Flow and Low-Flow Surface Water Study	USEPA	2008	The primary purpose of the 2008 High-Flow and Low-Flow Surface Water Study was to conduct surface water quality monitoring during seasonal high-flow and low-flow conditions in order to characterize impacts on surface water quality, and to determine the relative contribution from major contaminant source areas identified in the RI Report (see above). Surface water monitoring stations were situated upstream and downstream from the source areas, adits, and tailings pile seeps. The data sets collected during this study also provided current information to help with the prioritization of sites for remedial action in OU 3.	The high-flow and low-flow surface water study primarily focused on stations along Ninemile Creek and Canyon Creek, and also monitored select stations along the main stem of the SFCDR between Elizabeth Park and Mullan, Idaho. The difference in loading between the upstream and downstream stations for a given stream "reach" was calculated as the net gain or loss from all sources in-between, including the stream bed and the alluvium itself. In some stream reaches, a specific source was identified. In other cases, the net loading contribution was attributed to all sources in-between the upstream and downstream stations. Conclusions from this study include: • East Fork Ninemile Creek: Both dissolved zinc and total lead experienced similar patterns of loading. During high-flow conditions, the primary source of loading was from below the Success Reach, with reduced contributions from the Interstate Millsite Reach. During low-flow conditions, the primary source was the Success Reach. Net loading was found for both dissolved zinc and total lead. • Ninemile Creek: The primary contribution of dissolved zinc and total lead was from the East Fork of Ninemile Creek during high flow and low flow. There was a net loss of zinc and lead within the Dayrock Mine Reach for at both flow stages. • Canyon Creek: During high-flow and low-flow conditions, loading of dissolved zinc was primarily from the Woodland Park Reach and the Standard-Mammoth Mine Complex Reach. During high- and low-flow conditions, loading of total lead was highest from the Standard-Mammoth Mine Complex Reach. • South Fork Coeur d'Alene River: For zinc, loading under both flow conditions was highest from Canyon Creek. A net loss was measured between Wallace and the River Station SF-239. Total lead loading was highest from Ninemile Creek during high flow, but under low-flow conditions, Canyon Creek dominated loading. A net loss was also measured for total lead within the same stretch from Wallace to Station SF-239.	2008 High-Flow and Low-Flow Surface Water Study Report, Upper Basin of the South Fork Coeur d'Alene River (CH2M HILL, 2009f)
SFCDR (and Tributaries)	Groundwater Monitoring, Upper Basin Field Studies	USEPA	2008	This report presents procedures, field activities, and results for groundwater data from both May and October 2008 sampling in order to support the CSM and groundwater flow model.	Groundwater elevations were measured in May 2008 to assess groundwater table conditions during the spring snowmelt and high-flow surface water conditions in Canyon Creek, including Woodland Park and Ninemile Creek. Groundwater elevations were measured in October 2008 to assess groundwater table conditions during the dry season and low-flow surface water conditions. The 2008 groundwater monitoring activities were implemented as planned and provided valuable groundwater quality and elevation data with which to evaluate potential impacts of metals-laden groundwater on surface water throughout the Upper Basin. Collected data will be used to refine the CSM and support development of the numerical groundwater flow model of the SFCDR watershed and the subsequent evaluation of remedial options.	Groundwater Monitoring Report, Upper Basin Field Studies (CH2M HILL, 2009h)
SFCDR (and Tributaries)	OU 2 Groundwater-Surface Water Interaction Monitoring	USEPA	1999; 2003; 2006; 2007; and 2008	The first groundwater-surface water interaction study in OU 2 was conducted in 1999 by USGS. This study was replicated by CH2M HILL in 2003. In 2006, the study became part of the OU 2 EMP and has been repeated in 2006, 2007, and 2008. This study is intended to assess the contribution of metals loading from groundwater into receiving surface water in the area, and identify source areas.	The key findings below are based on the results of the 2008 study. This 3-day study was conducted during a hydrologic period when the SFCDR discharge was not stable. The key findings below are based mostly on data collected during the third day of the study, and include: • Evaluation of discharge data collected during the 2008 study indicated that the location of the transition between gaining and losing reaches in the western portion of OU 2 have changed. • Specific conductance profiles collected at SFCDR monitoring locations show lateral variations in specific conductance across the stream profile at Stations BH-SF-LF-0004, BH-SF-LF-0005, and BH-SF-LF-0006. All other stations show little or no change in specific conductance across the channel profile. This lateral stratification of specific conductance at these locations is likely the result of contaminated groundwater discharging to the SFCDR along the southern bank in this gaining reach of the SFCDR. • pH measured at SFCDR monitoring locations was generally lower in gaining reaches in the SFCDR and higher in losing reaches.	Dissolved Cadmium, Zinc, and Lead Loads from Ground-Water Seepage into the South Fork Coeur d'Alene River System, 1999 (Barton, 2002); 2008 High-Flow and Low-Flow Surface Water Study Report, Upper Basin of the South Fork Coeur d'Alene River (CH2M HILL, 2009f)

TABLE 2-2
Summary of Previous Studies in the Upper Basin of the Coeur d'Alene River, 2001 to 2008
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Name	Study Name	Responsible Party	Dates	Description	Key Conclusions	Reference
					• Dissolved cadmium and dissolved zinc concentrations in the SFCDR consistently increased in gaining reaches and decreased in losing reaches of the SFCDR, consistent with the discharge of groundwater with elevated concentrations to the SFCDR. • Dissolved lead concentrations in the SFCDR were relatively consistent within OU 2. • Total phosphorus, sulfate, dissolved iron, and dissolved manganese concentrations in the SFCDR increased substantially in the gaining reaches of the SFCDR. • The greatest loads of dissolved cadmium and dissolved zinc to the SFCDR from groundwater occurred in the gaining reach of the SFCDR in the eastern portion of OU 2, between monitoring locations BH-SF-LF-0003 and BH-SF-LF-0006. • Dissolved lead loads were highly variable and resulted in an overall negative load balance. This is a result of the geochemistry of lead in OU 2 surface water and groundwater. The highest load of dissolved lead was from Milo Creek. • AWQC ratios for dissolved cadmium and dissolved zinc exhibited their greatest increase in the gaining reach of the SFCDR in eastern OU 2. AWQC ratios for dissolved lead in the SFCDR and measured tributaries were consistently below 1 with the exception of Milo Creek (AWQC ratio = 15).	
SFCDR (and Tributaries)	Evaluation of Zinc Loading to the SFCDR	USEPA	2007	This study analyzes surface water, seep, adit, and groundwater data in the Upper Basin in order to identify where the primary zinc loading sources may originate.	The results of this analysis suggest that, within the Upper Basin area of the SFCDR, the largest source of dissolved metals loading to the river is the discharge from the Canyon Creek drainage. Numerous point sources such as adits and tailing piles, and distributed sources such as contaminated floodplain sediments, exist within the Canyon Creek watershed, and these sources collectively contribute to the overall metals load within Canyon Creek. Available data further suggest that the next largest contributors of dissolved metals to the SFCDR are: (1) the Ninemile Creek drainage; (2) the contaminated floodplain sediments in the vicinity of Osburn Flats (between Shields Gulch and Twomile Creek, Stations SF-241 to SF-249); (3) the contaminated floodplain sediments between Stations SF-249 and SF-254 (approximately 1 mile downstream from Osburn); and (4) the contaminated floodplain sediments between Stations SF-263 and SF-268 (near the confluence with Montgomery Creek).	Evaluation of Zinc Loading to the SFCDR, Upper Basin Analysis (CH2M HILL, 2007e)

TABLE 2-2
Summary of Previous Studies in the Upper Basin of the Coeur d'Alene River, 2001 to 2008
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Name	Study Name	Responsible Party	Dates	Description	Key Conclusions	Reference
Osburn Flats	Osburn Flats Groundwater-Surface Water Interaction Study	USEPA	2008	This study is a summary of the groundwater/surface water interaction along the SFCDR near Osburn Flats. This study was intended to replicate a USGS study (Barton, 2002) that was performed in the Box. It assessed metals concentrations in groundwater seeping to surface water in this area, evaluated AWQC ratios, and identified source areas.	The groundwater-surface-water interaction study at the SFCDR at Osburn Flats was performed over 3 days. Conclusions from this study include: • The 3-day average of discharge measurements at each station and vertical hydraulic gradient (VHG) measurements indicates that the SFCDR is generally losing between Stations B-1Alt and B-3, gaining between B-3 and B-4, losing between B-5Alt and B-7, and gaining between B-7 and B-8. • Concentrations of both dissolved cadmium and zinc in surface water increased at each station from downstream (B-8) to upstream (B-1Alt). • Dissolved metal concentrations in the shallow streambed are generally higher in areas with upward VHGs, with the exception of Station B-5Alt. • Dissolved metal concentrations and load estimates from the 1999 study (diel-adjusted) are slightly lower than observed during the 2008 study. • Stream reaches around Stations B-3, B-4, and B-8 appear to be the predominant zones where groundwater inflow to the stream and contaminant loading is occurring. This conclusion is based on vertical hydraulic gradients, shallow streambed water chemistry, surface water chemistry, and data and observations from the B-4 seep and the surrounding area. Surface water sampling conducted on the SFCDR upstream and downstream from these reaches, and at the mouth of Ninemile Creek, suggest that each of these sources contribute a significant quantity of dissolved metals to the SFCDR. Available loading data suggest that the remainder of the potential source areas in the Upper Basin contribute fairly insignificant quantities of dissolved metals loading to the SFCDR.	Osburn Flats Groundwater-Surface Water Interaction Study Technical Report (CH2M HILL, 2009g)
Osburn Flats	Osburn Flats Aquifer Testing Summary	USEPA	2008	Monitoring wells were installed in the Osburn area in October 2008. These were part of the hydrologic investigation in this area; this study summarizes aquifer testing and results.	Twelve aquifer tests were performed during this study. Four were single-well tests, and eight involved at least one monitoring well in an effort to investigate aquifer heterogeneity, aquifer anisotropy, and groundwater-surface water interaction. The following aquifer properties were determined: • Average transmissivity values for each location ranged from 22,000 to 85,000 square feet per day [ft2/day], with a median of 31,500 ft2/day. • Average hydraulic conductivity values ranged from 600 to 4,700 feet per day (ft/d) with a median of 1,300 ft/d. There were no apparent spatial trends in hydraulic conductivity distribution. These values and the lack of a spatial pattern (at the scale observed) are consistent with alluvial deposits of coarse sand and gravel. • Average storage coefficient values for each location ranged from 0.017 to 0.19, with a median value of 0.038. These values are consistent with unconfined to semi-confined alluvial systems.	Osburn Flats Aquifer Testing Summary Tech. Memo. (CH2M HILL, 2009j)
Osburn Flats	Osburn Flats Subsurface Exploration and Well Installation	USEPA	2008	This study summarizes field work conducted in the Osburn Flats area, including the installation of wells, performed to support the CSM for the area.	A summary of hydrogeologic conditions determined through this study includes: • On the basis of conditions encountered in boreholes advanced during the September/October 2008 subsurface investigation, the subsurface in the Osburn Valley generally consists of about 30 to 50 feet of alluvium overlying argillite bedrock. The alluvial aquifer is unconfined, with depth to water ranging from about 5 to 20 feet. • The alluvial aquifer appears somewhat stratified. In general, the alluvium consists of poor to well-graded sand (10 to 25 percent) and gravel with varying concentrations of silt, clay, and cobbles (5 to 15 percent). However, the upper sequence of this alluvium generally contains fewer fines (less than 5 percent to 15 percent), with increasing amounts of silt and clay (15 to 25 percent) in the 5 to 10 feet above the argillite bedrock. • The upper few feet of bedrock were weathered and/or fractured. Beneath this weathered zone, the bedrock appeared dry, and the bedrock is not expected to be a significant source of groundwater. • Specific capacity (the ratio of pumping rate to drawdown) data are often used to estimate aquifer properties; however, these calculations and further analysis are reserved for the more robust aquifer testing data collected post-development. They will be included in the technical memorandum titled Osburn Flats Aquifer Testing Program.	Osburn Flats Subsurface Exploration and Well Installation Summary Tech. Memo. (CH2M HILL, 2009e)

TABLE 2-3

Summary of Ongoing Data Collection Programs in the Upper Basin of the Coeur d'Alene River

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Program	Responsible Party	Dates	Description	Reference
Basin-Wide				
Operable Unit (OU) 2 Water Quality Monitoring as part of Environmental Monitoring Program (EMP)	Idaho Department of Environmental Quality (IDEQ), U.S. Environmental Protection Agency (USEPA)	1996 - Present	Monitoring of groundwater, surface water, groundwater-surface water interaction, and biological resources at several locations within OU 2 is conducted to provide water quality data during remedial action implementation, and to provide data with which to assess post-implementation Phase I remedial action effectiveness.	OU 2 Environmental Monitoring Plan (USEPA, 2006)
OU 3 Basin Environmental Monitoring Program (BEMP)	USEPA	2004 - Present	The OU 3-wide BEMP is designed to monitor and evaluate the progress of the remedy selected in the 2002 Record of Decision (ROD), in terms of improving environmental conditions. The objectives of the BEMP are to assess the long-term status and trends of soil, sediment, and surface water conditions in the Basin; evaluate the effectiveness of the remedy selected in the 2002 ROD for OU 3; evaluate progress toward cleanup benchmarks; provide data for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-required Five-Year Reviews of the progress of remedy implementation; and improve the understanding of Basin processes and variability in order to, in turn, improve the effectiveness and efficiency of subsequent remedial action implementation.	OU 3 Basin Environmental Monitoring Program (USEPA, 2004)
Upper Coeur d'Alene Basin				
Remedial Action Monitoring Program	USEPA	2007 - Present	The Remedial Action Monitoring Program was initiated in September 2007 at five remedial action sites selected by USEPA and project stakeholders. The referenced report presents the results from the initial four monitoring events conducted at Canyon Creek, Constitution Mine, Golconda Mine, Rex Mine, and Success Mine. Follow-on reports are planned to be developed annually. In addition, the pre-remedial action concentration data, loads (when flow data are available), and ambient water quality criteria (AWQC) (when hardness concentrations are available) will be compiled and compared to current site conditions to help evaluate remedial action effectiveness.	Draft Data Summary Report for the Coeur d'Alene Basin Remedial Action Monitoring Program (CH2M HILL, 2009m)

TABLE 4-1a
Remedial Action Objectives and General Response Actions for the Protection of Human Health
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Subject	Remedial Action Objective	General Response Actions
Soil/Sediments/Source Materials	Reduce human exposure to soil, sediments, and source materials, including residential garden soil, that have concentrations of contaminants of concern (COCs) greater than selected risk-based levels for soil.	Containment Removal Disposal
Surface Water	Restore surface water designated as beneficial use for drinking water to meet drinking water and water quality standards. Prevent ingestion of surface water used as drinking water and containing COCs exceeding drinking water standards and associated risk-based levels for drinking water. Prevent discharges of seeps, springs, and leachate that would cause surface water to exceed drinking water and water quality standards.	Source Control Hydraulic Isolation Treatment Removal for Treatment
Aquatic Food Sources	Prevent human exposure to unacceptable levels of COCs via ingestion of aquatic foods (e.g., fish and waterfowl)	Source Control

TABLE 4-1b
Remedial Action Objectives and General Response Actions for Ecological Receptors
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Subject	Remedial Action Objective	General Response Actions
Ecosystem - Physical Structure and Function	Remediate soil, sediments, and surface water to mitigate mining impacts and provide habitat capable of supporting a functional ecosystem for the aquatic and terrestrial plant and animal population in the Upper Coeur d'Alene Basin. Maintain (or provide) soil and sediment quality capable of supporting a functional ecosystem for waterfowl and riparian songbirds in the Upper Coeur d'Alene Basin. Maintain (or provide) soil, sediment, and surface water quality supportive of individuals of special-status biota that are protected under the Endangered Species Act, the Fish and Wildlife Conservation Act, and the Migratory Bird Treaty Act.	Containment Treatment Removal Disposal
Soil/Sediments/Source Materials	Prevent ingestion or uptake of and dermal contact with arsenic, cadmium, copper, lead, mercury, silver, and zinc by ecological receptors at concentrations that result in unacceptable risk. Prevent transport and deposition of arsenic, cadmium, copper, lead, mercury, silver, and zinc from soil and sediments into surface water and groundwater at concentrations above ARARs.	Containment Treatment Removal Disposal
Surface Water	Prevent ingestion of surface water containing COCs at concentrations that may cause adverse impacts to bull trout. Prevent ingestion or uptake of arsenic, cadmium, copper, lead, mercury, and zinc by birds, mammals, aquatic invertebrates and fish, aquatic plants, and amphibians at concentrations that exceed applicable ambient water quality criteria (AWQC) or state water quality standards, including site-specific criteria that will protect designated and existing beneficial uses.	Containment Treatment Removal Disposal
Mine Water, including Adits, Seeps, Springs, and Leachate	Prevent discharge of arsenic, cadmium, copper, lead, mercury, silver, and zinc to surface water at concentrations that exceed surface water quality ARARS.	Treatment
Groundwater	Prevent discharge of arsenic, cadmium, copper, lead, mercury, silver, and zinc in groundwater to surface water at concentrations that exceed surface water quality ARARs.	Containment Treatment Removal Disposal

TABLE 4-2
Potential Chemical-Specific ARARs and TBCs for Human Health and Ecological Receptors in the Upper Coeur d'Alene Basin
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Citation	Summary of Requirement	Evaluation
Groundwater		
Idaho Water Quality Standards and Wastewater Treatment Requirements (IDAPA 58.01.02)	Designates uses for waters of the state and water quality standards protective of those uses. This regulation adopts water quality criteria for individual chemicals based on protection of beneficial uses.	Potentially applicable
Idaho Rules for Public Drinking Water Systems (IDAPA 58.01.08)	Adopts national primary drinking water regulations that are no less stringent than the federal regulations in effect under 40 CFR Part 141. These rules provide a degree of assurance that public systems that use either groundwater or surface water are protected from contamination and maintained free from contaminants.	Potentially relevant and appropriate
Safe Drinking Water Act of 1974 (42 U.S.C. 300(f) et seq.), National Primary Drinking Water Standards, 40 CFR 141.61, and Maximum Contaminant Levels for Inorganic Contaminants, 40 CFR 141.62	Establishes maximum contaminant levels (MCLs) as criteria for groundwater and surface water that are or may be used for drinking water. The standards are designed to protect human health from the adverse effects of organic contaminants in the drinking water.	Potentially relevant and appropriate
Surface Water		
Idaho Water Quality Standards and Wastewater Treatment Requirements—Salmonid Sight Feeding Standard (IDAPA 58.01.02.250 and 284)	This standard (50 NT acute and 25 NT chronic above background) is often used to assess the effectiveness of erosion abatement efforts. South Fork Coeur d'Alene River subbasin aquatic life criteria for cadmium, lead, and zinc.	Potentially applicable
Clean Water Act (33 U.S.C. 1251 et seq.), "Water Quality Standards," 40 CFR 131, National Recommended Water Quality Criteria—2006	Establishes numeric water quality criteria for the protection of human health and aquatic organisms. Toxic criteria for the protection of aquatic life are provided in the water quality criteria regulations [40 CFR 131.36(b) (1)], which supersede criteria adopted by the state except where the state criteria are more stringent than the federal criteria.	Potentially relevant and appropriate
Idaho Rules for Public Drinking Water Systems (IDAPA 58.01.08)	Adopts national primary drinking water regulations that are no less stringent than the federal regulations in effect under 40 CFR Part 141. These rules provide a degree of assurance that public systems that use either groundwater or surface water are protected from contamination and maintained free from contaminants.	Potentially relevant and appropriate
Safe Drinking Water Act of 1974 (42 U.S.C. 300(f) et seq.), National Primary Drinking Water Standards, 40 CFR 141.61, and Maximum Contaminant Levels for Inorganic Contaminants, 40 CFR 141.62	Establishes maximum contaminant levels (MCLs) as criteria for groundwater and surface water that are or may be used for drinking water. The standards are designed to protect human health from the adverse effects of organic contaminants in the drinking water.	Potentially relevant and appropriate

TABLE 4-2
Potential Chemical-Specific ARARs and TBCs for Human Health and Ecological Receptors in the Upper Coeur d'Alene Basin
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Citation	Summary of Requirement	Evaluation
Soil		
Ecological Soil Screening Level (Eco-SSL) Guidance, OSWER Directive 9285.7-55	Provides a set of risk-based soil screening levels (Eco-SSLs) for several soil contaminants that are of ecological concern for terrestrial plants and animals at hazardous waste sites. Also describes the process used to derive these levels and provides guidance for their use.	Potentially TBC
Sediments		
NOAA Screening Quick Reference Tables (SQuiRT), NOAA Office of Response and Restoration Division (OR-R Report 08-1) (M.F. Buchman, 2008)	NOAA's SquiRT include screening concentrations for organics and inorganics in sediment, soil, and water.	Potentially TBC
Canadian Sediment Quality Guidelines for the Protection of Aquatic Life (CCME, 1999, updated 2002)	Summary Table 1, Interim Freshwater Sediment Quality Guidelines.	Potentially TBC

Notes:
CCME = Canadian Council of Ministers of the Environment
CFR = *Code of Federal Regulations*
IDAPA = Idaho Administrative Procedures Act
NOAA = National Oceanic and Atmospheric Administration
OSWER = Office of Solid Waste and Emergency Response
TBC = to be considered
U.S.C. = United States Code

TABLE 4-3
Potential Chemical-Specific ARARs for Groundwater as Drinking Water in the Upper Coeur d'Alene Basin
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Metal	MCL[a] (μg/L)	MCLG (μg/L)	Idaho Ground Water Quality Rule[d] (μg/L)	Idaho Rules for Public Drinking Water Systems[e] (μg/L)
Arsenic	10	None	50	10
Cadmium	5	5	5	5
Copper	1,300[b]	1,300	1,300	1,300
Lead	15 [b]	Zero	15	15
Mercury	2	2	2	2
Zinc[c]	5,000	5,000	5,000	5,000

Notes:
[a] Primary drinking water standards only (secondary standards are for protection of aesthetic qualities of water). U.S. Environmental Protection Agency, June 2003. MCL = maximum contaminant level.
[b] Action level at the tap.
[c] Secondary drinking water standard.
[d] Idaho Administrative Procedures Act (IDAPA) 58.01.11, March 1997-- primary constituent standards except for zinc (secondary constituent standard).
[e] IDAPA, Idaho Rules for Public Drinking Water Systems 58.01.08, Idaho Administrative Code (IAC) 2010.

MCLG = maximum contaminant level goal

μg/L = microgram(s) per liter

TABLE 4-4
Potential Chemical-Specific ARARs for Protection of Aquatic Life and Human Health in Surface Water in the Upper Coeur d'Alene Basin
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Federal Ambient Water Quality Criteria[a]						Idaho Water Quality Standards[a]						Site-Specific Criteria, South Fork Coeur d'Alene River (HUC 17010302)[b]					
	Acute			Chronic			Acute			Chronic			Acute			Chronic		
Hardness																		
Hardness[c]	30	50	100	30	50	100	30	50	100	30	50	100	30	50	100	30	50	100
Metals																		
Arsenic	340	340	340	150	150	150	340	340	340	150	150	150	N/A	N/A	N/A	N/A	N/A	N/A
Cadmium[d]	0.62	1.03	2.01	0.11	0.15	0.25	0.62	1.03	2.01	0.42	0.62	1.03	0.61	1.03	2.08	0.42	0.62	1.03
Copper	4.3	7.0	13	3.2	5.0	9.0	5.5	8.9	17	4.1	6.3	11	N/A	N/A	N/A	N/A	N/A	N/A
Lead	17	30	65	0.66	1.2	2.5	17.0	30.1	65	0.66	1.2	2.5	80	129	248	9.1	14.7	28.3
Mercury[e]	1.4	1.4	1.4	0.77	0.77	0.77	2.1	2.1	2.1	0.012	0.012	0.012	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	42	65	120	43	66	120	42	65	120	43	66	120	88	123	195	88	123	195

Notes:
[a] Criteria and standards in micrograms per liter (µg/L) from Idaho Administrative Procedures Act (IDAPA) 58.01.02.
[b] Criteria in micrograms per liter (µg/L) from IDAPA 58.01.02.284. HUC = Hydrologic Unit Code.
[c] Hardness in milligrams of calcium carbonate per liter (mg $CaCO_3$/L).
[d] In 2006, the State of Idaho adopted statewide site-specific aquatic life criteria for cadmium, revising the hardness-dependent criteria equations for cadmium in Section 210.02 of the rules. Until USEPA acts on this change to state water quality standards, the effective water column criteria for dissolved cadmium at 100 milligrams per liter (mg/L) hardness are summarized based on the 2005 version of IDAPA 58.01.02.210.01. A pending rule (Docket 58-0102-0801) before the 2010 Idaho Legislature will lower the cap on hardness for cadmium to 10 mg/L, which is expected to allow for USEPA approval and will change the cadmium aquatic life standards to 1.3 acute and 0.6 chronic accordingly.
[e] In 2005, the State of Idaho adopted USEPA's methylmercury fish tissue criterion for protection of human health. The decision was made to remove the old aquatic life criteria and rely on the fish tissue criterion to provide protection for aquatic life. Thus, current Idaho water quality standards do not have mercury water column criteria for the protection of aquatic life. While USEPA approved of Idaho's adoption of the fish tissue criterion, it has not yet acted on the removal of the water column criteria. Until USEPA acts on this change to state water quality standards, the effective water column criteria for total recoverable mercury are summarized in the table above (IDAPA 58.01.02.210.01, 2004).
N/A = not applicable

TABLE 4-5
Potential Chemical-Specific ARARs for Surface Water as Drinking Water in the Upper Coeur d'Alene Basin
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Metal	MCL[a] (µg/L)	MCLG (µg/L)	Idaho Rules for Public Drinking Water Systems[d] (µg/L)
Arsenic	10	None	10
Cadmium	5	5	5
Copper	1,300[b]	1,300	1,300
Lead	15 [b]	Zero	15
Mercury	2	2	2
Zinc[c]	5,000	5,000	5,000

Notes:
[a] Primary drinking water standards only (secondary standards are for protection of aesthetic qualities of water). U.S. Environmental Protection Agency, June 2003. MCL = maximum contaminant level.
[b] Action level at the tap.
[c] Secondary drinking water standard.
[d] Idaho Administrative Procedures Act (IDAPA), Idaho Rules for Public Drinking Water Systems 58.01.08, Idaho Administrative Code (IAC) 2010.

MCLG = maximum contaminant level goal.

µg/L = microgram(s) per liter

TABLE 4-6
Potential Location-Specific ARARs and TBCs for Ecological Receptors in the Upper Coeur d'Alene Basin
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Citation	Summary of Requirement	Evaluation
Federal		
American Indian Religious Freedom Act (42 U.S.C. 1996 et seq.)	Protects religious, ceremonial, and burial sites and the free practice of religions by Native American groups.	Potentially applicable
Native American Graves Protection and Repatriation Act (25 U.S.C. 3001 et seq., 43 CFR 10)	Protects Native American burial sites and funerary objects. If Native American graves are discovered within remediation areas, project activities must cease and consultation must take place between the Department of the Interior and the affected tribe.	Potentially applicable
National Historic Preservation Act [16 U.S.C. 470 et seq.; 36 CFR Parts 60, 63, 800; 40 CFR 6.301(b)]	Federal agencies must identify possible effects of proposed remedial activities on historic properties (cultural resources). If historic properties or landmarks eligible for, or included in, the National Register of Historic Places exist within remediation areas, remediation activities must be designed to minimize the effect on such properties or landmarks.	Potentially applicable
Archeological and Historic Preservation Act of 1979 [16 U.S.C. 469 et seq., 40 CFR 6.301(c); 470 aa-ii]	Establishes procedures to provide for preservation of historical and archaeological data that might be destroyed through the alteration of terrain as a result of a federal construction project or a federally licensed activity or program.	Potentially applicable if the site contains historical or archaeological data. The presence or absence of such data on the site must be verified. If historical or archaeological artifacts are present in remediation areas, the remedial actions must be designed to minimize adverse effects on the artifacts.
Endangered Species Act (16 U.S.C. 1531 et seq.)	Requires federal agencies to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of species designated as threatened or endangered by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service.	Potentially applicable
Migratory Bird Treaty Act (16 U.S.C. 703 et seq.)	Protects all migratory bird species and prevents "take" without a permit (e.g., lead poisoning of waterfowl due to sediment ingestion) or by unauthorized methods. Hunting of migratory birds under a license is a regulated "taking".	Potentially relevant and appropriate
Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds (66 FR 3853)	Encourages federal agencies to integrate migratory bird conservation principles into plans and actions.	Potentially TBC
Bald and Golden Eagle Protection Act (16 U.S.C. 668; 50 CFR 22)	Provides for the protection of the bald eagle and the golden eagle by prohibiting the unpermitted taking, possession, sale, purchase, barter, offer to sell, purchase, or barter, transport, export or import, of any bald or golden eagle, alive or dead,	Potentially relevant and appropriate

TABLE 4-6
Potential Location-Specific ARARs and TBCs for Ecological Receptors in the Upper Coeur d'Alene Basin
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Citation	Summary of Requirement	Evaluation
	including any part, nest, or egg [16 U.S.C. 668(a); 50 CFR 22]. "Take" includes pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb [16 U.S.C. 688(c); 50 CFR 22.3].	
Fish and Wildlife Conservation Act of 1980 (16 U.S.C. 2901et seq.; 50 CFR 83)	Preserve and promote conservation of non-game fish and wildlife and their habitats.	Potentially applicable
Fish and Wildlife Coordination Act of 1980 [16 U.S.C. 661 et seq.; 40CFR 6.302(g)]	Requires consultation with the U.S. Fish and Wildlife Service (and the Idaho Department of Fish and Game) when any modification of a stream or other waterbody greater than 10 hectares is proposed; requires adequate provisions for protection of fish and wildlife, including permanent or temporary mitigation.	Potentially applicable
Rivers and Harbors Act of 1899 (33 U.S.C. 401 et seq.; 33 CFR 320-330)	Prohibits unauthorized obstruction or alteration of navigable waters.	Potentially applicable
Clean Water Act of 1977 (Sections 404 and 401) - Dredge or Fill Requirements (33 U.S.C. 1251-1376; 33 CFR Parts 320-330; 40 CFR Part 230)	Establishes requirements that limit the discharge of dredged or fill material into navigable waters and associated wetlands. USEPA guidelines for discharge of dredged or fill materials in 40 CFR Part 230 specify consideration of alternatives that have less adverse impacts and prohibit discharges that would result in exceedance of surface water quality standards, exceedance of toxic effluent standards, and jeopardy of threatened or endangered species. Special consideration required for "special aquatic sites" defined to include wetlands.	Potentially applicable. Certain proposed alternatives may result in the temporary or permanent loss of or damage to surface water and wetlands through dredging and filling activities.
Protection of Wetlands [Executive Order 11990; 40 CFR 6.302(a); 40 CFR Part 6, Appendix A]	Requires federal agencies to take action to avoid adversely impacting wetlands, minimize wetland destruction, and preserve the value of wetlands. Also provides for wetlands enhancement and restoration.	Potentially TBC
Considering Wetlands at CERCLA Site Guidance (OSWER 9280.03, May 1994)	Provides guidance for considering potential impacts of response actions on wetlands at CERCLA sites.	Potentially TBC
Protection of Floodplains [Executive Order 11988; 40 CFR 6.302(b); 40 CFR Part 6, Appendix A]	Requires federal agencies to evaluate the potential effects of actions they may take in a floodplain to avoid the adverse impacts associated with direct and indirect development of a floodplain.	Potentially TBC

TABLE 4-6
Potential Location-Specific ARARs and TBCs for Ecological Receptors in the Upper Coeur d'Alene Basin
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Citation	Summary of Requirement	Evaluation
RCRA: Location Standards for Hazardous Waste Facilities-100 Year Floodplains [42 U.S.C. 6901; 40 CFR 264.18(b)]	Hazardous waste treatment, storage, and disposal facilities (TSDFs) located in a 100-year floodplain must be designed, constructed, operated, and maintained to prevent washout of any 100-year floodplain.	Potentially relevant and appropriate
State		
Idaho Water Quality and Wastewater Treatment—Hazardous and Deleterious Material Storage [Idaho Statute 39-105 and 39-3601 et seq.; IDAPA 58.01.02.800]	Hazardous and deleterious materials must not be stored, disposed of, or accumulated adjacent to or in the immediate vicinity of state waters, unless adequate measures and controls are provided to ensure that those materials will not enter state waters as a result of high water, precipitation runoff, wind, storage facility failure, accidents in operation, or unauthorized third-party activities.	Potentially applicable
Idaho Siting of Hazardous Waste Disposal Facility (Idaho Code 39-5801 et seq.) and Idaho Rules and Standards for Hazardous Waste (IDAPA 58.01.05)	The remedial action will be designed to satisfy some of the technical criteria in the Idaho Hazardous Waste Siting Management Plan as adopted by the Idaho State Legislature. Consideration will be given in remedy design to general considerations referenced by the Hazardous Waste Facility Siting Act. However, a siting license for an onsite hazardous waste disposal facility is not required.	Potentially relevant and appropriate
Idaho Lakes Protection Act [Idaho Code 58-104(9) and 58-1301 et seq.; IDAPA 20.03.04]	Requires that the protection of property, navigation, fish and wildlife habitat, aquatic life, recreation, aesthetic beauty, and water quality be given due consideration and weighed against the navigational or economic justification for encroachments of beds or waters of navigable lakes of the state.	Potentially applicable
Idaho Classification and Protection of Wildlife (Idaho Statute 36-201 and IDAPA 13.01.06)	The Idaho Department of Fish and Game classifies wildlife as game, protected non-game, endangered, threatened, and species of special concern. None of the protected non-game species of special concern, threatened, or endangered species may be taken or possessed.	Potentially relevant and appropriate
Idaho Preservation of Historical Sites (Idaho Statute 67-4601 et seq.) and Idaho State Historical Society (Idaho Statute 67-4101 et seq.)	Covers historical sites and districts within the State of Idaho and the excavation of archaeological resources. The Idaho State Historical Society is a state agency. It publishes the National Register of Historic Places for Idaho.	Potentially applicable

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
CFR = *Code of Federal Regulations;* USEPA = U.S. Environmental Protection Agency; FR = Federal Register
IDAPA = Idaho Administrative Procedures Act; OSWER = Office of Sold Waste and Emergency Response
RCRA = Resource Conservation and Recovery Act; TBC = to be considered; U.S.C. = United States Code

TABLE 4-7
Potential Action-Specific ARARs and TBCs for Ecological Receptors in the Upper Coeur d'Alene Basin
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Citation	Summary of Requirement	Evaluation
Federal		
RCRA: Subtitle C—Exemption for Extraction, Beneficiation and Processing Mining Waste [40 CFR 261.4(b)(7)]	USEPA exempts mining wastes from the extraction, beneficiation, and some processing of ores and minerals, in accordance with the Bevill amendment to RCRA.	Potentially applicable
RCRA: Subtitle C—Hazardous Waste Characteristics (40 CFR 261.20)	Generators of solid waste must determine whether the waste is hazardous. A solid waste is hazardous if it exhibits the toxicity characteristic (based on extraction procedure Method 1311).	Potentially applicable to solid waste generated during remediation
RCRA: Subtitle C—Hazardous Remediation Waste Management Requirements (HWIR-Media) (40 CFR 264.554)	The use of staging piles can facilitate short-term storage of remediation wastes so that sufficient volumes can be accumulated for shipment to an offsite treatment facility or for efficient onsite treatment. The regulations contain performance standards for these piles.	If contaminated media hazardous waste, potentially applicable; if not, potentially relevant and appropriate
RCRA Subtitle C—Hazardous Waste Treatment and Storage (40 CFR 264)	Requirements for storing or treating hazardous wastes in tanks, containers, or surface impoundments. Subpart F addresses groundwater monitoring at hazardous waste treatment, storage, and disposal facilities (TSDFs). Closure requirements for hazardous waste repositories are covered under Subpart G. Hazardous waste landfills must meet minimum design standards under Subpart N.	Potentially relevant and appropriate
RCRA Subtitle C—Treatment Standards for Hazardous Waste Debris (40 CFR 268.45)	Hazardous debris must be treated through identified technologies or standards, unless USEPA determines that debris is no longer contaminated, pursuant to 40 CFR 261.3(e)(2).	Potentially applicable
RCRA: Subtitle D—RCRA Criteria for Classification of Solid Waste Disposal Facilities and Practices (42 U.S.C. 6901 et seq.; 40 CFR 257)	Certain criteria are required to be met by solid waste disposal facilities and practices, such as not restricting the base flow of the floodplain, not taking threatened or endangered species, and not causing a discharge to navigable waters.	Potentially relevant and appropriate
RCRA Subtitle D—Disposal of Nonhazardous Solid Waste (42 U.S.C. 6901 et seq.; 40 CFR Part 258)	Provides criteria for cover material, run-on/runoff control systems, access control, liquid restrictions.	Potentially relevant and appropriate requirement
Best Management Practices for Soil Treatment Technologies (OSWER, 1997)	Provides technologies for controlling cross-media transfer of contaminants during materials handling activities.	Potentially TBC during excavation of contaminated soil

TABLE 4-7
Potential Action-Specific ARARs and TBCs for Ecological Receptors in the Upper Coeur d'Alene Basin
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Citation	Summary of Requirement	Evaluation
Clean Water Act/Water Pollution Control Act (33 U.S.C. 1251) Effluent Limitations (Sections 301-302) Water Quality Standards (Section 303) Federal Water Quality Criteria (Section 304) National Performance Standards (Section 306) Toxic and Pre-Treatment Standards (Section 307) National Pollutant Discharge Elimination System (Section 402)	These regulations govern water quality, including water discharged as part of a remedial process. Section 307—Pretreatment regulations under 40 CFR Part 403 provide for limits on discharge to a sanitary sewer system, protecting the municipal system from accepting wastewater that would cause it to exceed its NPDES permit discharge limits. Section 401—Water Quality Certification requires that USEPA receive a water quality certification from a state that a given project requiring a federal permit that may result in a discharge to navigable water will comply with the state's water quality standards. Section 402—The NPDES program establishes a comprehensive framework for addressing processing water and stormwater discharges under the program. Requires that point-source discharges not cause the exceedance of surface water quality standards outside the mixing zone. Specifies requirements under 40 CFR 122.26 for point-source discharge of stormwater from construction sites to surface water and provides for Best Management Practices such as erosion control for removal and management of sediment to prevent run-on and runoff.	Potentially applicable or relevant and appropriate
Clean Air Act (42 U.S.C. 7401 et seq.)	Requires minimization of the harmful effects to air quality from excavation, construction, and other removal activities.	Potentially applicable or relevant and appropriate
Surface Mining Control and Reclamation Act of 1977 (SMCRA) (30 U.S.C. 1201 et seq., 30 CFR 816)	Requires the protection of human health and the environment from the adverse effects of current and past surface coal mining operations. Some of the potentially relevant and appropriate requirements for the removal of contaminated surface soil include: --Stabilization of all exposed surface areas to effectively control erosion and air pollution attendant to erosion (30 CFR 816.95). --Use of best technology currently available to (1) minimize disturbances to and adverse impacts on fish, wildlife, and related environmental values and to achieve enhancement of such if possible; (2) conduct no activity that may jeopardize the continued existence of endangered species or that is likely to destroy or adversely modify their critical habitat; and (3) avoid disturbances to, enhance where practicable, or restore or replace wetlands, riparian vegetation, and habitats for fish and wildlife (30 CFR 816.97).	Potentially relevant and appropriate. Although coal mining did not occur in the Coeur d'Alene Basin, SMCRA requirements may be relevant and appropriate for cleanup of other types of mining sites.

TABLE 4-7
Potential Action-Specific ARARs and TBCs for Ecological Receptors in the Upper Coeur d'Alene Basin
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Citation	Summary of Requirement	Evaluation
State		
Idaho Rules and Standards for Hazardous Waste-Management of Hazardous Waste (IDAPA 58.01.05 et. seq.) and Land Disposal Restrictions (IDAPA 58.01.05.011)	Hazardous wastes that are generated must be managed in accordance with the generation and transportation, storage, and disposal requirements. LDRs place specific requirements (concentration or treatment) on RCRA hazardous wastes prior to their placement in a land disposal unit.	Potentially relevant and appropriate if any material accumulations are treated *ex situ*
Idaho Solid Waste Management Rules and Standards (IDAPA 58.01.06)	Requires all solid waste be managed to prevent human health hazards, public nuisances, or pollution of the environment. Elements relating to landfill cover, surface water management, and erosion control may be ARARs.	Potentially applicable or relevant and appropriate
Mine and Mill Waste Remedial Guidelines and Best Management Practices (Coeur d'Alene Basin Restoration Project)	Design and implementation of selected response actions should consider a number of factors and techniques for protecting water quality, fish and wildlife habitat, while minimizing the potential for human exposure.	Potentially TBC
Best Management Practices and Guidelines for Mine Tailings Repositories	Provides guidelines for location, design, construction, and management of mine waste repositories.	Potentially TBC
Idaho Rules Governing Exploration and Surface Mining—Best Management Practices, Reclamation (IDAPA 20.03.02.060, .140, .160)	Reclamation requirements include best management practices for the protection of water quality, non-point sediment control, clearing and grubbing operations, overburden and topsoil requirements to enhance revegetation of disturbed areas, and road construction requirements to minimize erosion. Additional best management practices are specified for backfilling and grading and revegetation activities.	Potentially relevant and appropriate
Idaho Mine Tailings Impoundment Structure Rules (IDAPA 37.03.05)	Design elements of the regulation may be relevant and appropriate to construction of regional repositories. Construction, enlargement, and alteration of mine tailings impoundments must conform to specific design specifications, spillways or diversion structures, cutoff walls, filters, and embankment slopes.	Potentially relevant and appropriate
Idaho Stream Channel Alteration Rules (IDAPA 37.03.07)	Governs the alteration of stream channels in Idaho.	Potentially applicable
Idaho Water Quality Standards and Wastewater Treatment Requirements (IDAPA 58.01.02)	Restrictions are placed on the discharge of wastewaters and on human activities that may adversely affect water quality in state waters. Under IDAPA 58.01.02.800, hazardous and deleterious materials must not be stored, disposed of, or accumulated adjacent to or in the immediate vicinity of state waters unless adequate measures and controls are provided to ensure that those materials will not enter state waters. Deleterious materials are defined as any non-toxic substances that may cause	Potentially applicable

TABLE 4-7
Potential Action-Specific ARARs and TBCs for Ecological Receptors in the Upper Coeur d'Alene Basin
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Citation	Summary of Requirement	Evaluation
	the tainting of edible species of fish, taste and odors in drinking water supplies, or the reduction of the usability of water without causing physical injury to water users or aquatic and terrestrial organisms. Non-point source activities conducted in a manner that demonstrates a knowledgeable and reasonable effort to minimize resulting adverse water quality impacts are not subject to conditions or legal actions (IDAPA 58.01.02.350.02.a).	
Idaho Non-Point Source Management Plan, Final (December 1999)	Remedial activities should be consistent with the state's goal of restoration, maintenance, and protection of the beneficial uses of both surface water and groundwater. Long-term goals include design and implementation of Best Management Practices for surface water and groundwater.	Potential TBC
Idaho Air Pollution Control Rules (IDAPA 58.01.01)	Requires that remedial activities be designed to take all reasonable precautions to prevent particulate matter from becoming airborne, including the use of water or chemicals as dust suppressants, the covering of trucks, and the prompt removal and handling of excavated materials.	Potentially applicable
Idaho Asbestos Statute	Any asbestos-containing materials encountered in mill demolition must be removed and disposed of in accordance with these regulations.	Potentially applicable
Idaho Land Remediation Rules (IDAPA 58.01.18.027)	Institutional controls may be used in instances where residual concentrations of chemicals exceed risk-based health standards, or when they are required to ensure the continued protection of human health and the environment or the integrity of the cleanup action.	Potentially applicable

Notes:
ARAR = applicable or relevant and appropriate requirement
CFR = *Code of Federal Regulations*
FR = Federal Register
HWIR = Hazardous Waste Identification Rule
IDAPA = Idaho Administrative Procedures Act
LDR = Land Disposal Restriction
NPDES = National Pollutant Discharge Elimination System
OSWER = Office of Sold Waste and Emergency Response
RCRA = Resource Conservation and Recovery Act
TBC = to be considered
USEPA = U.S. Environmental Protection Agency

TABLE 4-8
Preliminary Remediation Goals for Soil (mg/kg) for Protection of Terrestrial Biota[a] in the Upper Coeur d'Alene Basin
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Soil Biota[b]		Wildlife[b]			90th Percentile of Soil-Sediment Background	
Analyte	**Population/ Community**	**Individual/ NOAEL-based**	**Population/ LOAEL-based**	**Population/ ED_{20}-based**	**Site-specific Individual-level PRG for Riparian Songbirds[b]**	**Upper Basin[c]**	**Idaho REM IDTLs[d]**
Arsenic	16.8	14	67	40	NA	22	0.391
Cadmium	10	9.8	105	386	NA	2.7	1.35
Copper	100	496	751	1021	NA	53	921
Lead	450	2.5	159	522	530[f]	171	49.6
Mercury	None provided	None provided	None provided	None provided	NA	0.3e	.005
Zinc	106	27	434	261	NA	280	886

Notes:
[a] Birds and mammals occurring in upland, agricultural, and riparian habitats; terrestrial plants and invertebrates; and soil processes.
[b] Based on various lines of evidence available for evaluation (such as comparisons to single-chemical laboratory toxicity studies; toxicity testing using soil, sediment, or water from the Coeur d'Alene Basin; and field studies in the basin) (Source: Remedial Investigation/Feasibility Study Risk Assessment in U.S. Environmental Protection Agency [USEPA], 2001c).
[c] Gott and Cathrall (1980), and selected by USEPA as background values in the Remedial Investigation for the Coeur d'Alene Basin (USEPA, 2001c).
[d] State of Idaho Risk Evaluation Manual (REM), 2004. IDTLs = Initial Default Target Levels. Arsenic based on surficial soil exposure pathway; all other metals based on groundwater protection pathway.
[e] USEPA, 2001c, *Final (Revision 2) Remedial Investigation Report, Coeur d'Alene Basin Remedial Investigation/Feasibility Study*, Volume 1, Part 7 (Summary), Table 3.2-1, "Selected Background Concentrations for Metals in the Basin".
[f] See Attachment 4-1.

ED_{20} = effective dose – 20 percent response
LOAEL = lowest observed adverse effects level
NOAEL = no observed adverse effects level
mg/kg = milligram(s) per kilogram
NA = not available

TABLE 4-9
Preliminary Remediation Goals for Soil (mg/kg) for Protection of Aquatic Birds and Mammals[a] in the Upper Coeur d'Alene Basin
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Wildlife[b]				
Analyte	**Individual/ NOAEL-based**	**Population/ LOAEL-based**	**Population/ ED_{20}-based**	**Site-specific Individual-level PRG for Waterfowl[b]**	**90th Percentile of Soil-Sediment Background, Upper Basin[c]**
Arsenic	54	222	138	NA	22
Cadmium	11.7	173	664	NA	2.7
Copper	1,606	2,157	2,209	NA	53
Mercury[d]	0.2	2.5	7	NA	0.3
Lead	3.65[e]	249[e]	718[e]	530[f]	171
Zinc	5.3	519	390	NA	280

Notes:
[a] Birds and mammals occurring in palustrine, lacustrine, and riverine habitats.
[b] 10th percentile of individual-level sediment PRGs calculated for tundra swans, Canada geese, mallards, and wood ducks.
[c] Gott and Cathrall (1980).
[d] Mercury was not measured in Lower Basin sediment samples. Therefore, a background concentration could not be calculated.
[e] For the comparison used in the Ecological Risk Assessment (CH2M HILL and URS Greiner, 2001), analyses by Beyer et al. (2000) resulted in a waterfowl no-effect concentration of 24 mg/kg and a lowest-effect (reduced ALAD) activity concentration of 530 mg/kg. Using site-specific waterfowl mortality data, Beyer et al. further estimated that waterfowl mortality would begin to be observed at 1,800 mg/kg.
[f] See Attachment 4-1.

ALAD = aminolevulinic acid dehydratase
ED_{20} = effective dose – 20 percent response
LOAEL = lowest observed adverse effects level
NOAEL = no observed adverse effects level
mg/kg = milligram(s) per kilogram
NA = not available

TABLE 4-10
Preliminary Remediation Goals for Sediment for Protection of Human Health and Aquatic Organisms in the Upper Coeur d'Alene Basin[a]
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Analyte	Preliminary Remedial Goals (PRGs) (mg/kg dry weight)	
	Upper Basin [c]	**NOAA SQuiRT**[b]
Arsenic	22	5.9 – 33
Cadmium	2.7	0.583 – 10
Copper	53	16 – 197
Lead	530[d]	31 – 250
Mercury	0.3	0.174 – 2
Silver	1.1	0.5 – 4.5
Zinc	280	98 – 820

Notes:
[a] PRGs based on toxicity reference values; other PRGs default to background concentrations for those portions of the Basin.
[b] National Oceanic and Atmospheric Administration, 2008 Screening Quick Reference Tables (SQuiRT) -- Ranges for Freshwater Sediments.
[c] U.S. Environmental Protection Agency, 2008b, Ecological Soil Screening Levels (Eco-SSLs): freshwater sediment range for plants, soil biota, and avian and aquatic mammals.
[d] See Attachment 4-1.

mg/kg = milligram(s) per kilogram

TABLE 4-11
Preliminary Remediation Goals for Surface Water for Protection of Human Health and Aquatic Organisms in the Upper Coeur d'Alene Basin
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Federal Ambient Water Quality Criteria[a]						Idaho Water Quality Standards[a]						Site-Specific Criteria, South Fork Coeur d'Alene River (HUC 17010302)[b]					
Metal	**Acute**			**Chronic**			**Acute**			**Chronic**			**Acute**			**Chronic**		
Hardness[c]	30	50	100	30	50	100	30	50	100	30	50	100	30	50	100	30	50	100
Arsenic	340	340	340	150	150	150	340	340	340	150	150	150	N/A	N/A	N/A	N/A	N/A	N/A
Cadmium[d]	0.62	1.03	2.01	0.11	0.15	0.25	0.62	1.03	2.01	0.42	0.62	1.03	0.61	1.03	2.08	0.42	0.62	1.03
Copper	4.3	7.0	13	3.2	5.0	9.0	5.5	8.9	17	4. 1	6.3	11	N/A	N/A	N/A	N/A	N/A	N/A
Lead	17	30	65	0.66	1.2	2.5	17.0	30.1	65	0.66	1.2	2.5	80	129	248	9.1	14.7	28.3
Mercury[e]	1.4	1.4	1.4	0.77	0.77	0.77	2.1	2.1	2.1	0.012	0.012	0.012	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	42	65	120	43	66	120	42	65	120	43	66	120	88	123	195	88	123	195

Notes:
[a] Criteria and standards in micrograms per liter (µg/L) from Idaho Administrative Procedures Act (IDAPA) 58.01.02.
[b] Criteria in micrograms per liter (µg/L) from IDAPA 58.0102.284. HUC = Hydrologic Unit Code.
[c] Hardness in milligrams of calcium carbonate per liter (mg $CaCO_3$/L).
[d] In 2006, the State of Idaho adopted statewide site-specific aquatic life criteria for cadmium, revising the hardness-dependent criteria equations for cadmium in Section 210.02 of the rules. Until USEPA acts on a change to state water quality standards, the effective water column criteria for dissolved cadmium at 100 milligrams per liter (mg/L) hardness are summarized based on the 2005 version of IDAPA 58.01.02.210.01. A pending rule (Docket 58-0102-0801) before the 2010 Idaho Legislature will lower the cap on hardness for cadmium to 10 mg/L, which is expected to allow for USEPA approval and will change the cadmium aquatic life standards to 1.3 acute and 0.6 chronic accordingly.
[e] In 2005, Idaho adopted USEPA's methylmercury fish tissue criterion for protection of human health. The decision was made to remove the old aquatic life criteria and rely on the fish tissue criterion to provide protection for aquatic life. Thus, current Idaho water quality standards do not have mercury water column criteria for the protection of aquatic life. While USEPA approved of Idaho's adoption of the fish tissue criterion, it has not yet acted on the removal of the water column criteria. Until USEPA acts on this change to state water quality standards, the effective water column criteria for total recoverable mercury are summarized in the table above (IDAPA 58.01.02.210.01, 2004).

N/A = not applicable

TABLE 4-12
Preliminary Remediation Goals for Surface Water as Drinking Water in the Upper Coeur d'Alene Basin
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Metal	MCL[a] (μg/L)	MCLG (μg/L)	Idaho Rules for Public Drinking Water Systems[d] (μg/L)
Arsenic	10	None	10
Cadmium	5	5	5
Copper	1,300[b]	1,300	1,300
Lead	15 [b]	Zero	15
Mercury	2	2	2
Zinc[c]	5,000	5,000	5,000

Notes:
[a] Primary drinking water standards only (secondary standards are for protection of aesthetic qualities of water). U.S. Environmental Protection Agency, June 2003.
MCL = maximum contaminant level.
[b] Action level at the tap.
[c] Secondary drinking water standard.
[d] Idaho Administrative Procedures Act (IDAPA), Idaho Rules for Public Drinking Water Systems 58.01.08, Idaho Administrative Code (IAC) 2010.
MCLG = maximum contaminant level goal.
μg/L = microgram(s) per liter

TABLE 5-1

Descriptions of Typical Conceptual Designs and their Sustainable Elements
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Name	Description	Retained or New/ Revised[1]	USEPA Recommended Elements for Greener Cleanups					Comments
				Energy	Air	Water	Waste	Land	
Source Control TCDs									
C01	Excavation (dry)	Purpose: To physically remove solid waste material. Description: This can be conducted using a variety of methods and equipment, including backhoes, hydraulic excavators (trackhoes), draglines, bulldozers, and scrapers. The ability to screen mixed alluvial materials will be assessed on a site by site basis. The additional cost of the screening has not been added to the excavation TCDs because it is anticipated to be minimal relative to overall TCD costs and because the cost of screening would be partially or completely offset by the reduction in waste volume sent to the repository (which is unknown at this point). C01 assumes excavation above the water table using a hydraulic excavator without dewatering. Includes revegetation of the excavated area.	R	E1 E3	A1 A2 A3		R1	L2 L3	R1: Minimize waste generation by not disturbing clear areas. L2: Care should be taken to protect wildlife.
C01b	Excavation (60% dry/40% wet)	Purpose: Same as C01. Description: Same as C01, except that C01b assumes that 40% of the excavation would be conducted below the water table. Therefore, this option includes dewatering. Includes revegetation of excavated area. The ability to screen mixed alluvial materials will be assessed on a site by site basis. The additional cost of the screening has not been added to the excavation TCDs because it is anticipated to be minimal relative to overall TCD costs and because the cost of screening would be partially or completely offset by the reduction in waste volume sent to the repository (which is unknown at this point).	R	E1 E2 E3	A1 A2 A3	W1		L2 L3	E2: Choose clean fill from a local source. L2: Care should be taken to protect wildlife.
C02a	Regrade/Consolidate/ Revegetate: Lower Part of Pile in 100-Year Floodplain	Purpose: To reduce the potential for erosion and leaching of metals. Description: This TCD consists of regrading the waste material out of the nominal 100-year floodplain and placing a vegetative cover that consists of 12 inches of growth media and revegetation. C02a assumes that the waste material is on slopes where only the lower part extends into the 100-year floodplain.	R	E1 E2 E3	A1 A2 A3	W2	R1 R2	L1	L1: The vegetative cover should consist of native species.

TABLE 5-1

Descriptions of Typical Conceptual Designs and their Sustainable Elements

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Name	Description	Retained or New/ Revised[1]	USEPA Recommended Elements for Greener Cleanups					Comments
C02b	Regrade/Consolidate/ Revegetate: Waste Rock Pile in Stream Valley	Purpose: Same as C02a. Description: Same as C02a except C02b assumes that the waste material has largely filled in the stream valley.	R	E1 E2 E3	A1 A2 A3	W1 W2	R1 R2	L1	W1: A plan should be developed to prevent damage to the stream while removing the rock pile. L1: The vegetative cover should consist of native species.
C02c	Regrade/Consolidate/ Revegetate: Stabilize Using Erosion Protection	Purpose: Same as C02b. Description: C02c assumes that the waste rock piles are present in areas where the natural ground sideslopes (1.5H:1V or steeper) are too steep to allow regrading to a slope flat enough for placement of a vegetative cover. C02c includes riprap below the nominal 100-year flood elevation to limit erosion.	R	E1 E2 E3	A1 A2 A3	W2	R1 R2	L1	L1: The riprap put in place to eliminate erosion should be made to blend in with the natural surroundings.
C03	Low-Permeability Cap	Purpose: To significantly reduce metals loads by substantially reducing infiltration through waste materials. Description: This TCD includes a GCL liner as results from a preliminary cap performance analysis indicate that a geosynthetic clay liner (GCL) would more effectively reduce infiltration through the waste than a cap constructed of low-permeability native soil.	R	E1 E2 E3	A1 A2 A3	W1	R1 R2		W1: The GCL cap will reduce water infiltration and therefore contamination of that water. R1: A plan should be developed to reduce, reuse, and recycle and waste material from the development of the cap.
C04	Low-Permeability Cap with Seepage Collection	Purpose: Same as C03 for the low-permeability cap. The purpose of the water collection is to collect groundwater upgradient of the waste pile to minimize leaching of the waste and to collect seepage at the downgradient toe of the waste pile so that it could be treated. Description: Same cap as C03. This TCD also includes collection of both groundwater upgradient of the waste pile and seepage at the downgradient toe of the waste pile.	R	E1 E2 E3	A1 A2 A3	W1	R1 R2		W1: The GCL cap will reduce water infiltration and therefore contamination of that water. Also, the collection of the groundwater upgradient of the waste pile will prevent contamination of that water. R1: A plan should be developed to reduce, reuse, and recycle waste material from the development of the cap.

TABLE 5-1

Descriptions of Typical Conceptual Designs and their Sustainable Elements

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Name	Description	Retained or New/ Revised[1]	USEPA Recommended Elements for Greener Cleanups					Comments
C05	Low-Permeability Cap with Erosion Protection	Purpose: Same as C03 for the low-permeability cap. The purpose of the erosion protection is to minimize the erosion of waste below the nominal 100-year flood level. Description: Same cap as C03. The toe of the waste pile would remain within the nominal 100-year floodplain and be regraded to a sideslope of 2H:1V to 3H:1V or flatter and capped. Erosion protection would consist of riprap below the ordinary high-water level and vegetative stabilization or bioengineered revetments above the ordinary high-water level but below the nominal 100-year floodplain.	R	E1 E2 E3	A1 A2 A3	W1	R1 R2		W1: The GCL cap will reduce water infiltration and therefore contamination of that water. R1: A plan should be developed to reduce, reuse, and recycle and waste material from the development of the cap.
C06	Waste Consolidation Area with Erosion Protection	Purpose: Waste Consolidation Areas will serve for consolidation or placement of waste for disposal from specifically-identified sources such as mine and mill site remedial actions. They will typically not accept ICP waste. Description: This TCD consists of onsite consolidation of waste material in an area that includes a high-performance GCL cap. Geotextile and low-permeability native soil are beneath the waste.	R	E1 E3	A1 A2 A3	W1	R1 R2	L1	W1: The GCL cap will reduce water infiltration and therefore contamination of that water. R1: A plan should be developed to reduce, reuse, and recycle and waste material from the development of the cap.
C07	Waste Consolidation Area Above Flood Level	Purpose: Same as C06. Description: Same as C06 except this waste consolidation area is above the 100-year flood level. This TCD includes a high-performance GCL cap. Geotextile and low-permeability native soil are beneath the waste.	R	E1 E3	A1 A2 A3	W1	R1 R2		W1: The GCL cap will reduce water infiltration and therefore contamination of that water. R1: A plan should be developed to reduce, reuse, and recycle and waste material from the development of the cap.
C08a	Repository, 1 million cy	Purpose: To provide the highest level of protection among the containment TCDs. The current repository siting process is ongoing and has involved substantial public and stakeholder input/participation. Repository design will be based on appropriate and substantial technical evaluation. Description: This TCD includes an FML cap and an FML bottom liner that would provide a high level of performance. The capacity is 1 million cubic yards.	N	E1 E3	A1 A2 A3	W1	R1 R2		W1: The FML cap will reduce water infiltration and therefore contamination of that water. R1: A plan should be developed to reduce, reuse, and recycle and waste material from the development of the cap.

TABLE 5-1

Descriptions of Typical Conceptual Designs and their Sustainable Elements

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TCD Code	Name	Description	Retained or New/ Revised[1]	USEPA Recommended Elements for Greener Cleanups					Comments
C09	Impoundment Closure	Purpose: To address the closure of existing abandoned tailings impoundments or cells. Description: This TCD includes capping the impoundment with a GCL with 1 foot of compacted native soil and regrading as needed for drainage and stability.	R	E1 E2 E3	A1 A2 A3	W1	R1 R2		W1: The GCL cap will reduce water infiltration and therefore contamination of that water. R1: A plan should be developed to reduce, reuse, and recycle and waste material from the development of the cap.
HAUL-2	Haul to Repository	Purpose and description: Transport the waste materials to a repository.	R	E1 E3	A1 A2 A3			L2	L2: When hauling material, care should be taken to not interfere with wildlife.
Water Collection, Conveyance, and Management TCDs									
C10	Adit Drainage Collection	Purpose: To collect adit drainage for conveyance to a water treatment facility. Description: This TCD includes construction of a partial bulkhead at the base of the adit. The upper part of the adit above the bulkhead would be provided with metal bars to deter entry of humans but to allow bats to move in and out of the adit.	R	E1 E3	A1 A2 A3	W1	R2	L2	L2: Protections would be put in place to allow bats to move in an out of the adit.
C11a	Hydraulic Isolation Using Slurry Wall (15 ft deep, no drain)	Purpose: To minimize the discharge of contaminated groundwater to the surface water system, thereby reducing the dissolved metals loading to the surface water system. Description: This TCD would be implemented by constructing a vertical slurry wall through the contaminated groundwater zone and into a low-permeability soil or rock layer. This TCD includes a slurry wall on only one side of the river or contaminated source. If a slurry wall on both sides of the river or contaminated source is needed, the TCD will be applied for twice the length. The slurry wall is 15 feet deep.	N	E1 E3	A1 A2 A3	W1 W3	R2		R2: Materials for the slurry wall should come from a local source.
C11b	Hydraulic Isolation Using Slurry Wall (20 ft deep, no drain)	Purpose: Same as C11a. Description: Same as C11a except that the slurry wall is 20 feet deep.	N	E1 E3	A1 A2 A3	W1 W3	R2		R2: Materials for the slurry wall should come from a local source.

TABLE 5-1

Descriptions of Typical Conceptual Designs and their Sustainable Elements

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TCD Code	Name	Description	Retained or New/ Revised[1]	USEPA Recommended Elements for Greener Cleanups				Comments
C11c	Hydraulic Isolation Using Slurry Wall (30 ft deep, no drain)	Purpose: Same as C11a. Description: Same as C11a except that the slurry wall is 30 feet deep.	N	E1 E3	A1 A2 A3	W1 W3	R2	R2: Materials for the slurry wall should come from a local source.
C11d	Hydraulic Isolation Using Slurry Wall (40 ft deep, no drain)	Purpose: Same as C11a. Description: Same as C11a except that the slurry wall is 40 feet deep.	N	E1 E3	A1 A2 A3	W1 W3	R2	R2: Materials for the slurry wall should come from a local source.
C11e	Hydraulic Isolation Using Slurry Wall (45 ft deep, no drain)	Purpose: Same as C11a. Description: Same as C11a except that the slurry wall is 45 feet deep.	N	E1 E3	A1 A2 A3	W1 W3	R2	R2: Materials for the slurry wall should come from a local source.
C11f	Hydraulic Isolation Using Slurry Wall (50 ft deep, no drain)	Purpose: Same as C11a. Description: Same as C11a except that the slurry wall is 50 feet deep.	N	E1 E3	A1 A2 A3	W1 W3	R2	R2: Materials for the slurry wall should come from a local source.
C11g	Hydraulic Isolation Using Slurry Wall (50 ft deep, no drain, soil cement)	Purpose: Same as C11a. Description: Same as C11a except that the slurry wall is 50 feet deep and is a soil/cement mix instead of soil/bentonite.	N	E1 E3	A1 A2 A3	W1 W3	R2	R2: Materials for the slurry wall should come from a local source.
C11h	Hydraulic Isolation Using Slurry Wall (15 ft deep, with drain)	Purpose: Same as C11a. Description: Same as C11a except that the slurry wall is 15 feet deep with a drain.	N	E1 E3	A1 A2 A3	W1 W3	R2	R2: Materials for the slurry wall should come from a local source.
C11i	Hydraulic Isolation Using Slurry Wall (20 ft deep, with drain)	Purpose: Same as C11a. Description: Same as C11h except that the slurry wall is 20 feet deep.	N	E1 E3	A1 A2 A3	W1 W3	R2	R2: Materials for the slurry wall should come from a local source.
C11j	Hydraulic Isolation Using Slurry Wall (30 ft deep, with drain)	Purpose: Same as C11a. Description: Same as C11h except that the slurry wall is 30 feet deep.	N	E1 E3	A1 A2 A3	W1 W3	R2	R2: Materials for the slurry wall should come from a local source.

TABLE 5-1

Descriptions of Typical Conceptual Designs and their Sustainable Elements

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Name	Description	Retained or New/ Revised[1]	USEPA Recommended Elements for Greener Cleanups					Comments
C14a	Stream Lining (10 ft wide)	Purpose: To reduce dissolved metals loading from groundwater to the stream and reduce surface water recharge of the aquifer. Description: The liner would be polyvinyl chloride (PVC) and geotextile with an anchor trench. The PVC liner would be covered by sand bedding and topped with gravel. The geotextile would be placed over the gravel layer and keyed into the anchor trench. Bioengineering and stream stabilization measures would be used to protect the liner, stabilize the stream, and provide habitat. The lined stream width is 10 feet.	N	E1 E3	A1 A2 A3	W1	R1 R2	L1 L2 L3	L2: During the lining of the stream, care should be taken to protect wildlife. A plan may need to be developed to do so.
C14b	Stream Lining (20 ft wide)	Purpose: Same as C14a. Description: Same as C14a except that the lined stream width is 20 feet.	N	E1 E3	A1 A2 A3	W1	R1 R2	L1 L2 L3	L2: During the lining of the stream, care should be taken to protect wildlife. A plan may need to be developed to do so.
C14c	Stream Lining (100 ft wide)	Purpose: Same as C14a. Description: Same as C14a except that the lined stream width is 100 feet.	N	E1 E3	A1 A2 A3	W1	R1 R2	L1 L2 L3	L2: During the lining of the stream, care should be taken to protect wildlife. A plan may need to be developed to do so.
C15a	French Drain (10 ft below ground surface [bgs])	Purpose: To intercept contaminated groundwater that would otherwise discharge to the natural drain. Description: The French drain would be installed to a depth of 5 feet below the water table. C15a assumes a depth of 10 feet bgs. The trench excavation would be lined with a filter fabric to minimize silt migration into the collection system. A single pipe would be used. Water collected by the French drain system would be piped to a water treatment system for treatment and subsequent discharge.	N	E1 E3	A1 A2 A3	W1	R2		R2: Materials for the French drain should come from a local source.
C15b	French Drain (15 ft bgs)	Purpose: Same as C15a. Description: Same as C15a except that the French drain is at a depth of 15 feet bgs.	N	E1 E3	A1 A2 A3	W1	R2		R2: Materials for the French drain should come from a local source.
C15c	French Drain (20 ft bgs)	Purpose: Same as C15a. Description: Same as C15a except that the French drain is at a depth of 20 feet bgs.	N	E1 E3	A1 A2 A3	W1	R2		R2: Materials for the French drain should come from a local source.

TABLE 5-1

Descriptions of Typical Conceptual Designs and their Sustainable Elements

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Name	Description	Retained or New/ Revised[1]	USEPA Recommended Elements for Greener Cleanups					Comments
C15d	French Drain (25 ft bgs)	Purpose: Same as C15a. Description: Same as C15a except that the French drain is at a depth of 25 feet bgs.	N	E1 E3	A1 A2 A3	W1	R2		R2: Materials for the French drain should come from a local source.
C17a	Extraction Well - 20 ft deep, 6-inch-diameter pipe	Purpose: To intercept metals-laden groundwater prior to discharge into a surface water body. Description: This TCD assumes 6-inch-diameter pipe that is 20 feet deep and includes the cost of pumps, electrical wiring, and controls.	N	E1 E3	A1 A2 A3	W1	R2		W1: Care should be taken to properly install the groundwater extraction wells to minimize the impact to the groundwater.
C17b	Extraction Well - 40 ft deep, 6-inch-diameter pipe	Purpose: Same as C17a. Description: Same as C17a except 40 feet deep.	N	E1 E3	A1 A2 A3	W1	R2		W1: Care should be taken to properly install the groundwater extraction wells to minimize the impact to the groundwater.
C17c	Extraction Well - 50 ft deep, 6-inch-diameter pipe	Purpose: Same as C17a. Description: Same as C17a except this TCD assumes 10-inch diameter wells that are 50 feet deep.	N	E1 E3	A1 A2 A3	W1	R2		W1: Care should be taken to properly install the groundwater extraction wells to minimize the impact to the groundwater.
C17d	Extraction Well - 50 ft deep, 10-inch-diameter pipe	Purpose: Same as C17a. Description: Same as C17a except that this TCD assumes 10" diameter wells that are 50 feet deep.	N	E1 E3	A1 A2 A3	W1	R2		W1: Care should be taken to properly install the groundwater extraction wells to minimize the impact to the groundwater.
C17e	Extraction Well - 70 ft deep, 10-inch-diameter pipe	Purpose: Same as C17a. Description: Same as C17a except that this TCD assumes 10" diameter wells that are 70 feet deep.	N	E1 E3	A1 A2 A3	W1	R2		W1: Care should be taken to properly install the groundwater extraction wells to minimize the impact to the groundwater.
C18	SFCDR Diversion	Purpose: To temporarily divert the SFCDR. Description: SFCDR diversion is required for cutoff wall installation which transverses the SFCDR valley floor. The SFCDR diversion is assumed to include a cofferdam with a series of pumps and a conveyance pipeline to transport the SFCDR water to a downstream location.	N	E1 E3	A1 A2 A3	W1	R1	L1 L2	L2: Care should be taken to protect wildlife while diverting the SFCDR.

TABLE 5-1

Descriptions of Typical Conceptual Designs and their Sustainable Elements

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TCD Code	Name	Description	Retained or New/ Revised[1]	USEPA Recommended Elements for Greener Cleanups					Comments
C19	I-90 Crossing	Purpose: Transect Interstate 90. Description: Removal of I-90 at select locations is required for cutoff wall installation which transverses the SFCDR valley floor. Removal and replacement of I-90 is assumed to occur in phases.	N	E1 E3	A1 A2 A3		R1	L3	R1: When replacing I-90, recycled or reused materials should be considered.
C20	Check Dam	Purpose: To prevent the flow of Bunker Hill Mine water into the Reed and Russell tunnels and out of the adit openings. Description: The check dams would be constructed in the interior of the mine at the tunnel entrances to a height to retain the mine water within the mine. Materials to construct the check dams will be based on the specific water chemistry of the mine water.	N	E1 E3	A1 A2 A3	W1	R2	L1	W1: By retaining the mine water, there is prevention of contamination of clean water sources.
PIPE-1	Gravity Pipeline (6-inch)	Purpose: To convey water to the treatment plant. Description: It is assumed that the treatment plant would be located to enable conveyance by gravity flow to the extent possible. The pipeline is assumed to consist of below-grade high-density polyethylene (HDPE) pipe. PIPE-1 assumes 6-inch diameter pipe; this is assumed to include both laterals and the main.	R	E1 E3 E4	A1 A2 A3	W1	R2	L1	E4: These pipelines would be laid out so that they convey water using gravity. Therefore no electricity will be needed. L1: After covering the pipe, the area disturbed should be restored.
PIPE-2	Gravity Pipeline (12-inch)	Purpose: Same as PIPE-1. Description: Same as PIPE-1 except that PIPE-2 assumes 12-inch diameter pipe.	R	E1 E3 E4	A1 A2 A3	W1	R2	L1	E4: These pipelines would be laid out so that they convey water using gravity. Therefore no electricity will be needed. L1: After covering the pipe, the area disturbed should be restored.
PIPE-3	Gravity Pipeline (24-inch)	Purpose: Same as PIPE-1. Description: Same as PIPE-1 except that PIPE-3 assumes 24-inch diameter pipe.	R	E1 E3 E4	A1 A2 A3	W1	R2	L1	E4: These pipelines would be laid out so that they convey water using gravity. Therefore no electricity will be needed. L1: After covering the pipe, the area disturbed should be restored.

TABLE 5-1

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Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Name	Description	Retained or New/ Revised[1]	USEPA Recommended Elements for Greener Cleanups					Comments
PIPE-4	Gravity Pipeline (36-inch)	Purpose: Same as PIPE-1 though this will be used as the main along the I-90 corridor. Description: Same as PIPE-1 except that PIPE-4 assumes 36-inch diameter pipe.	N	E1 E3 E4	A1 A2 A3	W1	R2	L1	E4: These pipelines would be laid out so that they convey water using gravity. Therefore no electricity will be needed. L1: After covering the pipe, the area disturbed should be restored.
PRESSURE-PIPE-1	Pressurized Pipeline - <6-inch-diameter	Purpose: To convey water to the treatment plant. Description: It is assumed that water will be conveyed to the plant by pumping. The pipeline is assumed to consist of below-grade HDPE pipe. PRESSURE PIPE-1 includes pipes less than 6-inches in diameter; this is assumed to include both laterals and the main.	N	E1 E3	A1 A2 A3	W1	R2	L1	L1: After covering the pressure pipe, the area disturbed should be restored.
PRESSURE-PIPE-2	Pressurized Pipeline - 6- to 14-inch-diameter	Purpose: Same as PRESSURE PIPE-1. Description: Same as PRESSURE PIPE-1 except that the pipe diameters range from 6 to 14 inches.	N	E1 E3	A1 A2 A3	W1	R2	L1	L1: After covering the pressure pipe, the area disturbed should be restored.
PRESSURE-PIPE-3	Pressurized Pipeline - >14-inch-diameter	Purpose: Same as PRESSURE PIPE-1. Description: Same as PRESSURE PIPE-1 except that the pipes are 14 inches or greater in diameter.	N	E1 E3	A1 A2 A3	W1	R2	L1	L1: After covering the pressure pipe, the area disturbed should be restored.
PRESSURE-PIPE-4	Pressurized Pipeline – 3-inch-diameter, Cherry Raise	Purpose: To convey AMD back into the mine. Description: The pressure pipeline will convey water from a pump station down the Cherry Raise to the 9 level. The pipeline (3") is assumed to consist of below-grade HDPE pipe and installed within the pipe compartment of Cherry Raise.	N	E1 E3	A1 A2 A3	W1	R2	L1	L1: After covering the pressure pipe, the area disturbed should be restored.
PUMP-1	Pump Station - 0.14 MGD	Purpose: To contain and pump the collected water. Description: The pump station will contain and then pump waters designated for active treatment at the CTP. The pump station is assumed to include a wet well and stainless steel pumps. The capacity for this TCD is 0.14 MGD.	N	E1 E3 E5 E6	A1 A2 A3		R1 R2		E5: Onsite renewable energy sources should be considered to power the pumps. E6: If onsite renewable energy is not feasible, commercial renewable energy could be purchased.

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TCD Code	Name	Description	Retained or New/ Revised[1]	USEPA Recommended Elements for Greener Cleanups				Comments
PUMP-2	Pump Station - 1.4 MGD	Purpose: Same as PUMP-1. Description: Same as PUMP-1 except that the capacity is 1.4 MGD and includes a building, electrical, and mechanical controls in addition to a wet well and stainless steel pumps.	N	E1 E3 E5 E6	A1 A2 A3		R1 R2	E5: Onsite renewable energy sources should be considered to power the pumps. E6: If onsite renewable energy is not feasible, commercial renewable energy could be purchased.
PUMP-3	Pump Station - 3.9 MGD	Purpose: Same as PUMP-1. Description: Same as PUMP-2 except that the capacity is 3.9 MGD.	N	E1 E3 E5 E6	A1 A2 A3		R1 R2	E5: Onsite renewable energy sources should be considered to power the pumps. E6: If onsite renewable energy is not feasible, commercial renewable energy could be purchased.
PUMP-4	Pump Station - 6.3 MGD	Purpose: Same as PUMP-1. Description: Same as PUMP-2 except that the capacity is 6.3 MGD.	N	E1 E3 E5 E6	A1 A2 A3		R1 R2	E5: Onsite renewable energy sources should be considered to power the pumps. E6: If onsite renewable energy is not feasible, commercial renewable energy could be purchased.
PUMP-5	Pump Station - 6.5 MGD	Purpose: Same as PUMP-1. Description: Same as PUMP-2 except that the capacity is 6.5 MGD.	N	E1 E3 E5 E6	A1 A2 A3		R1 R2	E5: Onsite renewable energy sources should be considered to power the pumps. E6: If onsite renewable energy is not feasible, commercial renewable energy could be purchased.
Water Treatment TCDs								
WT01	Centralized High-Density Sludge (HDS) Treatment at Central Treatment Plant (CTP)	Purpose: To treat mining-impacted waters responsible for high metals loading to the South Fork Coeur d'Alene River (SFCDR), which are collected at Operable Unit (OU) 2/OU 3 sites and conveyed to the CTP in Kellogg, Idaho, for treatment. Description: This TCD combines HDS metals precipitation with granular media filtration, and includes necessary upgrades to the CTP.	N	E1 E3 E5 E6	A1 A2 A3	W1	R1 R2	E5: Onsite renewable energy sources should be considered to power the plant. E6: If onsite renewable energy is not feasible, commercial renewable energy could be purchased.

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TCD Code	Name	Description	Retained or New/ Revised[1]	USEPA Recommended Elements for Greener Cleanups					Comments
WT02	Onsite Semi-Passive Water Treatment Using Lime Addition and Settling Pond(s)	Purpose: To treat water onsite with modest operation and maintenance (O&M) requirements. Especially applicable for high-strength waters that are collected in a pipe or channel but not conveyed to the CTP for centralized treatment. Description: This TCD uses mechanical (non-electrical) addition of dry lime based on flow and sedimentation of metal hydroxide solids in settling ponds.	N	E1 E3 E4	A1 A2 A3	W1	R1 R2	L2	E4: This semi-passive treatment option does not rely on electricity to distribute the lime. It relies on the flow of the water. L2: This TCD includes a bird deterrent.
WT03	Onsite Semi-Passive Water Treatment Using Sulfate-Reducing Bioreactor (SRB) System	Purpose: To treat water onsite with low O&M requirements. Especially applicable for low- to moderate-strength waters that are collected in a pipe or channel but not conveyed to the CTP for centralized treatment. Description: This TCD consists of SRB vessels for precipitation of metal-sulfide solids, and a passive aeration channel, an aerobic polishing pond, and a wetland for removal of byproducts and polishing.	N	E1 E3 E4	A1 A2 A3	W1	R1 R2	L2	E2: The stable waste would be obtained from a local source. E4: This semi-passive treatment option does not rely on electricity. It relies on the flow of the water. L2: This TCD includes a bird deterrent.
WT04a	*In Situ* Semi-Passive Groundwater Treatment Using Sulfate-Reducing Permeable Reactive Barrier (SR-PRB) (10 ft deep, 100 ft long, 7.5 ft wide)	Purpose: To treat groundwater emanating from a metals-contaminated site prior to discharging to surface water. Description: A permeable reactive barrier, consisting of a trench filled with organic media, is constructed perpendicular to groundwater flow to intercept and treat groundwater. Treatment is effected by biological sulfate reduction and precipitation of metal-sulfide solids. This is designed for a 10 foot deep barrier.	N	E1 E2 E3 E4	A1 A2 A3	W1	R1 R2	L2	E2: The stable waste would be obtained from a local source. E4: This semi-passive treatment option does not rely on electricity. It relies on the flow of the water. L2: This TCD includes a bird deterrent.
WT04b	*In Situ* Semi-Passive Groundwater Treatment Using Sulfate-Reducing Permeable Reactive Barrier (SR-PRB) (40 ft deep, 100 ft long, 7.5 ft wide)	Purpose: Same as WT04a. Description: Same as WT04a, except this TCD is designed for a 40' deep barrier.	N	E1 E2 E3 E4	A1 A2 A3	W1	R1 R2	L2	E2: The stable waste would be obtained from a local source. E4: This semi-passive treatment option does not rely on electricity. It relies on the flow of the water. L2: This TCD includes a bird deterrent.

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TCD Code	Name	Description	Retained or New/ Revised[1]	USEPA Recommended Elements for Greener Cleanups					Comments
Human Health TCDs									
HH-2	Upland Waste Pile Soil Cover	Purpose: To decrease human exposure to mining-related waste materials at waste piles. Description: The cover would be similar to that used in C02a. Human health concerns at the majority of waste piles would be addressed by capping and cover systems that would eliminate the direct exposure pathway. To reduce direct human exposure at waste piles that are not capped or covered for ecological protection, selected waste piles would be provided with a soil cover. Specific waste piles where covers would be implemented have not been identified. For the purpose of feasibility-level analysis, it was assumed that covers would be provided at 15 waste piles for Alternative 3+ and 0 waste piles for Alternative 4+.	R	E1 E2 E3	A1 A2 A3	W2	R1 R2	L1	L1: The vegetative cover should consist of native species.
HH-3	Millsite Decontamination	Purpose: To decrease human exposure to mining-related waste materials at millsites. Description: The hazardous substances would be disposed of in accordance with applicable regulations. Human health exposure at mill sites would be minimized using access restrictions (fences) and decontamination of structures and material at 5 sites for Alternative 3+ and Alternative 4+.	R	E1 E3	A1 A2 A3		R1 R2	L3	L3: Decontaminating the millsite could reduce the areas requiring activity or land use restrictions.
HH-4	Millsite Demolition/ Disposal	Purpose: To decrease human exposure to mining-related waste materials at millsites. Description: Buildings and structures would be removed, including the foundations, and underlying contaminated soils removed. Nonhazardous construction materials would be capped onsite, disposed of in a repository with other mining related waste, or disposed of in a landfill. The hazardous substances would be disposed of in accordance with applicable regulations. Human health exposure at five mill sites would be minimized using demolition and disposal of affected structures and material at 5 mill sites for Alternative 3+ and 4+.	R	E1 E3	A1 A2 A3		R1 R2	L3	L3: Decontaminating the millsite could reduce the areas requiring activity or land use restrictions.

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TCD Code	Name	Description	Retained or New/ Revised[1]	USEPA Recommended Elements for Greener Cleanups					Comments
Stream and Riparian Cleanup Action TCDs									
CD-AVG	Current Deflectors	Purpose: To alter stream flows, directing stream energy away from erodible areas, or to prevent channel migration from outflanking shoreline stabilization structures. Description: Sufficient numbers of current deflectors, properly spaced and oriented, can slow drainage rates and increase off-channel water storage, reducing flow energy in downstream areas and limiting flood damage. These structures will also serve to stabilize sediment and bedload transport. Current deflectors can also be configured to trap migrating fine sediments. Current deflectors include several different types of structures constructed of wood, rock, or other materials attached to a bank or in midchannel which redirect stream energy away from erodible areas. This TCD takes the average cost of using groynes (spur dikes, spurs, barbs), weirs, turning rocks, and tiebacks.	R	E1 E3	A2 A3	W1 W2	R2	L1 L2	L1: Native materials should be considered for creating the deflectors. L2: Protections should be put in place for wildlife during the construction of the deflectors.
CD-SED	Current Deflectors, Sediment Traps	Purpose: Same as CD-AVG. Sediment traps are added to reduce sediment in areas where it impinges on the ecosystem. Description: The current deflectors are the same as CD-AVG. The sediment traps may be pools that are excavated to allow sediment to gather in those areas.	R	E1 E3	A2 A3	W1 W2	R2	L1 L2	L1: Native materials should be considered for creating the deflectors. L2: Protections should be put in place for wildlife during the construction of the deflectors.
VBS-AVG	Vegetative Bank Stabilization	Purpose: To introduce a self-maintaining mechanism for improving bank stability by planting native species adapted to stream banks. Description: Stream banks are stabilized by root growth and above-ground vegetation that reduces stream energy. Bank stabilization using vegetative techniques that include the placement/planting of living and organic materials on actively eroding stream banks. These materials may include seeded ground cover, live cuttings, or rooted plant stock, and bundles or mats of live native plant species well adapted to riparian and streambank conditions. This TCD takes the average cost of using brush mattresses, brush layers, live cuttings, and rooted stock.	R	E1 E3	A2 A3	W1 W2	R2	L1	L1: Native species should be planted to improve the bank stability.

TABLE 5-1

Descriptions of Typical Conceptual Designs and their Sustainable Elements

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Name	Description	Retained or New/ Revised[1]	USEPA Recommended Elements for Greener Cleanups					Comments
BSBR-AVG	Bioengineered Revetments	Purpose: To create a durable form of bank protection that provides riparian and instream habitat features. Description: Properly designed bioengineered revetments can be used in higher-energy areas where protection of controlled source areas in the floodplain is desired. Bioengineered revetments integrate several bank stabilization materials, including traditional riprap, large woody debris (LWD, e.g., large logs and rootwads), and live plantings. This TCD takes the average cost of using vegetated geogrids, live cribwalls, LWD revetments, and integrated structures.	R	E1 E3	A2 A3	W1 W2	R2	L1	L1: Native species or materials should be utilized.
FP/RP-AVG	Floodplain and Riparian Replanting	Purpose: To provide site stabilization. Description: Bioengineering techniques for riparian zone rehabilitation will generally include replanting of riparian vegetation where possible, including a diversity of native grasses, shrubs, and trees, and additional structural elements (e.g., nurse logs, snags) to provide additional site stabilization. In some cases this may require site preparation activities not discussed here, including soil removal and replacement, road retirement, and soil amendments. These activities are expected to be conducted in conjunction with excavation and removal of contaminated materials from the floodplain, but will also be used to stabilize areas with high erosion potential as appropriate. This TCD takes the average cost of using a less intensive "dig and drop" planting of seedlings and rooted stock and a more intensive site preparation including digging of planting trenches and other stabilizing features, and stabilization of rooted stock after planting.	R	E1 E3	A2 A3	W1 W2	R2	L1	L1: Native species or materials should be utilized.
OFFCH-AVG	Off-Channel Hydrologic Features	Purpose: To help to moderate and stabilize the hydrology of degraded stream systems. Description: This TCD takes the average cost of using surface water-fed side channels, groundwater-fed side channels, and off-channel ponds and wetlands.	R	E1 E3	A2 A3	W1 W2	R2	L1	L1: Native materials should be used in developing the hydrologic features. L2: Care should be taken to protect wildlife.

TABLE 5-1

Descriptions of Typical Conceptual Designs and their Sustainable Elements

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Name	Description	Retained or New/ Revised[1]	USEPA Recommended Elements for Greener Cleanups					Comments
CH REAL-1	Channel Realignment	Purpose: To reshape the stream channel to a more naturally stable condition and to recreate in-channel hydrologic features, particularly increased pool density and volume. Description: Channel stability in this context refers to the hydrologic and bedload transport conditions.	R	E1 E3	A2 A3	W1 W2	R2	L1	L1: Native materials should be used in developing the hydrologic features. L2: Care should be taken to protect wildlife.

Notes:

[1] R = Retained virtually intact from 2001 Feasibility Study; N = New or substantially revised.

Sustainability Legend

Minimize total **ENERGY** use and maximize use of renewable energy.

E1: Reduce idling of trucks and equipment
E2: Use local source areas for procuring fill.
E3: Use local sources for materials/equipment.
E4: Minimize energy consumption.
E5: Power cleanup equipment through onsite renewable energy sources.
E6: Purchase commercial energy from renewable resources.

Minimize **AIR** pollutants and greenhouse gas emissions.

A1: Onsite dust and noise control.
A2: Use clean fuel incentives in contract for trucks and heavy equipment
A3: Maximize use of equipment and vehicles equipped with advanced emission controls.

Minimize **WATER** use and impacts to water resources

W1: Reduce impact to water source.
W2: Minimize water use for revegetation.
W3: Minimize water use.

Reduce, reuse, and recycle material and waste

R1: Minimize waste generation
R2: Use recycled products and local materials

Protect **Land** and Ecosystems

L1: Use native species to support habitat.
L2: Put protections in place for wildlife.
L3: Minimize areas requiring activity or use limitations (e.g. destroy or remove contaminant sources)

Project-Wide

Conduct electronic document transactions, whenever possible. Follow USEPA guidance.

Develop renewable energy sources to serve electrical demands. This may include solar photovoltaic to power instrumentation and potentially wind for pumping and other needs.

TABLE 5-2
Summary of Estimated Costs for Typical Conceptual Designs
Feasibility Study Report, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Name	Unit	2009 Direct Capital Unit Cost[1] ($)	2009 Indirect Capital Unit Cost[2] (%)	Present Value of 30 Years of Operations and Maintenance Costs[2] (%)
Source Control TCDs					
C01	Excavation (dry)	CY	4.28	70	0
C01b	Excavation (60% dry/40% wet)	CY	13.49	70	0
C02a	Regrade/Consolidate/Revegetate: Lower Part of Pile in 100-Year Floodplain	AC	84,300.00	70	13
C02b	Regrade/Consolidate/Revegetate: Waste Rock Pile in Stream Valley	AC	167,000.00	70	13
C02c	Regrade/Consolidate/Revegetate: Stabilize Using Erosion Protection	AC	14,900	70	23
C03	Low-Permeability Cap	AC	225,000.00	70	12
C04	Low-Permeability Cap with Seepage Collection	AC	254,000.00	70	23
C05	Low-Permeability Cap with Erosion Protection	AC	252,000.00	70	23
C06	Waste Consolidation Area with Erosion Protection	CY	15.70	70	23
C07	Waste Consolidation Area Above Flood Level	CY	14.70	70	22
C08a	Repository, 1 million cy	CY	17.70	70	14
C09	Impoundment Closure	AC	246,000.00	70	20
HAUL-2	Haul to Repository	CY-MI	1.10	70	0
Water Collection, Conveyance, and Management TCDs					
C10	Adit Drainage Collection	LS	9,680.00	70	18
C11a	Hydraulic Isolation Using Slurry Wall (no drain): 15 ft deep	LF	196.00	70	0
C11b	Hydraulic Isolation Using Slurry Wall (no drain): 20 ft deep	LF	261.00	70	0
C11c	Hydraulic Isolation Using Slurry Wall (no drain): 30 ft deep	LF	391.00	70	0
C11d	Hydraulic Isolation Using Slurry Wall (no drain): 40 ft deep	LF	522.00	70	0
C11e	Hydraulic Isolation Using Slurry Wall (no drain): 45 ft deep	LF	595.00	70	0

TABLE 5-2
Summary of Estimated Costs for Typical Conceptual Designs
Feasibility Study Report, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Name	Unit	2009 Direct Capital Unit Cost[1] ($)	2009 Indirect Capital Unit Cost[2] (%)	Present Value of 30 Years of Operations and Maintenance Costs[2] (%)
C11f	Hydraulic Isolation Using Slurry Wall (no drain): 50 ft deep	LF	652.00	70	0
C11g	Hydraulic Isolation Using Slurry Wall (no drain, soil cement): 50 ft deep	LF	4,170.00	70	0
C11h	Hydraulic Isolation Using Slurry Wall (w/drain): 15 ft deep	LF	1,120.00	70	2
C11i	Hydraulic Isolation Using Slurry Wall (w/drain): 20 ft deep	LF	1,210.00	70	2
C11j	Hydraulic Isolation Using Slurry Wall (w/drain): 30 ft deep	LF	1,590.00	70	2
C14a	Stream Lining (10 ft wide)	LF	318.00	70	4
C14b	Stream Lining (20 ft wide)	LF	505.00	70	4
C14c	Stream Lining (100 ft wide)	LF	2,970.00	70	3
C15a	French Drain (10 ft below ground surface [bgs])	LF	545.00	70	2
C15b	French Drain (15 ft bgs)	LF	907.00	70	2
C15c	French Drain (20 ft bgs)	LF	949.00	70	2
C15d	French Drain (25 ft bgs)	LF	1,210.00	70	2
C17a	Extraction Well - 20 ft deep, 6-inch-diameter pipe	EA	65,700.00	70	100
C17b	Extraction Well - 40 ft deep, 6-inch-diameter pipe	EA	68,600.00	70	100
C17c	Extraction Well - 50 ft deep, 6-inch-diameter pipe	EA	72,900.00	70	100
C17d	Extraction Well - 50 ft deep, 10-inch-diameter pipe	EA	80,400.00	70	100
C17e	Extraction Well - 70 ft deep, 10-inch-diameter pipe	EA	83,300.00	70	100
C18	SFCDR Diversion	EA	882,000.00	70	0
C19	I-90 Crossing	EA	276,000.00	70	0
C20	Check Dam	LS	47,900.00	70	0
PIPE-1	Gravity Pipeline (6-inch)	LF	58.70	70	8
PIPE-2	Gravity Pipeline (12-inch)	LF	86.20	70	8

TABLE 5-2
Summary of Estimated Costs for Typical Conceptual Designs
Feasibility Study Report, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Name	Unit	2009 Direct Capital Unit Cost[1] ($)	2009 Indirect Capital Unit Cost[2] (%)	Present Value of 30 Years of Operations and Maintenance Costs[2] (%)
PIPE-3	Gravity Pipeline (24-inch)	LF	139.00	70	8
PIPE-4	Gravity Pipeline (36-inch)	LF	180.00	70	8
PRESSURE-PIPE-1	Pressurized Pipeline - <6-inch-diameter	LF	44.10	70	20
PRESSURE-PIPE-2	Pressurized Pipeline - 6- to 14-inch-diameter	LF	91.40	70	20
PRESSURE-PIPE-3	Pressurized Pipeline - >14-inch-diameter	LF	180.00	70	20
PRESSURE-PIPE-4	Pressurized Pipeline – 3-inch-diameter, Cherry Raise	LF	155.00	70	20
PUMP-1	Pump Station - 0.14 MGD	EA	29,300.00	70	100
PUMP-2	Pump Station - 1.4 MGD	EA	959,000.00	70	100
PUMP-3	Pump Station - 3.9 MGD	EA	1,025,000.00	70	100
PUMP-4	Pump Station - 6.3 MGD	EA	1,188,000.00	70	100
PUMP-5	Pump Station - 6.5 MGD	EA	1,208,000.00	70	100
Water Treatment TCDs					
WT01[3]	Centralized High-Density Sludge (HDS) Treatment at Central Treatment Plant (CTP)	GPM	y = 672	107	Y = 1,019
WT02[4]	Onsite Semi-Passive Water Treatment Using Lime Addition and Settling Pond(s)	GPM	y = 2,613x + 258,722	70	y = (4,254.9x + 997,357) / (2,613x + 258,722)
WT03[4]	Onsite Semi-Passive Water Treatment Using Sulfate-Reducing Bioreactor (SRB) System	GPM	y = 6,482.4x + 132,414	70	y = (3,012.9x + 526,116) / (6,482.4x + 132,414)
WT04a	*In Situ* Semi-Passive Groundwater Treatment Using Sulfate-Reducing Permeable Reactive Barrier (SR-PRB) (10 ft deep, 100 ft long, 7.5 ft wide)	EA	19,500.00	70	1,993
WT04b	*In Situ* Semi-Passive Groundwater Treatment Using Sulfate-Reducing Permeable Reactive Barrier (SR-PRB) (40 ft deep, 100 ft long, 7.5 ft wide)	EA	118,000.00	70	480

TABLE 5-2
Summary of Estimated Costs for Typical Conceptual Designs
Feasibility Study Report, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Name	Unit	2009 Direct Capital Unit Cost[1] ($)	2009 Indirect Capital Unit Cost[2] (%)	Present Value of 30 Years of Operations and Maintenance Costs[2] (%)
Human Health TCDs					
HH-2	Upland Waste Pile Soil Cover	AC	58,400.00	70	13
HH-3	Millsite Decontamination	LF	136,000.00	70	13
HH-4	Millsite Demolition/Disposal	CY	169.00	70	13
Stream and Riparian Cleanup Action TCDs					
CD-AVG	Current Deflectors	EA	2,060.00	70	30
CD-SED	Current Deflectors, Sediment Traps	EA	1,870.00	70	600
VBS-AVG	Vegetative Bank Stabilization	LF	52.00	70	30
BSBR-AVG	Bioengineered Revetments	LF	122.00	70	30
FP/RP-AVG	Floodplain and Riparian Replanting	SF	1.34	70	18
OFFCH-AVG	Off-Channel Hydrologic Features	SY	42.70	70	18
CH REAL-1	Channel Realignment	SY	42.20	70	17

Notes:

[1] Appendix D provides detailed information about the TCD unit costs.

[2] As a percentage of the 2009 Direct Capital Unit Cost.

[3] Cost equations valid for flow rates between 2,000 and 20,000 GPM.

[4] Cost equations valid for flow rates between 5 and 1,000 GPM.

Abbreviations:

AC = acre; CY = cubic yard; CY-MI = cubic yard–mile;

EA = each; GPM = gallons per minute; LF = linear foot; LS = lump sum; SF = square foot; SY = square yard

NOTE: The above costs are presented rounded to three significant figures.

NOTE: The above cost opinion is a Feasibility-Study-level estimate with a nominal accuracy of –30 percent to +50 percent (–30/+50%).

NOTE: The above cost opinion is in 2009 dollars and does not include future escalation. The order-of-magnitude cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, the final project scope, the final project schedule, and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

TABLE 5-3
Water Treatment Options Screening
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Process Description	Reference(s)	Screening Comments	Effectiveness	Implementability	Relative Cost	Screening Decision* (Score)
			Active Treatment				
TRMT-1	*HDS with Media Filtration* [Centralized active water treatment at a new wastewater treatment plant (WWTP) at Pinehurst]	1	• Well demonstrated for treating mine water. • Centralized treatment offers potential efficiency in terms of capital and operations and maintenance (O&M) costs. • More efficiency would be provided by centralized treatment at the existing Bunker Hill Central Treatment Plant (CTP). • Relatively high capital and O&M costs compared to centralized treatment at CTP.	●	◑	○	NR (1.5)
WT01	*Centralized High-Density Sludge (HDS) Treatment at Central Treatment Plant (CTP)* [Centralized active water treatment at the existing CTP at Kellogg, Idaho]	4,6, 8	• Well demonstrated for treating mine water (CTP has treated Bunker Hill mine water for ~35 years). • Demonstrated effective for treating mine water combined with Canyon Creek groundwater (Ref. 6). • Treatment of Upper Basin water is implementable with only minor changes to CTP operations. • Sludge disposal facility is available adjacent to CTP. • Relatively low incremental O&M costs. • Would require new pipeline to CTP. • Would require upgrades to CTP for media filtration, new reactors, and increased hydraulic capacity.	●	●	◑	R (2.5)
NA	Onsite active water treatment using HDS with media filtration	4,6, 8	• Well demonstrated for treating mine water. • Demonstrated effective for treating Canyon Creek groundwater (Ref. 6). • Relatively high capital and O&M costs compared to centralized treatment. • Would require repository for sludge.	●	◑	○	NR (1.5)

TABLE 5-3
Water Treatment Options Screening
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Process Description	Reference(s)	Screening Comments	Effectiveness	Implementability	Relative Cost	Screening Decision* (Score)
NA	Onsite active water treatment using simple lime addition and infiltration/settling ponds ("lime lagoon system")	3,4, 7	• Well demonstrated for treating mine water. • Unconditioned solids will settle slowly, requiring large settling ponds (high land requirement) and/or polymer to increase settling rates (higher O&M requirements). • Infiltration will likely become restricted by sludge blinding, resulting in most of the discharge via pond overflow. • Large volumes of dilute sludge are produced. • Would require repository for sludge. • Less routine O&M attention than an onsite HDS plant, but probably ~10 times more sludge volume and associated sludge management/disposal cost.	◑	◑	◑	NR (1.5)
			Semi-Passive and *In Situ* Treatment				
WT02	*Onsite Semi-Passive Water Treatment Using Lime Addition and Settling Pond(s)*		• Similar process to onsite active water treatment using simple lime addition and infiltration/settling ponds (see above), except uses mechanical (i.e., non-electrical) addition of dry lime based on flow (e.g., Aquafix equipment), and overflow discharge of settling ponds (no reliance on infiltration). • Well demonstrated for treating mine water. • Control of treatment pH is not precise. • Solids will settle slowly, requiring relatively large settling ponds. • Large volumes of dilute sludge are produced. • Would require repository for sludge. • Relatively low O&M – principally maintaining lime supply, periodic O&M visits, and infrequent sludge removal from settling ponds. • Applicable for remote locations with poor access and no electrical power.	◑	●	◑	R (2.0)
PT-1	*Permeable Reactive Barriers using Apatite or Other Mixture*	1,4	• Pilot testing of apatite systems has shown that this process is subject to operational problems related to clogging/fouling/gelling (of apatite), resulting in loss of permeability.	○	◑	●	NR (1.5)

TABLE 5-3
Water Treatment Options Screening
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Process Description	Reference(s)	Screening Comments	Effectiveness	Implementability	Relative Cost	Screening Decision* (Score)
	[Using an abiotic reactive media bed (apatite or other)]		• pH adjustment would be required for acidic waters. • Undesirable byproducts in apatite system effluent potentially include nutrients (phosphorus), biological oxygen demand (BOD), odors, dissolved Fe, dissolved Mn, sulfide, arsenic.				
WT03	*Onsite Semi-Passive Water Treatment Using Sulfate-Reducing Bioreactor (SRB) System*	1,4, 6,8	• Demonstrated effective for treating Canyon Creek water (Ref. 6) and other adit discharges in the area (e.g., Bureau of Land Management [BLM] systems). • Undesirable byproducts in SRB effluent potentially include nutrients, BOD, odors, dissolved Fe, dissolved Mn, sulfide, arsenic. • Aerobic polishing pond/wetland likely required for removal of byproducts and polishing of solids. • Low O&M requirements. • High land requirements. • O&M costs depend on frequency of media change-out and residuals disposal. • Applicable for remote locations with poor access and no electrical power.	◑	●	●	R (2.5)
PT-2	*Permeable Reactive Barriers using Apatite or Other Mixture*	1,4	• Comments similar to those for onsite semi-passive water treatment using an abiotic reactive media bed (see above). • Loss of permeability in a PRB application could cause water to flow around (bypass) the treatment system. • Should assume that spent media would eventually be removed and disposed of to avoid the chance of metals re-mobilization. • O&M costs depend on frequency of media change-out and residuals disposal. • Applicable for remote locations with poor access and no electrical power.	○	◑	●	NR (1.5)
WT04	*In Situ Semi-Passive Groundwater Treatment Using Sulfate-Reducing Permeable Reactive Barrier (SR-*	1,4	• Comments similar to those for onsite semi-passive water treatment using a biological reactive media bed (see above). • In a sulfate-reducing-PRB application, cannot easily implement post-treatment for	◑	●	●	R (2.5)

TABLE 5-3
Water Treatment Options Screening
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Process Description	Reference(s)	Screening Comments	Effectiveness	Implementability	Relative Cost	Screening Decision* (Score)
	PRB) [*In situ* water treatment using a biological (sulfate-reducing) PRB]		byproduct removal (analogous to that provided by an aerobic polishing pond/wetland in an *ex situ* SRB system). • Subject to clogging/fouling resulting in loss of permeability. • Should assume that spent media would eventually be removed and disposed of to avoid the chance of metals re-mobilization. • O&M costs depend on frequency of media change-out and residuals disposal. • Applicable for remote locations with poor access and no electrical power. • Not applicable for sites with excessively high groundwater flow rates (because PRB width requirement becomes too great).				
PT-5	*In Situ Treatment of Soil and Sediment (Abiotic)* [Using an inorganic reagent to promote metals precipitation (phosphate, alkaline, or other, applied by injection or soil mixing)]	1	• Comments similar to those for *in situ* water treatment using an abiotic permeable reactive barrier (see above). • Loss of permeability is more likely for this type of application than for a PRB application, because PRBs can incorporate highly permeable inert media to help maintain porous structure. • Can be implemented for area treatment or to create a treatment barrier. • Implementation costs would be modest for injection approach but high for soil mixing approach. Solid products such as apatite cannot be effectively applied via injection. • This type of system may require system maintenance (e.g., periodic reagent dosing) in perpetuity to prevent dissolution and re-mobilization of precipitated metals (e.g., due to flow of acidic groundwater through treatment area).	○	◑	◑	NR (1.0)
PT-6	*In Situ Treatment of Soil and Sediment (Biochemical)* [*In situ* water treatment using an organic substrate to promote sulfate reduction (e.g., emulsified vegetable oil, molasses, etc., applied by soil mixing or injection)]	4,5	• Comments similar to those for *in situ* water treatment using a biological permeable reactive barrier (see above). • Loss of permeability is more likely for this type of application than for a PRB application, because PRBs can incorporate highly permeable inert media to help maintain porous structure. • Can be implemented for area treatment or to create a treatment barrier.	◑	◑	◑	NR (1.5)

TABLE 5-3
Water Treatment Options Screening
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Process Description	Reference(s)	Screening Comments	Effectiveness	Implementability	Relative Cost	Screening Decision* (Score)
			• Implementation costs would be modest for injection approach but high for soil mixing approach. • This type of system may require system maintenance (e.g., periodic reagent dosing) in perpetuity to prevent dissolution and re-mobilization of precipitated metals (e.g., due to flow of aerobic/oxidizing groundwater through treatment area).				

Notes:

● Good ◑ Average ○ Poor

*R = Retained; NR = Not retained

NA = Not applicable as these were not discussed in the 2001 FS Report (Ref. 1) and therefore did not receive TCD codes.

References:

1 U.S. Environmental Protection Agency (USEPA). October 2001. *Final (Revision 2) Feasibility Study Report for the Coeur D'Alene Basin Remedial Investigation/Feasibility Study, Part 3, Ecological Alternatives*.

2 URS. August 19, 2003. "Canyon Creek Treatability Study – Summary of Current Thinking". Memorandum from Chuck Vita/URS to Bill Adams/USEPA Region 10.

3 Rust, W.C. August 5, 2003. "Canyon Creek Water Treatment". Memorandum to the Water Treatment Project Focus Team.

4 CH2M HILL. April 1, 2005. "Canyon Creek Water Treatment Technology Evaluation". Technical Memorandum from G.T. Hickman, P. Lawson, and R.S. Maco/CH2M HILL to USEPA Region 10.

5 Arcadis. April 18, 2005. "Key Terms Of Consent Decree And Implementation Agreement For Bunker Hill Superfund Site OU2 Mine Water ROD (Global Settlement)". Proposal to USEPA Region 10.

6 CH2M HILL. October 2006. *Canyon Creek Phase Ii Treatability Study, Draft Report*. Prepared for U.S. EPA Region 10.

7 Pioneer Technical Services. October 4, 2006. "Canyon Creek Pilot-Scale Lime Lagoon Treatment System". Presentation to the Water Treatment Project Focus Team.

8 CH2M HILL. August 2007. *Draft – Remedial Component Screening for the Woodland Park Area of Canyon Creek.* Prepared for USEPA Region 10.

TABLE 6-1

Typical Conceptual Designs Applied to Tailings and Tailings-Impacted Floodplain Sediments in Alternatives 3+ and 4+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	TCD Name	Applicability in Alternatives 3+ and 4+
Impounded and Unimpounded Tailings		
C09	Impoundment Closure	Alternative 3+: Impounded tailings *not* constructed on tailings-impacted sediments. Alternative 4+: TCD not used in Alternative 4+.
C09 + C11	Impoundment Closure Hydraulic Isolation Using Slurry Wall	Alternative 3+: Impounded tailings constructed on tailings-impacted sediments. Alternative 4+: Only for impounded tailings constructed on tailings-impacted sediments at sites considered operational or active in the 2001 FS Report.
C01 + C07	Excavation Waste Consolidation Area	Alternative 3+: Unimpounded tailings if a local repository is planned for other waste types at the site. Alternative 4+: TCDs not used in Alternative 4+.
C01 + C08a	Excavation Repository	Alternative 3+: Unimpounded tailings if a local repository is *not* planned for other waste types at the site. Alternative 4+: All impounded and unimpounded tailings except at sites considered operational or active.
Tailings-Impacted Floodplain Sediments		
C01b + C07	Excavation Waste Consolidation Area	Alternative 3+: Suitable for tailings-impacted floodplain sediments if a local repository is planned for other waste types at the site. Alternative 4+: TCDs not used in Alternative 4+.
C01b + C08a	Excavation Repository	Alternative 3+: Suitable for tailings-impacted floodplain sediments if a local repository is *not* planned for other waste types at the site. Alternative 4+: Suitable for tailings-impacted floodplain sediments.
C14 + C15	Stream Lining French Drain	Alternatives 3+ and 4+: Provided for Sites located along the SFCDR between Wallace and Elizabeth Park based on an updated analysis using the numerical groundwater model for the SFCDR Watershed.
C11 + Water Treatment	Hydraulic Isolation Using Slurry Wall Water Treatment	Alternatives 3+ and 4+: Provided for discrete areas where contaminated sediments are present beneath existing structures and inaccessible for removal.

TABLE 6-2

Typical Conceptual Designs Applied to Waste Rock in Alternatives 3+ and 4+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	TCD Name	Applicability in Alternatives 3+ and 4+
C01	Excavation	Alternative 3+: Waste rock piles that are probable load sources. Used in conjunction with C03, C04, C07, and C08a. Alternative 4+: Waste rock piles that are less likely to be load sources. Used in conjunction with C07 and C08a.
C02	Regrade/Consolidate/Revegetate	Alternative 3+: Waste rock piles that are probable load sources. Alternative 4+: Upland waste rock piles that are less likely to be load sources.
C03	Low-Permeability Cap	Alternative 3+: Waste rock, and waste rock/tailings mixtures likely to be smaller sources of metals. Used individually and in conjunction with C01 and C07. (In the case where only C01+C03 are combined, C01 serves the purpose of regrading and consolidating a portion of the waste onsite and C03 provides a more protective cover than revegetation.) Alternative 4+: Not used in Alternative 4+.
C04	Low-Permeability Cap with Seepage Collection	Alternative 3+: Sites where groundwater potentially would flow through and leach waste materials. Used individually and in conjunction with C01. Alternative 4+: Not used in Alternative 4+.
C05	Low-Permeability Cap with Erosion Protection	Alternatives 3+ and 4+: Typically not used in Alternative 3+ or 4+.
C07	Waste Consolidation Area	Alternative 3+: Waste rock/tailings mixtures. Used in conjunction with C01. Alternative 4+: Waste rock with erosion or leaching potential. Used in conjunction with C01.
C08a	Repository	Alternative 3+: Waste rock with erosion or leaching potential. Used in conjunction with C01. Alternative 4+: Waste rock with erosion or leaching potential. Used in conjunction with C01.

TABLE 6-3

Screening Criteria[1] for Water Treatment Screening Step 1: Treatment Versus No Treatment

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Estimated Average Flow Rate (cfs)	Concentration of COCs[2]	Result[4]
Less than 0.1	No Data	Professional Judgement/Site-Specific Factors Used to Make Determination
	Less than AWQC[3]	No Treatment under Either Alternative
	Greater than AWQC[3] but less than 10 x AWQC[3]	Treatment under Alternative 4+ Only
	Greater than 10 x AWQC[3]	Treatment under Alternatives 3+ and 4+
No Data, Greater than, or Equal to 0.1	No Data	Professional Judgement/Site-Specific Factors Used to Make Determination
	Less than or equal to AWQC[3]	No Treatment under Either Alternative
	Greater than AWQC[3]	Treatment under Alternatives 3+ and 4+

Notes:

1. The above criteria are based on the criteria used in the 2001 FS. The only exception being that SFCDR-specific AWQC are used rather than the Statewide AWQC that were in effect at the time of the 2001 FS.

2. COCs include Arsenic, Cadmium, Copper, Lead, Mercury, Zinc

3. Chronic AWQC, based on 30 mg/L hardness as $CaCO_3$ as shown in Table 4-10. Values for COCs (dissolved) are as follows:

   Arsenic = 150 μg/L
   Cadmium = 0.42 μg/L
   Copper = 4.1 μg/L
   Lead = 9.1 μg/L
   Zinc = 88 μg/L

4. There is an exception to this general methodology for seeps. It is assumed that seeps that exist adjacent to areas slated for source-control remedies such as capping, surface water diversion, or groundwater diversion would be eliminated as a result of these remedial actions, and would therefore not require treatment.

AWQC = Ambient Water Quality Criteria
COCs = Contaminants of Concern
cfs = cubic feet per second
mg/L = milligrams per liter
ug/L = microgram(s) per liter

TABLE 6-4
Water Treatment Screening Results, Alternatives 3+ and 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

							Alternative 3+			Alternative 4+		
Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Average Discharge Rate (CFS)	Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Step 1: Treatment vs. No Treatment	Notes from 2001 or other sources	Step 2: TCD Selection	Step 1: Treatment vs. No Treatment	Notes from 2001 or other sources	Step 2: TCD Selection
SEGNM01	BUR051	SUNSET MINE	Adit drainage	No Data	No Data	28,400	Treatment	N/A	WT02	Treatment	N/A	WT02
SEGNM01	BUR053	INTERSTATE-CALLAHAN MINE/ROCK DUMPS	Adit drainage	0.072	0.14	59.76	No Treatment	N/A	No Action	No Treatment	Zn conc (59.76) >SL in 2001 (43), but <SL in 2009 (88)	No Action
SEGNM01	BUR053	INTERSTATE-CALLAHAN MINE/ROCK DUMPS	Seep	1.8	4.27	182	No Treatment	Meets SL Criteria for Treatment, but received No Treatment based on 2001 Seep Approach (Note[a]).	No Action	No Treatment	Meets SL Criteria for Treatment, but received No Treatment based on 2001 Seep Approach (Note[a]).	No Action
SEGNM02	BUR054	REX NO.2 / SIXTEEN-TO-ONE MINE	Adit drainage	0.017	0.027	1,995	Treatment	N/A	WT03	Treatment	N/A	WT03
SEGNM02	BUR054	REX NO.2 / SIXTEEN-TO-ONE MINE	Seep	0.03	0.06	11,400	No Treatment	Meets SL Criteria for Treatment, but received No Treatment based on 2001 Seep Approach (Note[a]).	No Action	No Treatment	Meets SL Criteria for Treatment, but received No Treatment based on 2001 Seep Approach (Note[a]).	No Action
SEGNM02	BUR055	INTERSTATE MILLSITE	Seep	0.0043	0.007	350,000	No Treatment	Meets SL Criteria for Treatment, but received No Treatment based on 2001 Seep Approach (Note[a]).	No Action	No Treatment	Meets SL Criteria for Treatment, but received No Treatment based on 2001 Seep Approach (Note[a]).	No Action
SEGNM02	BUR056	TAMARACK ROCK DUMPS	Adit drainage	No Data	No Data	No Data	No Treatment	N/A	No Action	No Treatment	N/A	No Action
SEGNM02	BUR058	TAMARACK NO.3	Adit drainage	No Data	No Data	No Data	Treatment	No data	WT02	Treatment	No data	WT02
SEGCC04	BUR067	TAMARACK NO.7 (1200 LEVEL)	Adit drainage	1.58	3.15	1,437	Treatment	N/A	WT01	Treatment	N/A	WT01
SEGCC04	BUR073	STANDARD-MAMMOTH CAMPBELL ADIT	Adit drainage	No Data	No Data	No Data	No Treatment	N/A	No Action	No Treatment	N/A	No Action
SEGCC04	BUR076	SHERMAN 1500 LEVEL	Adit drainage	No Data	No Data	No Data	Not included in Alternative 3+			No Treatment	N/A	No Action
SEGNM01	BUR081	GUELPH MINE	Adit drainage	No Data	No Data	No Data	Not included in Alternative 3+			Treatment	Observed discharge (Ridolfi 1998), no data	WT02
SEGCC03	BUR085	HERCULES NO. 1 & ASSOCIATED PITS	Adit drainage	No Data	No Data	No Data	Not included in Alternative 3+			Treatment	Suspected but not documented; no data (producing mine)	WT02
SEGCC03	BUR087	HERCULES NO. 3	Adit drainage	No Data	No Data	No Data	No Treatment	N/A	No Action	Treatment	Suspected but not documented; no data	WT01
SEGCC03	BUR088	AJAX NO.2	Adit drainage	No Data	No Data	No Data	Treatment	No data (producing mine)	WT01	Treatment	No data (producing mine)	WT01
SEGCC03	BUR091	TRADE DOLLAR MINE	Adit drainage	No Data	No Data	No Data	Not included in Alternative 3+			Treatment	No data	WT01
SEGCC04	BUR096	ANCHOR MINE	Adit drainage	0.0081	0.0162	22.2	Treatment	Non-Zn COC conc >SL	WT01	Treatment	Non-Zn COC conc >SL	WT01
SEGCC04	BUR097	HIDDEN TREASURE MINE	Adit drainage	1.44	2.88	392	Treatment	N/A	WT01	Treatment	N/A	WT01
SEGCC04	BUR098	HERCULES NO. 5	Adit drainage	1.96	3	1,693	Treatment	N/A	WT01	Treatment	N/A	WT01
SEGCC03	BUR099	BENTON MINE	Adit drainage	No Data	No Data	No Data	Treatment	No data (producing mine)	WT01	Treatment	No data (producing mine)	WT01
SEGCC02	BUR107	AJAX NO.3	Adit drainage	No Data	No Data	No Data	Treatment	No data (producing mine)	WT01	Treatment	No data (producing mine)	WT01
SEGCC02	BUR107	AJAX NO.3	Seep	No Data	No Data	No Data	No Treatment	N/A	No Action	No Treatment	N/A	No Action
SEGCC01	BUR109	OOM PAUL NO. 1	Adit drainage	No Data	No Data	No Data	No Treatment	N/A	No Action	Treatment	No data (not a producing mine)	WT01
SEGCC04	BUR112	GEM NO.2	Adit drainage	No Data	No Data	No Data	Treatment	No data (producing mine)	WT01	Treatment	No data (producing mine)	WT01
SEGCC04	BUR114	WEST STAR MINE	Adit drainage	No Data	No Data	No Data	Not included in Alternative 3+			Treatment	No data (not a producing mine)	WT01
SEGCC04	BUR121	BLACK BEAR FRACTION	Adit drainage	1.13	2.26	90.6	Treatment	N/A	WT01	Treatment	N/A	WT01
SEGCC04	BUR123	GREAT EASTERN MINE	Adit drainage	No Data	No Data	No Data	Not included in Alternative 3+			Treatment	No data	
SEGCC04	BUR124	OMAHA MINE	Adit drainage	No Data	No Data	No Data	No Treatment	N/A	No Action	Treatment	No data	WT01
SEGCC04	BUR128	HECLA-STAR MINE & MILLSITE COMPLEX	Adit drainage	0.33	0.66	63.0	No Treatment	Zn conc (63) >SL in 2001 (43), but <SL in 2009 (88)	No Action	No Treatment	Zn conc (63) >SL in 2001 (43), but <SL in 2009 (88)	No Action
SEGCC04	BUR129	TIGER-POORMAN MINE	Adit drainage	No Data	No Data	No Data	Treatment	No data; flows underground and discharges into covered reach of Canyon Creek	WT01	Treatment	No data; flows underground and discharges into covered reach of Canyon Creek	WT01
SEGCC02	BUR132	GERTIE MINE	Adit drainage	0.6	1.2	No Data	No Treatment	N/A	No Action	No Treatment	N/A	No Action
SEGCC02	BUR134	ALCIDES PROSPECT & IMPERIAL MINE	Adit drainage	No Data	No Data	No Data	No Treatment	N/A	No Action	No Treatment	N/A	No Action
SEGNM02	BUR170	TAMARACK 400 LEVEL	Adit drainage	0.083	0.166	111	Treatment	N/A	WT02	Treatment	N/A	WT02

TABLE 6-4
Water Treatment Screening Results, Alternatives 3+ and 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

							Alternative 3+			Alternative 4+		
Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Average Discharge Rate (CFS)	Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Step 1: Treatment vs. No Treatment	Notes from 2001 or other sources	Step 2: TCD Selection	Step 1: Treatment vs. No Treatment	Notes from 2001 or other sources	Step 2: TCD Selection
SEGNM02	BUR171	TAMARACK NO.5	Adit drainage	0.032	0.061	195.00	Treatment	Non-Zn COC conc >10xSL	WT02	Treatment	N/A	WT02
SEGCC01	BUR185	WEST MAMMOTH MINE	Adit drainage	No Data	No Data	No Data	No Treatment	N/A	No Action	No Treatment	N/A	No Action
SEGCC01	BUR188	COEUR D ALENE CHAMPION MINE (Champion Gold & Silver)	Adit drainage	No Data	No Data	No Data	Not included in Alternative 3+			No Treatment	N/A	No Action
SEGCC04	BUR190	GEM NO.3	Adit drainage	0.36	1	15,000	Treatment	N/A	WT01	Treatment	N/A	WT01
SEGBIG04	KLE024	SUNSHINE TAILINGS POND: NO. 1	Groundwater	0.02	0.1	No Data	Not included in Alternative 3+			Treatment	Professional Judgement	WT03
SEGMG01	KLE034	SILVER DOLLAR MINE	Adit drainage	0.018	0.024	No Data	No Treatment	N/A	No Action	No Treatment	N/A	No Action
SEGMG01	KLE035	SILVER SUMMIT MINE	Adit drainage	0.045	0.09	No Data	No Treatment	N/A	No Action	No Treatment	N/A	No Action
SEGMG01	KLE040	SF CDA RIVER IMPACTED FLOODPLAIN: NO. 5	Groundwater	1.33	1.33	1,787	Treatment	N/A	WT01	Treatment	N/A	WT01
SEGMG01	KLE048	SF CDA RIVER SVNRT REHAB	Groundwater	1.33	1.33	1,787	Treatment	N/A	WT01	Treatment	N/A	WT01
SEGMG01	KLE049	SF CDA RIVER IMPACTED RIPARIAN (MidGradSeg01 & MidGradSeg02)	Groundwater	1.33	1.33	1,787	Treatment	N/A	WT01	Treatment	N/A	WT01
SEGBIG04	KLE054	CRESCENT/HOOPER TUNNEL	Adit drainage	No Data	No Data	190	Treatment	N/A	WT03	Treatment	N/A	WT03
SEGMG01	KLE067	ST. JOE NO.4	Adit drainage	0.0055	0.007	455	No Treatment	Zn conc (455) >10xSL in 2001 (430), but <10xSL in 2009 (880)	No Action	Treatment	N/A	WT02
SEGMG01	KLE068	UNNAMED ADIT (St. Joe No. 2)	Adit drainage	0.0001	0.0002	No Data	No Treatment	N/A	No Action	No Treatment	N/A	No Action
SEGMG01	KLE069	ST. JOE NO.3	Adit drainage	0.0001	0.0002	No Data	No Treatment	N/A	No Action	No Treatment	N/A	No Action
SEGPC03	KLW081	AMY-MATCHLESS MILLSITE	Adit drainage	0.0043	0.00821	211	Not included in Alternative 3+			Treatment	N/A	
SEGPC03	KLW081	AMY-MATCHLESS MILLSITE	Seep	0.426	0.68	888	Not included in Alternative 3+			No Treatment	Meets SL Criteria for Treatment, but received No Treatment based on 2001 Seep Approach (Note[a]).	No Action
SEGUG01	LOK002	LUCKY CALUMET NO. 2	Adit drainage	0.056	0.112	No Data	No Treatment	N/A	No Action	No Treatment	N/A	No Action
SEGUG01	LOK004	SNOWSHOE NO. 2	Adit drainage	0.112	0.224	3.00	Treatment	> SL for dissolved Cd	WT02	Treatment	>SL for dissolved Cd	WT02
SEGUG01	LOK008	IDAHO SILVER NO. 2	Adit drainage	No Data	No Data	No Data	No Treatment	N/A	No Action	Treatment	No data	WT01
SEGUG01	LOK011	SNOWSTORM NO. 3	Adit drainage	5.74	12	12.00	Treatment	520 ug/L dissolved copper	WT01	Treatment	520 ug/L dissolved Cu	WT01
SEGUG01	LOK014	PANDORA MINE	Adit drainage	No Data	No Data	No Data	Not included in Alternative 3+			Treatment	No data	WT02
SEGUG01	LOK017	BEACON LIGHT	Adit drainage	0.0045	0.009	3.00	No Treatment	N/A	No Action	Treatment	>SL for dissolved Cd	WT03
SEGUG01	LOK019	PRINCETON MAGNA MINE	Adit drainage	0.0003	0.0006	21.00	Not included in Alternative 3+			Treatment	>SL for total Cd	WT03
SEGUG01	LOK024	SILVER CABLE MINE	Adit drainage	No Data	No Data	1,100	Treatment	N/A	WT02	Treatment	N/A	WT02
SEGUG01	LOK028	HUNTER-SNOWSTORM LODE/UNNAMED PROSP	Adit drainage	No Data	No Data	10.00	Not included in Alternative 3+			Treatment	>SL for dissolved Cd	WT02
SEGPC03	MAS003	LIBERAL KING MINE & MILLSITE	Adit drainage	0.0046	0.00656	58.00	No Treatment	N/A	No Action	Treatment	>SL for dissolved Zn and Pb	WT03
SEGPC03	MAS003	LIBERAL KING MINE & MILLSITE	Seep	No Data	No Data	1,430	No Treatment	Meets SL Criteria for Treatment, but received No Treatment based on 2001 Seep Approach (Note[a]).	No Action	No Treatment	Meets SL Criteria for Treatment, but received No Treatment based on 2001 Seep Approach (Note[a]).	No Action
SEGPC01	MAS004	LOOKOUT MOUNTAIN MINE	Adit drainage	0.0268	0.0536	49.00	Not included in Alternative 3+			Treatment	>SL for dissolved Cd, Pb and Zn	WT02
SEGPC01	MAS007	NABOB 1300 LEVEL	Adit drainage	0.0513	0.074	7,665	Treatment	N/A	WT03	Treatment	N/A	WT03
SEGPC01	MAS009	SHETLAND MINING CO-NABOB SILVER-LEAD	Adit drainage	0.000651	0.000825	14.00	No Treatment	N/A	No Action	Treatment	>SL for dissolved Pb	WT03
SEGPC01	MAS011	IDAHO PROSPECT: NO. 2	Adit drainage	0.000642	0.001284	10,500	Treatment	N/A	WT03	Treatment	N/A	WT03
SEGPC01	MAS012	LYNCH-PINE CREEK MINE	Adit drainage	No Data	No Data	15,900	Treatment	N/A	WT02	Treatment	N/A	WT02
SEGPC01	MAS014	HILARITY MINE	Adit drainage	No Data	No Data	6,230	Treatment	N/A	WT02	Treatment	N/A	WT02
SEGPC01	MAS014	HILARITY MINE	Seep	No Data	No Data	7,500	Treatment	N/A	WT02	Treatment	N/A	WT02
SEGPC01	MAS015	LITTLE PITTSBURG MINE: NO. 2	Adit drainage	0.00174	0.0067	8,150	Treatment	N/A	WT03	Treatment	N/A	WT03

TABLE 6-4
Water Treatment Screening Results, Alternatives 3+ and 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

							Alternative 3+			Alternative 4+		
Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Average Discharge Rate (CFS)	Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Step 1: Treatment vs. No Treatment	Notes from 2001 or other sources	Step 2: TCD Selection	Step 1: Treatment vs. No Treatment	Notes from 2001 or other sources	Step 2: TCD Selection
SEGPC01	MAS015	LITTLE PITTSBURG MINE: NO. 2	Seep	No Data	No Data	640.00	No Treatment	Meets SL Criteria for Treatment, but received No Treatment based on 2001 Seep Approach (Note[a]).	No Action	No Treatment	Meets SL Criteria for Treatment, but received No Treatment based on 2001 Seep Approach (Note[a]).	No Action
SEGPC01	MAS016	LITTLE PITTSBURG MINE: NO. 1	Adit drainage	0.000422	0.000844	61,400	Treatment	N/A	WT03	Treatment	N/A	WT03
SEGPC01	MAS017	SIDNEY (DENVER) 500 LEVEL	Adit drainage	No Data	No Data	3,460	Treatment	N/A	WT02	Treatment	N/A	WT02
SEGPC01	MAS020	SIDNEY (RED CLOUD) MINE/MILLSITE	Adit drainage	0.018	0.089	43,700	Treatment	N/A	WT03	Treatment	N/A	WT03
SEGPC01	MAS021	NEVADA-STEWART MINE	Adit drainage	0.0735	0.111	9,833	Treatment	N/A	WT02	Treatment	N/A	WT02
SEGPC01	MAS021	NEVADA-STEWART MINE	Seep	0.0028	0.0056	2,735	No Treatment	Meets SL Criteria for Treatment, but received No Treatment based on 2001 Seep Approach (Note[a]).	No Action	No Treatment	Meets SL Criteria for Treatment, but received No Treatment based on 2001 Seep Approach (Note[a]).	No Action
SEGPC01	MAS023	BLUE EAGLE MINE	Adit drainage	No Data	No Data	No Data	No Treatment	N/A	No Action	No Treatment	N/A	No Action
SEGPC01	MAS025	DOUGLAS MINE & MILLSITE	Adit drainage	No Data	No Data	No Data	No Treatment	N/A	No Action	Treatment	Intermittent discharge; low Zn, high Fe concentrations (Fortier 2000)	WT02
SEGPC01	MAS029	BIG IT MINE	Adit drainage	0.00106	0.00212	36.00	No Treatment	N/A	No Action	Treatment	>SL for dissolved Pb	WT03
SEGPC01	MAS036	DENVER CK TAILINGS PILE	Seep	No Data	No Data	3,690	No Treatment	Meets SL Criteria for Treatment, but received No Treatment based on 2001 Seep Approach (Note[a]).	No Action	No Treatment	Meets SL Criteria for Treatment, but received No Treatment based on 2001 Seep Approach (Note[a]).	No Action
SEGPC01	MAS049	CONSTITUTION UPPER TAILINGS (non-BLM land)	Seep	No Data	No Data	1,300	No Treatment	Meets SL Criteria for Treatment, but received No Treatment based on 2001 Seep Approach (Note[a]).	No Action	No Treatment	Meets SL Criteria for Treatment, but received No Treatment based on 2001 Seep Approach (Note[a]).	No Action
SEGPC01	MAS050	CONSTITUTION UPPER TUNNEL & ROCK DUMP	Adit drainage	0.079	0.0979	328	Treatment	>10xSL for lead and zinc	WT02	Treatment	N/A	WT02
SEGPC01	MAS052	OWL/FRED MINE	Adit drainage	No Data	No Data	452	No Treatment	Per D. Fortier 2009 Pine Creek Discussion	No Action	No Treatment	Per D. Fortier 2009 Pine Creek Discussion	No Action
SEGPC01	MAS054	MARMION OR SF FRACTION	Adit drainage	0.0089	0.0178	111	Treatment	>10xSL for dissolved zinc	WT03	Treatment	N/A	WT03
SEGPC01	MAS067	LOOKOUT MOUNTAIN MINE UPPER ROCK DUMP	Seep	No Data	No Data	17.00	Not included in Alternative 3+			No Treatment	Per D. Fortier 2009 Pine Creek Discussion, treated in 2001 b/c >SL for dissolved Pb	No Action
SEGPC01	MAS078	HIGHLAND-SURPRISE MINE & MILLSITE	Adit drainage	0.038	0.076	2,853.00	Treatment	N/A	WT03	Treatment	N/A	WT03
SEGPC01	MAS078	HIGHLAND-SURPRISE MINE & MILLSITE	Seep	0.0106	0.0212	7,700	No Treatment	Meets SL Criteria for Treatment, but received No Treatment based on 2001 Seep Approach (Note[a]).	No Action	No Treatment	Meets SL Criteria for Treatment, but received No Treatment based on 2001 Seep Approach (Note[a]).	No Action
SEGUG01	MUL001	GOLCONDA MINESITE	Adit drainage	0.0304	0.0608	18.00	No Treatment	N/A	No Action	Treatment	>SL for dissolved Pb	WT01
SEGUG01	MUL006	SQUARE DEAL MINE	Adit drainage	0.0775	0.134	No Data	No Treatment	N/A	No Action	No Treatment	N/A	No Action
SEGUG01	MUL008	ALICE MINE	Adit drainage	0	0	No Data	No Treatment	N/A	No Action	No Treatment	N/A	No Action
SEGUG01	MUL012	STAR 1200 LEVEL	Adit drainage	0.431	0.695	7,010	Treatment	N/A	WT01	Treatment	N/A	WT01
SEGUG01	MUL013	WE LIKE MINE	Adit drainage	No Data	No Data	No Data	No Treatment	N/A	No Action	Treatment	No data; not a producing mine	WT01
SEGUG01	MUL014	GROUSE MINE	Adit drainage	1.82	3.64	84.00	Treatment	>10 x SL for dPb	WT01	Treatment	>10xSL for dPb	WT01
SEGUG01	MUL019	MORNING NO.6	Adit drainage	1.18	1.85	167	Treatment	N/A	WT01	Treatment	N/A	WT01
SEGUG01	MUL019	MORNING NO.6	Seep	1.71	2.37	116	No Treatment	Meets SL Criteria for Treatment, but received No Treatment based on 2001 Seep Approach (Note[a]).	No Action	No Treatment	Meets SL Criteria for Treatment, but received No Treatment based on 2001 Seep Approach (Note[a]).	No Action

TABLE 6-4
Water Treatment Screening Results, Alternatives 3+ and 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

							Alternative 3+			Alternative 4+		
Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Average Discharge Rate (CFS)	Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Step 1: Treatment vs. No Treatment	Notes from 2001 or other sources	Step 2: TCD Selection	Step 1: Treatment vs. No Treatment	Notes from 2001 or other sources	Step 2: TCD Selection
SEGUG01	MUL020	LUCKY FRIDAY TAILINGS POND No. 3	Groundwater	0.02	0.1	50,000	Treatment	N/A	WT01	Treatment	N/A	WT01
SEGUG01	MUL023	FANNY GREMM MINE	Adit drainage	No Data	No Data	40.00	Treatment	SL for dissolved zinc	WT02	Treatment	>SL for dissolved zinc, however given Zn conc (40) is <SL (43)	WT02
SEGUG01	MUL024	YOU LIKE MINE	Adit drainage	No Data	No Data	2,310	Not included in Alternative 3+			Treatment	N/A	WT02
SEGUG01	MUL027	MORNING NO.4	Adit drainage	0.0152	0.0304	950	Treatment	N/A	WT03	Treatment	N/A	WT03
SEGUG01	MUL028	MORNING NO.5	Adit drainage	0.0547	0.088	1,616	Treatment	N/A	WT03	Treatment	N/A	WT03
SEGUG01	MUL037	LUCKY FRIDAY TAILINGS POND No. 2	Groundwater	0.02	0.1	No Data	Treatment	Professional Judgement	WT01	Treatment	Professional Judgement	WT01
SEGUG01	MUL052	COPPER KING MINE	Adit drainage	0.084	0.112	40.00	Treatment	<10xSL for tPb, no value given	WT02	Treatment	<10xSL for tPb but does not give a value	WT02
SEGUG01	MUL053	NATIONAL MINE	Adit drainage	0.174	0.348	35.00	No Treatment	N/A	No Action	Treatment	>SL for Cd and Pb	WT02
SEGUG01	MUL054	UNNAMED ADIT	Adit drainage	0.007	0.014	51.00	No Treatment	N/A	No Action	Treatment	>SL for total Pb	WT03
SEGUG01	MUL058	LUCKY FRIDAY TAILINGS POND No.1	Groundwater	0.02	0.1	No Data	Treatment	Professional Judgement	WT01	Treatment	Professional Judgement	WT01
SEGUG01	MUL071	ATLAS MINE	Adit drainage	0	0	201	No Treatment	N/A	No Action	Treatment	N/A	WT01
SEGUG01	MUL072	LOWER GIANT MINE	Adit drainage	0.0223	0.0446	3.00	Not included in Alternative 3+			Treatment	>SL for dissolved Cd	WT02
SEGUG01	MUL081	REINDEER QUEEN MINE	Adit drainage	0.0075	0.011	8.00	No Treatment	N/A	No Action	Treatment	>SL for total Cd	WT03
SEGMG01	MUL085	VIENNA INTERNATIONAL MINE	Adit drainage	0.356	0.712	32.00	No Treatment	N/A	No Action	Treatment	COC conc >SL	WT02
SEGMG01	MUL085	VIENNA INTERNATIONAL MINE	Seep	No Data	No Data	3.00	No Treatment	N/A	No Action	No Treatment	N/A	No Action
SEGUG01	MUL103	MISSOULA MINE	Adit drainage	No Data	No Data	No Data	No Treatment	N/A	No Action	Treatment	No data	WT02
SEGNM04	OSB032	DULUTH MINE BLACKCLOUD CK	Adit drainage	0.0096	0.0192	No Data	No Treatment	N/A	No Action	No Treatment	N/A	No Action
SEGNM04	OSB039	DAYROCK MINE	Adit drainage	0.0068	0.0136	75.60	Treatment	COC conc >100xSL	WT01	Treatment	COC conc >100xSL	WT01
SEGNM02	OSB044	SUCCESS MINE ROCK DUMP	Groundwater	0.24	0.48	0.20	No Treatment	N/A	No Action	No Treatment	N/A	No Action
SEGNM02	OSB044	SUCCESS MINE ROCK DUMP	Seep	0.023	0.044	No Data	No Treatment	N/A	No Action	No Treatment	N/A	No Action
SEGCC05	OSB047	CANYON CK FORMOSA REACH SVNRT REHAB	Groundwater	0.87	0.87	30,000	Treatment	N/A	Included in Woodland Park Action (WT01)	No Treatment	N/A	No Action
SEGNM04	OSB055	SILVER STAR MINE	Adit drainage	0.0067	0.0134	125	Not included in Alternative 3+			Treatment	N/A	
SEGMG01	OSB065	SF CDA RIVER IMPACTED FLOODPLAIN: NO. 3	Groundwater	1.33	1.33	1,787	Treatment	N/A	WT01	Treatment	N/A	WT01
SEGMG01	OSB074	ST. JOE NO.1	Adit drainage	No Data	No Data	2,700	Treatment	N/A	WT02	Treatment	N/A	WT02
SEGMG01	OSB076	UNNAMED ADIT (May Claim)	Adit drainage	0.0011	0.0022	3.00	No Treatment	N/A	No Action	Treatment	>SL for Cd	WT03
SEGMG01	OSB079	CAPITOL SILVER MAIN ADIT	Adit drainage	0.0007	0.0014	No Data	Not included in Alternative 3+			No Treatment	N/A	No Action
SEGMG01	OSB080	HARLOW TUNNEL	Adit drainage	0.0022	0.0044	3.00	Not included in Alternative 3+			Treatment	COC conc >SL	WT03
SEGNM03	OSB087	UNNAMED TUNNEL	Adit drainage	No Data	No Data	No Data	Not included in Alternative 3+			No Treatment	N/A	No Action
SEGNM02	OSB088	ALAMEDA MINE	Adit drainage	0.0065	0.013	No Data	Treatment	No data	WT01	Treatment	No data	WT01
SEGNM02	OSB089	SUCCESS NO.3	Adit drainage	0.019	0.035	62,100	Treatment	N/A	WT01	Treatment	N/A	WT01
SEGMG01	OSB119	OSBURN ZANETTI GRAVEL OPERATION	Groundwater	0.05	0.1	No Data	Treatment	Professional Judgement	WT01	Treatment	Professional Judgement	WT01
SEGMG01	OSB120	SF CDA RIVER IMPACTED FLOODPLAIN: NO. 4	Groundwater	1.33	1.33	1,787	Treatment	N/A	WT01	Treatment	N/A	WT01
SEGMG01	OSB120	SF CDA RIVER IMPACTED FLOODPLAIN: NO. 4	Seep	0.06	0.12	6,545	No Treatment	Meets SL Criteria for Treatment, but received No Treatment based on 2001 Seep Approach (Note[a]).	No Action	No Treatment	Meets SL Criteria for Treatment, but received No Treatment based on 2001 Seep Approach (Note[a]).	No Action
SEGBIG03	POL001	SUNSHINE CONSOLIDATED ROCKFORD GROUP	Adit drainage	No Data	No Data	No Data	No Treatment	N/A	No Action	No Treatment	N/A	No Action
SEGBIG03	POL002	SILVER DALE AND BIG HILL MINE	Adit drainage	0.0156	0.0312	3.00	No Treatment	N/A	No Action	Treatment	>SL for total Cd	WT03
SEGBIG03	POL004	BISMARK MINE	Adit drainage	0.0112	0.0224	3.00	Not included in Alternative 3+			Treatment	N/A	WT02
SEGMG01	POL018	MERGER MINE	Adit drainage	0.0094	0.0188	No Data	No Treatment	N/A	No Action	No Treatment	N/A	No Action

TABLE 6-4
Water Treatment Screening Results, Alternatives 3+ and 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

							Alternative 3+			Alternative 4+		
Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Average Discharge Rate (CFS)	Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Step 1: Treatment vs. No Treatment	Notes from 2001 or other sources	Step 2: TCD Selection	Step 1: Treatment vs. No Treatment	Notes from 2001 or other sources	Step 2: TCD Selection
SEGMG01	POL019	COEUR D ALENE MINE	Adit drainage	No Data	No Data	No Data	No Treatment	N/A	No Action	No Treatment	N/A	No Action
SEGBIG04	POL022	FIRST NATIONAL MINE	Adit drainage	0.001	0.002	4.00	No Treatment	N/A	No Action	Treatment	=SL for total Cd	WT03
SEGBIG02	POL024	ROYAL APEX MINE	Adit drainage	No Data	No Data	No Data	Not included in Alternative 3+			No Treatment	N/A	No Action
SEGBIG03	POL067	UNNAMED ADIT	Adit drainage	0.112	0.224	10.00	Treatment	COC conc >SL	WT02	Treatment	COC conc >SL	WT02
SEGCC01	THO018	HALF MOON MINE (Blue Ribbon Group)	Adit drainage	No Data	No Data	No Data	Not included in Alternative 3+			No Treatment	N/A	No Action
SEGMG01	WAL001	OSBURN TAILINGS PONDS	Groundwater	0.04	0.2	No Data	Treatment	Professional Judgement	WT01	Treatment	Professional Judgement	WT01
SEGMG01	WAL002	WESTERN UNION LOWER ADIT	Adit drainage	0.0008	0.002	No Data	Treatment	Water used domestically and COC conc >100SL	WT01	Treatment	Water used domestically and COC conc >100SL	WT01
SEGMG01	WAL004	SF CDA RIVER RAILROAD YARDS & IMP FLDP	Groundwater	1.33	1.33	1,787	Treatment	N/A	WT01	Treatment	N/A	WT01
SEGCC05	WAL009	HECLA-STAR TAILINGS PONDS	Groundwater	0.01	0.05	50,000	Treatment	N/A	Included in Woodland Park Action (WT01)	No Treatment	N/A	No Action
SEGCC05	WAL009	HECLA-STAR TAILINGS PONDS	Seep	1.03	1.1	1,400	Treatment	N/A	WT01	No Treatment	Meets SL Criteria for Treatment, but received No Treatment based on 2001 Seep Approach (Note[a]).	No Action
SEGCC05	WAL010	CANYON CK POND REACH SVNRT REHAB	Groundwater	1.16	1.16	30,000	Treatment	N/A	Included in Woodland Park Action (WT01)	No Treatment	N/A	No Action
SEGCC05	WAL011	CANYON SILVER (FORMOSA) MINE	Adit drainage	No Data	No Data	208	Treatment	N/A	WT01	Treatment	N/A	WT01
SEGMG01	WAL020	CALADAY MINE	Adit drainage	No Data	No Data	46.00	Treatment	>10xSL for tPb, NPDES-permitted discharge	WT01	Treatment	>10xSL for tPb, NPDES-permitted discharge	WT01
SEGUG01	WAL038	SF CDA RIVER IMPACTED FLOODPLAIN: NO. 1	Groundwater	6.02	6.02	5,000	No Treatment	Meets SL Criteria for Treatment, but received No Treatment based on Professional Judgement	No Action	Treatment	N/A	WT01
SEGCC05	WAL040	CANYON CK IMPACTED FLOODPLAIN	Groundwater	0.58	1.16	30,000	Treatment	N/A	Included in Woodland Park Action (WT01)	No Treatment	N/A	No Action
SEGCC05	WAL041	CANYON CK REPOSITORY REACH SVNRT REHAB	Groundwater	1.45	1.45	30,000	No Treatment	N/A	No Action	No Treatment	N/A	No Action
SEGCC05	WAL041	CANYON CK REPOSITORY REACH SVNRT REHAB	Seep	0.02	0.02	32,000	No Treatment	N/A	No Action	No Treatment	N/A	No Action
SEGUG01	WAL077	GOLCONDA TAILINGS	Groundwater	0.02	0.1	No Data	No Treatment	N/A	No Action	No Treatment	N/A	No Action
SEGCC05	WP-OPTIONC	Woodland Park Groundwater Action	Groundwater	1.2	1.5	18,101	Treatment	N/A	WT01	No Treatment	N/A	No Action

Notes:

The source IDs, names, trait descriptions, and estimated quantities are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency, 2001c, 2001d). For the purposes of comparing Ecological Alternatives 3 and 4 with Alternatives 3+ and 4+, the waste material quantites for all alternatives are based on the most recent estimates from BLM.

CFS = cubic feet per second
µg/L = micrograms per liter
Cu = Copper
COC = Contaminant of Concern
Cd = Cadmium
Pb = Lead
N/A = Not Applicable

TABLE 6-4

Water Treatment Screening Results, Alternatives 3+ and 4+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

							Alternative 3+			Alternative 4+		
Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Average Discharge Rate (CFS)	Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Step 1: Treatment vs. No Treatment	Notes from 2001 or other sources	Step 2: TCD Selection	Step 1: Treatment vs. No Treatment	Notes from 2001 or other sources	Step 2: TCD Selection

SL = Screening Level, defined in Table 6-3

Zn = Zinc

WP = Woodland Park area of Canyon Creek Segment 5

Typical Conceptual Design (TCD) Codes

WT01 = Centralized High-Density Sludge (HDS) Treatment at CTP

WT02 = Onsite Semi-Passive Water Treatment Using Lime Addition and Settling Pond(s)

WT03 = Onsite Semi-Passive Water Treatment Using Sulfate-Reducing Bioreactor (SRB) System

Note (a) =The general approach for seeps was to identify source-control remedies such as capping, surface water diversion, or groundwater diversion that would eliminate seeps and the need to treat them in perpetuity. Consequently, water treatment is not included for many seeps. (2001 FS, pg 4-6)

Note (b) = If no data were available for flow rate, for screening purposes a value of 0.1 cfs was assumed for the average discharge rate and a value of 0.2 cfs was assumed for the maximum discharge rate.

TABLE 6-5

Stream and Riparian Cleanup Actions, Alternatives 3+ and 4+, Upper SFCDR Watershed

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment	Reach	Reach Description	TCD Description	Alternative 3+ TCD Quantity	Alternative 4+ TCD Quantity	Unit of Measure
UpperSFCDRSeg01	UG01-1	Headwaters to unnamed tributary at mile 32.6	Floodplain and Riparian Replanting	0	0.24	AC
	UG01-4	Obrien Gulch to unnamed tributary at mile 29.8	Bioengineered Revetments	51	51	LF
			Vegetative Bank Stabilization	100	100	LF
	UG01-5	Unnamed tributary at ile 29.8 to Daisy Gulch	Bioengineered Revetments	1,100	1,600	LF
			Current Deflector	28	31	EA
			Current Deflectors, Sediment Traps	3	0	EA
			Floodplain and Riparian Replanting	2.1	2.1	AC
			Vegetative Bank Stabilization	1,100	1,600	LF
	UG01-6	Daisy Gulch to Gentle Anne Gulch	Bioengineered Revetments	1,400	1,400	LF
			Current Deflector	27	30	EA
			Current Deflectors, Sediment Traps	3	0	EA
			Floodplain and Riparian Replanting	16	8.3	AC
			Off-Channel Hydrologic Features	0.47	7.7	AC
			Vegetative Bank Stabilization	2,600	2,600	LF
	UG01-7	Gentle Anne Gulch to Deadman Gulch	Bioengineered Revetments	810	810	LF
			Current Deflector	24	26	EA
			Current Deflectors, Sediment Traps	3	0	EA
			Floodplain and Riparian Replanting	4.8	4.8	AC
			Vegetative Bank Stabilization	1,500	1,500	LF
	UG01-8	Deadman Gulch to Willow Creek	Bioengineered Revetments	330	330	LF
			Current Deflector	7	8	EA
			Current Deflectors, Sediment Traps	1	0	EA
			Vegetative Bank Stabilization	290	290	LF
			Floodplain and Riparian Replanting	0	3.5	AC
	UG01-9	Willow Creek to Goldhunter Gulch	Bioengineered Revetments	1,400	1,400	LF
			Current Deflector	36	40	EA
			Current Deflectors, Sediment Traps	4	0	EA
			Floodplain and Riparian Replanting	3.5	2.3	AC
			Vegetative Bank Stabilization	2,700	2,700	LF
	UG01-10	Goldhunter Gulch to Boulder Creek	Bioengineered Revetments	1,200	1,200	LF
			Current Deflector	28	31	EA
			Current Deflectors, Sediment Traps	3	0	EA
			Floodplain and Riparian Replanting	2.6	2.7	AC
			Vegetative Bank Stabilization	1,500	1,100	LF
	UG01-11	Boulder Creek to Mill Creek	Bioengineered Revetments	350	350	LF
			Current Deflector	8	9	EA
			Current Deflectors, Sediment Traps	1	0	EA
			Floodplain and Riparian Replanting	2.5	2.5	AC
			Vegetative Bank Stabilization	650	650	LF

TABLE 6-5

Stream and Riparian Cleanup Actions, Alternatives 3+ and 4+, Upper SFCDR Watershed

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment	Reach	Reach Description	TCD Description	Alternative 3+ TCD Quantity	Alternative 4+ TCD Quantity	Unit of Measure
	UG01-12	Mill Creek to Gold Creek	Bioengineered Revetments	4,400	4,400	LF
			Current Deflector	80	89	EA
			Current Deflectors, Sediment Traps	9	0	EA
			Floodplain and Riparian Replanting	12	20	AC
			Vegetative Bank Stabilization	4,400	4,400	LF
			Off-Channel Hydrologic Features	0	3	AC
	UG01-13	Gold Creek to St Joe Creek	Bioengineered Revetments	2,400	2,400	LF
			Current Deflector	44	49	EA
			Current Deflectors, Sediment Traps	5	0	EA
			Floodplain and Riparian Replanting	2.2	1.1	AC
			Vegetative Bank Stabilization	2,400	2,400	LF
			Off-Channel Hydrologic Features	0	2.4	AC
	UG01-14	St Joe Creek to Grouse Gulch	Bioengineered Revetments	470	470	LF
			Current Deflector	9	9	EA
			Current Deflectors, Sediment Traps	1	0	EA
			Floodplain and Riparian Replanting	0.38	0.32	AC
			Vegetative Bank Stabilization	470	470	LF
	UG01-15	Grouse Gulch to Ruby Gulch	Bioengineered Revetments	1,700	1,700	LF
			Current Deflector	31	34	EA
			Current Deflectors, Sediment Traps	3	0	EA
			Floodplain and Riparian Replanting	0.12	0.093	AC
			Vegetative Bank Stabilization	1,700	1,700	LF
	UG01-16	Ruby Gulch to Trowbridge Gulch	Bioengineered Revetments	1,600	1,600	LF
			Current Deflector	27	30	EA
			Current Deflectors, Sediment Traps	3	0	EA
			Floodplain and Riparian Replanting	8.7	6.5	AC
			Vegetative Bank Stabilization	2,900	2,900	LF
	UG01-17	Trowbridge Gulch to Dexter Gulch	Bioengineered Revetments	3,700	3,200	LF
			Current Deflector	67	74	EA
			Current Deflectors, Sediment Traps	7	0	EA
			Floodplain and Riparian Replanting	11	17	AC
			Off-Channel Hydrologic Features	3.6	4	AC
			Vegetative Bank Stabilization	3,700	5,900	LF
	UG01-18	Dexter Gulch to Watson Gulch	Bioengineered Revetments	3,000	3,000	LF
			Current Deflector	54	60	EA
			Current Deflectors, Sediment Traps	6	0	EA
			Vegetative Bank Stabilization	3,000	3,000	LF
			Floodplain and Riparian Replanting	0	0.34	AC

TABLE 6-5

Stream and Riparian Cleanup Actions, Alternatives 3+ and 4+, Upper SFCDR Watershed

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment	Reach	Reach Description	TCD Description	Alternative 3+ TCD Quantity	Alternative 4+ TCD Quantity	Unit of Measure
	UG01-19	Watson Gulch to Weyer Gulch, just outside of Wallace	Bioengineered Revetments	320	490	LF
			Current Deflector	7	7	EA
			Current Deflectors, Sediment Traps	1	0	EA
			Floodplain and Riparian Replanting	0.63	0.64	AC
			Off-Channel Hydrologic Features	0.22	0.22	AC
			Vegetative Bank Stabilization	590	910	LF

Notes:

TCD = typical conceptual design

The listed TCDs are defined in Section 6.2.1.3 and described in detail in Section 5.0 of this FFS Report.

AC = acres
EA = each
LF = lineal feet

TABLE 6-6
Comparison of Previous Ecological Alternatives and Updated Remedial Alternatives, Upper SFCDR Watershed
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Volume (CY) or Average Discharge Rate (CFS)	Area (AC) or Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Alt. 3 TCDs	Alt. 3+ TCDs	Alt. 4 TCDs	Alt. 4+ TCDs	Notes
UpperSFCDRSeg01	BUR136	LIQUIDATOR (EAST HECLA GROUP)	Upland waste rock	7,200 CY	0.3 AC	--	NONE	NONE	C02a	C02a	
	BUR137	EAST HECLA GROUP	Upland waste rock	3,840 CY	0.32 AC	--	NONE	NONE	C02a	C02a	
	HHWPUG01-1	Upland waste pile w/human health exposure	Upland waste rock	0 CY	1 AC	--	HH-2	HH-2	NONE	NONE	
	HHWPUG01-2	Upland waste pile w/human health exposure	Upland waste rock	0 CY	1 AC	--	HH-2	HH-2	NONE	NONE	
	HHWPUG01-3	Upland waste pile w/human health exposure	Upland waste rock	0 CY	1 AC	--	HH-2	HH-2	NONE	NONE	
	HHWPUG01-4	Upland waste pile w/human health exposure	Upland waste rock	0 CY	1 AC	--	HH-2	HH-2	NONE	NONE	
	HHWPUG01-5	Upland waste pile w/human health exposure	Upland waste rock	0 CY	1 AC	--	HH-2	HH-2	NONE	NONE	
	LOK001	LUCKY CALUMET NO. 1	Upland waste rock (erosion potential)	30,960 CY	1.29 AC	--	C02a	C02a	C02a	C02a	
	LOK002	LUCKY CALUMET NO. 2	Adit drainage	0.056 CFS	0.112 CFS	0 µg/L	NONE	NONE	NONE	NONE	Alt. 3+ and 4+: Note (a)
			Upland waste rock (erosion potential)	30,480 CY	1.27 AC	--	C02a	C02a	C02a	C02a	
	LOK003	SNOWSHOE NO. 1	Upland waste rock	20,800 CY	0.24 AC	--	NONE	NONE	C02a	C02a	
	LOK004	SNOWSHOE NO. 2	Adit drainage	0.112 CFS	0.224 CFS	3 µg/L	C10+PT-1a	WT02+C10	C10+PT-1a	WT02+C10	Alt. 3+ and 4+: Note (a)
			Floodplain waste rock	61,200 CY	0.71 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	LOK005	LUCKY BOY NO. 2	Upland waste rock (erosion potential)	4,320 CY	0.18 AC	--	C02a	C02a	C02a	C02a	
	LOK006	LUCKY BOY NO. 1	Floodplain waste rock	6,240 CY	0.26 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	LOK007	BUTTE & COEUR D ALENE (IDAHO SILVER)	Upland waste rock (erosion potential)	6,480 CY	0.27 AC	--	C02a	C02a	C01+C07	C01+C07	
	LOK008	IDAHO SILVER NO. 2	Adit drainage	0.1 CFS	0.2 CFS	0 µg/L	NONE	NONE	C10+PT-1a	WT01+C10	Alt. 3+ and 4+: Note (a)
			Floodplain waste rock	9,120 CY	0.38 AC	--	C01+C03	C01+C03	C01+C07	C01+C07	
	LOK009	SNOWSTORM NO. 4	Floodplain waste rock	22,080 CY	0.92 AC	--	C01+C07	C01+C07	C01+C07	C01+C07	
	LOK010	HASH HOUSE MINE	Floodplain waste rock	3,360 CY	0.14 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	LOK011	SNOWSTORM NO. 3	Adit drainage	5.74 CFS	12 CFS	12 µg/L	C10+PT-1a	WT01+C10	C10+PT-1a	WT01+C10	Alt. 3+ and 4+: Note (a)
			Floodplain waste rock	55,000 CY	1.81 AC	--	C01+C07	C01+C07	C01+C07	C01+C07	
	LOK012	SNOWSTORM NO. 2	Upland waste rock	34,800 CY	1.45 AC	--	NONE	NONE	C02a	C02a	
	LOK013	SNOWSTORM NO. 1	Upland waste rock	30,720 CY	1.28 AC	--	NONE	NONE	C02a	C02a	
	LOK014	PANDORA MINE	Adit drainage	0.1 CFS	0.2 CFS	0 µg/L	NONE	NONE	C10+PT-1a	WT02+C10	Alt. 4+: Note (a)
			Upland waste rock	11,520 CY	0.48 AC	--	NONE	NONE	C02a	C02a	
	LOK015	UNIDENTIFIED DISTURBANCE	Upland waste rock	200 CY	0.12 AC	--	NONE	NONE	C02a	C02a	
	LOK016	LOST BOOZE MINE	Upland waste rock	19,680 CY	0.82 AC	--	NONE	NONE	C02a	C02a	
	LOK017	BEACON LIGHT	Adit drainage	0.0045 CFS	0.009 CFS	3 µg/L	NONE	NONE	C10+PT-1a	WT03+C10	Alt. 3+ and 4+: Note (a)
			Floodplain waste rock	31,000 CY	3.63 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	LOK018	SILVER CLIFF	Upland waste rock	13,440 CY	0.56 AC	--	NONE	NONE	C02a	C02a	
	LOK019	PRINCETON MAGNA MINE	Adit drainage	0.0003 CFS	0.0006 CFS	21 µg/L	NONE	NONE	C10+PT-1a	WT03+C10	Alt. 4+: Note (a)
			Upland waste rock	15,840 CY	0.66 AC	--	NONE	NONE	C02b	C02b	
	LOK020	PRINCETON MINE	Upland waste rock	12,960 CY	0.54 AC	--	NONE	NONE	C02a	C02a	
	LOK021	UNNAMED PROSPECT	Upland waste rock	27,360 CY	1.14 AC	--	NONE	NONE	C02a	C02a	
	LOK022	UNNAMED PROSPECT	Upland waste rock	35,280 CY	1.47 AC	--	NONE	NONE	C02a	C02a	
	LOK024	SILVER CABLE MINE	Adit drainage	0.1 CFS	0.2 CFS	1,100 µg/L	C10+PT-1a	WT02+C10	C10+PT-1a	WT02+C10	Alt. 3+ and 4+: Note (a)
			Upland waste rock	31,680 CY	1.32 AC	--	NONE	NONE	C02a	C02a	
	LOK025	UNNAMED PROSPECT	Upland waste rock	200 CY	0.38 AC	--	NONE	NONE	C02a	C02a	
	LOK026	IDAHO SILVER NO.1	Upland waste rock	8,160 CY	0.34 AC	--	NONE	NONE	C02a	C02a	
	LOK027	UNNAMED ADIT	Upland waste rock	200 CY	0.19 AC	--	NONE	NONE	C02a	C02a	
	LOK028	HUNTER-SNOWSTORM LODE/UNNAMED PROSP	Adit drainage	0.1 CFS	0.2 CFS	10 µg/L	NONE	NONE	C10+PT-1a	WT02+C10	Alt. 4+: Note (a)
			Upland waste rock	11,040 CY	0.46 AC	--	NONE	NONE	C02a	C02a	
	LOK041	IDAHO MONTANA SILVER	Upland waste rock	22,560 CY	0.94 AC	--	NONE	NONE	C02a	C02a	

TABLE 6-6
Comparison of Previous Ecological Alternatives and Updated Remedial Alternatives, Upper SFCDR Watershed
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Volume (CY) or Average Discharge Rate (CFS)	Area (AC) or Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Alt. 3 TCDs	Alt. 3+ TCDs	Alt. 4 TCDs	Alt. 4+ TCDs	Notes
	LOK044	LEWIS & CLARK GROUP	Upland waste rock	2,500 CY	0.76 AC	--	NONE	NONE	C02b	C02b	
	LOK045	COEUR D ALENE SILVER LEAD MINING CO.	Upland waste rock	8,880 CY	0.37 AC	--	NONE	NONE	C02a	C02a	
	LOK047	TUCKER GROUP	Upland waste rock	54,240 CY	2.26 AC	--	NONE	NONE	C02a	C02a	
	LOK048	SNOWSTORM APEX	Floodplain waste rock	6,480 CY	0.27 AC	--	C02a	C02a	C01+C07	C01+C07	
	LOK049	LUCKY FRIDAY ROCK DUMPS	Floodplain waste rock	388,900 CY	3.2 AC	--	NONE	NONE	NONE	NONE	
	LOK050	DAISY GULCH TAILINGS POND	Upland tailings - inactive facilities	13,000 CY	2.73 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	LOK051	DAISY GULCH OLD LANDFILL	Floodplain artificial fill	45,840 CY	1.91 AC	--	C02a	C02a	C01+C08a	C01+C08a	
	LOK052	UNNAMED ADIT	Upland waste rock	200 CY	0.31 AC	--	NONE	NONE	C02a	C02a	
	LOK053	UNNAMED ADIT	Upland waste rock (erosion potential)	200 CY	0.31 AC	--	C02a	C02a	C02a	C02a	
	LOK054	UNNAMED ADIT	Upland waste rock	200 CY	0.13 AC	--	NONE	NONE	C02a	C02a	
	MUL001	GOLCONDA MINESITE	Adit drainage	0.0304 CFS	0.0608 CFS	18 µg/L	NONE	NONE	C10+PT-1a	WT01+C10	Alt. 3+ and 4+: Note (a)
			Floodplain waste rock	75,360 CY	3.14 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MUL002	GOLCONDA MILLSITE	Upland tailings	23,000 CY	5.04 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MUL003	MAYFLOWER MINE	Upland waste rock	65,760 CY	2.74 AC	--	NONE	NONE	C02a	C02a	
	MUL004	UNITED LEAD ZINC MINE	Floodplain waste rock	19,680 CY	0.82 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	MUL005	WEST FEDERAL GROUP	Upland waste rock	8,160 CY	0.34 AC	--	NONE	NONE	C02a	C02a	
	MUL006	SQUARE DEAL MINE	Adit drainage	0.0775 CFS	0.134 CFS	0 µg/L	NONE	NONE	NONE	NONE	Alt. 3+ and 4+: Note (a)
			Floodplain waste rock	17,520 CY	0.73 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	MUL007	WONDER MINE	Upland waste rock (erosion potential)	22,800 CY	0.95 AC	--	C02a	C02a	C02a	C02a	
	MUL008	ALICE MINE	Adit drainage	0 CFS	0 CFS	0 µg/L	NONE	NONE	NONE	NONE	Alt. 3+ and 4+: Note (a)
			Floodplain waste rock	33,000 CY	1.34 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	MUL009	SILVER SHAFT	Upland waste rock (erosion potential)	6,000 CY	0.25 AC	--	C02a	C02a	C02a	C02a	
	MUL010	NATIONAL LEAD MINING CO.	Upland waste rock	7,680 CY	0.32 AC	--	NONE	NONE	C02a	C02a	
	MUL011	IVANHOE MINE	Upland waste rock	3,600 CY	0.15 AC	--	NONE	NONE	C02a	C02a	
	MUL012	STAR 1200 LEVEL	Adit drainage	0.431 CFS	0.695 CFS	7010 µg/L	C10+TRMT-1	WT01+C10	C10+TRMT-1	WT01+C10	Alt. 3+ and 4+: Note (a)
			Floodplain waste rock	216,000 CY	6.75 AC	--	C01+C03	C01+C03	C01+C07	C01+C07	
	MUL013	WE LIKE MINE	Adit drainage	0.1 CFS	0.2 CFS	0 µg/L	NONE	NONE	C10+PT-1a	WT01+C10	Alt. 3+ and 4+: Note (a)
			Upland waste rock (erosion potential)	12,720 CY	0.53 AC	--	C02a	C02a	C02a	C02a	
	MUL014	GROUSE MINE	Adit drainage	1.82 CFS	3.64 CFS	84 µg/L	C10+PT-1a	WT01+C10	C10+PT-1a	WT01+C10	Alt. 3+ and 4+: Note (a)
			Upland waste rock (erosion potential)	7,920 CY	0.33 AC	--	C01+C03	C01+C03	C01+C07	C01+C07	
	MUL015	WEST STAR MINE	Upland waste rock (erosion potential)	23,000 CY	9.34 AC	--	C02a	C02a	C01+C07	C01+C07	
	MUL016	UNNAMED ADIT	Upland waste rock	200 CY	0.55 AC	--	NONE	NONE	C02a	C02a	
	MUL017	BUTCHER MINE	Upland waste rock	12,960 CY	0.54 AC	--	NONE	NONE	C02a	C02a	
	MUL018	MULLAN METALS MINE	Floodplain waste rock	14,400 CY	0.6 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MUL019	MORNING NO.6	Adit drainage	1.18 CFS	1.85 CFS	167 µg/L	C10+PT-1a	WT01+C10	C10+PT-1a	WT01+C10	Alt. 3+ and 4+: Note (a)
			Floodplain tailings	85,000 CY	4.5 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
			Floodplain waste rock	336,300 CY	17.65 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
			Seep	1.71 CFS	2.37 CFS	116 µg/L	NONE	NONE	NONE	NONE	Alt. 3+ and 4+: Note (a)
	MUL020	LUCKY FRIDAY TAILINGS POND No. 3	Floodplain sediments (underlying tailings pond)	190,000 CY	11.03 AC	--	C11	C11j	C11	C11j	
			Floodplain tailings - active facilities	183,000 CY	11.03 AC	--	C11	C09	C11	C09	Alt. 3+ and 4+: Note (b)
			Groundwater	0.02 CFS	0.1 CFS	50,000 µg/L	PT-1a	WT01	TRMT-1	WT01	Alt. 3+ and 4+: Note (a)
	MUL021	INDEPENDENCE MINE	Floodplain waste rock	29,040 CY	1.21 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	MUL022	SUNSHINE PREMIER MINE	Upland waste rock (erosion potential)	8,400 CY	0.35 AC	--	C02a	C02a	C02a	C02a	
	MUL023	FANNY GREMM MINE	Adit drainage	0.1 CFS	0.2 CFS	40 µg/L	C10+PT-1a	WT02+C10	C10+PT-1a	WT02+C10	Alt. 3+ and 4+: Note (a)

TABLE 6-6
Comparison of Previous Ecological Alternatives and Updated Remedial Alternatives, Upper SFCDR Watershed
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Volume (CY) or Average Discharge Rate (CFS)	Area (AC) or Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Alt. 3 TCDs	Alt. 3+ TCDs	Alt. 4 TCDs	Alt. 4+ TCDs	Notes
			Floodplain waste rock	31,200 CY	1.3 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MUL024	YOU LIKE MINE	Adit drainage	0.1 CFS	0.2 CFS	2,310 µg/L	NONE	NONE	C10+PT-1a	WT02+C10	Alt. 4+: Note (a)
			Upland waste rock	26,880 CY	1.12 AC	--	NONE	NONE	C02b	C02b	
	MUL025	YOU LIKE MINE UPPER WORKINGS	Upland waste rock	24,240 CY	1.01 AC	--	NONE	NONE	C02a	C02a	
	MUL026	MORNING NO.1 & NO.2	Upland waste rock	24,480 CY	1.02 AC	--	NONE	NONE	C02b	C02b	
	MUL027	MORNING NO.4	Adit drainage	0.0152 CFS	0.0304 CFS	950 µg/L	C10+PT-1a	WT03+C10	C10+PT-1a	WT03+C10	Alt. 3+ and 4+: Note (a)
			Upland waste rock	23,760 CY	0.99 AC	--	C02b	C02b	C01+C07	C01+C07	
	MUL028	MORNING NO.5	Adit drainage	0.0547 CFS	0.088 CFS	1,616 µg/L	C10+PT-1a	WT03+C10	C10+PT-1a	WT03+C10	Alt. 3+ and 4+: Note (a)
			Floodplain waste rock	102,000 CY	4.25 AC	--	C01+C03	C01+C03	C01+C07	C01+C07	
	MUL029	NORTH FRANKLIN MINE	Floodplain waste rock	20,400 CY	0.85 AC	--	C01+C07	C01+C07	C01+C07	C01+C07	
	MUL030	WALL STREET MINE	Floodplain waste rock	8,640 CY	0.36 AC	--	C01+C03	C01+C03	C01+C07	C01+C07	
	MUL031	CINCINNATI MINE	Upland waste rock (erosion potential)	8,160 CY	0.34 AC	--	C02a	C02a	C01+C07	C01+C07	
	MUL032	UNNAMED PROSPECT	Upland waste rock	200 CY	0.34 AC	--	NONE	NONE	C02a	C02a	
	MUL033	AMERICAN COMMANDER NO.2	Floodplain waste rock	15,840 CY	0.66 AC	--	C01+C07	C01+C07	C01+C07	C01+C07	
	MUL034	YOLANDE PROSPECT No. 2	Upland waste rock	10,560 CY	0.44 AC	--	NONE	NONE	C02b	C02b	
	MUL035	YOLANDE PROSPECT No. 1	Upland waste rock	7,200 CY	0.3 AC	--	NONE	NONE	C02a	C02a	
	MUL036	AMERICAN COMMANDER NO.1	Upland waste rock	6,720 CY	0.28 AC	--	NONE	NONE	C02a	C02a	
	MUL037	LUCKY FRIDAY TAILINGS POND No. 2	Floodplain sediments	90,000 CY	0 AC	--	C01b+C08a+NONE [48]	C01b+C08a+NONE [48]	C01b+C08a+NONE [49]	C01b+C08a+NONE [49]	
			Floodplain sediments (underlying tailings pond)	42,000 CY	10.05 AC	--	C11	C11j	C11	C11j	
			Floodplain tailings - active facilities	167,000 CY	10.05 AC	--	C11	C09	C11	C09	Alt. 3+ and 4+: Note (b)
			Groundwater	0.02 CFS	0.1 CFS	0 µg/L	PT-1a	WT01	TRMT-1	WT01	Alt. 3+ and 4+: Note (a)
	MUL038	GOLD HUNTER NO. 6	Floodplain tailings	13,000 CY	0.54 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
			Floodplain waste rock	66,480 CY	2.77 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	MUL039	LUCKY FRIDAY MINE COMPLEX	Upland tailings	140,000 CY	29 AC	--	NONE	NONE	NONE	NONE	
	MUL040	PLYMOUTH NO. 4	Upland waste rock	4,560 CY	0.19 AC	--	NONE	NONE	C02a	C02a	
	MUL041	GOLD HUNTER COLLAPSED TUNNEL	Upland waste rock	22,080 CY	3.72 AC	--	NONE	NONE	C02a	C02a	
	MUL042	GOLD HUNTER NO. 5	Floodplain waste rock	13,920 CY	0.58 AC	--	C01+C07	C01+C07	C01+C07	C01+C07	
	MUL043	SILVER REEF MINE	Floodplain waste rock	17,520 CY	0.73 AC	--	C01+C07	C01+C07	C01+C07	C01+C07	
	MUL045	HOMESTAKE MINE	Floodplain waste rock	27,600 CY	1.15 AC	--	C01+C07	C01+C07	C01+C07	C01+C07	
	MUL046	UNNAMED PROSPECT	Upland waste rock	200 CY	0.35 AC	--	NONE	NONE	C02a	C02a	
	MUL047	LOTTIE L. MINE	Floodplain waste rock	5,520 CY	0.23 AC	--	C01+C03	C01+C03	C01+C07	C01+C07	
	MUL048	ALMA MINE	Floodplain waste rock	21,360 CY	0.89 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MUL049	COPPER PLATE MINE	Upland waste rock (erosion potential)	7,200 CY	0.3 AC	--	C02a	C02a	C02a	C02a	
	MUL050	MULLAN GROUP	Upland waste rock	8,880 CY	0.37 AC	--	NONE	NONE	C02a	C02a	
	MUL051	PILOT MINE	Floodplain waste rock	28,800 CY	1.2 AC	--	C01+C03	C01+C03	C01+C07	C01+C07	
	MUL052	COPPER KING MINE	Adit drainage	0.084 CFS	0.112 CFS	40 µg/L	C10+PT-1a	WT02+C10	C10+PT-1a	WT02+C10	Alt. 3+ and 4+: Note (a)
			Floodplain waste rock	15,000 CY	1.33 AC	--	C01+C03	C01+C03	C01+C07	C01+C07	
	MUL053	NATIONAL MINE	Adit drainage	0.174 CFS	0.348 CFS	35 µg/L	NONE	NONE	C10+PT-1a	WT02+C10	Alt. 3+ and 4+: Note (a)
			Upland waste rock (erosion potential)	73,000 CY	3.16 AC	--	C02a	C02a	C01+C07	C01+C07	
	MUL054	UNNAMED ADIT	Adit drainage	0.007 CFS	0.014 CFS	51 µg/L	NONE	NONE	C10+PT-1a	WT03+C10	Alt. 3+ and 4+: Note (a)
			Upland waste rock (erosion potential)	200 CY	0.94 AC	--	C02a	C02a	C01+C07	C01+C07	
	MUL055	VINDICATOR MINE	Upland waste rock	62,640 CY	2.61 AC	--	NONE	NONE	C02a	C02a	
	MUL056	COUGHLIN MINE	Upland waste rock (erosion potential)	8,400 CY	0.35 AC	--	C02a	C02a	C02a	C02a	
	MUL057	BUTTE AND COEUR D ALENE MINE	Upland waste rock (erosion potential)	18,960 CY	0.79 AC	--	C02a	C02a	C02a	C02a	

TABLE 6-6
Comparison of Previous Ecological Alternatives and Updated Remedial Alternatives, Upper SFCDR Watershed
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Volume (CY) or Average Discharge Rate (CFS)	Area (AC) or Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Alt. 3 TCDs	Alt. 3+ TCDs	Alt. 4 TCDs	Alt. 4+ TCDs	Notes
	MUL058	LUCKY FRIDAY TAILINGS POND No.1	Floodplain sediments	140,000 CY	0 AC	--	C01b+C08a	C01b+C08a	C01b+C08a	C01b+C08a	
			Floodplain sediments (underlying tailings pond)	130,000 CY	34.72 AC	--	C11	C11j	C11	C11j	
			Floodplain tailings - active facilities	576,000 CY	34.72 AC	--	C11	C09	C11	C09	Alt. 3+ and 4+: Note (b)
			Groundwater	0.02 CFS	0.1 CFS	0 µg/L	PT-1a	WT01	TRMT-1	WT01	Alt. 3+ and 4+: Note (a)
	MUL059	ROCK CREEK MINE ROCK DUMP	Floodplain waste rock	22,560 CY	0.94 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MUL060	ROCK CREEK MINE	Floodplain waste rock	5,040 CY	0.21 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	MUL061	BLUE JAY MINE	Upland waste rock	8,400 CY	0.35 AC	--	NONE	NONE	C02a	C02a	
	MUL062	UNNAMED ADIT	Upland waste rock	200 CY	0.25 AC	--	NONE	NONE	C02a	C02a	
	MUL063	GEM STATE MINE	Floodplain waste rock	5,040 CY	0.21 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	MUL064	UNNAMED ADIT	Upland waste rock	200 CY	0.56 AC	--	NONE	NONE	C02a	C02a	
	MUL065	MOE MINE	Floodplain waste rock	7,440 CY	0.31 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	MUL066	BITTERROOT PROSPECT	Upland waste rock	22,560 CY	0.94 AC	--	NONE	NONE	C02a	C02a	
	MUL067	BOULDER CK QUARRY	Upland waste rock	32,160 CY	1.34 AC	--	NONE	NONE	C02a	C02a	
	MUL068	CENTRAL PROSPECT	Upland waste rock	8,640 CY	0.36 AC	--	NONE	NONE	C02a	C02a	
	MUL069	BANNER MINE NO. 01	Upland waste rock	5,280 CY	0.22 AC	--	NONE	NONE	C02a	C02a	
	MUL071	ATLAS MINE	Adit drainage	0 CFS	0 CFS	201 µg/L	NONE	NONE	C10+PT-1a	WT01+C10	Alt. 3+ and 4+: Note (a)
			Floodplain waste rock	2,500 CY	8.14 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	MUL072	LOWER GIANT MINE	Adit drainage	0.0223 CFS	0.0446 CFS	3 µg/L	NONE	NONE	C10+PT-1a	WT02+C10	Alt. 4+: Note (a)
			Upland waste rock	1,200 CY	0.77 AC	--	NONE	NONE	C02a	C02a	
	MUL073	ATLAS MINE (CARBONATE HILL)	Upland waste rock	560 CY	2.06 AC	--	C02a	C02a	C02a	C02a	
	MUL074	IDAHO COPPER	Upland waste rock	11,040 CY	0.46 AC	--	NONE	NONE	C02a	C02a	
	MUL075	ARGENTA MINE	Upland waste rock	7,200 CY	0.3 AC	--	NONE	NONE	C02a	C02a	
	MUL076	NORANDA (SUPERIOR SILVER) MINE	Upland waste rock	8,400 CY	0.35 AC	--	NONE	NONE	C02a	C02a	
	MUL077	NONPAREIL GROUP	Upland waste rock	5,760 CY	0.24 AC	--	NONE	NONE	C02a	C02a	
	MUL078	CARNEY NO.2	Upland waste rock	27,360 CY	1.14 AC	--	NONE	NONE	C02a	C02a	
	MUL079	CARNEY NO.3	Upland waste rock	21,360 CY	0.89 AC	--	NONE	NONE	C02a	C02a	
	MUL080	CARNEY NO.1	Upland waste rock	8,160 CY	0.34 AC	--	NONE	NONE	C02a	C02a	
	MUL081	REINDEER QUEEN MINE	Adit drainage	0.0075 CFS	0.011 CFS	8 µg/L	NONE	NONE	C10+PT-1a	WT03+C10	Alt. 3+ and 4+: Note (a)
			Floodplain waste rock	8,000 CY	0.76 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	MUL082	UNNAMED ADIT	Upland waste rock	200 CY	0.25 AC	--	NONE	NONE	C02a	C02a	
	MUL083	COPPER QUEEN MINE	Floodplain waste rock	15,360 CY	0.64 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	MUL084	UNNAMED PROSPECT	Upland waste rock	27,120 CY	1.13 AC	--	NONE	NONE	C02a	C02a	
	MUL103	MISSOULA MINE	Adit drainage	0.1 CFS	0.2 CFS	0 µg/L	NONE	NONE	C10+PT-1a	WT02+C10	Alt. 3+ and 4+: Note (a)
			Floodplain waste rock	6,300 CY	0.94 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	MUL107	UNNAMED PROSPECT	Upland waste rock	200 CY	0.13 AC	--	NONE	NONE	C02a	C02a	
	MUL108	UNNAMED PROSPECT	Upland waste rock	200 CY	0.14 AC	--	NONE	NONE	C02a	C02a	
	MUL109	UNNAMED PROSPECT	Upland waste rock	200 CY	0.17 AC	--	NONE	NONE	C02a	C02a	
	MUL110	UNNAMED PROSPECT	Upland waste rock	200 CY	0.14 AC	--	NONE	NONE	C02a	C02a	
	MUL111	UNNAMED PROSPECT	Upland waste rock	200 CY	0.19 AC	--	NONE	NONE	C02a	C02a	
	MUL112	UNNAMED PROSPECT	Upland waste rock	200 CY	0.18 AC	--	NONE	NONE	C02a	C02a	
	MUL113	UNNAMED PROSPECT	Upland waste rock	200 CY	0.21 AC	--	NONE	NONE	C02a	C02a	
	MUL114	UNNAMED ADIT	Upland waste rock	200 CY	0.22 AC	--	NONE	NONE	C02a	C02a	
	MUL115	UNNAMED ADIT	Upland waste rock	200 CY	0.24 AC	--	NONE	NONE	C02a	C02a	
	MUL116	UNNAMED ADIT	Upland waste rock	200 CY	0.18 AC	--	NONE	NONE	C02a	C02a	

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Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Volume (CY) or Average Discharge Rate (CFS)	Area (AC) or Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Alt. 3 TCDs	Alt. 3+ TCDs	Alt. 4 TCDs	Alt. 4+ TCDs	Notes
	MUL117	UNNAMED ADIT	Upland waste rock	200 CY	0.28 AC	--	NONE	NONE	C02a	C02a	
	MUL118	UPPER GIANT PROSPECT	Upland waste rock	7,680 CY	0.32 AC	--	NONE	NONE	C02a	C02a	
	MUL119	UNNAMED ADIT	Upland waste rock (erosion potential)	200 CY	0.28 AC	--	C02a	C02a	C02a	C02a	
	MUL120	BANNER MINE NO. 02	Floodplain waste rock	560 CY	0.34 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	MUL121	UNNAMED ADIT	Upland waste rock	200 CY	0.16 AC	--	NONE	NONE	C02a	C02a	
	MUL122	UNNAMED ADIT	Upland waste rock	200 CY	0.21 AC	--	NONE	NONE	C02a	C02a	
	MUL123	UNNAMED PROSPECT	Upland waste rock	200 CY	0.15 AC	--	NONE	NONE	C02a	C02a	
	MUL124	UNNAMED ADIT	Upland waste rock	200 CY	0.18 AC	--	NONE	NONE	C02a	C02a	
	MUL125	UNNAMED PROSPECT	Upland waste rock	200 CY	0.25 AC	--	NONE	NONE	C02a	C02a	
	MUL126	UNNAMED ADIT	Upland waste rock	200 CY	0.22 AC	--	NONE	NONE	C02a	C02a	
	MUL127	UNNAMED ADIT	Upland waste rock	200 CY	0.23 AC	--	NONE	NONE	C02a	C02a	
	MUL128	UNNAMED ADIT	Upland waste rock	200 CY	0.19 AC	--	NONE	NONE	C02a	C02a	
	MUL129	ATLAS MINE ROCK DUMP	Floodplain waste rock	26,640 CY	1.11 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	MUL130	MULLAN GRAVEL PIT	Upland waste rock	42,480 CY	1.77 AC	--	NONE	NONE	C02a	C02a	
	MUL131	NATIONAL MILLSITE	Upland tailings	6,600 CY	1.4 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MUL132	NATIONAL MILLSITE ADJACENT TAILINGS	Upland tailings	1,800 CY	0.37 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MUL133	UNNAMED ADIT	Upland waste rock	200 CY	0.25 AC	--	NONE	NONE	C02a	C02a	
	MUL134	UNNAMED ADIT	Upland waste rock	200 CY	0.58 AC	--	NONE	NONE	C02a	C02a	
	MUL135	UNNAMED ADIT	Upland waste rock (erosion potential)	200 CY	0.18 AC	--	C02a	C02a	C01+C07	C01+C07	
	MUL136	UNNAMED ADIT	Upland waste rock (erosion potential)	200 CY	0.12 AC	--	C02a	C02a	C01+C07	C01+C07	
	MUL137	UNNAMED ADIT	Upland waste rock	200 CY	0.36 AC	--	NONE	NONE	C02a	C02a	
	MUL138	UNNAMED PROSPECT	Upland waste rock	200 CY	0.81 AC	--	NONE	NONE	C02a	C02a	
	MUL139	UNNAMED ADIT	Upland waste rock (erosion potential)	200 CY	0.24 AC	--	C01+C07	C01+C07	C01+C07	C01+C07	
	MUL140	UNNAMED ADIT	Upland waste rock	200 CY	0.17 AC	--	NONE	NONE	C02a	C02a	
	MUL141	MILL CK IMPACTED RIPARIAN No. 3	Floodplain sediments	9,650 CY	1.93 AC	--	C01b+C07+NONE [50]	C01b+C07+NONE [50]	C01b+C08a	C01b+C08a	
	MUL142	GROUSE GULCH IMPACTED RIPARIAN	Floodplain sediments	34,300 CY	6.86 AC	--	C01b+C07+NONE [50]	C01b+C07+NONE [50]	C01b+C08a	C01b+C08a	
	MUL143	UNNAMED ADIT	Upland waste rock	200 CY	0.36 AC	--	NONE	NONE	C02a	C02a	
	MUL144	UNNAMED ADIT	Upland waste rock	200 CY	0.24 AC	--	NONE	NONE	C02a	C02a	
	MUL145	MILL CK IMPACTED RIPARIAN No. 2	Floodplain sediments	4,200 CY	0.84 AC	--	C01b+C07+NONE [50]	C01b+C07+NONE [50]	C01b+C08a	C01b+C08a	
	MUL146	MORNING NO.3	Upland waste rock (erosion potential)	31,440 CY	1.31 AC	--	C01+C03	C01+C03	C01+C07	C01+C07	
	MUL147	UNNAMED ADIT	Upland waste rock	200 CY	0.19 AC	--	NONE	NONE	C02a	C02a	
	MUL148	MORNING NO.4 ADJACENT DISTURBANCE	Upland waste rock	16,080 CY	0.67 AC	--	NONE	NONE	C02b	C02b	
	MUL149	MILL CK IMPACTED RIPARIAN No. 1	Floodplain sediments	5,650 CY	1.13 AC	--	C01b+C07+NONE [50]	C01b+C07+NONE [50]	C01b+C08a	C01b+C08a	
	MUL150	DEADMAN GULCH IMPACTED RIPARIAN	Floodplain sediments	15,100 CY	3.02 AC	--	C01b+C07+NONE [50]	C01b+C07+NONE [50]	C01b+C08a	C01b+C08a	
	MUL151	UNNAMED ADIT	Upland waste rock	200 CY	0.25 AC	--	NONE	NONE	C02a	C02a	
	MUL152	UNNAMED ADIT	Upland waste rock	200 CY	0.17 AC	--	NONE	NONE	C02a	C02a	
	MUL153	DEADMAN GULCH IMPACTED RIPARIAN	Floodplain sediments	7,600 CY	1.52 AC	--	C01b+C07+NONE [50]	C01b+C07+NONE [50]	C01b+C08a	C01b+C08a	
	MUL154	UNNAMED ADIT	Upland waste rock	41,760 CY	1.74 AC	--	NONE	NONE	C02a	C02a	
	MUL155	NEW YORK MINE	Upland waste rock	9,120 CY	0.38 AC	--	NONE	NONE	C02a	C02a	
	MUL156	PORTAL CLAIM TUNNEL	Upland waste rock	4,080 CY	0.17 AC	--	NONE	NONE	C02a	C02a	
	MUL157	UNNAMED ADIT	Upland waste rock	200 CY	0.11 AC	--	NONE	NONE	C02a	C02a	
	THO019	MILITARY MINE	Upland waste rock	8,160 CY	0.34 AC	--	NONE	NONE	C02a	C02a	
	THO020	BULL FROG MINE	Floodplain waste rock	6,960 CY	0.29 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	THO021	IDAHO MONTANA MINING COMPANY	Upland waste rock	7,200 CY	0.3 AC	--	NONE	NONE	C02a	C02a	

TABLE 6-6
Comparison of Previous Ecological Alternatives and Updated Remedial Alternatives, Upper SFCDR Watershed
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Volume (CY) or Average Discharge Rate (CFS)	Area (AC) or Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Alt. 3 TCDs	Alt. 3+ TCDs	Alt. 4 TCDs	Alt. 4+ TCDs	Notes
	WAL013	GRANADA MINE	Floodplain waste rock	8,160 CY	0.34 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	WAL038	SF CDA RIVER IMPACTED FLOODPLAIN: NO. 1	Floodplain sediments	480,000 CY	149 AC	--	C01b+C08a+NONE [58]	C01b+C08a+NONE [58]	C01b+C08a+C11	C01b+C08a+C11j	
			Groundwater	6.02 CFS	6.02 CFS	5,000 µg/L	NONE3	NONE3	TRMT-1+NONE [50]	WT01	Alt. 3+ and 4+: Note (a)
	WAL068	WESTERN SILVER LEAD	Upland waste rock	6,960 CY	0.29 AC	--	NONE	NONE	C02a	C02a	
	WAL076	MARY D CLAIM WORKINGS	Floodplain waste rock	40,800 CY	1.7 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	WAL077	GOLCONDA TAILINGS	Floodplain sediments	42,000 CY	6.71 AC	--	NONE	C01b+C08a	C01b+C08a	C01b+C08a	
			Groundwater	0.02 CFS	0.1 CFS	0 µg/L	NONE3	NONE3	NONE3	NONE3	Alt. 3+: Note (c); 4+: Note (a)

Notes:

The source IDs, names, trait descriptions, and estimated quantities are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency, 2001c, 2001d). For the purposes of comparing Ecological Alternatives 3 and 4 with Alternatives 3+ and 4+, the waste material quantites for all alternatives are based on the most recent estimates from BLM.

AC = acres
CFS = cubic feet per second
CY = cubic yards
µg/L = micrograms per liter

Typical Conceptual Design (TCD) Codes

C01 = Excavation (dry)
C01b = Excavation (60% dry, 40% wet)
C02a = Regrade/Consolidate/Revegetate: Lower Part of Pile in 100-Year Floodplain
C02b = Regrade/Consolidate/Revegetate: Waste Rock Pile in Stream Valley
C03 = Low-Permeability Cap
C07 = Waste Consolidation Area Above Flood Level
C08a = Repository, 1 million cy
C09 = Impoundment Closure
C10 = Adit Drainage Collection
C11 = Hydraulic Isolation Using Slurry Wall
C11j = Hydraulic Isolation Using Slurry Wall (with drain, 30 ft deep)
HH-2 = Upland Waste Pile Soil Cover
NONE = No Action
NONE3 = No Groundwater Extracted
PT-1a = Passive Treatment
TRMT-1 = Active Treatment
WT01 = Centralized High-Density Sludge (HDS) Treatment at CTP
WT02 = Onsite Semi-Passive Water Treatment Using Lime Addition and Settling Pond(s)
WT03 = Onsite Semi-Passive Water Treatment Using Sulfate-Reducing Bioreactor (SRB) System

The number in the bracket [ ] following the TCD code = Percentage of known materials addressed by the TCD. For TCDs other than "NONE", no bracket assumes that all known materials will be addressed.

Note (a) = TCD(s) updated based on an evaluation of water treatment technologies.
Note (b) = TCD(s) updated to provide remedial actions for operating sites. In the 2001 FS, operating sites included in the alternatives either were not assigned actions or were assigned only a hydraulic isolation (C11) action. In the current FFS, operating sites are assigned a complete set of remedial actions based on the waste types present.
Note (c) = This site was not included in the 2001 FS for this alternative, but has been added for evaluation in this FFS. TCD(s) have been assigned to this site in accordance with the waste-type methodology used in the 2001 FS, as described in Section 6.2 .

TABLE 6-7

Stream and Riparian Cleanup Actions, Alternatives 3+ and 4+, Canyon Creek Watershed

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment	Reach	Reach Description	TCD Description	Alternative 3+ TCD Quantity	Alternative 4+ TCD Quantity	Unit of Measure
CCSeg02	CC02-1	Oom Paul No. 1 mine site to Gorge Gulch	Bioengineered Revetments	2,000	3,300	LF
			Current Deflector	60	66	EA
			Current Deflectors, Sediment Traps	7	0	EA
			Floodplain and Riparian Replanting	15	15	AC
			Vegetative Bank Stabilization	3,300	3,300	LF
CCSeg04	CC04-1	Gorge Gulch to West Bell mine site	Bioengineered Revetments	6,000	10,000	LF
			Current Deflector	180	200	EA
			Current Deflectors, Sediment Traps	20	0	EA
			Floodplain and Riparian Replanting	8.7	55	AC
			Vegetative Bank Stabilization	10,000	10,000	LF
			Off-Channel Hydrologic Features	0	8.7	AC
CCSeg05	CC05-1	West Bell mine site to unnamed creek	Bioengineered Revetments	670	1,100	LF
			Current Deflector	10	11	EA
			Current Deflectors, Sediment Traps	1	0	EA
			Floodplain and Riparian Replanting	16	82	AC
			Off-Channel Hydrologic Features	0	78	AC
			Vegetative Bank Stabilization	1,100	1,100	LF
	CC05-2	Unnamed creek to the South Fork Coeur d'Alene River	Bioengineered Revetments	4,000	6,700	LF
			Channel Realignment	19	19	AC
			Current Deflector	60	67	EA
			Current Deflectors, Sediment Traps	7	0	EA
			Floodplain and Riparian Replanting	31	31	AC
			Vegetative Bank Stabilization	6,700	6,700	LF

Notes:

TCD = typical conceptual design

The listed TCDs are defined in Section 6.2.1.3 and described in detail in Section 5.0 of this FFS Report.

AC = acres
EA = each
LF = lineal feet

TABLE 6-8
Comparison of Previous Ecological Alternatives and Updated Remedial Alternatives, Canyon Creek Watershed
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Volume (CY) or Average Discharge Rate (CFS)	Area (AC) or Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Alt. 3 TCDs	Alt. 3+ TCDs	Alt. 4 TCDs	Alt. 4+ TCDs	Notes
CCSeg01	BUR102	CENTRAL MINING COMPANY CLAIMS	Upland waste rock	200 CY	1.42 AC	--	NONE	NONE	C02a	C02a	
	BUR105	OOM PAUL NO. 2	Upland waste rock (erosion potential)	6,500 CY	0.27 AC	--	C01+C03	C01+C03	C01+C07	C01+C07	
	BUR109	OOM PAUL NO. 1	Adit drainage	0.1 CFS	0.2 CFS	0 µg/L	NONE	NONE	C10+PT-1a	WT01+C10	Alt. 3+ and 4+: Note (a)
			Upland waste rock (erosion potential)	27,400 CY	1.14 AC	--	C01+C03	C01+C03	C01+C07	C01+C07	
	BUR110	BURKE MINE	Upland waste rock	200 CY	0.29 AC	--	NONE	NONE	C02a	C02a	
	BUR182	UNNAMED ADIT	Upland waste rock	200 CY	0.16 AC	--	NONE	NONE	C02a	C02a	
	BUR183	HOMESTAKE SILVER LEAD	Upland waste rock	200 CY	0.22 AC	--	NONE	NONE	C02a	C02a	
	BUR184	UNNAMED ADIT	Upland waste rock	200 CY	0.21 AC	--	NONE	NONE	C02a	C02a	
	BUR185	WEST MAMMOTH MINE	Adit drainage	0.1 CFS	0.2 CFS	0 µg/L	NONE	NONE	NONE	NONE	Alt. 3+ and 4+: Note (a)
			Upland waste rock (erosion potential)	200 CY	0.31 AC	--	C01+C03	C01+C03	C01+C07	C01+C07	
	BUR186	UNNAMED ADIT	Upland waste rock	200 CY	0.24 AC	--	NONE	NONE	C02a	C02a	
	BUR187	UNNAMED ADIT	Upland waste rock (erosion potential)	200 CY	0.25 AC	--	C01+C03	C01+C03	C01+C07	C01+C07	
	BUR188	COEUR D ALENE CHAMPION MINE	Adit drainage	0.1 CFS	0.2 CFS	0 µg/L	NONE	NONE	NONE	NONE	Alt. 4+: Note (a)
			Upland waste rock	200 CY	0.43 AC	--	NONE	NONE	C02a	C02a	
	THO012	UNNAMED ADIT	Upland waste rock	500 CY	0.33 AC	--	NONE	NONE	C02a	C02a	
	THO013	UNNAMED ADIT	Upland waste rock	0 CY	0.35 AC	--	NONE	NONE	C02a	C02a	
	THO014	ORLANDO MINE	Upland waste rock	200 CY	0.28 AC	--	NONE	NONE	C02a	C02a	
	THO015	UNIDENTIFIED DISTURBANCE	Upland waste rock	200 CY	0.41 AC	--	NONE	NONE	C02a	C02a	
	THO016	IDAHO MINING COMPANY	Upland waste rock	200 CY	0.13 AC	--	NONE	NONE	C02a	C02a	
	THO017	BURKE MINING COMPANY	Upland waste rock	200 CY	0.54 AC	--	NONE	NONE	C02a	C02a	
	THO018	HALF MOON MINE□(Blue Ribbon Group)	Adit drainage	0.1 CFS	0.2 CFS	0 µg/L	NONE	NONE	NONE	NONE	Alt. 4+: Note (a)
			Upland waste rock	7,000 CY	0.2 AC	--	NONE	NONE	C02a	C02a	
	THO023	UNNAMED ADIT	Upland waste rock (erosion potential)	200 CY	0.19 AC	--	C01+C03	C01+C03	C01+C07	C01+C07	
	BUR100	NEVERSWEAT MINE	Upland waste rock	6,000 CY	0.25 AC	--	NONE	NONE	C02a	C02a	
	BUR106	ECHO GROUP	Upland waste rock	200 CY	0.25 AC	--	NONE	NONE	C02a	C02a	
	BUR107	AJAX NO.3	Adit drainage	0.1 CFS	0.2 CFS	0 µg/L	C10+PT-1a	WT01+C10	C10+PT-1a	WT01+C10	Alt. 3+ and 4+: Note (a)
			Seep	0.1 CFS	0.2 CFS	0 µg/L	NONE	NONE	NONE	NONE	
			Upland waste rock (erosion potential)	139,000 CY	2.34 AC	--	C01+C04	C01+C04	C01+C07	C01+C07	
	BUR130	MARSH MINE	Upland waste rock (erosion potential)	3,000 CY	2.38 AC	--	C01+C03	C01+C03	C01+C07	C01+C07	
			Upland tailings	0 CY	0 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	BUR131	UNIDENTIFIED DISTURBANCE	Upland waste rock	200 CY	0.45 AC	--	NONE	NONE	C02a	C02a	
	BUR132	GERTIE MINE	Adit drainage	0.6 CFS	1.2 CFS	0 µg/L	NONE	NONE	NONE	NONE	Alt. 3+ and 4+: Note (a)
			Upland waste rock (erosion potential)	92,000 CY	1.67 AC	--	C01+C03	C01+C03	C01+C07	C01+C07	
	BUR133	RUSSEL MINE	Upland waste rock (erosion potential)	5,300 CY	0.22 AC	--	C01+C07	C01+C07	C01+C07	C01+C07	
	BUR134	ALCIDES PROSPECT & IMPERIAL MINE	Adit drainage	0.1 CFS	0.2 CFS	0 µg/L	NONE	NONE	NONE	NONE	Alt. 3+ and 4+: Note (a)
			Upland waste rock (erosion potential)	14,400 CY	0.6 AC	--	C01+C07	C01+C07	C01+C07	C01+C07	
	BUR135	SONORA MINE	Upland waste rock (erosion potential)	200 CY	0.58 AC	--	C01+C03	C01+C03	C01+C07	C01+C07	
	BUR138	COPPER KING MINE UPPER ADIT	Upland waste rock	200 CY	0.58 AC	--	NONE	NONE	C02a	C02a	
	BUR145	ONEILL GULCH UNNAMED ROCK DUMP	Upland waste rock (erosion potential)	56,000 CY	2.54 AC	--	C01+C07	C01+C07	C01+C07	C01+C07	
	BUR150	CANYON CK GARBAGE DUMP	Floodplain artificial fill	0 CY	1.36 AC	--	NONE	NONE	NONE	NONE	
			Floodplain waste rock	32,600 CY	1.36 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	BUR151	CANYON CK ROCKPIT	Upland waste rock	0 CY	1.76 AC	--	NONE	NONE	C02a	C02a	
	BUR153	CANYON CK IMPACTED FLOODPLAIN	Floodplain sediments	35,000 CY	7.2 AC	--	C01b+C08a+NONE [50]	C01b+C08a+NONE [50]	C01b+C08a	C01b+C08a	
CCSeg03	BUR085	HERCULES NO. 1 & ASSOCIATED PITS	Adit drainage	0.1 CFS	0.2 CFS	0 µg/L	NONE	NONE	C10+PT-1a	WT02+C10	Alt. 4+: Note (a)
			Upland waste rock	93,000 CY	0.41 AC	--	NONE	NONE	C02a	C02a	
			Upland tailings	0 CY	0 AC	--	NONE2	NONE2	NONE2	NONE2	

TABLE 6-8
Comparison of Previous Ecological Alternatives and Updated Remedial Alternatives, Canyon Creek Watershed
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Volume (CY) or Average Discharge Rate (CFS)	Area (AC) or Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Alt. 3 TCDs	Alt. 3+ TCDs	Alt. 4 TCDs	Alt. 4+ TCDs	Notes
	BUR086	HERCULES NO. 2	Upland waste rock	16,000 CY	1.67 AC	--	NONE	NONE	C02a	C02a	
			Upland tailings	0 CY	0 AC	--	NONE2	NONE2	NONE2	NONE2	
	BUR087	HERCULES NO. 3	Adit drainage	0.1 CFS	0.2 CFS	0 µg/L	NONE	NONE	C10+PT-1a	WT01+C10	Alt. 3+ and 4+: Note (a)
			Upland waste rock (erosion potential)	25,000 CY	3.88 AC	--	C01+C03	C01+C03	C01+C07	C01+C07	
			Upland tailings	0 CY	0 AC	--	NONE2	NONE2	NONE2	NONE2	
	BUR088	AJAX NO.2	Adit drainage	0.1 CFS	0.2 CFS	0 µg/L	C10+PT-1a	WT01+C10	C10+PT-1a	WT01+C10	Alt. 3+ and 4+: Note (a)
	BUR089	IDAHO AND EASTERN MINE	Upland waste rock (erosion potential)	200 CY	0.2 AC	--	C01+C03	C01+C03	C01+C07	C01+C07	
	BUR090	HERCULES NO. 4	Upland waste rock (erosion potential)	55,000 CY	10.49 AC	--	C01+C03	C01+C03	C01+C07	C01+C07	
			Upland tailings	30,000 CY	1.86 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	BUR091	TRADE DOLLAR MINE	Adit drainage	0,000 CFS	0.2 CFS	0 µg/L	NONE	NONE	C10+PT-1a	WT01+C10	Alt. 4+: Note (a)
			Upland waste rock	7,000 CY	0.29 AC	--	NONE	NONE	C02a	C02a	
	BUR092	FAIRVIEW/WIDE WEST MINE	Upland waste rock	4,600 CY	0.19 AC	--	NONE	NONE	C02a	C02a	
			Adit drainage	0.1 CFS	0.2 CFS	0 µg/L	C10+PT-1a	WT01+C10	C10+PT-1a	WT01+C10	
			Upland waste rock	5,000 CY	0.21 AC	--	NONE	NONE	C02a	C02a	
	BUR099	BENTON MINE	Adit drainage	0,000 CFS	0.2 CFS	0 µg/L	C10+PT-1a	WT01+C10	C10+PT-1a	WT01+C10	
			Upland waste rock	5000 CY	0 AC	--	NONE	NONE	C02a	C02a	
	BUR101	SMUGGLER-VIRGINA	Upland waste rock	5,800 CY	0.24 AC	--	NONE	NONE	C02a	C02a	
	BUR146	GORGE GULCH IMPACTED RIPARIAN	Floodplain sediments	51,000 CY	5.18 AC	--	C01b+C08a+NONE [50]	C01b+C08a+NONE [50]	C01b+C08a	C01b+C08a	
	BUR149	AJAX NO.2 ADJACENT ROCK DUMP	Upland waste rock (erosion potential)	10,400 CY	0.51 AC	--	C01+C03	C01+C03	C01+C07	C01+C07	
	BUR165	HONOLULU MINE	Upland waste rock	1,700 CY	0.21 AC	--	NONE	NONE	C02a	C02a	
	BUR166	UNNAMED ADIT	Upland waste rock (erosion potential)	200 CY	0.33 AC	--	C01+C03	C01+C03	C01+C07	C01+C07	
	BUR167	UNNAMED ADIT	Upland waste rock	200 CY	0.42 AC	--	NONE	NONE	C02a	C02a	
	BUR168	GORGE GULCH IMPACTED RIPARIAN	Floodplain sediments	0 CY	2.2 AC	--	NONE4	NONE4	NONE4	NONE4	
	BUR169	GORGE GULCH IMPACTED RIPARIAN	Floodplain sediments	0 CY	3.13 AC	--	NONE4	NONE4	NONE4	NONE4	
	BUR179	UNNAMED ADIT	Upland waste rock	200 CY	0.24 AC	--	NONE	NONE	C02a	C02a	
	BUR180	STANLEY MINE	Upland waste rock (erosion potential)	5,500 CY	0.23 AC	--	C01+C03	C01+C03	C01+C07	C01+C07	
CCSeg04	BUR063	BELL OF THE WEST MINE	Upland waste rock	45,000 CY	1.89 AC	--	NONE	NONE	C02a	C02a	
	BUR064	BIG DIVIDE	Upland waste rock	10,000 CY	0.41 AC	--	NONE	NONE	C02a	C02a	
	BUR065	EAST ALAMEDA MINE	Upland waste rock	24,000 CY	1.01 AC	--	NONE	NONE	C02a	C02a	
	BUR066	MOONLIGHT MINE	Upland waste rock (erosion potential)	7,000 CY	0.3 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	BUR067	TAMARACK NO.7 (1200 LEVEL)	Adit drainage	1.58 CFS	3.15 CFS	1,437 µg/L	C10+TRMT-1	WT01+C10	C10+TRMT-1	WT01+C10	Alt. 3+ and 4+: Note (a)
			Upland waste rock (potential intermixed tailings)	350,000 CY	9.5 AC	--	C01+C03+C07	C01+C03+C07	C01+C08a	C01+C08a	
			Upland tailings	2,500 CY	0.15 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	BUR068	HEADLIGHT MINE	Upland waste rock (erosion potential)	12,000 CY	0.49 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	BUR069	STANDARD-MAMMOTH NO.2	Upland waste rock	25,000 CY	1.05 AC	--	NONE	NONE	C02a	C02a	
	BUR070	STANDARD-MAMMOTH NO.1 & UNNAMED ADIT	Upland waste rock	67,000 CY	2.81 AC	--	NONE	NONE	C02a	C02a	
	BUR071	STANDARD-MAMMOTH NO.3	Upland waste rock	47,000 CY	1.97 AC	--	NONE	NONE	C02a	C02a	
	BUR072	STANDARD-MAMMOTH NO.4	Upland waste rock (erosion potential)	14,300 CY	1.74 AC	--	C03	C03	C01+C08a	C01+C08a	
	BUR073	STANDARD-MAMMOTH CAMPBELL ADIT	Adit drainage	0.1 CFS	0.2 CFS	0 µg/L	NONE	NONE	NONE	NONE	Alt. 3+ and 4+: Note (a)
			Upland waste rock (erosion potential)	126,000 CY	5.27 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	BUR074	STANDARD-MAMMOTH NO.5	Upland waste rock	28,000 CY	1.72 AC	--	NONE	NONE	C02a	C02a	
	BUR075	SHERMAN 1000 LEVEL (OREANO ADIT)	Upland waste rock	42,000 CY	1.75 AC	--	NONE	NONE	C02a	C02a	
			Upland tailings	3,500 CY	0.22 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	BUR076	SHERMAN 1500 LEVEL	Adit drainage	0.1 CFS	0.2 CFS	0 µg/L	NONE	NONE	NONE	NONE	Alt. 4+: Note (a)
			Upland waste rock	3,000 CY	0.11 AC	--	NONE	NONE	C02a	C02a	
	BUR093	HUMMINGBIRD MINE	Upland waste rock	3,000 CY	0.14 AC	--	NONE	NONE	C02a	C02a	

TABLE 6-8
Comparison of Previous Ecological Alternatives and Updated Remedial Alternatives, Canyon Creek Watershed
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Volume (CY) or Average Discharge Rate (CFS)	Area (AC) or Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Alt. 3 TCDs	Alt. 3+ TCDs	Alt. 4 TCDs	Alt. 4+ TCDs	Notes
	BUR094	SHERMAN 600 LEVEL	Upland waste rock (erosion potential)	34,000 CY	1.4 AC	--	NONE	C02a	C02a	C02a	Alt. 3+: Note (b)
			Upland tailings	0 CY	0 AC	--	NONE2	NONE2	NONE2	NONE2	
	BUR095	MIDVALE MNG CO CLAIMS/ANCHOR GROUP	Upland waste rock (erosion potential)	200 CY	0.22 AC	--	NONE	NONE	C02a	C02a	
	BUR096	ANCHOR MINE	Adit drainage	0.0081 CFS	0.0162 CFS	22.2 µg/L	C10+PT-1a	WT01+C10	C10+PT-1a	WT01+C10	Alt. 3+ and 4+: Note (a)
			Upland waste rock	34,000 CY	1.42 AC	--	C02a	C02a	C02a	C02a	
	BUR097	HIDDEN TREASURE MINE	Adit drainage	1.44 CFS	2.88 CFS	392 µg/L	C10+PT-1a	WT01+C10	C10+TRMT-1	WT01+C10	Alt. 3+ and 4+: Note (a)
			Upland waste rock	20,900 CY	0.87 AC	--	C02a	C02a	C02a	C02a	
	BUR098	HERCULES NO. 5	Adit drainage	1.96 CFS	3 CFS	1,693 µg/L	C10+TRMT-1	WT01+C10	C10+TRMT-1	WT01+C10	Alt. 3+ and 4+: Note (a)
			Upland waste rock (potential intermixed tailings)	55,000 CY	2.73 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	BUR111	WEST BELL MINE	Upland waste rock	6,000 CY	0.24 AC	--	NONE	NONE	C02a	C02a	
	BUR112	GEM NO.2	Adit drainage	0.1 CFS	0.2 CFS	0 µg/L	C10+PT-1a	WT01+C10	C10+PT-1a	WT01+C10	Alt. 3+ and 4+: Note (a)
			Upland waste rock	0 CY	1.32 AC	--	NONE	NONE	C02a	C02a	
	BUR113	BETTY LOU MINE	Upland waste rock	6,000 CY	0.27 AC	--	NONE	NONE	C02a	C02a	
	BUR114	WEST STAR MINE	Adit drainage	0.1 CFS	0.2 CFS	0 µg/L	NONE	NONE	C10+PT-1a	WT01+C10	Alt. 4+: Note (a)
			Upland waste rock (erosion potential)	28,000 CY	1.17 AC	--	NONE	NONE	C02a	C02a	
	BUR115	WALLACE MINING COMPANY	Upland waste rock	14,000 CY	0.59 AC	--	NONE	NONE	C02a	C02a	
	BUR116	GOODENOUGH GROUP	Upland waste rock (erosion potential)	200 CY	0.33 AC	--	NONE	NONE	C02a	C02a	
	BUR117	FRISCO MILLSITE	Upland waste rock (potential intermixed tailings)	145,000 CY	1.11 AC	--	C03	C03	C01+C08a	C01+C08a	
			Upland tailings	1,800 CY	0 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	BUR118	FRISCO NO.2 & NO.1	Upland waste rock (erosion potential)	33,000 CY	1.39 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	BUR119	BLACK BEAR NO.4	Upland waste rock	44,000 CY	2.08 AC	--	NONE	C02a	C02a	C02a	Alt. 3+: Note (b)
	BUR120	SILVER MOON MINE	Upland waste rock (erosion potential)	22,000 CY	0.93 AC	--	NONE	C02a	C02a	C02a	Alt. 3+: Note (b)
	BUR121	BLACK BEAR FRACTION	Adit drainage	1.13 CFS	2.26 CFS	90.6 µg/L	C10+PT-1a	WT01+C10	C10+PT-1a	WT01+C10	Alt. 3+ and 4+: Note (a)
			Upland waste rock (erosion potential)	103,000 CY	2.01 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	BUR122	FLYNN MINE	Upland waste rock (erosion potential)	27,000 CY	1.12 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	BUR123	GREAT EASTERN MINE	Adit drainage	0.1 CFS	0.2 CFS	0 µg/L	NONE	NONE	C10+PT-1a	WT01+C10	Alt. 4+: Note (a)
			Upland waste rock (erosion potential)	3,800 CY	0.16 AC	--	NONE	NONE	C02a	C02a	
	BUR124	OMAHA MINE	Adit drainage	0.1 CFS	0.2 CFS	0 µg/L	NONE	NONE	C10+PT-1a	WT01+C10	Alt. 3+ and 4+: Note (a)
			Floodplain sediments	0 CY	0 AC	--	NONE2	NONE2	NONE2	NONE2	
			Upland waste rock (erosion potential)	24,000 CY	1 AC	--	NONE	C02a	C02a	C02a	Alt. 3+: Note (b)
	BUR125	MIDWAY SUMMIT MINE	Upland waste rock (erosion potential)	8,000 CY	0.32 AC	--	NONE	C02a	C02a	C02a	Alt. 3+: Note (b)
	BUR126	ALBANY LEAD MINING COMPANY	Upland waste rock	11,000 CY	0.47 AC	--	NONE	NONE	C02a	C02a	
	BUR127	EAST STANDARD MINE	Upland waste rock	4,100 CY	0.17 AC	--	NONE	NONE	C02a	C02a	
	BUR128	HECLA-STAR MINE & MILLSITE COMPLEX	Adit drainage	0.33 CFS	0.66 CFS	63 µg/L	C10+PT-1a	NONE	C10+PT-1a	NONE	Alt. 3+ and 4+: Note (a)
			Floodplain sediments	0 CY	0 AC	--	NONE2	NONE2	NONE2	NONE2	
			Upland waste rock	0 CY	9.37 AC	--	NONE	NONE	NONE	NONE	
			Upland tailings	43,400 CY	9.37 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	BUR129	TIGER-POORMAN MINE	Adit drainage	0.1 CFS	0.2 CFS	0 µg/L	C10+PT-1a	WT01+C10	C10+PT-1a	WT01+C10	Alt. 3+ and 4+: Note (a)
			Upland waste rock (potential intermixed tailings)	0 CY	1.89 AC	--	NONE	NONE	NONE	NONE	
			Upland tailings	5,250 CY	0.33 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	BUR141	CANYON CK IMPACTED FLOODPLAIN	Floodplain sediments	22,000 CY	15.41 AC	--	C01b+C08a	C01b+C08a	C01b+C08a	C01b+C08a	
	BUR142	GEM MILLSITE	Upland waste rock (potential intermixed tailings)	72,500 CY	3.02 AC	--	C03	C03	C01+C08a	C01+C08a	
			Upland tailings	4,900 CY	0 AC	--	C01+C07+NONE [50]	C01+C07+NONE [50]	C01+C08a	C01+C08a	
	BUR143	CANYON CK IMPACTED RIPARIAN	Floodplain sediments	32,000 CY	39.03 AC	--	C01b+C08a	C01b+C08a	C01b+C08a	C01b+C08a	
	BUR144	STANDARD-MAMMOTH LOADING AREA	Floodplain tailings (discrete site)	0 CY	0 AC	--	NONE2	NONE2	NONE2	NONE2	
			Upland waste rock (erosion potential)	39,000 CY	2.54 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
			Upland tailings	0 CY	0 AC	--	NONE2	NONE2	NONE2	NONE2	

TABLE 6-8
Comparison of Previous Ecological Alternatives and Updated Remedial Alternatives, Canyon Creek Watershed
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Volume (CY) or Average Discharge Rate (CFS)	Area (AC) or Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Alt. 3 TCDs	Alt. 3+ TCDs	Alt. 4 TCDs	Alt. 4+ TCDs	Notes
	BUR174	CUSTER PEAK EXPLORATION PITS	Upland waste rock	121,000 CY	5.06 AC	--	NONE	NONE	C02a	C02a	
	BUR175	UNNAMED ADIT	Upland waste rock	200 CY	0.25 AC	--	NONE	NONE	C02a	C02a	
	BUR176	UNNAMED ADIT	Upland waste rock (erosion potential)	200 CY	0.56 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	BUR177	JOE MATT MINE	Upland waste rock (erosion potential)	200 CY	0.68 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	BUR178	WEST HECLA MINE	Upland waste rock (erosion potential)	11,000 CY	0.46 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	BUR189	DULUTH MINE CANYON CK	Upland waste rock (erosion potential)	200 CY	0.2 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	BUR190	GEM NO.3	Adit drainage	0.36 CFS	1 CFS	15,000 µg/L	C10+TRMT-1	WT01+C10	C10+TRMT-1	WT01+C10	Alt. 3+ and 4+: Note (a)
	BUR191	FRISCO NO.3	Upland waste rock	0 CY	1.55 AC	--	C02a	C02a	C02a	C02a	
	BUR192	BLACK BEAR MILLSITE	Floodplain tailings (discrete site)	3,100 CY	0.19 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
			Upland waste rock (erosion potential)	27,000 CY	1.12 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	BUR193	BLACK BEAR NO.3	Upland waste rock	18,000 CY	0.75 AC	--	NONE	NONE	C02a	C02a	
	BUR194	BLACK BEAR NO.2	Upland waste rock	17,000 CY	0.69 AC	--	NONE	NONE	C02a	C02a	
	BUR195	UNNAMED ADIT	Upland waste rock	200 CY	0.42 AC	--	NONE	NONE	C02a	C02a	
	BUR198	UNIDENTIFIED DISTURBANCE	Upland waste rock	25,000 CY	1.35 AC	--	NONE	NONE	C02a	C02a	
	BUR199	UNIDENTIFIED DISTURBANCE	Upland waste rock	200 CY	0.32 AC	--	NONE	NONE	C02a	C02a	
	BUR200	UNIDENTIFIED DISTURBANCE	Upland waste rock	200 CY	0.23 AC	--	NONE	NONE	C02a	C02a	
	BUR202	UNNAMED ROCK DUMPS	Upland waste rock	200 CY	0.11 AC	--	NONE	NONE	C02a	C02a	
	BUR203	GREENHILL CLEVELAND MINE	Upland waste rock	2,900 CY	0.12 AC	--	NONE	NONE	C02a	C02a	
	BUR204	UNNAMED ROCK DUMP	Upland waste rock (erosion potential)	200 CY	0.19 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	HHWPCC04-	Upland waste pile w/human health exposure	Upland waste rock	0 CY	1 AC	--	HH-2	HH-2	NONE	NONE	
	HHWPCC04-	Upland waste pile w/human health exposure	Upland waste rock	0 CY	1 AC	--	HH-2	HH-2	NONE	NONE	
	HHWPCC04-	Upland waste pile w/human health exposure	Upland waste rock	0 CY	1 AC	--	HH-2	HH-2	NONE	NONE	
CCSeg05	CSMCC05-1	RR EMBANKMENT ALONG CCSEG05	Floodplain artificial fill	200,000 CY	0 AC	--	C01+C07	NONE2	C01+C08a	C01+C08a	
	OSB047	CANYON CK FORMOSA REACH SVNRT REHAB	Floodplain sediments	17,000 CY	30.02 AC	--	C01b+C08a+C11	C01b+C08a+C14b+C15b+NONE [76.15]	C01b+C08a	C01b+C08a	Alt. 3+ and 4+: Note (c)
			Floodplain sediments	17,000 CY	30.02 AC	--	C01b+C08a+C11	C01b+C08a+C14b+C15b+NONE [76.15]	C01b+C08a	C01b+C08a	Alt. 3+ and 4+: Note (c)
			Groundwater	0.87 CFS	0.87 CFS	30,000 µg/L	TRMT-1+NONE [50]	NONE3	NONE3	NONE3	Alt. 3+ and 4+: Note (c)
	WAL007	CANYON CK GRAVEL PIT	Upland waste rock	0 CY	0.44 AC	--	NONE	NONE	C02a	C02a	Alt. 3+ and 4+: Note (c)
	WAL008	SISTERS MINE	Upland waste rock	14,000 CY	0.57 AC	--	NONE	NONE	C02a	C02a	Alt. 3+ and 4+: Note (c)
	WAL009	HECLA-STAR TAILINGS PONDS	Floodplain sediments (underlying tailings pond)	323,000 CY	61.55 AC	--	C11	C14b+C15b+NONE [70]	C01b+C08a	C01b+C08a	Alt. 3+ and 4+: Note (c)
			Floodplain tailings - inactive Facilities	2,100,000 CY	61.55 AC	--	C09+C11	C14b+C15b+NONE [70]	C01+C08a	C01+C08a	Alt. 3+ and 4+: Note (c)
			Groundwater	0.01 CFS	0.05 CFS	50,000 µg/L	TRMT-1	NONE3	NONE3	NONE3	Alt. 3+ and 4+: Note (c)
			Seep	1.03 CFS	1.1 CFS	1,400 µg/L	PT-1a	NONE	NONE	NONE	Alt. 3+ and 4+: Note (c)
	WAL010	CANYON CK POND REACH SVNRT REHAB	Floodplain sediments	15,000 CY	25.81 AC	--	C01b+C08a+C11+NONE [77]	C01b+C08a+C14b+C15b+NONE [72.04]	C01b+C08a	C01b+C08a	Alt. 3+ and 4+: Note (c)
			Groundwater	1.16 CFS	1.16 CFS	30,000 µg/L	TRMT-1+NONE [50]	NONE3	NONE3	NONE3	Alt. 3+ and 4+: Note (c)
	WAL011	CANYON SILVER (FORMOSA) MINE	Adit drainage	0.1 CFS	0.2 CFS	208 µg/L	C10+PT-1a	WT01+C10	C10+PT-1a	WT01+C10	Alt. 3+ and 4+: Note (c)
			Floodplain sediments	8,800 CY	0.55 AC	--	C01b+C08a	C01b+C08a+C14b+C15b+NONE [77.5]	C01b+C08a	C01b+C08a	Alt. 3+ and 4+: Note (c)
			Upland waste rock	13,000 CY	0.55 AC	--	NONE	NONE	C02a	C02a	Alt. 3+ and 4+: Note (c)
			Upland tailings	11,600 CY	4.15 AC	--	C01+C07	NONE	C01+C08a	C01+C08a	Alt. 3+ and 4+: Note (c)
	WAL012	VERDE MAY MINE	Upland waste rock	2,200 CY	0.09 AC	--	NONE	NONE	C02a	C02a	Alt. 3+ and 4+: Note (c)
	WAL039	STANDARD-MAMMOTH MILLSITE	Floodplain sediments	0 CY	0 AC	--	NONE2	NONE2	NONE2	NONE2	Alt. 3+ and 4+: Note (c)
			Upland waste rock	47,000 CY	1.96 AC	--	NONE	NONE	C02a	C02a	Alt. 3+ and 4+: Note (c)
			Upland tailings	12,500 CY	1.96 AC	--	C01+C07	C01+C08a	C01+C08a	C01+C08a	Alt. 3+ and 4+: Note (c)
	WAL040	CANYON CK IMPACTED FLOODPLAIN	Floodplain sediments	18,000 CY	26.16 AC	--	C01b+C08a+C11	C01b+C08a+NONE [72]	C01b+C08a	C01b+C08a	Alt. 3+ and 4+: Note (c)
			Groundwater	0.58 CFS	1.16 CFS	30,000 µg/L	TRMT-1+NONE [50]	NONE3	NONE3	NONE3	Alt. 3+ and 4+: Note (c)
			Surface Water	35 CFS	60 CFS	2,160 µg/L	PT-7	NONE	NONE	NONE	Alt. 3+ and 4+: Note (c)

TABLE 6-8
Comparison of Previous Ecological Alternatives and Updated Remedial Alternatives, Canyon Creek Watershed
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Volume (CY) or Average Discharge Rate (CFS)	Area (AC) or Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Alt. 3 TCDs	Alt. 3+ TCDs	Alt. 4 TCDs	Alt. 4+ TCDs	Notes
	WAL041	CANYON CK REPOSITORY REACH SVNRT REHA	Floodplain sediments	61,000 CY	88.57 AC	--	C01b+C08a+C11+NONE [76]	C01b+C08a+C14b+C15b	C01b+C08a+NONE [59]	C01b+C08a+NONE [59]	Alt. 3+ and 4+: Note (c)
			Groundwater	1.45 CFS	1.45 CFS	30,000 µg/L	TRMT-1+NONE [50]	NONE3	NONE3	NONE3	Alt. 3+ and 4+: Note (c)
			Seep	0.02 CFS	0.02 CFS	32,000 µg/L	NONE	NONE2	NONE	NONE2	Alt. 3+ and 4+: Note (c)
	WAL042	CANYON CK TAILINGS REPOSITORY SVNRT	Floodplain sediments	8,100 CY	5.15 AC	--	NONE	C14b+C15b	C01b+C08a	C01b+C08a	Alt. 3+ and 4+: Note (c)
			Floodplain tailings - inactive Facilities	600,000 CY	5.15 AC	--	C09	C03+C14b+C15b	C01+C08a	C01+C08a	Alt. 3+ and 4+: Note (c)
	WAL081	WALLACE OLD PRIVATE LANDFILL	Floodplain artificial fill	5,700 CY	2.65 AC	--	C01+C07+NONE [50]	C01+C08a+NONE [50]	C01+C08a	C01+C08a	Alt. 3+ and 4+: Note (c)

Notes:

The source IDs, names, trait descriptions, and estimated quantities are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency, 2001c, 2001d). For the purpose of comparing Ecological Alternatives 3 and 4 with Alternatives 3+ and 4+, the waste material quantities for all alternatives are based on the most recent estimates from BLM.

AC = acres
CFS = cubic feet per second
CY = cubic yards
µg/L = micrograms per liter

Typical Conceptual Design (TCD) Codes

C01 = Excavation (dry)
C01b = Excavation (60% dry, 40% wet)
C02a = Regrade/Consolidate/Revegetate: Lower Part of Pile in 100-Year Floodplain
C03 = Low-Permeability Cap
C07 = Waste Consolidation Area Above Flood Level
C08a = Repository, 1 million cy
C09 = Impoundment Closure
C10 = Adit Drainage Collection
C11 = Hydraulic Isolation Using Slurry Wall
C14b = Stream Lining (20 feet wide)
C15b = French Drain (15 feet bgs)
HH-2 = Upland Waste Pile Soil Cover
NONE = No Action
NONE2 = Source/Waste Type Not Identified
NONE3 = No Groundwater Extracted
PT-1a = Passive Treatment
PT-7 = Passive Stream Flow Treatment
TRMT-1 = Active Treatment
WT01 = Centralized High-Density Sludge (HDS) Treatment at CTP
WT02 = Onsite Semi-Passive Water Treatment Using Lime Addition and Settling Pond(s)

The number in the bracket [ ] following the TCD code = Percentage of known materials addressed by the TCD. For TCDs other than "NONE", no bracket assumes that all known materials will be addressed.

Note (a) = TCD(s) updated based on an evaluation of water treatment technologies.
Note (b) = This site was not included in the 2001 FS for this alternative, but has been added for evaluation in this FFS. TCD(s) have been assigned to this site in accordance with the waste-type methodology used in the 2001 FS, as described in Section 6.2.
Note (c) = TCD(s) updated as part of the evaluation of remedial components of Alternatives 3 and 4 for the Woodland Park area of Canyon Creek, described in Appendix E.

TABLE 6-9

Stream and Riparian Cleanup Actions, Alternatives 3+ and 4+, Ninemile Creek Watershed

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment	Reach	Reach Description	TCD Description	Alternative 3+ TCD Quantity	Alternative 4+ TCD Quantity	Unit of Measure
NMSeg01	NM01-1	Headwaters of East Fork Ninemile Creek to Interstate Mill site	Bioengineered Revetments	4,000	4,000	LF
			Current Deflector	48	40	EA
			Current Deflectors, Sediment Traps	5	0	EA
			Floodplain and Riparian Replanting	4.6	4.6	AC
			Vegetative Bank Stabilization	4,000	4,000	LF
NMSeg02	NM02-1	Interstate Mill site on the East Fork to the mainstem Ninemile Creek	Bioengineered Revetments	7,600	7,600	LF
			Current Deflector	90	76	EA
			Current Deflectors, Sediment Traps	10	0	EA
			Floodplain and Riparian Replanting	8.7	8.7	AC
			Off-Channel Hydrologic Features	0.072	0.076	AC
			Vegetative Bank Stabilization	7,600	7,600	LF
NMSeg03	NM03-1	Headwaters of Ninemile Creek to confluence with the East Fork	Current Deflector	33	37	EA
			Current Deflectors, Sediment Traps	4	0	EA
			Floodplain and Riparian Replanting	11	11	AC
			Off-Channel Hydrologic Features	0.27	0.27	AC
			Vegetative Bank Stabilization	3,200	4,600	LF
NMSeg04	NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	Bioengineered Revetments	2,100	2,100	LF
			Channel Realignment	5.7	5.7	AC
			Current Deflector	25	21	EA
			Current Deflectors, Sediment Traps	3	0	EA
			Floodplain and Riparian Replanting	3.3	3.3	AC
			Off-Channel Hydrologic Features	0.41	0.49	AC
			Vegetative Bank Stabilization	2,100	2,100	LF
	NM04-2	Black Cloud Creek to Silver Star Mine	Bioengineered Revetments	720	720	LF
			Channel Realignment	2	2	AC
			Current Deflector	9	7	EA
			Current Deflectors, Sediment Traps	1	0	EA
			Floodplain and Riparian Replanting	3.3	3.3	AC
			Vegetative Bank Stabilization	720	720	LF
	NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	Bioengineered Revetments	5,600	5,600	LF
			Channel Realignment	15	15	AC
			Current Deflector	67	56	EA
			Current Deflectors, Sediment Traps	7	0	EA
			Floodplain and Riparian Replanting	15	15	AC
			Vegetative Bank Stabilization	5,600	5,600	LF

Notes:

TCD = typical conceptual design

The listed TCDs are defined in Section 6.2.1.3 and described in detail in Section 5.0 of this FFS Report.

AC = acres
EA = each
LF = lineal feet

TABLE 6-10
Comparison of Previous Ecological Alternatives and Updated Remedial Alternatives, Ninemile Creek Watershed
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Volume (CY) or Average Discharge Rate (CFS)	Area (AC) or Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Alt. 3 TCDs	Alt. 3+ TCDs	Alt. 4 TCDs	Alt. 4+ TCDs	Notes
NMSeg01	BUR051	SUNSET MINE	Adit drainage	0.1 CFS	0.2 CFS	28,400 µg/L	C10+PT-1a	WT02+C10	C10+PT-1a	WT02+C10	Alt. 3+ and 4+: Note (a)
			Upland waste rock	43,000 CY	1.81 AC	--	NONE	NONE	C02a	C02a	
	BUR052	LITTLE SUNSET MINE	Upland waste rock	4,000 CY	0.16 AC	--	C01+C03	C01+C03	C01+C07	C01+C07	
	BUR053	INTERSTATE-CALLAHAN MINE/ROCK DUMPS	Adit drainage	0.072 CFS	0.14 CFS	59.76 µg/L	NONE	NONE	C10+PT-1a	NONE	Alt. 3+ and 4+: Note (a)
			Seep	1.8 CFS	4.27 CFS	182 µg/L	NONE	NONE	NONE	NONE	Alt. 3+ and 4+: Note (a)
			Upland waste rock (erosion potential)	692,000 CY	8.45 AC	--	C01+C04	C01+C04	C01+C07	C01+C07	
	BUR077	LACLEDE MINE	Upland waste rock	22,000 CY	1.14 AC	--	NONE	NONE	C02a	C02a	
	BUR081	GUELPH MINE	Adit drainage	0.1 CFS	0.2 CFS	0 µg/L	NONE	NONE	C10+PT-1a	WT02+C10	Alt. 4+: Note (a)
			Upland waste rock	15,000 CY	0.61 AC	--	NONE	NONE	C02a	C02a	
	BUR082	UNIDENTIFIED DISTURBANCE	Upland waste rock	200 CY	0.42 AC	--	NONE	NONE	C02a	C02a	
	BUR083	AMBERGRIS MINE	Upland waste rock	8,000 CY	0.32 AC	--	NONE	NONE	C02a	C02a	
	BUR084	HERCULES NO. 2 (NINEMILE)	Upland waste rock	200 CY	0.27 AC	--	NONE	NONE	C02a	C02a	
	BUR140	NINEMILE CREEK IMPACTED FLOODPLAIN	Floodplain sediments	10,000 CY	5.5 AC	--	C01b+C08a	C01b+C08a	C01b+C08a	C01b+C08a	
	BUR160	INTERSTATE-CALLAHAN LOWER ROCK DUMPS	Upland waste rock (erosion potential)	0 CY	4.2 AC	--	C04	C04	NONE4	NONE4	
NMSeg02	BUR054	REX NO.2 / SIXTEEN-TO-ONE MINE	Adit drainage	0.017 CFS	0.027 CFS	1,995 µg/L	C10+PT-1a	WT03+C10	C10+PT-1a	WT03+C10	Alt. 3+ and 4+: Note (a)
			Seep	0.03 CFS	0.06 CFS	11,400 µg/L	NONE	NONE	NONE	NONE	Alt. 3+ and 4+: Note (a)
			Upland waste rock (potential intermixed tailings)	75,000 CY	21.4 AC	--	C03	C03	C01+C08a	C01+C08a	
			Upland tailings - inactive facilities	225,000 CY	2.5 AC	--	C09	C09	C01+C08a	C01+C08a	
	BUR055	INTERSTATE MILLSITE	Floodplain sediments	5,500 CY	8.96 AC	--	C01b+C08a	C01b+C08a	C01b+C08a	C01b+C08a	
			Seep	0.0043 CFS	0.007 CFS	350,000 µg/L	NONE	NONE	NONE	NONE	Alt. 3+ and 4+: Note (a)
			Upland tailings	14,000 CY	8.96 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	BUR056	TAMARACK ROCK DUMPS	Adit drainage	0.1 CFS	0.2 CFS	0 µg/L	NONE	NONE	NONE	NONE	Alt. 3+ and 4+: Note (a)
			Upland waste rock (potential intermixed tailings)	293,000 CY	13.34 AC	--	C02b	C02b	C01+C08a	C01+C08a	
	BUR057	TAMARACK NO.4	Upland waste rock	22,000 CY	0.91 AC	--	NONE	NONE	C02a	C02a	
	BUR058	TAMARACK NO.3	Adit drainage	0.1 CFS	0.2 CFS	0 µg/L	C10+PT-1a	WT02+C10	C10+PT-1a	WT02+C10	Alt. 3+ and 4+: Note (a)
			Upland waste rock	23,000 CY	0.97 AC	--	NONE	NONE	C02a	C02a	
	BUR059	TAMARACK NO.1 & NO.2 (CUSTER MINE)	Upland waste rock	42,000 CY	1.74 AC	--	NONE	NONE	C02a	C02a	
	BUR060	SUCCESS NO.2	Upland waste rock	51,000 CY	2.14 AC	--	NONE	NONE	C02a	C02a	
	BUR061	SUCCESS NO.1	Upland waste rock	34,000 CY	1.42 AC	--	NONE	NONE	C02a	C02a	
	BUR062	SUCCESS MINE ADJACENT DISTURBANCE	Upland waste rock	0 CY	0.68 AC	--	NONE	NONE	C02a	C02a	
	BUR139	REX NO.1	Upland waste rock	0 CY	1.31 AC	--	C03	C03	NONE4	NONE4	
	BUR170	TAMARACK 400 LEVEL	Adit drainage	0.083 CFS	0.166 CFS	111 µg/L	C10+PT-1a	WT02+C10	C10+PT-1a	WT02+C10	Alt. 3+ and 4+: Note (a)
			Upland waste rock (potential intermixed tailings)	11,000 CY	0.95 AC	--	C03	C03	C01+C08a	C01+C08a	
	BUR171	TAMARACK NO.5	Adit drainage	0.032 CFS	0.061 CFS	195 µg/L	C10+PT-1a	WT02+C10	C10+PT-1a	WT02+C10	Alt. 3+ and 4+: Note (a)
			Upland waste rock (potential intermixed tailings)	0 CY	0.66 AC	--	C03	C03	C01+C08a	C01+C08a	
	BUR172	TAMARACK UNNAMED ADIT	Upland waste rock	0 CY	0.43 AC	--	C03	C03	C01+C08a	C01+C08a	
	BUR173	TAMARACK MILLSITE	Upland tailings	0 CY	0.97 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	BUR196	INDUS CLAIM UNNAMED ADIT	Upland waste rock	7,000 CY	0.31 AC	--	NONE	NONE	C02a	C02a	
	BUR197	MEDICO CLAIM UNNAMED ADIT	Upland waste rock	11,000 CY	0.46 AC	--	NONE	NONE	C02a	C02a	
	BUR205	TAMARACK UNNAMED ADJACENT ROCK DUMP	Upland waste rock	16,000 CY	0.65 AC	--	NONE	NONE	C02a	C02a	

TABLE 6-10
Comparison of Previous Ecological Alternatives and Updated Remedial Alternatives, Ninemile Creek Watershed
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Volume (CY) or Average Discharge Rate (CFS)	Area (AC) or Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Alt. 3 TCDs	Alt. 3+ TCDs	Alt. 4 TCDs	Alt. 4+ TCDs	Notes
	OSB040	EF NINEMILE CK HECLA REHAB	Floodplain sediments	19,000 CY	9.35 AC	--	C01b+C08a+NONE [89]	C01b+C08a+NONE [89]	C01b+C08a	C01b+C08a	
	OSB044	SUCCESS MINE ROCK DUMP	Floodplain sediments	10,000 CY	0.27 AC	--	C01b+C08a	C01b+C08a	C01b+C08a	C01b+C08a	
			Groundwater	0.24 CFS	0.48 CFS	0.2 µg/L	NONE3	NONE3	NONE3	NONE3	Alt. 3+ and 4+: Note (a)
			Seep	0.023 CFS	0.044 CFS	0 µg/L	NONE	NONE	NONE	NONE	Alt. 3+ and 4+: Note (a)
			Upland waste rock	17,000 CY	0.45 AC	--	C02a	C02a	C01+C08a	C01+C08a	
			Upland tailings (jig tailings)	360,000 CY	9.54 AC	--	C01+C08a	C01+C08a	C01+C08a	C01+C08a	
	OSB045	ALAMEDA PROSPECT	Upland waste rock	20,000 CY	0.84 AC	--	NONE	NONE	C02a	C02a	
	OSB046	LANSING MINE (ALBION)	Upland waste rock	8,000 CY	0.35 AC	--	NONE	NONE	C02a	C02a	
	OSB048	AMERICAN MINE	Upland waste rock	200 CY	0.15 AC	--	NONE	C02a	C02a	C02a	Alt. 3+: Note (b)
	OSB056	EF NINEMILE CK IMPACTED RIPARIAN	Floodplain sediments	1,600 CY	10.97 AC	--	C01b+C08a	C01b+C08a	C01b+C08a	C01b+C08a	
	OSB057	EF NINEMILE CK IMPACTED RIPARIAN	Floodplain sediments	13,000 CY	9.67 AC	--	C01b+C08a	C01b+C08a	C01b+C08a	C01b+C08a	
	OSB058	EF NINEMILE CK SVNRT REHAB	Floodplain sediments	1,600 CY	12.14 AC	--	C01b+C08a	C01b+C08a	C01b+C08a	C01b+C08a	
	OSB088	ALAMEDA MINE	Adit drainage	0.0065 CFS	0.013 CFS	0 µg/L	C10+PT-1a	WT01+C10	C10+PT-1a	WT01+C10	Alt. 3+ and 4+: Note (a)
			Floodplain waste rock	0 CY	0.51 AC	--	NONE	NONE	NONE	NONE	
	OSB089	SUCCESS NO.3	Adit drainage	0.019 CFS	0.035 CFS	62,100 µg/L	C10+TRMT-1	WT01+C10	C10+TRMT-1	WT01+C10	Alt. 3+ and 4+: Note (a)
			Upland waste rock	0 CY	0.27 AC	--	NONE	NONE	NONE	NONE	
NMSeg03	OSB041	GALENA NO. 2	Upland waste rock	20,000 CY	0.82 AC	--	NONE	NONE	C02a	C02a	
	OSB042	NINEMILE MINING COMPANY NO.2	Upland waste rock	200 CY	0.19 AC	--	NONE	NONE	C02a	C02a	
	OSB043	MAYFLOWER NO.3	Upland waste rock	32,000 CY	1.34 AC	--	NONE	NONE	C02a	C02a	
	OSB049	TREASURE VAULT	Upland waste rock	13,000 CY	0.55 AC	--	NONE	NONE	C02a	C02a	
	OSB081	NINEMILE MINING COMPANY NO.1	Upland waste rock	200 CY	0.14 AC	--	NONE	NONE	C02a	C02a	
	OSB087	UNNAMED TUNNEL	Adit drainage	0.1 CFS	0.2 CFS	0 µg/L	NONE2	NONE2	NONE2	NONE2	Alt. 4+: Note (a)
			Upland waste rock	200 CY	0.1 AC	--	NONE	NONE	C02a	C02a	
NMSeg04	OSB031	IDAHO GALENA PROSPECT	Upland waste rock	13,000 CY	0.56 AC	--	NONE	NONE	C02a	C02a	
	OSB032	DULUTH MINE BLACKCLOUD CK	Adit drainage	0.0096 CFS	0.0192 CFS	0 µg/L	NONE	NONE	NONE	NONE	Alt. 3+ and 4+: Note (a)
			Floodplain waste rock	20,000 CY	0.84 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	OSB033	RUTH MINE	Upland waste rock (erosion potential)	16,000 CY	0.68 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	OSB034	MCDONALD MINE	Upland waste rock	7,000 CY	0.3 AC	--	NONE	NONE	C02a	C02a	
	OSB035	UNIDENTIFIED DISTURBANCE	Upland waste rock	200 CY	0.49 AC	--	NONE	NONE	C02a	C02a	
	OSB036	UNIDENTIFIED DISTURBANCE	Upland waste rock	6,000 CY	0.25 AC	--	NONE	NONE	C02a	C02a	
	OSB037	UNNAMED ADIT	Upland waste rock	200 CY	0.71 AC	--	NONE	NONE	C02a	C02a	
	OSB038	CALIFORNIA NO.4	Floodplain waste rock	31,000 CY	1.28 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	OSB039	DAYROCK MINE	Adit drainage	0.0068 CFS	0.0136 CFS	75.6 µg/L	C10+PT-1a	WT01+C10	C10+PT-1a	WT01+C10	Alt. 3+ and 4+: Note (a)
			Floodplain sediments	22,000 CY	0 AC	--	C01b+C08a+NONE [50]	C01b+C08a+NONE [50]	C01b+C08a	C01b+C08a	
			Upland waste rock	33,000 CY	11.76 AC	--	NONE	NONE	C02a	C02a	
			Upland tailings	11,000 CY	0.7 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	OSB052	DAYROCK MINE TLGS PILE/SVNRT REPOSITORY	Upland tailings - inactive facilities	200,000 CY	5.55 AC	--	C09	C09	C01+C08a	C01+C08a	
	OSB055	SILVER STAR MINE	Adit drainage	0.0067 CFS	0.0134 CFS	125 µg/L	NONE	NONE	C10+PT-1a	WT01+C10	Alt. 4+: Note (a)
			Upland waste rock	9,000 CY	0.36 AC	--	NONE	NONE	C02a	C02a	
	OSB059	NINEMILE CK BELOW DAYROCK MINE	Floodplain sediments	33,000 CY	5.43 AC	--	C01b+C08a	C01b+C08a	C01b+C08a	C01b+C08a	

TABLE 6-10
Comparison of Previous Ecological Alternatives and Updated Remedial Alternatives, Ninemile Creek Watershed
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Volume (CY) or Average Discharge Rate (CFS)	Area (AC) or Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Alt. 3 TCDs	Alt. 3+ TCDs	Alt. 4 TCDs	Alt. 4+ TCDs	Notes
	OSB060	NINEMILE CK SVNRT REHAB NEAR BLACKCLD	Floodplain sediments	800 CY	15.87 AC	--	C01b+C07	C01b+C07	C01b+C08a	C01b+C08a	
	OSB061	BLACKCLOUD CK MILLSITE	Upland tailings	7,000 CY	1.5 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	OSB082	MONARCH MINE BLACKCLOUD CK	Floodplain waste rock	13,000 CY	0.54 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	OSB083	BLACKCLOUD NO.3	Upland waste rock	18,000 CY	0.77 AC	--	NONE	NONE	C02a	C02a	
	OSB084	BLACKCLOUD CK IMPACTED RIPARIAN	Floodplain sediments	0 CY	1.23 AC	--	NONE2	C01b+C08a	NONE2	C01b+C08a	
	OSB085	BLACKCLOUD CK IMPACTED RIPARIAN	Floodplain sediments	0 CY	8.96 AC	--	NONE2	C01b+C08a	NONE2	C01b+C08a	
	OSB114	UNNAMED ADIT	Upland waste rock	200 CY	0.22 AC	--	NONE	NONE	C02a	C02a	
	OSB115	OPTION MINE	Upland waste rock (erosion potential)	200 CY	0.34 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	OSB116	PANHANDLE MINE	Upland waste rock	200 CY	0.31 AC	--	NONE	NONE	C02a	C02a	
	WAL006	NORTHSIDE MINE	Upland waste rock (erosion potential)	200 CY	0.25 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	WAL033	NINEMILE CK POTENTIAL TAILINGS DEPOSIT	Floodplain sediments	34,000 CY	31.73 AC	--	C01b+C07+NONE [97]	C01b+C07+NONE [97]	C01b+C08a	C01b+C08a	
	WAL069	SIERRA SILVER MINE	Upland waste rock	200 CY	0.24 AC	--	NONE	NONE	C02a	C02a	
	WAL075	UNNAMED ADIT	Upland waste rock	200 CY	0.09 AC	--	NONE	NONE	C02a	C02a	
	WAL078	UNNAMED ADIT	Upland waste rock	200 CY	0.27 AC	--	NONE	NONE	C02a	C02a	

Notes:

The source IDs, names, trait descriptions, and estimated quantities are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency, 2001c, 2001d). For the purpose of comparing Ecological Alternatives 3 and 4 with Alternatives 3+ and 4+, the waste material quantities for all alternatives are based on the most recent estimates from BLM.

AC = acres
CFS = cubic feet per second
CY = cubic yards
µg/L = micrograms per liter

Typical Conceptual Design (TCD) Codes

C01 = Excavation (dry)
C01b = Excavation (60% dry, 40% wet)
C02a = Regrade/Consolidate/Revegetate: Lower Part of Pile in 100-Year Floodplain
C02b = Regrade/Consolidate/Revegetate: Waste Rock Pile in Stream Valley
C03 = Low-Permeability Cap
C04 = Low-Permeability Cap with Seepage Collection
C07 = Waste Consolidation Area Above Flood Level
C08a = Repository, 1 million cy
C09 = Impoundment Closure
C10 = Adit Drainage Collection
NONE = No Action
NONE2 = Source/Waste Type Not Identified
NONE3 = No Groundwater Extracted
NONE4 = Actions Included as part of Another Source

TABLE 6-10

Comparison of Previous Ecological Alternatives and Updated Remedial Alternatives, Ninemile Creek Watershed

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Volume (CY) or Average Discharge Rate (CFS)	Area (AC) or Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Alt. 3 TCDs	Alt. 3+ TCDs	Alt. 4 TCDs	Alt. 4+ TCDs	Notes

PT-1a = Passive Treatment

TRMT-1 = Active Treatment

WT01 = Centralized High-Density Sludge (HDS) Treatment at CTP

WT02 = Onsite Semi-Passive Water Treatment Using Lime Addition and Settling Pond(s)

WT03 = Onsite Semi-Passive Water Treatment Using Sulfate-Reducing Bioreactor (SRB) System

The number in the bracket [ ] following the TCD code = Percentage of known materials addressed by the TCD. For TCDs other than "NONE", no bracket assumes that all known materials will be addressed.

Note (a) = TCD(s) updated based on an evaluation of water treatment technologies.

Note (b) = This site was not included in the 2001 FS for this alternative, but has been added for evaluation in this FFS. TCD(s) have been assigned to this site in accordance with the waste-type methodology used in the 2001 FS, as described in Section 6.2.

TABLE 6-11

Stream and Riparian Cleanup Actions, Alternatives 3+ and 4+, Big Creek Watershed

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment	Reach	Reach Description	TCD Description	Alternative 3+ TCD Quantity	Alternative 4+ TCD Quantity	Unit of Measure
BigCrkSeg04	BIG04-2	WF Big Creek to the Sunshine Mine site	Bioengineered Revetments	1,100	1,100	LF
			Current Deflector	17	19	EA
			Current Deflectors, Sediment Traps	2	0	EA
			Vegetative Bank Stabilization	1,100	1,100	LF
	BIG04-3	Sunshine Mine site to the South Fork Coeur d'Alene River	Bioengineered Revetments	4,700	4,700	LF
			Current Deflector	120	130	EA
			Current Deflectors, Sediment Traps	14	0	EA
			Floodplain and Riparian Replanting	7.4	8.6	AC
			Off-Channel Hydrologic Features	4	4.1	AC
			Vegetative Bank Stabilization	4,700	4,700	LF

Notes:

TCD = typical conceptual design

The listed TCDs are defined in Section 6.2.1.3 and described in detail in Section 5.0 of this FFS Report.

AC = acres
EA = each
LF = lineal feet

TABLE 6-12

Comparison of Previous Ecological Alternatives and Updated Remedial Alternatives, Big Creek Watershed

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Volume (CY) or Average Discharge Rate (CFS)	Area (AC) or Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Alt. 3 TCDs	Alt. 3+ TCDs	Alt. 4 TCDs	Alt. 4+ TCDs	Notes
BigCrkSeg01	POL044	UNNAMED PROSPECT	Upland waste rock (erosion potential)	200 CY	0.3 AC	--	C02c	C02c	C01+C08a	C01+C08a	
	POL045	UNNAMED PROSPECT	Upland waste rock	200 CY	0.19 AC	--	NONE	NONE	C02a	C02a	
	POL046	UNNAMED PROSPECT	Upland waste rock	200 CY	0.18 AC	--	NONE	NONE	C02a	C02a	
	POL047	UNNAMED PROSPECT	Upland waste rock	200 CY	0.22 AC	--	NONE	NONE	C02a	C02a	
	POL048	UNNAMED PROSPECT	Upland waste rock	200 CY	0.17 AC	--	NONE	NONE	C02a	C02a	
	POL049	UNNAMED PROSPECT	Upland waste rock	200 CY	0.13 AC	--	NONE	NONE	C02a	C02a	
	POL050	UNNAMED PROSPECT	Upland waste rock	200 CY	0.22 AC	--	NONE	NONE	C02a	C02a	
	POL051	UNNAMED ADIT	Upland waste rock	200 CY	0.2 AC	--	NONE	NONE	C02b	C02b	
	POL052	LUCKY BOY MINE	Floodplain waste rock	4,600 CY	0.14 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
BigCrkSeg02	POL024	ROYAL APEX MINE	Adit drainage	0.1 CFS	0.2 CFS	0 µg/L	NONE	NONE	NONE	NONE	Alt. 4+: Note (a)
			Upland waste rock	8,300 CY	0.2 AC	--	NONE	NONE	C02a	C02a	
	POL025	UNNAMED PROSPECT	Upland waste rock	200 CY	0.27 AC	--	NONE	NONE	C02a	C02a	
	POL026	UNNAMED PROSPECT	Upland waste rock	200 CY	0.23 AC	--	NONE	NONE	C02a	C02a	
	POL027	UNNAMED PROSPECT	Upland waste rock	200 CY	0.47 AC	--	NONE	NONE	C02a	C02a	
	POL028	UNNAMED PROSPECT	Upland waste rock	200 CY	0.13 AC	--	NONE	NONE	C02a	C02a	
	POL036	UNNAMED PROSPECT	Upland waste rock	200 CY	0.51 AC	--	NONE	NONE	C02a	C02a	
	POL037	UNNAMED PROSPECT	Upland waste rock	200 CY	0.28 AC	--	NONE	NONE	C02a	C02a	
	POL038	UNNAMED PROSPECT	Upland waste rock	200 CY	0.17 AC	--	NONE	NONE	C02a	C02a	
	POL039	UNNAMED PROSPECT	Upland waste rock	200 CY	0.21 AC	--	NONE	NONE	C02a	C02a	
	POL040	POWHATAN (POWHATTAN-POWHATTON)	Upland waste rock	11,280 CY	0.47 AC	--	NONE	NONE	C02b	C02b	
	POL041	UNNAMED PROSPECT	Upland waste rock	200 CY	0.37 AC	--	NONE	NONE	C02a	C02a	
	POL042	UNNAMED PROSPECT	Upland waste rock	200 CY	0.34 AC	--	NONE	NONE	C02a	C02a	
	POL043	UNNAMED PROSPECT	Upland waste rock	200 CY	0.35 AC	--	NONE	NONE	C02a	C02a	
	POL053	UNNAMED PROSPECT	Upland waste rock	200 CY	0.25 AC	--	NONE	NONE	C02a	C02a	
	POL054	UNNAMED PROSPECT	Upland waste rock	200 CY	0.3 AC	--	NONE	NONE	C02a	C02a	
	POL056	UNNAMED PROSPECT	Upland waste rock	200 CY	0.42 AC	--	NONE	NONE	C02a	C02a	
	POL062	UNNAMED PROSPECT	Upland waste rock	200 CY	0.32 AC	--	NONE	NONE	C02a	C02a	
	POL063	UNNAMED PROSPECT	Upland waste rock	200 CY	0.22 AC	--	NONE	NONE	C02a	C02a	
BigCrkSeg03	POL001	SUNSHINE CONSOLIDATED ROCKFORD GROUP	Adit drainage	0.1 CFS	0.2 CFS	0 µg/L	NONE	NONE	NONE	NONE	Alt. 3+ and 4+: Note (a)
			Floodplain waste rock	8,160 CY	0.34 AC	--	C02c	C02c	C01+C08a	C01+C08a	
	POL002	SILVER DALE AND BIG HILL MINE	Adit drainage	0.0156 CFS	0.0312 CFS	3 µg/L	NONE	NONE	C10+PT-1a	WT03+C10	Alt. 3+ and 4+: Note (a)
			Floodplain waste rock	1,700 CY	0.68 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	POL004	BISMARK MINE	Adit drainage	0.0112 CFS	0.0224 CFS	3 µg/L	NONE	NONE	C10+PT-1a	WT02+C10	Alt. 4+: Note (a)
			Upland waste rock	6,630 CY	0.21 AC	--	NONE	NONE	C02b	C02b	
	POL067	UNNAMED ADIT	Adit drainage	0.112 CFS	0.224 CFS	10 µg/L	C10+PT-1a	WT02+C10	C10+PT-1a	WT02+C10	Alt. 3+ and 4+: Note (a)
	POL067		Upland waste rock	200 CY	0.49 AC	--	NONE	NONE	C02a	C02a	
	POL068	UNNAMED ADIT	Upland waste rock (erosion potential)	200 CY	0.2 AC	--	C02a	C02a	C01+C08a	C01+C08a	
	POL069	UNNAMED ADIT	Upland waste rock	200 CY	0.29 AC	--	NONE	NONE	C02a	C02a	

TABLE 6-12
Comparison of Previous Ecological Alternatives and Updated Remedial Alternatives, Big Creek Watershed
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Volume (CY) or Average Discharge Rate (CFS)	Area (AC) or Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Alt. 3 TCDs	Alt. 3+ TCDs	Alt. 4 TCDs	Alt. 4+ TCDs	Notes
	POL070	UNNAMED PROSPECT	Upland waste rock	200 CY	0.21 AC	--	NONE	NONE	C02b	C02b	
	POL071	UNNAMED PROSPECT	Upland waste rock	200 CY	0.14 AC	--	NONE	NONE	C02b	C02b	
BigCrkSeg04	KLE024	SUNSHINE TAILINGS POND: NO. 1	Floodplain sediments (underlying tailings pond)	39,000 CY	42.26 AC	--	NONE	NONE	C11	C11j	
			Floodplain tailings - active facilities	707,000 CY	42.26 AC	--	NONE	NONE	C11	C09	Alt. 4+: Note (b)
			Groundwater	0.02 CFS	0.1 CFS	0 µg/L	NONE3	NONE3	TRMT-1	WT03	Alt. 4+: Note (a)
	KLE025	SUNSHINE TAILINGS POND: NO. 2	Floodplain sediments	10,000 CY	24.12 AC	--	NONE	NONE	C01b+C08a	C01b+C08a	
			Floodplain tailings - inactive Facilities	404,000 CY	24.12 AC	--	C09	C09	C01+C08a	C01+C08a	
	KLE026	SILVER SYNDICATE	Floodplain waste rock	88,000 CY	12.2 AC	--	C02c	C02c	C01+C08a	C01+C08a	
	KLE027	NORTH AMERICAN MINE	Upland waste rock (erosion potential)	93,120 CY	3.88 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	KLE028	UNIDENTIFIED DISTURBANCE	Upland waste rock	200 CY	0.94 AC	--	NONE	NONE	NONE	NONE	
	KLE029	COEUR D ALENE BIG CREEK MINE	Upland waste rock	53,280 CY	2.22 AC	--	NONE	NONE	C02a	C02a	
	KLE030	SUNSHINE MINE	Floodplain waste rock	1,000 CY	8.34 AC	--	NONE	NONE	NONE	NONE	
	KLE031	SUNSHINE MINE EXTENSION	Upland waste rock	68,640 CY	2.86 AC	--	NONE	NONE	NONE	NONE	
	KLE047	BIG CK IMPACTED RIPARIAN: NO. 1	Floodplain sediments	3,323 CY	1.19 AC	--	C01b+C08a	C01b+C08a	C01b+C08a	C01b+C08a	
	KLE053	NORTH AMERICAN/SILVER SYNDICATE MINE	Floodplain waste rock	196,700 CY	12.19 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	KLE054	CRESCENT/HOOPER TUNNEL	Adit drainage	0.1 CFS	0.2 CFS	190 µg/L	C10+PT-1a	WT03+C10	C10+PT-1a	WT03+C10	Alt. 3+ and 4+: Note (a)
			Upland waste rock (erosion potential)	160,080 CY	6.67 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	KLE055	SUNSHINE OPERATIONS & MILL COMPLX	Upland tailings	86,230 CY	10.69 AC	--	NONE	NONE	NONE	NONE	
	KLE071	BIG CK IMPACTED RIPARIAN: NO. 3	Floodplain sediments	49,000 CY	31.32 AC	--	C01b+C08a+NONE [80]	C01b+C08a+NONE [80]	C01b+C08a	C01b+C08a	
	KLE072	SUNSHINE MILL COMPLEX	Upland tailings	121,890 CY	15.11 AC	--	NONE	NONE	NONE	NONE	
	KLE073	BIG CK IMPACTED RIPARIAN: NO. 2	Floodplain sediments	100,000 CY	5.81 AC	--	C01b+C08a	C01b+C08a	C01b+C08a	C01b+C08a	
	POL005	YANKEE GIRL MINE	Upland waste rock	8,160 CY	0.34 AC	--	NONE	NONE	C02b	C02b	
	POL006	UNNAMED ADIT	Upland waste rock	200 CY	0.19 AC	--	NONE	NONE	C02b	C02b	
	POL007	IDAHO PIT	Upland waste rock	14,160 CY	0.59 AC	--	NONE	NONE	NONE	NONE	
	POL008	GLOBE MINE	Floodplain waste rock	8,160 CY	0.34 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	POL009	METROPOLITAN MINE	Upland waste rock	14,640 CY	0.61 AC	--	NONE	NONE	NONE	NONE	
	POL010	WESTERN STAR MINE	Upland waste rock (erosion potential)	4,560 CY	0.19 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	POL011	WOLFSON MINE	Floodplain waste rock	3,120 CY	0.13 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	POL012	UNIDENTIFIED DISTURBANCE	Upland waste rock	200 CY	0.14 AC	--	NONE	NONE	NONE	NONE	
	POL013	BIG CK GRAVEL PIT	Floodplain waste rock	0 CY	7.83 AC	--	NONE	NONE	NONE	NONE	
	POL014	BIG CK GRAVEL PIT EXTENSION	Upland waste rock	0 CY	4 AC	--	NONE	NONE	NONE	NONE	
	POL022	FIRST NATIONAL MINE	Adit drainage	0.001 CFS	0.002 CFS	4 µg/L	NONE	NONE	C10+PT-1a	WT03+C10	Alt. 3+ and 4+: Note (a)
			Floodplain waste rock	4,600 CY	0.85 AC	--	C02c	C02c	C01+C08a	C01+C08a	
	POL023	UNNAMED ADIT	Upland waste rock	200 CY	0.3 AC	--	NONE	NONE	C02b	C02b	
	POL066	UNNAMED ADIT	Upland waste rock (erosion potential)	200 CY	0.15 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	POL072	UNNAMED PROSPECT	Upland waste rock	200 CY	0.29 AC	--	NONE	NONE	NONE	NONE	
	POL073	UNNAMED PROSPECT	Upland waste rock	200 CY	0.24 AC	--	NONE	NONE	NONE	NONE	
	POL074	UNNAMED PROSPECT	Upland waste rock	200 CY	0.24 AC	--	NONE	NONE	NONE	NONE	

TABLE 6-12
Comparison of Previous Ecological Alternatives and Updated Remedial Alternatives, Big Creek Watershed
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Volume (CY) or Average Discharge Rate (CFS)	Area (AC) or Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Alt. 3 TCDs	Alt. 3+ TCDs	Alt. 4 TCDs	Alt. 4+ TCDs	Notes
	POL075	UNNAMED ADIT	Upland waste rock	200 CY	0.2 AC	--	NONE	NONE	C02b	C02b	
	POL076	UNNAMED PROSPECT	Upland waste rock	200 CY	0.23 AC	--	NONE	NONE	NONE	NONE	

Notes:

The source IDs, names, trait descriptions, and estimated quantities are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency, 2001c, 2001d). For the purpose of comparing Ecological Alternatives 3 and 4 with Alternatives 3+ and 4+, the waste material quantities for all alternatives are based on the most recent estimates from BLM.

AC = acres
CFS = cubic feet per second
CY = cubic yards
µg/L = micrograms per liter

Typical Conceptual Design (TCD) Codes

C01 = Excavation (dry)
C01b = Excavation (60% dry, 40% wet)
C02a = Regrade/Consolidate/Revegetate: Lower Part of Pile in 100-Year Floodplain
C02b = Regrade/Consolidate/Revegetate: Waste Rock Pile in Stream Valley
C02c = Regrade/Consolidate/Revegetate: Stabilize Using Erosion Protection
C07 = Waste Consolidation Area Above Flood Level
C08a = Repository, 1 million cy
C09 = Impoundment Closure
C10 = Adit Drainage Collection
C11 = Hydraulic Isolation Using Slurry Wall
C11j = Hydraulic Isolation Using Slurry Wall (with drain, 30 ft deep)
NONE = No Action
PT-1a = Passive Treatment
TRMT-1 = Active Treatment
WT02 = Onsite Semi-Passive Water Treatment Using Lime Addition and Settling Pond(s)

The number in the bracket [ ] following the TCD code = Percentage of known materials addressed by the TCD. For TCDs other than "NONE", no bracket assumes that all known materials will be addressed.

Note (a) = TCD(s) updated based on an evaluation of water treatment technologies.
Note (b) = TCD(s) updated to provide remedial actions for operating sites. In the 2001 FS, operating sites included in the alternatives either were not assigned actions or were assigned only a hydraulic isolation (C11) action. In the current FFS, operating sites are assigned a complete set of remedial actions based on the waste types present.

TABLE 6-13

Stream and Riparian Cleanup Actions, Alternatives 3+ and 4+, Moon Creek Watershed

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment	Reach	Reach Description	TCD Description	Alternative 3+ TCD Quantity	Alternative 4+ TCD Quantity	Unit of Measure
MoonCrkSeg01	MC01-2	Unnamed tributary at mile 1.8 to mainstem Mook Creek confluence	Bioengineered Revetments	1,500	1,500	LF
			Current Deflector	34	34	EA
			Current Deflectors, Sediment Traps	4	4	EA
			Floodplain and Riparian Replanting	2.6	2.6	AC
			Vegetative Bank Stabilization	1,500	1,500	LF
MoonCrkSeg02	MC02-2	Unnamed tributary at mile 2.8 to confluence with WF	Bioengineered Revetments	1,300	1,300	LF
			Current Deflector	60	67	EA
			Current Deflectors, Sediment Traps	7	0	EA
			Floodplain and Riparian Replanting	7.7	7.7	AC
			Off-Channel Hydrologic Features	1	2	EA
			Vegetative Bank Stabilization	1,300	1,300	LF
	MC02-3	WF confluence to unnamed tributary at mile 1.2	Bioengineered Revetments	1,100	1,100	LF
			Current Deflector	25	28	EA
			Current Deflectors, Sediment Traps	3	0	EA
			Floodplain and Riparian Replanting	3.8	3.8	AC
			Off-Channel Hydrologic Features	1	1	EA
			Vegetative Bank Stabilization	1,100	1,100	LF
	MC02-4	Unnamed tributary at mile 1.2 to South Fork Coeur d'Alene River	Bioengineered Revetments	580	580	LF
			Current Deflector	26	29	EA
			Current Deflectors, Sediment Traps	3	0	EA
			Floodplain and Riparian Replanting	3.3	3.3	AC
			Vegetative Bank Stabilization	870	870	LF

Notes:

TCD = typical conceptual design

The listed TCDs are defined in Section 6.2.1.3 and described in detail in Section 5.0 of this FFS Report.

AC = acres
EA = each
LF = lineal feet

TABLE 6-14

Comparison of Previous Ecological Alternatives and Updated Remedial Alternatives, Moon Creek Watershed

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Volume (CY) or Average Discharge Rate (CFS)	Area (AC) or Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Alt. 3 TCDs	Alt. 3+ TCDs	Alt. 4 TCDs	Alt. 4+ TCDs
MoonCrkSeg01	KLE007	WASHINGTON-IDAHO MINE	Upland waste rock	1,890 CY	0.62 AC	--	NONE	NONE	C02b	C02b
	KLE061	UNNAMED TUNNEL	Floodplain waste rock	200 CY	0.13 AC	--	C01+C08a	C01+C08a	C01+C08a	C01+C08a
MoonCrkSeg02	KLE008	MAINE-STANDARD MINE	Upland waste rock (erosion potential)	16,000 CY	0.65 AC	--	C02b	C02b	C02b	C02b
	KLE009	HIGHLAND MINE	Upland waste rock	33,000 CY	1.38 AC	--	NONE	NONE	C02a	C02a
	KLE012	SILVER SUMMIT TAILINGS POND	Floodplain tailings	0 CY	6.39 AC	--	NONE	NONE	NONE	NONE
	KLE013	COGDILL MINE	Upland waste rock	13,000 CY	0.53 AC	--	NONE	NONE	C02b	C02b
	KLE014	ROYAL ANNE MINE	Upland waste rock (erosion potential)	200 CY	0.49 AC	--	C01+C08a	C01+C08a	C01+C08a	C01+C08a
	KLE041	MOON CK IMPACTED RIPARIAN	Floodplain sediments	3,300 CY	49.62 AC	--	C01b+C08a	C01b+C08a	C01b+C08a	C01b+C08a
	KLE063	UNNAMED ADIT	Upland waste rock (erosion potential)	200 CY	0.15 AC	--	C02b	C02b	C02b	C02b
	KLE064	UNNAMED ADIT	Upland waste rock (erosion potential)	200 CY	0.13 AC	--	C02b	C02b	C02b	C02b
	KLE065	UNNAMED ADITS	Upland waste rock (erosion potential)	200 CY	0.23 AC	--	C02b	C02b	C02b	C02b
	KLE076	SILVER CRESCENT MINE SITE & ROCKDUMP	Upland waste rock	0 CY	1.18 AC	--	NONE	NONE	NONE	NONE
	KLE077	SILVER CRESCENT MILL & ADJACENT BLDGS	Upland tailings	0 CY	2.98 AC	--	NONE	NONE	NONE	NONE
	KLE078	CHARLES DICKENS MINE COMPLEX	Upland waste rock	0 CY	4.93 AC	--	NONE	NONE	NONE	NONE

Notes:

The source IDs, names, trait descriptions, and estimated quantities are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency, 2001c, 2001d). For the purpose of comparing Ecological Alternatives 3 and 4 with Alternatives 3+ and 4+, the waste material quantities for all alternatives are based on the most recent estimates from BLM.

AC = acres
CFS = cubic feet per second
CY = cubic yards
µg/L = micrograms per liter

Typical Conceptual Design (TCD) Codes

C01 = Excavation (dry)
C01b = Excavation (60% dry, 40% wet)
C02a = Regrade/Consolidate/Revegetate: Lower Part of Pile in 100-Year Floodplain
C02b = Regrade/Consolidate/Revegetate: Waste Rock Pile in Stream Valley
C08a = Repository, 1 million cy
NONE = No Action

The number in the bracket [ ] following the TCD code = Percentage of known materials addressed by the TCD. For TCDs other than "NONE", no bracket assumes that all known materials will be addressed.

TABLE 6-15

Stream and Riparian Cleanup Actions, Alternatives 3+ and 4+, Pine Creek Watershed

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment	Reach	Reach Description	TCD Description	Alternative 3+ TCD Quantity	Alternative 4+ TCD Quantity	Unit of Measure
PineCrkSeg03	PC03-1	Unnamed tributary to unnamed tributary	Bioengineered Revetments	2,000	2,000	LF
			Current Deflector	37	41	EA
			Current Deflectors, Sediment Traps	4	0	EA
			Floodplain and Riparian Replanting	5.3	5.4	AC
			Off-Channel Hydrologic Features	3.8	3.8	AC
			Vegetative Bank Stabilization	2,000	2,000	LF
	PC03-2	Unnamed tributary to Little Pine Creek and I-90 in Pinehurst	Bioengineered Revetments	1,600	1,600	LF
			Current Deflector	20	22	EA
			Current Deflectors, Sediment Traps	2	0	EA
			Floodplain and Riparian Replanting	4.2	4.5	AC
			Off-Channel Hydrologic Features	3.7	3.3	AC
			Vegetative Bank Stabilization	1,600	1,600	LF
	PC03-3	Little Pine Creek and I-90 to unnamed tributary	Bioengineered Revetments	1,000	1,000	LF
			Current Deflector	8	10	EA
			Current Deflectors, Sediment Traps	2	0	EA
			Floodplain and Riparian Replanting	6.5	6.5	AC
			Vegetative Bank Stabilization	1,000	1,000	LF

Notes:

TCD = typical conceptual design

The listed TCDs are defined in Section 6.2.1.3 and described in detail in Section 5.0 of this FFS Report.

AC = acres
EA = each
LF = lineal feet

TABLE 6-16
Comparison of Previous Ecological Alternatives and Updated Remedial Alternatives, Pine Creek Watershed
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Volume (CY) or Average Discharge Rate (CFS)	Area (AC) or Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Alt. 3 TCDs	Alt. 3+ TCDs	Alt. 4 TCDs	Alt. 4+ TCDs	Notes
PineCrkSeg01	CSMPC01-1	MATCHLESS MINE	Upland waste rock	6,000 CY	0 AC	--	NONE	NONE	NONE	NONE	
	HHWPPC01-1	Upland waste pile w/human health exposure	Upland waste rock	0 CY	1 AC	--	HH-2	HH-2	NONE	NONE	
	HHWPPC01-2	Upland waste pile w/human health exposure	Upland waste rock	0 CY	1 AC	--	HH-2	HH-2	NONE	NONE	
	MAS004	LOOKOUT MOUNTAIN MINE	Adit drainage	0.0268 CFS	0.0536 CFS	49 µg/L	NONE	NONE	C10+PT-1a	WT02+C10	Alt. 4+: Note (a)
			Upland waste rock	20,400 CY	0.85 AC	--	NONE	NONE	C02a	C02a	
	MAS005	LYNCH PINE NO.2	Upland waste rock	6,960 CY	0.29 AC	--	NONE	NONE	C02a	C02a	
	MAS006	NABOB TAILINGS POND	Floodplain tailings - inactive Facilities	42,000 CY	4.1 AC	--	C09+C11	C09+C11j	C01+C08a	C01+C08a	
	MAS007	NABOB 1300 LEVEL	Adit drainage	0.0513 CFS	0.074 CFS	7,665 µg/L	C10+PT-1a	WT03+C10	C10+PT-1a	WT03+C10	Alt. 3+ and 4+: Note (a)
			Upland waste rock	48,000 CY	1.82 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	MAS008	NABOB 600 LEVEL (Crystalite)	Upland waste rock (erosion potential)	25,000 CY	1.36 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MAS009	SHETLAND MINING CO-NABOB SILVER-LEAD	Adit drainage	0.000651 CFS	0.00083 CFS	14 µg/L	NONE	NONE	C10+PT-1a	WT03+C10	Alt. 3+ and 4+: Note (a)
			Upland waste rock (erosion potential)	7,440 CY	0.31 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MAS010	IDAHO PROSPECT: NO. 1	Upland waste rock	200 CY	0 AC	--	NONE	NONE	NONE	NONE	
	MAS011	IDAHO PROSPECT: NO. 2	Adit drainage	0.000642 CFS	0.00128 CFS	10,500 µg/L	C10+PT-1a	WT03+C10	C10+PT-1a	WT03+C10	Alt. 3+ and 4+: Note (a)
			Upland waste rock	200 CY	0 AC	--	NONE	NONE	NONE	NONE	
	MAS012	LYNCH-PINE CREEK MINE	Adit drainage	0.1 CFS	0.2 CFS	15,900 µg/L	C10+PT-1a	WT02+C10	C10+PT-1a	WT02+C10	Alt. 3+ and 4+: Note (a)
			Upland waste rock (erosion potential)	500 CY	0.93 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MAS013	NABOB 600 LEVEL (300 Level)	Upland waste rock (erosion potential)	4,700 CY	0.42 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MAS014	HILARITY MINE	Adit drainage	0.1 CFS	0.2 CFS	6,230 µg/L	C10+PT-1a	WT02+C10	C10+PT-1a	WT02+C10	Alt. 3+ and 4+: Note (a)
			Seep	0.1 CFS	0.2 CFS	7,500 µg/L	PT-1a	WT02	PT-1a	WT02	Alt. 3+ and 4+: Note (a)
			Upland waste rock	30,720 CY	1.28 AC	--	NONE	C01+C03	NONE	C01+C07	Alt. 3+ and 4+: Note (b)
			Upland tailings	80 CY	0 AC	--	C01+C08a	C01+C08a	C01+C08a	C01+C08a	
	MAS015	LITTLE PITTSBURG MINE: NO. 2	Adit drainage	0.00174 CFS	0.0067 CFS	8,150 µg/L	C10+PT-1a	WT03+C10	C10+PT-1a	WT03+C10	Alt. 3+ and 4+: Note (a)
			Seep	0.1 CFS	0.2 CFS	640 µg/L	NONE	NONE	NONE	NONE	
			Upland waste rock (erosion potential)	1,000 CY	1.51 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MAS016	LITTLE PITTSBURG MINE: NO. 1	Adit drainage	0.000422 CFS	0.00084 CFS	61,400 µg/L	C10+PT-1a	WT03+C10	C10+PT-1a	WT03+C10	Alt. 3+ and 4+: Note (a)
			Upland waste rock (erosion potential)	23,280 CY	0.97 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MAS017	SIDNEY (DENVER) 500 LEVEL	Adit drainage	0.1 CFS	0.2 CFS	3,460 µg/L	C10+PT-1a	WT02+C10	C10+PT-1a	WT02+C10	Alt. 3+ and 4+: Note (a)
			Upland waste rock (erosion potential)	62,640 CY	2.61 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MAS018	DENVER MINE (NABOB ADIT)	Upland waste rock (erosion potential)	2,700 CY	3.77 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MAS019	STAR ANTIMONY LOWER ADIT	Floodplain waste rock	1,000 CY	0.35 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MAS020	SIDNEY (RED CLOUD) MINE/MILLSITE	Adit drainage	0.018 CFS	0.089 CFS	43,700 µg/L	C10+TRMT-1	WT03+C10	C10+TRMT-1	WT03+C10	Alt. 3+ and 4+: Note (a)
			Upland tailings	0 CY	0 AC	--	NONE	NONE	NONE	NONE	
	MAS021	NEVADA-STEWART MINE	Adit drainage	0.0735 CFS	0.111 CFS	9,833 µg/L	C10+PT-1a	WT02+C10	C10+PT-1a	WT02+C10	Alt. 3+ and 4+: Note (a)
			Seep	0.0028 CFS	0.0056 CFS	2,735 µg/L	NONE	NONE	NONE	NONE	
			Upland waste rock (erosion potential)	1,000 CY	0.63 AC	--	C01+C04	C01+C04	C01+C08a	C01+C08a	
	MAS022	SURPRISE MINE & UPPER ROCK DUMP	Floodplain waste rock	48,000 CY	1.68 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MAS023	BLUE EAGLE MINE	Adit drainage	0.1 CFS	0.2 CFS	0 µg/L	NONE	NONE	NONE	NONE	Alt. 3+ and 4+: Note (a)
			Upland waste rock (erosion potential)	1,000 CY	0.35 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MAS024	DOUGLAS MINE TAILINGS	Floodplain tailings	0 CY	3.01 AC	--	NONE	NONE	NONE	NONE	
	MAS025	DOUGLAS MINE & MILLSITE	Adit drainage	0.1 CFS	0.2 CFS	0 µg/L	NONE	NONE	C10+PT-1a	WT03+C10	Alt. 4+: Note (a)
			Floodplain waste rock (intermixed tailings)	35,000 CY	0 AC	--	NONE	C01+C03	NONE	C01+C08a	Alt. 3+ and 4+: Note (c)
	MAS026	CONSTITUTION UPPER MILLSITE (BLM land)	Floodplain tailings	0 CY	1.25 AC	--	NONE	NONE	NONE	NONE	

TABLE 6-16
Comparison of Previous Ecological Alternatives and Updated Remedial Alternatives, Pine Creek Watershed
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Volume (CY) or Average Discharge Rate (CFS)	Area (AC) or Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Alt. 3 TCDs	Alt. 3+ TCDs	Alt. 4 TCDs	Alt. 4+ TCDs	Notes
	MAS027	CONSTITUTION LOWER MINE & ROCK DUMP	Floodplain waste rock	7,000 CY	2.42 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	MAS028	LON CHANEY GROUP	Upland waste rock (erosion potential)	10,800 CY	0.45 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MAS029	BIG IT MINE	Adit drainage	0.00106 CFS	0.00212 CFS	36 µg/L	NONE	NONE	C10+PT-1a	WT03+C10	Alt. 3+ and 4+: Note (a)
			Upland waste rock (intermixed tailings)	700 CY	0.22 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MAS030	TRAPPER CREEK SILVER	Upland waste rock (erosion potential)	6,720 CY	0.28 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	MAS031	TRAPPER MINING & SMELTING COMPANY LTD.	Upland waste rock (erosion potential)	4,320 CY	0.18 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MAS032	L AND J PROSPECT	Upland waste rock (erosion potential)	80 CY	0.27 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MAS033	COEUR D ALENE PREMIER	Upland waste rock (erosion potential)	4,800 CY	0.2 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MAS034	BRISTOL GROUP	Upland waste rock	3,600 CY	0.15 AC	--	NONE	NONE	C02a	C02a	
	MAS035	NABOB 600 LEVEL SHAFT	Upland waste rock (erosion potential)	8,000 CY	0.3 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MAS036	DENVER CK TAILINGS PILE	Floodplain tailings	2,700 CY	1.87 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	Alt. 3+ and 4+: Note (a)
			Seep	0.1 CFS	0.2 CFS	3,690 µg/L	NONE	NONE	NONE	NONE	
	MAS037	EF PINE CK ROCK PIT: NO. 3	Floodplain waste rock	0 CY	1.58 AC	--	NONE	NONE	NONE	NONE	
	MAS038	EF PINE CK ROCK PIT: NO. 2	Floodplain waste rock	0 CY	3.43 AC	--	NONE	NONE	NONE	NONE	
	MAS039	EF PINE CK ROCK PIT: NO. 1	Floodplain waste rock	0 CY	3.05 AC	--	NONE	NONE	NONE	NONE	
	MAS040	DENVER CK IMPACTED RIPARIAN: NO. 2	Floodplain sediments	4,600 CY	1.43 AC	--	C01b+C08a	C01b+C08a+NONE [70]	C01b+C08a	C01b+C08a+NONE [70]	Alt. 3+ and 4+: Note (c)
	MAS041	DENVER CK IMPACTED RIPARIAN: NO. 3	Floodplain sediments	7,800 CY	2.43 AC	--	C01b+C08a	C01b+C08a+NONE [70]	C01b+C08a	C01b+C08a+NONE [70]	Alt. 3+ and 4+: Note (c)
	MAS042	DENVER CK IMPACTED RIPARIAN: NO. 4	Floodplain sediments	3,600 CY	1.13 AC	--	C01b+C08a	C01b+C08a+NONE [70]	C01b+C08a	C01b+C08a+NONE [70]	Alt. 3+ and 4+: Note (c)
	MAS043	DENVER CK IMPACTED RIPARIAN: NO. 1	Floodplain sediments	10,000 CY	3.11 AC	--	C01b+C08a	C01b+C08a+NONE [70]	C01b+C08a	C01b+C08a+NONE [70]	Alt. 3+ and 4+: Note (c)
	MAS044	HIGHLAND CK ROCK PIT	Floodplain waste rock	0 CY	0.92 AC	--	NONE	NONE	NONE	NONE	
	MAS045	HIGHLAND CK IMPACTED RIPARIAN	Floodplain sediments	10,000 CY	3.1 AC	--	C01b+C08a	C01b+C08a+NONE [70]	C01b+C08a	C01b+C08a+NONE [70]	Alt. 3+ and 4+: Note (c)
	MAS046	HIGHLAND & RED CLOUD CK IMPACTED RIPAR	Floodplain sediments	79,500 CY	24.61 AC	--	C01b+C08a	C01b+C08a+NONE [70]	C01b+C08a	C01b+C08a+NONE [70]	Alt. 3+ and 4+: Note (c)
	MAS047	EF PINE & PINE CK IMPACTED FLOODPLAIN (PineCrk	Floodplain sediments	193,000 CY	134.3 AC	--	C01b+C07+NONE [96]	NONE	C01b+C08a	NONE	Alt. 3+ and 4+: Note (c)
	MAS048	CONSTITUTION LOWER MILLSITE & TAILINGS	Floodplain tailings	4,950 CY	0.68 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
			Upland tailings	16,320 CY	1 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MAS049	CONSTITUTION UPPER TAILINGS (non-BLM land)	Floodplain tailings	36,000 CY	2.93 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	Alt. 3+ and 4+: Note (a)
			Seep	0.1 CFS	0.2 CFS	1,300 µg/L	NONE	NONE	NONE	NONE	
	MAS050	CONSTITUTION UPPER TUNNEL & ROCK DUMP	Adit drainage	0.079 CFS	0.0979 CFS	328 µg/L	C10+PT-1a	WT02+C10	C10+PT-1a	WT02+C10	Alt. 3+ and 4+: Note (a)
			Floodplain waste rock (intermixed tailings)	21,400 CY	1.5 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	MAS051	UNNAMED ADIT	Upland waste rock	200 CY	0.23 AC	--	NONE	NONE	C02b	C02b	
	MAS052	OWL/FRED MINE	Adit drainage	0.1 CFS	0.2 CFS	452 µg/L	C10+PT-1a	NONE	C10+PT-1a	NONE	Alt. 3+ and 4+: Note (a) ar
			Upland waste rock (erosion potential)	5,280 CY	0.22 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	MAS053	UNNAMED ADITS	Upland waste rock (erosion potential)	200 CY	0.45 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MAS054	MARMION OR SF FRACTION	Adit drainage	0.0089 CFS	0.0178 CFS	111 µg/L	C10+PT-1a	WT03+C10	C10+PT-1a	WT03+C10	Alt. 3+ and 4+: Note (a)
			Floodplain waste rock	10,560 CY	0.44 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MAS055	UNNAMED ADIT	Upland waste rock (erosion potential)	200 CY	0.24 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MAS056	UNNAMED PROSPECT	Upland waste rock	200 CY	0.19 AC	--	NONE	NONE	C02b	C02b	
	MAS057	UNNAMED ADIT	Upland waste rock (erosion potential)	200 CY	0.17 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MAS058	STAR ANTIMONY UPPER ADIT	Upland waste rock	7,200 CY	0.3 AC	--	NONE	NONE	C02a	C02a	
	MAS059	UNNAMED ADIT	Upland waste rock	200 CY	0.28 AC	--	NONE	NONE	C02a	C02a	
	MAS060	HIGHLAND CHIEF	Upland waste rock	6,480 CY	0.27 AC	--	NONE	NONE	C02b	C02b	
	MAS061	UNNAMED ADIT	Upland waste rock	200 CY	0.31 AC	--	NONE	NONE	C02a	C02a	
	MAS062	UNNAMED ADIT	Upland waste rock	200 CY	0.23 AC	--	NONE	NONE	C02b	C02b	

TABLE 6-16
Comparison of Previous Ecological Alternatives and Updated Remedial Alternatives, Pine Creek Watershed
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Volume (CY) or Average Discharge Rate (CFS)	Area (AC) or Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Alt. 3 TCDs	Alt. 3+ TCDs	Alt. 4 TCDs	Alt. 4+ TCDs	Notes
	MAS063	UNNAMED ADIT	Upland waste rock	200 CY	0.15 AC	--	NONE	NONE	C02a	C02a	
	MAS065	UNNAMED PROSPECT	Upland waste rock (erosion potential)	200 CY	0.2 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MAS067	LOOKOUT MOUNTAIN MINE UPPER ROCK DUMP	Seep	0.1 CFS	0.2 CFS	17 µg/L	NONE	NONE	PT-1a	NONE	Alt. 4+: Note (a) and (c)
			Upland waste rock	50,000 CY	0.36 AC	--	NONE	NONE	C02a	C02a	
	MAS068	UNNAMED ADIT	Upland waste rock (erosion potential)	200 CY	0.16 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	MAS069	SIDNEY (DENVER) 500 LEVEL ADJ ADITS	Upland waste rock	45,360 CY	1.89 AC	--	NONE	NONE	C02a	C02a	
	MAS071	UNNAMED PROSPECT	Upland waste rock	200 CY	0.25 AC	--	NONE	NONE	NONE	NONE	
	MAS072	UNNAMED ADIT	Upland waste rock (erosion potential)	200 CY	0.33 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MAS073	UNIDENTIFIED DISTURBANCE	Upland waste rock	200 CY	0.18 AC	--	NONE	NONE	NONE	NONE	
	MAS074	UNIDENTIFIED DISTURBANCE	Upland waste rock	200 CY	0.43 AC	--	NONE	NONE	NONE	NONE	
	MAS075	SILVER BAND GROUP	Upland waste rock	4,560 CY	0.19 AC	--	NONE	NONE	C02a	C02a	
	MAS076	STAR ANTIMONY UPPER ROCK DUMP	Upland waste rock	10,800 CY	0.45 AC	--	NONE	NONE	C02a	C02a	
	MAS077	STEUNENBERG CLAIM	Upland waste rock	26,160 CY	1.09 AC	--	NONE	NONE	C02a	C02a	
	MAS078	HIGHLAND-SURPRISE MINE & MILLSITE	Adit drainage	0.038 CFS	0.076 CFS	2,853 µg/L	C10+PT-1a	WT03+C10	C10+PT-1a	WT03+C10	Alt. 3+ and 4+: Note (a)
			Seep	0.0106 CFS	0.0212 CFS	7,700 µg/L	NONE	NONE	NONE	NONE	Alt. 3+ and 4+: Note (a)
			Upland waste rock	0 CY	2.51 AC	--	NONE	NONE	NONE	NONE	
			Upland tailings	0 CY	2.51 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MAS079	HIGHLAND-SURPRISE LOWER ROCK DUMP	Floodplain waste rock	37,300 CY	1.9 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	MAS080	NEVADA TUNNEL & ROCK DUMP	Upland waste rock	10,320 CY	0.43 AC	--	NONE	NONE	C02a	C02a	
	MAS081	SIDNEY (RED CLOUD) ROCK DUMP	Floodplain waste rock	95,000 CY	2.1 AC	--	NONE	C02a	NONE	C02a	Alt. 3+ and 4+: Note (c)
	MAS082	SIDNEY (RED CLOUD) LOWER ROCK DUMP	Upland waste rock	14,880 CY	0.62 AC	--	NONE	NONE	C02b	C02b	
	MAS083	NABOB MILLSITE	Upland waste rock	29,000 CY	2.81 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
			Upland tailings	8,150 CY	2.81 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MAS084	DOUGLAS MINESITE TAILINGS REPOSITORY	Floodplain tailings	30,000 CY	1.63 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
			Upland tailings	0 CY	2.51 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MAS085	CONSTITUTION UPPER/TAILINGS REPOSITORY	Floodplain tailings	0 CY	1.59 AC	--	NONE	NONE	NONE	NONE	
PineCrkSeg02	TWI001	PALISADE MINE BLACKSMITH SHOP WORKINGS	Upland waste rock	13,440 CY	0.56 AC	--	NONE	NONE	C02a	C02a	
	TWI002	PALISADE MINE LOWER WORKINGS	Floodplain waste rock	5,760 CY	0.24 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	TWI003	INEZ GROUP: NO. 3	Upland waste rock	3,840 CY	0.16 AC	--	NONE	NONE	C02a	C02a	
	TWI004	INEZ GROUP: NO. 2	Upland waste rock	5,520 CY	0.23 AC	--	NONE	NONE	C02a	C02a	
	TWI005	INEZ GROUP: NO. 1	Upland waste rock	7,200 CY	0.3 AC	--	NONE	NONE	C02a	C02a	
	TWI006	MANHATTAN MINE	Upland waste rock (erosion potential)	4,800 CY	0.2 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	TWI007	WESTERN KING PROSPECT	Upland waste rock	200 CY	0.25 AC	--	NONE	NONE	C02b	C02b	
	TWI008	WEST PINE CREEK DEPOSIT	Floodplain waste rock	200 CY	0.21 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	TWI009	EQUITABLE PROSPECT	Floodplain waste rock	6,480 CY	0.27 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	TWI010	LONE PINE MINE	Upland waste rock	7,920 CY	0.33 AC	--	NONE	NONE	C02b	C02b	
	TWI011	UNNAMED ADIT	Upland waste rock (erosion potential)	200 CY	0.23 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	TWI012	KC PROSPECT	Floodplain waste rock	3,840 CY	0.16 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	TWI013	BLUEBIRD PROSPECT (HANNIBAL)	Upland waste rock	7,680 CY	0.32 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	TWI014	GREAT DUNKARD MINE	Floodplain waste rock	6,000 CY	0.25 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	TWI015	SHERMAN PROSPECT	Upland waste rock	7,680 CY	0.32 AC	--	NONE	NONE	C02b	C02b	
	TWI016	INTERNATIONAL MINE	Upland waste rock	6,000 CY	0.25 AC	--	NONE	NONE	C02b	C02b	
	TWI017	TIBERIUS PROSPECT	Upland waste rock	6,480 CY	0.27 AC	--	NONE	NONE	C02a	C02a	

TABLE 6-16
Comparison of Previous Ecological Alternatives and Updated Remedial Alternatives, Pine Creek Watershed
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Volume (CY) or Average Discharge Rate (CFS)	Area (AC) or Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Alt. 3 TCDs	Alt. 3+ TCDs	Alt. 4 TCDs	Alt. 4+ TCDs	Notes
	TWI018	UNNAMED PROSPECT	Upland waste rock (erosion potential)	200 CY	0.31 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	TWI019	UNNAMED PROSPECT	Upland waste rock	200 CY	0.33 AC	--	NONE	NONE	C02b	C02b	
	TWI020	UNNAMED ADIT	Upland waste rock (erosion potential)	200 CY	0.24 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	TWI021	UNNAMED ADIT	Upland waste rock	200 CY	0.22 AC	--	NONE	NONE	C02a	C02a	
	TWI022	PALISADE MINE SURFACE DISTURBANCE	Upland waste rock	17,520 CY	0.73 AC	--	NONE	NONE	C02a	C02a	
	TWI023	PALISADE MINE ROCK DUMP	Upland waste rock	12,000 CY	0.5 AC	--	NONE	NONE	C02a	C02a	
	TWI024	UNNAMED PROSPECT	Upland waste rock	200 CY	0.42 AC	--	NONE	NONE	C02a	C02a	
	TWI025	UNNAMED PROSPECT	Upland waste rock	200 CY	0.3 AC	--	NONE	NONE	C02a	C02a	
	TWI026	UNNAMED PROSPECT	Upland waste rock	33,120 CY	1.38 AC	--	NONE	NONE	C02a	C02a	
	TWI027	UNNAMED PROSPECT	Upland waste rock (erosion potential)	200 CY	0.23 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	TWI028	UNNAMED PROSPECT	Upland waste rock	200 CY	0.18 AC	--	NONE	NONE	C02b	C02b	
	TWI029	UNNAMED ADIT	Upland waste rock	200 CY	0.24 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	TWI030	UNNAMED ADIT	Upland waste rock (erosion potential)	200 CY	0.28 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
PineCrkSeg03	KLW005	PINEHURST ROCK PIT ALONG I-90: NO. 2	Floodplain waste rock	137,520 CY	5.73 AC	--	NONE	NONE	NONE	NONE	
	KLW072	COEUR D ALENE ANTIMONY MINE	Upland waste rock	24,960 CY	1.04 AC	--	NONE	NONE	C02a	C02a	
	KLW073	SILVERSTONE MINE	Upland waste rock	8,400 CY	0.35 AC	--	NONE	NONE	C01+C08a	C01+C08a	
	KLW074	NORTHERN LIGHT MINE	Upland waste rock	7,200 CY	0.3 AC	--	NONE	NONE	NONE	NONE	
	KLW075	MATCHLESS MINE	Floodplain waste rock	17,040 CY	0.71 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	KLW076	DEGERSTROM PIT	Upland waste rock	28,080 CY	1.17 AC	--	NONE	NONE	NONE	NONE	
	KLW077	GENERAL MINE	Floodplain waste rock	11,040 CY	0.46 AC	--	NONE	C01+C07	NONE	C01+C08a	Alt. 3+ and 4+: Note (b)
	KLW079	GOLD EAGLE MINING CO.	Floodplain waste rock	9,600 CY	0.4 AC	--	NONE	C01+C07	NONE	C01+C08a	Alt. 3+ and 4+: Note (b)
	KLW080	BOBBY ANDERSON MINE	Upland waste rock	7,200 CY	0.3 AC	--	NONE	C01+C03	NONE	C01+C07	Alt. 3+ and 4+: Note (c)
	KLW081	AMY-MATCHLESS MILLSITE	Adit drainage	0.0043 CFS	0.00821 CFS	211 µg/L	NONE	NONE	C10+PT-1a	WT03+C10	Alt. 4+: Note (a)
			Floodplain sediments	0 CY	5.07 AC	--	NONE	NONE	NONE	NONE	
			Floodplain tailings	0 CY	0 AC	--	NONE	NONE	NONE	NONE	
			Seep	0.426 CFS	0.68 CFS	888 µg/L	NONE	NONE	NONE	NONE	
	KLW082	CARBONATE MINE: NO. 2	Floodplain waste rock	8,160 CY	0.34 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	KLW083	LIBERAL KING PART OF TUNNEL: NO. 2	Floodplain waste rock	13,920 CY	0.58 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	KLW084	LIBERAL KING PART OF TUNNEL: NO. 1	Upland waste rock	8,160 CY	0.34 AC	--	NONE	NONE	C02a	C02a	
	KLW085	CARBONATE MINE: NO. 1	Floodplain waste rock	14,400 CY	0.6 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	KLW105	CORBY MINE	Upland waste rock	38,160 CY	1.59 AC	--	NONE	NONE	NONE	NONE	
	MAS001	EAST HYPOTHEEK MINE	Upland waste rock	25,920 CY	1.08 AC	--	NONE	NONE	C02a	C02a	
	MAS002	LIBERAL KING TAILINGS	Floodplain tailings	0 CY	2.33 AC	--	NONE	NONE	NONE	NONE	
	MAS003	LIBERAL KING MINE & MILLSITE	Adit drainage	0.0046 CFS	0.00656 CFS	58 µg/L	NONE	NONE	C10+PT-1a	WT03+C10	Alt. 3+ and 4+: Note (a)
			Seep	0.1 CFS	0.2 CFS	1,430 µg/L	NONE	NONE	NONE	NONE	
			Upland waste rock (intermixed tailings)	20,000 CY	3.86 AC	--	C04	C04	C06	C06	
	MAS064	UNNAMED ADIT	Upland waste rock	200 CY	0.25 AC	--	NONE	NONE	C02a	C02a	
	MAS066	UNNAMED PROSPECT	Upland waste rock	200 CY	0.25 AC	--	NONE	NONE	C01+C08a	C01+C08a	

Notes:

The source IDs, names, trait descriptions, and estimated quantities are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency, 2001c, 2001d). For the purpose of comparing Ecological Alternatives 3 and 4 with Alternatives 3+ and 4+, the waste material quantities for all alternatives are based on the most recent estimates from BLM.

TABLE 6-16
Comparison of Previous Ecological Alternatives and Updated Remedial Alternatives, Pine Creek Watershed
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Volume (CY) or Average Discharge Rate (CFS)	Area (AC) or Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Alt. 3 TCDs	Alt. 3+ TCDs	Alt. 4 TCDs	Alt. 4+ TCDs	Notes

AC = acres
CFS = cubic feet per second
CY = cubic yards
µg/L = micrograms per liter

Typical Conceptual Design (TCD) Codes

C01 = Excavation (dry)
C01b = Excavation (60% dry, 40% wet)
C02a = Regrade/Consolidate/Revegetate: Lower Part of Pile in 100-Year Floodplain
C02b = Regrade/Consolidate/Revegetate: Waste Rock Pile in Stream Valley
C03 = Low-Permeability Cap
C04 = Low-Permeability Cap with Seepage Collection
C06 = Waste Consolidation Area with Erosion Protection
C07 = Waste Consolidation Area Above Flood Level
C08a = Repository, 1 million cy
C09 = Impoundment Closure
C10 = Adit Drainage Collection
C11 = Hydraulic Isolation Using Slurry Wall
C11j = Hydraulic Isolation Using Slurry Wall (with drain, 30 ft deep)
HH-2 = Upland Waste Pile Soil Cover
NONE = No Action
PT-1a = Passive Treatment
TRMT-1 = Active Treatment
WT02 = Onsite Semi-Passive Water Treatment Using Lime Addition and Settling Pond(s)
WT03 = Onsite Semi-Passive Water Treatment Using Sulfate-Reducing Bioreactor (SRB) System

The number in the bracket [ ] following the TCD code = Percentage of known materials addressed by the TCD. For TCDs other than "NONE", no bracket assumes that all known materials will be addressed.

Note (a) = TCD(s) updated based on an evaluation of water treatment technologies.
Note (b) = This site was not included in the 2001 FS for this alternative, but has been added for evaluation in this FFS. TCD(s) have been assigned to this site in accordance with the waste-type methodology used in the 2001 FS, as described in Section 6.2.
Note (c) = TCD(s) and waste volumes updated based on input from BLM.

TABLE 6-17

Stream and Riparian Cleanup Actions, Alternatives 3+ and 4+, Mainstem SFCDR Watershed

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment	Reach	Reach Description	TCD Description	Alternative 3+ TCD Quantity	Alternative 4+ TCD Quantity	Unit of Measure
MIDGradSeg01	MG01-1	Canyon Creek to Ninemile Creek	Bioengineered Revetments	900	900	LF
			Current Deflector	26	29	EA
			Current Deflectors, Sediment Traps	3	0	EA
			Floodplain and Riparian Replanting	0.8	0.81	AC
	MG01-2	Ninemile Creek to Placer Creek	Bioengineered Revetments	800	800	LF
			Current Deflector	14	16	EA
			Current Deflectors, Sediment Traps	2	0	EA
			Floodplain and Riparian Replanting	2.2	2.3	AC
	MG01-3	Placer Creek to Daly Gulch	Bioengineered Revetments	1,100	1,600	LF
			Current Deflector	9	10	EA
			Current Deflectors, Sediment Traps	1	0	EA
			Floodplain and Riparian Replanting	3.4	9.5	AC
			Vegetative Bank Stabilization	1,100	1,600	LF
	MG01-4	Daly Gulch to Lake Creek	Bioengineered Revetments	2,500	2,500	LF
			Current Deflector	26	58	EA
			Current Deflectors, Sediment Traps	3	0	EA
			Floodplain and Riparian Replanting	27	15	AC
			Vegetative Bank Stabilization	2,500	2,500	LF
	MG01-5	Lake Creek to Revenue Gulch	Bioengineered Revetments	800	800	LF
			Current Deflector	6	7	EA
			Current Deflectors, Sediment Traps	1	0	EA
			Floodplain and Riparian Replanting	0.6	14	AC
			Vegetative Bank Stabilization	800	800	LF
	MG01-6	Revenue Gulch to Dry Gulch	Bioengineered Revetments	3,200	3,200	LF
			Current Deflector	34	38	EA
			Current Deflectors, Sediment Traps	4	0	EA
			Floodplain and Riparian Replanting	8.9	33	AC
			Off-Channel Hydrologic Features	4.6	16	AC
			Vegetative Bank Stabilization	3,200	3,200	LF
	MG01-7	Dry Gulch to west end Osburn tailings pond	Bioengineered Revetments	3,600	3,600	LF
			Current Deflector	9	10	EA
			Current Deflectors, Sediment Traps	1	0	EA
			Floodplain and Riparian Replanting	7.6	8.3	AC
			Off-Channel Hydrologic Features	4.8	2.1	AC
			Vegetative Bank Stabilization	3,600	3,600	LF
	MG01-8	West end tailings ponds to Twomile Creek	Bioengineered Revetments	2,300	2,300	LF
			Channel Realignment	6.5	6.5	AC
			Current Deflector	21	23	EA
			Current Deflectors, Sediment Traps	2	0	EA
			Floodplain and Riparian Replanting	0.31	54	AC
			Off-Channel Hydrologic Features	18	13	AC
			Vegetative Bank Stabilization	2,300	2,300	LF

TABLE 6-17

Stream and Riparian Cleanup Actions, Alternatives 3+ and 4+, Mainstem SFCDR Watershed

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment	Reach	Reach Description	TCD Description	Alternative 3+ TCD Quantity	Alternative 4+ TCD Quantity	Unit of Measure
	MG01-9	Twomile Creek to W.F. Rosebud Creek	Bioengineered Revetments	560	560	LF
			Channel Realignment	1.5	1.5	AC
			Current Deflector	5	6	EA
			Current Deflectors, Sediment Traps	1	0	EA
			Floodplain and Riparian Replanting	5.2	0.52	AC
			Vegetative Bank Stabilization	560	560	LF
	MG01-10	W.F. Rosebud Creek to unnamed creek at RM 14.0	Bioengineered Revetments	400	850	LF
			Current Deflector	4	5	EA
			Current Deflectors, Sediment Traps	1	0	EA
			Floodplain and Riparian Replanting	1.2	7	AC
			Vegetative Bank Stabilization	400	850	LF
			Off-Channel Hydrologic Features	0	14	AC
	MG01-11	Unnamed creek at RM 14.0 to unnamed creek at RM 13.7	Bioengineered Revetments	1,200	1,200	LF
			Current Deflector	7	8	EA
			Current Deflectors, Sediment Traps	1	0	EA
			Floodplain and Riparian Replanting	6.6	3	AC
			Vegetative Bank Stabilization	1,200	1,200	LF
	MG01-12	Unnamed creek at RM 13.7 to unnamed creek at RM 13.1	Bioengineered Revetments	1,100	1,100	LF
			Current Deflector	13	15	EA
			Current Deflectors, Sediment Traps	2	0	EA
			Floodplain and Riparian Replanting	9.5	4.1	AC
			Off-Channel Hydrologic Features	11	0	AC
			Vegetative Bank Stabilization	1,100	1,100	LF
	MG01-13	Unnamed creek at RM 13.1 to unnamed creek at RM 12.3	Bioengineered Revetments	2,500	2,500	LF
			Channel Realignment	6.2	6.2	AC
			Current Deflector	21	23	EA
			Current Deflectors, Sediment Traps	2	0	EA
			Floodplain and Riparian Replanting	5.9	12	AC
			Off-Channel Hydrologic Features	17	13	AC
			Vegetative Bank Stabilization	2,500	2,500	LF
	MG01-14	Unnamed creek at RM 12.3 to unnamed creek at RM 12.0	Bioengineered Revetments	760	760	LF
			Channel Realignment	2.1	2.1	AC
			Current Deflector	7	8	EA
			Current Deflectors, Sediment Traps	1	0	EA
			Floodplain and Riparian Replanting	3.5	1.1	AC
			Off-Channel Hydrologic Features	0.87	0.27	AC
			Vegetative Bank Stabilization	760	760	LF
	MG01-15	Unnamed creek at RM 12.0 to Big Creek	Bioengineered Revetments	390	1,900	LF
			Current Deflector	17	19	EA
			Current Deflectors, Sediment Traps	2	0	EA
			Floodplain and Riparian Replanting	0.89	17	AC
			Off-Channel Hydrologic Features	13	8.7	AC
			Vegetative Bank Stabilization	390	580	LF

TABLE 6-17

Stream and Riparian Cleanup Actions, Alternatives 3+ and 4+, Mainstem SFCDR Watershed

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment	Reach	Reach Description	TCD Description	Alternative 3+ TCD Quantity	Alternative 4+ TCD Quantity	Unit of Measure
	MG01-16	Big Creek to Moon Creek	Bioengineered Revetments	110	1,100	LF
			Current Deflector	10	11	EA
			Current Deflectors, Sediment Traps	1	0	EA
			Floodplain and Riparian Replanting	0.33	1	AC
			Off-Channel Hydrologic Features	2.2	6.8	AC
			Vegetative Bank Stabilization	110	320	LF
	MG01-17	Moon Creek to unnamed creek at RM 9.8	Bioengineered Revetments	2,700	2,700	LF
			Channel Realignment	7.5	7.5	AC
			Current Deflector	24	27	EA
			Current Deflectors, Sediment Traps	3	0	EA
			Floodplain and Riparian Replanting	9	24	AC
			Off-Channel Hydrologic Features	3.2	5.3	AC
			Vegetative Bank Stabilization	2,700	2,700	LF
	MG01-18	Unnamed creek at RM 9.8 to Montgomery Creek	Bioengineered Revetments	1,400	1,400	LF
			Channel Realignment	3.8	3.8	AC
			Current Deflector	12	14	EA
			Current Deflectors, Sediment Traps	2	0	EA
			Floodplain and Riparian Replanting	9.2	9.3	AC
			Off-Channel Hydrologic Features	1.1	1.1	AC
			Vegetative Bank Stabilization	1,400	1,400	LF
MIDGradSeg02	MG02-10	Bear Creek confluence to McPhee Gulch confluence	Bioengineered Revetments	62	120	LF
			Current Deflector	11	6	EA
			Current Deflectors, Sediment Traps	1	0	EA
			Vegetative Bank Stabilization	120	120	LF
			Floodplain and Riparian Replanting	0	0.28	AC
	MG02-11	McPhee Gulch to unnamed tributary approx. 50ft from North Fork Coeur d'Alene River	Bioengineered Revetments	55	110	LF
			Current Deflector	4	5	EA
			Current Deflectors, Sediment Traps	1	0	EA
			Vegetative Bank Stabilization	110	110	LF
			Floodplain and Riparian Replanting	0	0.25	AC
	MG02-12	Unnamed tributary 50ft from confluence to North Fork Coeur d'Alene River	Bioengineered Revetments	15	77	LF
			Current Deflector	1	1	EA
			Floodplain and Riparian Replanting	0.035	0.11	AC
			Vegetative Bank Stabilization	7.7	23	LF

Notes:

TCD = typical conceptual design

The listed TCDs are defined in Section 6.2.1.3 and described in detail in Section 5.0 of this FFS Report.

AC = acres
EA = each
LF = lineal feet

TABLE 6-18
Comparison of Previous Ecological Alternatives and Updated Remedial Alternatives, Mainstem SFCDR Watershed
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Volume (CY) or Average Discharge Rate (CFS)	Area (AC) or Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Alt. 3 TCDs	Alt. 3+ TCDs	Alt. 4 TCDs	Alt. 4+ TCDs	Notes
MIDGradSeg01	HHWPMG01-1	Upland waste pile w/human health exposure	Upland waste rock	0 CY	1 AC	--	HH-2	HH-2	NONE	NONE	
	HHWPMG01-2	Upland waste pile w/human health exposure	Upland waste rock	0 CY	1 AC	--	HH-2	HH-2	NONE	NONE	
	HHWPMG01-3	Upland waste pile w/human health exposure	Upland waste rock	0 CY	1 AC	--	HH-2	HH-2	NONE	NONE	
	HHWPMG01-4	Upland waste pile w/human health exposure	Upland waste rock	0 CY	1 AC	--	HH-2	HH-2	NONE	NONE	
	HHWPMG01-5	Upland waste pile w/human health exposure	Upland waste rock	0 CY	1 AC	--	HH-2	HH-2	NONE	NONE	
	KLE004	LIBERTY BELL GROUP	Upland waste rock	200 CY	0.35 AC	--	NONE	NONE	C02a	C02a	
	KLE005	BENEWAH-SHOSHONE MINE	Upland waste rock	200 CY	0.64 AC	--	NONE	NONE	C02a	C02a	
	KLE006	TEDDY NO.2	Upland waste rock	200 CY	1.37 AC	--	NONE	NONE	C02a	C02a	
	KLE010	OSBURN ROCKPIT ALONG I-90: NO. 1	Floodplain waste rock	0 CY	13.38 AC	--	NONE	NONE	NONE	NONE	
	KLE011	SILVER CRESCENT TAILINGS	Upland tailings - inactive facilities	82,000 CY	7.89 AC	--	C09	C09	C01+C08a	C01+C08a	
	KLE015	BIG CK ROCKPIT ALONG I-90	Upland waste rock	0 CY	13.65 AC	--	NONE	NONE	NONE	NONE	
	KLE016	SYNDICATE MINING & EXPLORATION CO.	Upland waste rock (erosion potential)	200 CY	0.62 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	KLE017	EVOLUTION MINE	Floodplain sediments	0 CY	10.55 AC	--	NONE4	NONE4	NONE4	NONE4	
	KLE020	NEW HILARITY MINE	Upland waste rock (erosion potential)	36,000 CY	1.48 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	KLE021	ALHAMBRA MINE	Upland waste rock (erosion potential)	200 CY	0.65 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	KLE022	NEW JERSEY MINE	Upland waste rock	3,700 CY	1.05 AC	--	NONE	NONE	C02a	C02a	
	KLE023	PIONEER MINES INC. PROPERTY	Upland waste rock (erosion potential)	200 CY	1.15 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	KLE032	SUNSHINE ANTIMONY	Upland waste rock	200 CY	0.28 AC	--	NONE	NONE	C02a	C02a	
	KLE033	POLARIS MINE	Upland waste rock (erosion potential)	25,000 CY	1.6 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	KLE034	SILVER DOLLAR MINE	Adit drainage	0.018 CFS	0.024 CFS	0 µg/L	NONE	NONE	NONE	NONE	Alt. 3+ and 4+: Note (a)
			Floodplain waste rock	22,000 CY	2.29 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	KLE035	SILVER SUMMIT MINE	Adit drainage	0.045 CFS	0.09 CFS	0 µg/L	NONE	NONE	NONE	NONE	Alt. 3+ and 4+: Note (a)
			Floodplain waste rock	120,000 CY	13.45 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	KLE036	NELLIE MINE	Upland waste rock	200 CY	0.69 AC	--	NONE	NONE	C02a	C02a	
	KLE038	UNIDENTIFIED DISTURBANCE	Upland waste rock	0 CY	3.64 AC	--	NONE	NONE	C02a	C02a	
	KLE039	UNNAMED ADIT	Upland waste rock (erosion potential)	35,000 CY	1.46 AC	--	NONE	NONE	C01+C08a	C01+C08a	
	KLE040	SF CDA RIVER IMPACTED FLOODPLAIN: NO. 5	Floodplain sediments	112,000 CY	12.07 AC	--	C11	C14c+C15b	C01b+C08a	C01b+C08a	
			Groundwater	1.33 CFS	1.33 CFS	1,787 µg/L	TRMT-1	TRMT-1	WT01	WT01	Alt. 3+ and 4+: Note (a)
	KLE042	MOON CK POND AT MOUTH	Floodplain sediments	50,000 CY	2.6 AC	--	C01b+C08a	C01b+C08a	C01b+C08a	C01b+C08a	
			Floodplain tailings	13,000 CY	2.6 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	KLE043	GOLD RUN GULCH RECENT MINE ACTIVITY	Upland waste rock	65,000 CY	2.69 AC	--	NONE	NONE	NONE	NONE	
	KLE044	GOLD RUN GULCH RECENT MINE ACTIVITY	Upland waste rock	23,000 CY	0.96 AC	--	NONE	NONE	NONE	NONE	
	KLE045	GOLD RUN GULCH RECENT MINE ACTIVITY	Upland waste rock	33,000 CY	1.37 AC	--	NONE	NONE	NONE	NONE	
	KLE048	SF CDA RIVER SVNRT REHAB	Floodplain sediments	190,000 CY	20.37 AC	--	C01b+C08a+C11+NONE [79]	C01b+C08a+C14c+C15b	C01b+C08a+C11	C01b+C08a+C14c+C15b	
			Groundwater	1.33 CFS	1.33 CFS	1,787 µg/L	TRMT-1+NONE [50]	WT01	TRMT-1+NONE [50]	WT01	Alt. 3+ and 4+: Note (a)
	KLE049	SF CDA RIVER IMPACTED RIPARIAN (MidGradSeg01 & Mic	Floodplain sediments	200,000 CY	67.22 AC	--	C01b+C08a+C11	C01b+C08a+C14c+C15b	C01b+C08a+C11	C01b+C08a+C14c+C15b	
			Groundwater	1.33 CFS	1.33 CFS	1,787 µg/L	TRMT-1+NONE [50]	WT01	TRMT-1+NONE [50]	WT01	Alt. 3+ and 4+: Note (a)
	KLE051	FLORENCE MINE	Upland waste rock (erosion potential)	200 CY	0.33 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	KLE056	MINERAL MOUNTAIN MINE	Upland waste rock	200 CY	0.36 AC	--	NONE	NONE	C02a	C02a	
	KLE057	TEDDY NO.3	Upland waste rock	200 CY	0.18 AC	--	NONE	NONE	C02a	C02a	
	KLE058	TEDDY NO.1	Upland waste rock	200 CY	0.23 AC	--	NONE	NONE	C02a	C02a	
	KLE059	ENTERPRISE MINE	Upland waste rock	200 CY	0.14 AC	--	NONE	NONE	C02a	C02a	
	KLE060	ENTERPRISE EXTENSION	Upland waste rock	200 CY	0.24 AC	--	NONE	NONE	C02a	C02a	
	KLE062	OSBURN FLATS BUREAU OF MINES TESTPLOTS	Floodplain sediments	26,000 CY	3.3 AC	--	C01b+C08a	C01b+C08a	C01b+C08a	C01b+C08a	
			Upland waste rock	0 CY	3.3 AC	--	NONE	NONE	C02a	C02a	

TABLE 6-18
Comparison of Previous Ecological Alternatives and Updated Remedial Alternatives, Mainstem SFCDR Watershed
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Volume (CY) or Average Discharge Rate (CFS)	Area (AC) or Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Alt. 3 TCDs	Alt. 3+ TCDs	Alt. 4 TCDs	Alt. 4+ TCDs	Notes
	KLE066	RHODE ISLAND NO.1 & NO.2 & ASSOC.ADITS	Upland waste rock (erosion potential)	200 CY	0.38 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	KLE067	ST. JOE NO.4	Adit drainage	0.0055 CFS	0.007 CFS	455 µg/L	C10+PT-1a	NONE	C10+PT-1a	WT02+C10	Alt. 3+ and 4+: Note (a)
			Upland waste rock (erosion potential)	27,500 CY	0.2 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	KLE068	UNNAMED ADIT (St. Joe No. 2)	Adit drainage	0.0001 CFS	0.0002 CFS	0 µg/L	NONE	NONE	NONE	NONE	Alt. 3+ and 4+: Note (a)
			Upland waste rock (erosion potential)	14,000 CY	0.21 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	KLE069	ST. JOE NO.3	Adit drainage	0.0001 CFS	0.0002 CFS	0 µg/L	NONE	NONE	NONE	NONE	Alt. 3+ and 4+: Note (a)
			Upland waste rock (erosion potential)	1,300 CY	0.42 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	KLE070	UNNAMED ADIT	Upland waste rock (erosion potential)	200 CY	0.42 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	KLE074	COEUR D ALENE MILLSITE	Upland tailings	14,000 CY	2.88 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	KLE075	SILVER SUMMIT MILLSITE (Polaris)	Upland tailings	4,000 CY	0.86 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	MUL085	VIENNA INTERNATIONAL MINE	Adit drainage	0.356 CFS	0.712 CFS	32 µg/L	NONE	NONE	C10+PT-1a	WT02+C10	Alt. 3+ and 4+: Note (a)
			Seep	0.1 CFS	0.2 CFS	3 µg/L	NONE	NONE	NONE	NONE	Alt. 3+ and 4+: Note (a)
			Upland waste rock (erosion potential)	200 CY	0.37 AC	--	C01+C04	C01+C04	C01+C08a	C01+C08a	
	MUL086	WIBBERDING-GOLDEN SLIPPER MINES	Upland waste rock (erosion potential)	30,000 CY	1.26 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	MUL087	FLOIODO MINE	Upland waste rock	200 CY	0.37 AC	--	NONE	NONE	C02a	C02a	
	OSB024	CAPITOL SILVER-LEAD NO. 2	Upland waste rock	16,000 CY	0.65 AC	--	NONE	NONE	C02a	C02a	
	OSB025	CAPITOL SILVER-LEAD: NO. 3	Upland waste rock (erosion potential)	12,000 CY	0.5 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	OSB026	CAPITOL SILVER-LEAD: NO. 1	Upland waste rock	19,000 CY	0.78 AC	--	NONE	NONE	C02a	C02a	
	OSB027	UNNAMED ADIT	Upland waste rock	200 CY	1.19 AC	--	NONE	NONE	C02a	C02a	
	OSB028	SILVER ROCK PROSPECT	Upland waste rock	200 CY	0.11 AC	--	NONE	NONE	C02a	C02a	
	OSB029	OSBURN GRAVEL PIT	Upland artificial fill	0 CY	0.84 AC	--	NONE	NONE	NONE	NONE	
	OSB030	SILVERTON PROSPECT UPPER ADIT	Upland waste rock (erosion potential)	200 CY	0.45 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	OSB065	SF CDA RIVER IMPACTED FLOODPLAIN: NO. 3	Floodplain sediments	1,400,000 CY	167.38 AC	--	C01b+C08a+C11+NONE [81]	C01b+C08a+C14c+C15b	C01b+C08a+C11	C01b+C08a+C14c+C15b	
			Groundwater	1.33 CFS	1.33 CFS	1,787 µg/L	TRMT-1+NONE [50]	WT01	TRMT-1+NONE [50]	WT01	Alt. 3+ and 4+: Note (a)
	OSB070	SILVERORE-INSPIRATION MINE	Upland waste rock (erosion potential)	31,000 CY	1.3 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	OSB071	UNNAMED ADIT	Upland waste rock	200 CY	0.32 AC	--	NONE	NONE	C02a	C02a	
	OSB072	WESTERN UNION UPPER ADIT	Upland waste rock (erosion potential)	200 CY	0.23 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	OSB073	SILVERTON PROSPECT LOWER ADIT	Upland waste rock (erosion potential)	22,000 CY	0.58 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	OSB074	ST. JOE NO.1	Adit drainage	0.1 CFS	0.2 CFS	2,700 µg/L	C10+PT-1a	WT02+C10	C10+PT-1a	WT02+C10	Alt. 3+ and 4+: Note (a)
			Upland waste rock	3,800 CY	0.25 AC	--	NONE	NONE	C02a	C02a	
	OSB075	UNNAMED ADIT	Upland waste rock (erosion potential)	200 CY	0.28 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	OSB076	UNNAMED ADIT (May Claim)	Adit drainage	0.0011 CFS	0.0022 CFS	3 µg/L	NONE	NONE	C10+PT-1a	WT03+C10	Alt. 4+: Note (a)
			Upland waste rock (erosion potential)	200 CY	0.2 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	OSB078	UNNAMED ADIT (Hardscrabble Claim)	Upland waste rock (erosion potential)	200 CY	0.08 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	OSB079	CAPITOL SILVER MAIN ADIT	Adit drainage	0.0007 CFS	0.0014 CFS	0 µg/L	NONE	NONE	NONE	NONE	Alt. 4+: Note (a)
			Upland waste rock	200 CY	0.16 AC	--	NONE	NONE	C02a	C02a	
	OSB080	HARLOW TUNNEL	Adit drainage	0.0022 CFS	0.0044 CFS	3 µg/L	NONE	NONE	C10+PT-1a	WT03+C10	Alt. 4+: Note (a)
			Upland waste rock	5,000 CY	0.22 AC	--	NONE	NONE	C02a	C02a	
	OSB117	OSBURN ZANETTI STOCKPILED TAILINGS	Floodplain tailings	14,000 CY	1.34 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	OSB118	OSBURN NORTH TAILINGS AREA	Floodplain sediments	60,000 CY	23.7 AC	--	C01b+C08a	C01b+C08a	C01b+C08a	C01b+C08a	

TABLE 6-18
Comparison of Previous Ecological Alternatives and Updated Remedial Alternatives, Mainstem SFCDR Watershed
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Volume (CY) or Average Discharge Rate (CFS)	Area (AC) or Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Alt. 3 TCDs	Alt. 3+ TCDs	Alt. 4 TCDs	Alt. 4+ TCDs	Notes
	OSB119	OSBURN ZANETTI GRAVEL OPERATION	Floodplain sediments (underlying tailings pond)	410,000 CY	56.67 AC	--	C11	C11j	C01b+C08a+C11	C01b+C08a+C11j	Alt. 3+ and 4+: Note (b)
			Groundwater	0.05 CFS	0.1 CFS	0 µg/L	TRMT-1	WT01	TRMT-1	WT01	Alt. 3+ and 4+: Note (a)
	OSB120	SF CDA RIVER IMPACTED FLOODPLAIN: NO. 4	Floodplain sediments	1,200,000 CY	214.4 AC	--	C01b+C08a+C11+NONE [74]	C01b+C08a+C14c+C15b	C01b+C08a+C11	C01b+C08a+C14c+C15b	
			Groundwater	1.33 CFS	1.33 CFS	1,787 µg/L	TRMT-1+NONE [50]	WT01	TRMT-1+NONE [50]	WT01	Alt. 3+ and 4+: Note (a)
			Seep	0.06 CFS	0.12 CFS	6,545 µg/L	NONE	NONE	NONE	NONE	Alt. 3+ and 4+: Note (a)
	POL015	PURIM GROUP HAYDEN HILL CONSOLIDATED	Upland waste rock	200 CY	0.32 AC	--	NONE	NONE	C02a	C02a	
	POL016	CONSOLIDATED SILVER	Upland waste rock	200 CY	0.3 AC	--	NONE	NONE	C02a	C02a	
	POL017	LUCKY STONE MINE	Upland waste rock	200 CY	0.25 AC	--	NONE	NONE	C02a	C02a	
	POL018	MERGER MINE	Adit drainage	0.0094 CFS	0.0188 CFS	0 µg/L	NONE	NONE	NONE	NONE	Alt. 3+ and 4+: Note (a)
			Upland waste rock (erosion potential)	22,000 CY	0.91 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	POL019	COEUR D ALENE MINE	Adit drainage	0.1 CFS	0.2 CFS	0 µg/L	NONE	NONE	NONE	NONE	Alt. 3+ and 4+: Note (a)
			Upland waste rock (erosion potential)	200,000 CY	7.48 AC	--	C05	C05	C01+C08a	C01+C08a	
	POL020	AMERICAN SILVER MINE	Upland waste rock	200 CY	0.19 AC	--	NONE	NONE	C02a	C02a	
	POL021	ECLIPSE MINE	Upland waste rock (erosion potential)	200 CY	0.66 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	POL029	UNNAMED PROSPECT	Upland waste rock	200 CY	0.16 AC	--	NONE	NONE	C02a	C02a	
	POL030	UNNAMED PROSPECT	Upland waste rock	200 CY	0.48 AC	--	NONE	NONE	C02a	C02a	
	POL031	UNNAMED PROSPECT	Upland waste rock	200 CY	0.43 AC	--	NONE	NONE	C02a	C02a	
	POL032	GAHEY GROUP	Upland waste rock	200 CY	0.23 AC	--	NONE	NONE	C02a	C02a	
	POL033	UNNAMED PROSPECT	Upland waste rock	200 CY	0.23 AC	--	NONE	NONE	C02a	C02a	
	POL034	UNNAMED PROSPECT	Upland waste rock	200 CY	0.82 AC	--	NONE	NONE	C02a	C02a	
	POL035	UNNAMED PROSPECT	Upland waste rock	200 CY	1.96 AC	--	NONE	NONE	C02a	C02a	
	POL055	UNNAMED PROSPECT	Upland waste rock	200 CY	0.45 AC	--	NONE	NONE	C02a	C02a	
	POL057	UNNAMED PROSPECT	Upland waste rock	200 CY	0.18 AC	--	NONE	NONE	C02a	C02a	
	POL058	UNNAMED PROSPECT	Upland waste rock	200 CY	0.23 AC	--	NONE	NONE	C02a	C02a	
	POL059	UNNAMED PROSPECT	Upland waste rock	200 CY	0.27 AC	--	NONE	NONE	C02a	C02a	
	POL060	UNNAMED PROSPECT	Upland waste rock	200 CY	0.21 AC	--	NONE	NONE	C02a	C02a	
	POL061	UNNAMED PROSPECT	Upland waste rock	200 CY	0.38 AC	--	NONE	NONE	C02a	C02a	
	POL064	UNNAMED ADIT	Upland waste rock (erosion potential)	200 CY	0.2 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	POL065	UNNAMED PROSPECT	Upland waste rock	200 CY	0.21 AC	--	NONE	NONE	C02a	C02a	
	POL077	UNNAMED PROSPECT	Upland waste rock	200 CY	0.2 AC	--	NONE	NONE	C02a	C02a	
	POL078	UNNAMED PROSPECT	Upland waste rock	200 CY	0.16 AC	--	NONE	NONE	C02a	C02a	
	POL079	UNNAMED ADIT	Upland waste rock	200 CY	0.18 AC	--	NONE	NONE	C02a	C02a	
	POL080	UNNAMED PROSPECT	Upland waste rock	200 CY	0.16 AC	--	NONE	NONE	C02a	C02a	
	POL081	UNNAMED PROSPECT	Upland waste rock	200 CY	0.22 AC	--	NONE	NONE	C02a	C02a	
	POL082	UNNAMED PROSPECT	Upland waste rock	200 CY	0.22 AC	--	NONE	NONE	C02a	C02a	
	POL083	UNNAMED PROSPECT	Upland waste rock	200 CY	0.18 AC	--	NONE	NONE	C02a	C02a	
	POL084	UNNAMED PROSPECT	Upland waste rock	200 CY	0.16 AC	--	NONE	NONE	C02a	C02a	
	POL085	UNNAMED PROSPECT	Upland waste rock	200 CY	0.14 AC	--	NONE	NONE	C02a	C02a	
	POL086	UNNAMED PROSPECT	Upland waste rock	200 CY	0.18 AC	--	NONE	NONE	C02a	C02a	
	POL087	UNNAMED PROSPECT	Upland waste rock	200 CY	0.18 AC	--	NONE	NONE	C02a	C02a	
	POL088	UNNAMED ADIT	Upland waste rock	200 CY	0.32 AC	--	NONE	NONE	C02a	C02a	
	POL089	UNNAMED PROSPECT	Upland waste rock	200 CY	0.22 AC	--	NONE	NONE	C02a	C02a	
	POL090	UNNAMED ADIT	Upland waste rock	200 CY	0.11 AC	--	NONE	NONE	C02a	C02a	
	POL091	UNNAMED ADIT	Upland waste rock	200 CY	0.19 AC	--	NONE	NONE	C02a	C02a	
	POL092	UNNAMED ADIT	Upland waste rock	200 CY	0.28 AC	--	NONE	NONE	C02a	C02a	

TABLE 6-18
Comparison of Previous Ecological Alternatives and Updated Remedial Alternatives, Mainstem SFCDR Watershed
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Volume (CY) or Average Discharge Rate (CFS)	Area (AC) or Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Alt. 3 TCDs	Alt. 3+ TCDs	Alt. 4 TCDs	Alt. 4+ TCDs	Notes
	WAL001	OSBURN TAILINGS PONDS	Floodplain sediments (underlying tailings pond)	430,000 CY	66.24 AC	--	C11	C11j	C11	C11j	
			Groundwater	0.04 CFS	0.2 CFS	0 µg/L	TRMT-1	WT01	TRMT-1	WT01	Alt. 3+ and 4+: Note (a)
			Upland tailings - active facilities	3,100,000 CY	66.24 AC	--	C11	C09	C11	C09	Alt. 3+ and 4+: Note (b)
	WAL002	WESTERN UNION LOWER ADIT	Adit drainage	0.0008 CFS	0.002 CFS	0 µg/L	C10+PT-1a	WT01+C10	C10+PT-1a	WT01+C10	Alt. 3+ and 4+: Note (a)
			Floodplain waste rock	200 CY	0.87 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	WAL003	SILVERTON ROADCUT ALONG I-90	Upland waste rock	0 CY	3.29 AC	--	NONE	NONE	C02a	C02a	
	WAL004	SF CDA RIVER RAILROAD YARDS & IMP FLDP	Floodplain sediments	160,000 CY	70.27 AC	--	C01b+C08a+C11	C01b+C08a+C14c+C15b	C01b+C08a+C11	C01b+C08a+C14c+C15b	
			Groundwater	1.33 CFS	1.33 CFS	1,787 µg/L	TRMT-1+NONE [50]	WT01	TRMT-1+NONE [50]	WT01	Alt. 3+ and 4+: Note (a)
	WAL005	COMSTOCK GROUP	Upland waste rock	200 CY	0.34 AC	--	NONE	NONE	C02a	C02a	
	WAL014	ST. ELMO MINE	Upland waste rock (erosion potential)	39,000 CY	1.61 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	WAL015	COEUR MINE (RAINBOW)	Upland waste rock	400,000 CY	26.76 AC	--	NONE	NONE	NONE	NONE	
	WAL016	ARGENTINE MINE	Upland waste rock (erosion potential)	200 CY	0.48 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	WAL017	VULCAN MINE	Upland waste rock	200 CY	2.07 AC	--	NONE	NONE	C02a	C02a	
	WAL018	GALENA MINE AND MILLSITE	Upland waste rock	0 CY	18.25 AC	--	NONE	NONE	NONE	NONE	
			Upland tailings	88,000 CY	0 AC	--	NONE	NONE	NONE	NONE	
	WAL019	STERLING PROSPECT	Upland waste rock	200 CY	0.29 AC	--	NONE	NONE	C02a	C02a	
	WAL020	CALADAY MINE	Adit drainage	0.1 CFS	0.2 CFS	0 µg/L	C10+PT-1a	C10+WT01	C10+PT-1a	C10+WT01	Alt. 3+ and 4+: Note (a)
			Floodplain sediments	0 CY	0 AC	--	NONE2	NONE2	NONE2	NONE2	
			Upland waste rock (erosion potential)	139,000 CY	5.8 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	WAL021	WALLACE TUNNEL	Upland waste rock	200 CY	0.18 AC	--	NONE	NONE	C02a	C02a	
	WAL022	SILVER RANGE	Upland waste rock	200 CY	0.13 AC	--	NONE	NONE	C02a	C02a	
	WAL023	VULCAN EXTENSION	Upland waste rock	200 CY	0.16 AC	--	NONE	NONE	C02a	C02a	
	WAL024	WAR EAGLE MINE	Upland waste rock (erosion potential)	200 CY	0.43 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	WAL025	HORNSILVER MINE	Upland waste rock	200 CY	0.2 AC	--	NONE	NONE	C02a	C02a	
	WAL026	SMART ALECK MINE	Upland waste rock	200 CY	0.09 AC	--	NONE	NONE	C02a	C02a	
	WAL027	CASTLE ROCK MINE	Upland waste rock	200 CY	0.91 AC	--	NONE	NONE	C02a	C02a	
	WAL028	TILICUM PROSPECT	Upland waste rock	200 CY	0.18 AC	--	NONE	NONE	C02a	C02a	
	WAL029	SPOKANE TUNNEL	Upland waste rock	200 CY	0.36 AC	--	NONE	NONE	C02a	C02a	
	WAL034	SHIELDS GULCH IMPACTED RIPARIAN	Floodplain sediments	78,000 CY	16.3 AC	--	C01b+C08a+NONE [50]	C01b+C08a+NONE [50]	C01b+C08a	C01b+C08a	
	WAL035	OSBURN ROCKPIT ALONG I-90: NO. 2	Floodplain waste rock	140,000 CY	5.89 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	WAL036	LAKE CK IMPACTED RIPARIAN	Floodplain sediments	45,000 CY	9.27 AC	--	C01b+C07+NONE [50]	C01b+C07+NONE [50]	C01b+C08a	C01b+C08a	
	WAL037	HERCULES MILLSITE	Upland tailings	12,000 CY	2.42 AC	--	C01+C07	C01+C07	C01+C08a	C01+C08a	
	WAL046	DAY MINES CLAIMS	Upland waste rock (erosion potential)	200 CY	0.26 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	WAL047	UNNAMED ADIT	Upland waste rock	200 CY	0.22 AC	--	NONE	NONE	C02a	C02a	
	WAL048	UNNAMED PROSPECT	Upland waste rock	200 CY	1.21 AC	--	NONE	NONE	C02a	C02a	
	WAL049	UNNAMED PROSPECT	Upland waste rock	200 CY	1.13 AC	--	NONE	NONE	C02a	C02a	
	WAL050	UNNAMED PROSPECT	Upland waste rock	200 CY	0.84 AC	--	NONE	NONE	C02a	C02a	
	WAL051	UNNAMED PROSPECT	Upland waste rock	200 CY	0.64 AC	--	NONE	NONE	C02a	C02a	
	WAL052	UNNAMED PROSPECT	Upland waste rock	200 CY	0.84 AC	--	NONE	NONE	C02a	C02a	
	WAL053	UNNAMED PROSPECT	Upland waste rock	200 CY	0.32 AC	--	NONE	NONE	C02a	C02a	
	WAL054	UNNAMED PROSPECT	Upland waste rock	200 CY	0.69 AC	--	NONE	NONE	C02a	C02a	
	WAL055	UNNAMED ADIT	Upland waste rock (erosion potential)	200 CY	0.17 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	WAL056	PEERLESS GROUP (OSCEOLA)	Upland waste rock (erosion potential)	200 CY	0.24 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	WAL057	PEERLESS GROUP	Upland waste rock (erosion potential)	200 CY	0.1 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	WAL058	UNNAMED ADIT	Upland waste rock (erosion potential)	200 CY	0.09 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	

TABLE 6-18
Comparison of Previous Ecological Alternatives and Updated Remedial Alternatives, Mainstem SFCDR Watershed
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Volume (CY) or Average Discharge Rate (CFS)	Area (AC) or Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Alt. 3 TCDs	Alt. 3+ TCDs	Alt. 4 TCDs	Alt. 4+ TCDs	Notes
	WAL059	UNNAMED PROSPECT	Upland waste rock	200 CY	0.42 AC	--	NONE	NONE	C02a	C02a	
	WAL060	UNNAMED PROSPECT	Upland waste rock	200 CY	0.24 AC	--	NONE	NONE	C02a	C02a	
	WAL061	UNNAMED PROSPECT	Upland waste rock	200 CY	0.38 AC	--	NONE	NONE	C02a	C02a	
	WAL062	UNNAMED ADIT	Upland waste rock (erosion potential)	200 CY	0.19 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	WAL063	UNNAMED ADIT	Upland waste rock	200 CY	0.29 AC	--	NONE	NONE	C02a	C02a	
	WAL064	UNNAMED ADIT	Upland waste rock (erosion potential)	200 CY	0.35 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	WAL065	UNNAMED PROSPECT	Upland waste rock	200 CY	0.37 AC	--	NONE	NONE	C02a	C02a	
	WAL066	UNNAMED PROSPECT	Upland waste rock	200 CY	0.33 AC	--	NONE	NONE	C02a	C02a	
	WAL067	UNNAMED PROSPECT	Upland waste rock	200 CY	0.69 AC	--	NONE	NONE	C02a	C02a	
	WAL070	UNNAMED PROSPECT	Upland waste rock	200 CY	0.71 AC	--	NONE	NONE	C02a	C02a	
	WAL071	UNNAMED ADIT	Upland waste rock	200 CY	0.2 AC	--	NONE	NONE	C02a	C02a	
	WAL072	UNNAMED ADIT	Upland waste rock (erosion potential)	200 CY	0.08 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	WAL073	UNNAMED ADIT	Upland waste rock (erosion potential)	200 CY	0.1 AC	--	C01+C03	C01+C03	C01+C08a	C01+C08a	
	WAL074	UNNAMED ADIT	Upland waste rock	200 CY	0.26 AC	--	NONE	NONE	C02a	C02a	
	WAL079	GALENA MINE ROCK DUMPS	Upland waste rock	0 CY	13.32 AC	--	NONE	NONE	NONE	NONE	
	WAL080	GALENA MINE TAILINGS	Upland tailings - active facilities	1,235,000 CY	25.14 AC	--	NONE	NONE	NONE	NONE	
MIDGradSeg02	KLW001	SF CDA RIVER BELOW PINEHURST NARROWS DAM	Floodplain sediments	280,000 CY	1,781 AC	--	NONE	NONE	NONE	NONE	
	KLW061	BH NO. 2	Upland waste rock	333,120 CY	13.88 AC	--	C02b	C02b	C02b	C02b	
	KLW062	BLUEBIRD MINE & GUY CAVE AREA	Upland waste rock	51,120 CY	2.13 AC	--	C02b	C02b	C02b	C02b	
	KLW063	CHERRY SHAFT	Upland waste rock	38,400 CY	1.6 AC	--	NONE	NONE	NONE	NONE	
	KLW069	REED MINE	Upland waste rock	14,880 CY	0.62 AC	--	NONE	NONE	NONE	NONE	
	KLW070	MILO CK IMPACTED RIPARIAN: NO. 1	Floodplain sediments	9,350 CY	1.87 AC	--	C01b+C08a	C01b+C08a	C01b+C08a	C01b+C08a	
	KLW071	SULLIVAN NO.1	Upland waste rock	82,800 CY	3.45 AC	--	NONE	NONE	C02b	C02b	
	KLW095	PHIL SHERIDAN MINE	Upland waste rock	19,680 CY	0.82 AC	--	C02b	C02b	C02b	C02b	
	KLW096	RUSSELL MINE	Upland waste rock	13,200 CY	0.55 AC	--	NONE	NONE	NONE	NONE	
	KLW123	WATERWORKS TUNNEL	Upland waste rock	4,320 CY	0.18 AC	--	NONE	NONE	C02a	C02a	
	KLW124	BLUEBIRD UPPER MINE	Upland waste rock	200 CY	0.37 AC	--	NONE	NONE	C02b	C02b	
	KLW125	LOWER JACKASS/DON MINES	Upland waste rock	200 CY	0.23 AC	--	NONE	NONE	C02b	C02b	
	KLW126	UNIDENTIFIED DISTURBANCE	Upland waste rock	200 CY	0.26 AC	--	NONE	NONE	C02a	C02a	
	KLW127	KLONDIKE OR GUS MINE	Upland waste rock	200 CY	0.13 AC	--	NONE	NONE	C02b	C02b	
	KLW128	ALLA LOWER	Upland waste rock	30,480 CY	1.27 AC	--	NONE	NONE	C02b	C02b	
	MAS070	UNNAMED PROSPECT	Upland waste rock	200 CY	0.4 AC	--	NONE	NONE	C02a	C02a	

Notes:

The source IDs, names, trait descriptions, and estimated quantities are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency, 2001c, 2001d). For the purpose of comparing Ecological Alternatives 3 and 4 with Alternatives 3+ and 4+, the waste material quantities for all alternatives are based on the most recent estimates from BLM.

AC = acres
CFS = cubic feet per second
CY = cubic yards
µg/L = micrograms per liter

Typical Conceptual Design (TCD) Codes

C01 = Excavation (dry)
C01b = Excavation (60% dry, 40% wet)

TABLE 6-18
Comparison of Previous Ecological Alternatives and Updated Remedial Alternatives, Mainstem SFCDR Watershed
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Name	Trait Description (Waste Types)	Volume (CY) or Average Discharge Rate (CFS)	Area (AC) or Maximum Discharge Rate (CFS)	Average Zinc Conc. in Water (ug/L)	Alt. 3 TCDs	Alt. 3+ TCDs	Alt. 4 TCDs	Alt. 4+ TCDs	Notes

C02a = Regrade/Consolidate/Revegetate: Lower Part of Pile in 100-Year Floodplain
C02b = Regrade/Consolidate/Revegetate: Waste Rock Pile in Stream Valley
C03 = Low-Permeability Cap
C04 = Low-Permeability Cap with Seepage Collection
C05 = Low-Permeability Cap with Erosion Protection
C07 = Waste Consolidation Area Above Flood Level
C08a = Repository, 1 million cy
C09 = Impoundment Closure
C10 = Adit Drainage Collection
C11 = Hydraulic Isolation Using Slurry Wall
C11j = Hydraulic Isolation Using Slurry Wall (with drain, 30 ft deep)
C14c = Stream Lining (100 feet wide)
C15b = French Drain (15 feet bgs)
HH-2 = Upland Waste Pile Soil Cover
NONE = No Action
NONE2 = Source/Waste Type Not Identified
NONE4 = Actions Included as part of Another Source
PT-1a = Passive Treatment
TRMT-1 = Active Treatment
WT01 = Centralized High-Density Sludge (HDS) Treatment at CTP
WT02 = Onsite Semi-Passive Water Treatment Using Lime Addition and Settling Pond(s)
WT03 = Onsite Semi-Passive Water Treatment Using Sulfate-Reducing Bioreactor (SRB) System

The number in the bracket [ ] following the TCD code = Percentage of known materials addressed by the TCD. For TCDs other than "NONE", no bracket assumes that all known materials will be addressed.

Note (a) = TCD(s) updated based on an evaluation of water treatment technologies.

Note (b) = TCD(s) updated to provide remedial actions for operating sites. In the 2001 FS, operating sites included in the alternatives either were not assigned actions or were assigned only a hydraulic isolation (C11) action. In the current FFS, operating sites are assigned a complete set of remedial actions based on the waste types present.

TABLE 6-19

Overview of Changes from Ecological Alternative 3 to Alternative 3+, OU 3

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Basis of Change	Change Description	Watershed	Segment	Site ID	Site Description	Trait Description
Sites Added on the Basis of Relatively High Metals Loading to Surface Water	Changed from No Action to Regrade/ Consolidate/ Revegetate (C02)	Canyon Creek	CCSeg04	BUR094	SHERMAN 600 LEVEL	Upland waste rock (erosion potential)
				BUR119	BLACK BEAR NO.4	Upland waste rock
				BUR120	SILVER MOON MINE	Upland waste rock (erosion potential)
				BUR124	OMAHA MINE	Upland waste rock (erosion potential)
				BUR125	MIDWAY SUMMIT MINE	Upland waste rock (erosion potential)
		Ninemile Creek	NMSeg02	OSB048	AMERICAN MINE	Upland waste rock
	Changed from No Action to Excavation/Disposal in Repository (C01+C08a)	Pine Creek	PineCrkSeg03	KLW077	GENERAL MINE	Floodplain waste rock
				KLW079	GOLD EAGLE MINING CO.	Floodplain waste rock
		Ninemile Creek	NMSeg04	OSB084	BLACKCLOUD CK IMPACTED RIPARIAN	Floodplain sediments
				OSB085	BLACKCLOUD CK IMPACTED RIPARIAN	Floodplain sediments
		Upper SFCDR	UpperSFCDRSeg01	WAL077	GOLCONDA TAILINGS	Floodplain sediments
Tailings Impoundment Closures at Active Sites	Changed from Hydraulic Isolation to Cap (Tailings, Impounded in Active Facilities) (C09)	Mainstem SFCDR	MIDGradSeg01	WAL001	OSBURN TAILINGS PONDS	Upland tailings - active facilities
		Upper SFCDR	UpperSFCDRSeg01	MUL020	LUCKY FRIDAY TAILINGS POND No. 3	Floodplain tailings - active facilities
				MUL037	LUCKY FRIDAY TAILINGS POND No. 2	Floodplain tailings - active facilities
				MUL058	LUCKY FRIDAY TAILINGS POND No.1	Floodplain tailings - active facilities
Updated Active Treatment TCDs for Adit Drainage and Groundwater Sources	Changed the location of the Active Treatment plant from a new facility in Pinehurst to the CTP in Kellogg (WT01)	Canyon Creek	CCSeg04	BUR067	TAMARACK NO.7 (1200 LEVEL)	Adit drainage
				BUR098	HERCULES NO. 5	Adit drainage
				BUR190	GEM NO.3	Adit drainage
		Mainstem SFCDR	MIDGradSeg01	KLE040	SF CDA RIVER IMPACTED FLOODPLAIN: NO. 5	Groundwater
				KLE048	SF CDA RIVER SVNRT REHAB	Groundwater
				KLE049	SF CDA RIVER IMPACTED RIPARIAN (MidGradSeg01 & MidGradSeg02)	Groundwater
				OSB065	SF CDA RIVER IMPACTED FLOODPLAIN: NO. 3	Groundwater
				OSB119	OSBURN ZANETTI GRAVEL OPERATION	Groundwater
				OSB120	SF CDA RIVER IMPACTED FLOODPLAIN: NO. 4	Groundwater
				WAL001	OSBURN TAILINGS PONDS	Groundwater
				WAL004	SF CDA RIVER RAILROAD YARDS & IMP FLDP	Groundwater
		Ninemile Creek	NMSeg02	OSB089	SUCCESS NO.3	Adit drainage
		Upper SFCDR	UpperSFCDRSeg01	MUL012	STAR 1200 LEVEL	Adit drainage
Updated from Active Treatment to Passive Treatment	Changed from Active Treatment to updated Semi-Passive SRB Treatment (WT03)	Pine Creek	PineCrkSeg01	MAS020	SIDNEY (RED CLOUD) MINE/MILLSITE	Adit drainage
Updated from Passive Treatment to Active Treatment	Changed from Passive Treatment to Active Treatment at the CTP in Kellogg (WT01)	Canyon Creek	CCSeg02	BUR107	AJAX NO.3	Adit drainage
			CCSeg03	BUR088	AJAX NO.2	Adit drainage
				BUR099	BENTON MINE	Adit drainage
			CCSeg04	BUR096	ANCHOR MINE	Adit drainage
				BUR097	HIDDEN TREASURE MINE	Adit drainage
				BUR112	GEM NO.2	Adit drainage
				BUR121	BLACK BEAR FRACTION	Adit drainage
				BUR129	TIGER-POORMAN MINE	Adit drainage
		Mainstem SFCDR	MIDGradSeg01	WAL002	WESTERN UNION LOWER ADIT	Adit drainage
				WAL020	CALADAY MINE	Adit drainage
		Ninemile Creek	NMSeg02	OSB088	ALAMEDA MINE	Adit drainage
			NMSeg04	OSB039	DAYROCK MINE	Adit drainage
		Upper SFCDR	UpperSFCDRSeg01	LOK011	SNOWSTORM NO. 3	Adit drainage
				MUL014	GROUSE MINE	Adit drainage
				MUL019	MORNING NO.6	Adit drainage
				MUL020	LUCKY FRIDAY TAILINGS POND No. 3	Groundwater
				MUL037	LUCKY FRIDAY TAILINGS POND No. 2	Groundwater
				MUL058	LUCKY FRIDAY TAILINGS POND No.1	Groundwater
Updated Method of Hydraulic Isolation	Changed from Hydraulic Isolation with a Slurry Wall and Drain to Hydraulic Isolation with a Liner and French Drain (C14+C15)	Mainstem SFCDR	MIDGradSeg01	KLE040	SF CDA RIVER IMPACTED FLOODPLAIN: NO. 5	Floodplain sediments
				KLE048	SF CDA RIVER SVNRT REHAB	Floodplain sediments
				KLE049	SF CDA RIVER IMPACTED RIPARIAN (MidGradSeg01 & MidGradSeg02)	Floodplain sediments
				OSB065	SF CDA RIVER IMPACTED FLOODPLAIN: NO. 3	Floodplain sediments
				OSB120	SF CDA RIVER IMPACTED FLOODPLAIN: NO. 4	Floodplain sediments
				WAL004	SF CDA RIVER RAILROAD YARDS & IMP FLDP	Floodplain sediments

TABLE 6-19

Overview of Changes from Ecological Alternative 3 to Alternative 3+, OU 3

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Basis of Change	Change Description	Watershed	Segment	Site ID	Site Description	Trait Description
Updated Passive Treatment TCDs	Changed from Passive Treatment to updated Semi-Passive Lime Treatment (WT02)	Big Creek	BigCrkSeg03	POL067	UNNAMED ADIT	Adit drainage
		Mainstem SFCDR	MIDGradSeg01	OSB074	ST. JOE NO.1	Adit drainage
		Ninemile Creek	NMSeg02	BUR051	SUNSET MINE	Adit drainage
			NMSeg04	BUR058	TAMARACK NO.3	Adit drainage
				BUR170	TAMARACK 400 LEVEL	Adit drainage
				BUR171	TAMARACK NO.5	Adit drainage
		Pine Creek	PineCrkSeg01	MAS012	LYNCH-PINE CREEK MINE	Adit drainage
				MAS014	HILARITY MINE	Adit drainage
						Seep
				MAS017	SIDNEY (DENVER) 500 LEVEL	Adit drainage
				MAS021	NEVADA-STEWART MINE	Adit drainage
				MAS050	CONSTITUTION UPPER TUNNEL & ROCK DUMP	Adit drainage
		Upper SFCDR	UpperSFCDRSeg01	LOK004	SNOWSHOE NO. 2	Adit drainage
				LOK024	SILVER CABLE MINE	Adit drainage
				MUL023	FANNY GREMM MINE	Adit drainage
				MUL052	COPPER KING MINE	Adit drainage
	Changed from Passive Treatment to updated Semi-Passive SRB Treatment (WT03)	Big Creek	BigCrkSeg04	KLE054	CRESCENT/HOOPER TUNNEL	Adit drainage
		Ninemile Creek	NMSeg02	BUR054	REX NO.2 / SIXTEEN-TO-ONE MINE	Adit drainage
		Pine Creek	PineCrkSeg01	MAS007	NABOB 1300 LEVEL	Adit drainage
				MAS011	IDAHO PROSPECT: NO. 2	Adit drainage
				MAS015	LITTLE PITTSBURG MINE: NO. 2	Adit drainage
				MAS016	LITTLE PITTSBURG MINE: NO. 1	Adit drainage
				MAS054	MARMION OR SF FRACTION	Adit drainage
				MAS078	HIGHLAND-SURPRISE MINE & MILLSITE	Adit drainage
		Upper SFCDR	UpperSFCDRSeg01	MUL027	MORNING NO.4	Adit drainage
				MUL028	MORNING NO.5	Adit drainage
Changed to No Treatment per new water treatment screening levels	Changed from Passive Treatment to No Treatment	Canyon Creek	CCSeg04	BUR128	HECLA-STAR MINE & MILLSITE COMPLEX	Adit drainage
		Big Creek	BigCrkSeg04	KLE067	ST. JOE NO.4	Adit drainage
Changed to No Action per discussion with BLM	Changed from Excavation/Disposal in Repository to No Action	Pine Creek	PineCrkSeg01	MAS047	EF PINE & PINE CK IMPACTED FLOODPLAIN (PineCrkSeg01 & PineCrkSeg03)	Floodplain sediments
	Changed from Passive Treatment to No Action	Pine Creek	PineCrkSeg01	MAS052	OWL/FRED MINE	Adit drainage
Changed to Action per discussion with BLM	Changed from No Action to Excavation/Cap (C01+C08a)	Pine Creek	PineCrkSeg01	MAS014	HILARITY MINE	Upland waste rock
				MAS025	DOUGLAS MINE & MILLSITE	Floodplain waste rock (intermixed tailings)
		Pine Creek	PineCrkSeg03	KLW080	BOBBY ANDERSON MINE	Upland waste rock
	Changed from No Action to Regrade/ Consolidate/ Revegetate (C02)	Pine Creek	PineCrkSeg01	MAS081	SIDNEY (RED CLOUD) ROCK DUMP	Floodplain waste rock
Sites located in the Woodland Park area within the Canyon Creek Watershed.	Changed from Excavation/ Disposal in Waste Consolidation Area to No Action	Canyon Creek	CCSeg05	CSMCC05-1	RR EMBANKMENT ALONG CCSEG05	Floodplain artificial fill
				WAL011	CANYON SILVER (FORMOSA) MINE	Upland tailings
	Changed from Disposal in Waste Consolidation Area to Disposal in a Repository (C08a)	Canyon Creek	CCSeg05	WAL039	STANDARD-MAMMOTH MILLSITE	Upland tailings
				WAL081	WALLACE OLD PRIVATE LANDFILL	Floodplain artificial fill
	Changed from Excavation/Disposal in Repository to Hydraulic Isolation with a Liner and French Drain (C14+C15)	Canyon Creek	CCSeg05	WAL011	CANYON SILVER (FORMOSA) MINE	Floodplain sediments

TABLE 6-19

Overview of Changes from Ecological Alternative 3 to Alternative 3+, OU 3

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Basis of Change	Change Description	Watershed	Segment	Site ID	Site Description	Trait Description
	Changed from Hydraulic Isolation with a Slurry Wall and Drain to Hydraulic Isolation with a Liner and French Drain (C14+C15)	Canyon Creek	CCSeg05	WAL009	HECLA-STAR TAILINGS PONDS	Floodplain tailings - inactive Facilities
				WAL009	HECLA-STAR TAILINGS PONDS	Floodplain sediments (underlying tailings pond)
				WAL010	CANYON CK POND REACH SVNRT REHAB	Floodplain sediments
				OSB047	CANYON CK FORMOSA REACH SVNRT REHAB	Floodplain sediments
				OSB047	CANYON CK FORMOSA REACH SVNRT REHAB	Floodplain sediments
				WAL041	CANYON CK REPOSITORY REACH SVNRT REHAB	Floodplain sediments
	Changed from Hydraulic Isolation with a Slurry Wall and Drain to No Action	Canyon Creek	CCSeg05	WAL040	CANYON CK IMPACTED FLOODPLAIN	Floodplain sediments
	Changed from Impoundment Closure to Low-Permeability Cap and Hydraulic Isolation with a Liner and French Drain (C03+C14+C15)	Canyon Creek	CCSeg05	WAL042	CANYON CK TAILINGS REPOSITORY SVNRT	Floodplain tailings - inactive Facilities
	Changed from Passive Treatment to Active Treatment at the CTP in Kellogg (WT01)	Canyon Creek	CCSeg05	WAL011	CANYON SILVER (FORMOSA) MINE	Adit drainage
	Changed from No Action to Hydraulic Isolation with a Liner and French Drain (C14+C15)	Canyon Creek	CCSeg05	WAL042	CANYON CK TAILINGS REPOSITORY SVNRT	Floodplain sediments
	Changed from Passive Treatment to No Treatment	Canyon Creek	CCSeg05	WAL009	HECLA-STAR TAILINGS PONDS	Seep
				WAL040	CANYON CK IMPACTED FLOODPLAIN	Surface Water
	Changed from Active Treatment to No Treatment	Canyon Creek	CCSeg05	OSB047	CANYON CK FORMOSA REACH SVNRT REHAB	Groundwater
				WAL009	HECLA-STAR TAILINGS PONDS	Groundwater
				WAL010	CANYON CK POND REACH SVNRT REHAB	Groundwater
				WAL040	CANYON CK IMPACTED FLOODPLAIN	Groundwater
				WAL041	CANYON CK REPOSITORY REACH SVNRT REHAB	Groundwater

Note:

The source IDs, names, trait descriptions, and estimated quantities are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency, 2001c, 2001d). For the purpose of comparing Ecological Alternatives 3 and 4 with Alternatives 3+ and 4+, the waste material quantities for all alternatives are based on the most recent estimates from BLM.

TABLE 6-20

Overview of Changes from Ecological Alternative 4 to Alternative 4+, OU 3

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Basis of Change	Change Description	Watershed	Segment	Site ID	Site Description	Trait Description
Sites Added on the Basis of Relatively High Metals Loading to Surface Water	Changed from No Action to Excavation/Disposal in Repository (C01+C08a)	Pine Creek	PineCrkSeg03	KLW077	GENERAL MINE	Floodplain waste rock
				KLW079	GOLD EAGLE MINING CO.	Floodplain waste rock
		Ninemile Creek	NMSeg04	OSB084	BLACKCLOUD CK IMPACTED RIPARIAN	Floodplain sediments
				OSB085	BLACKCLOUD CK IMPACTED RIPARIAN	Floodplain sediments
Tailings Impoundment Closures at Active Sites	Changed from Hydraulic Isolation to Cap (Tailings, Impounded in Active Facilities) (C09)	Big Creek	BigCrkSeg04	KLE024	SUNSHINE TAILINGS POND: NO. 1	Floodplain tailings - active facilities
		Upper SFCDR	UpperSFCDRSeg01	MUL020	LUCKY FRIDAY TAILINGS POND No. 3	Floodplain tailings - active facilities
				MUL037	LUCKY FRIDAY TAILINGS POND No. 2	Floodplain tailings - active facilities
				MUL058	LUCKY FRIDAY TAILINGS POND No.1	Floodplain tailings - active facilities
		Mainstem SFCDR	MIDGradSeg01	WAL001	OSBURN TAILINGS PONDS	Upland tailings - active facilities
Updated Active Treatment TCDs for Adit Drainage and Groundwater Sources	Changed the location of the Active Treatment plant from a new facility in Pinehurst to the CTP in Kellogg (WT01)	Canyon Creek	CCSeg04	BUR067	TAMARACK NO.7 (1200 LEVEL)	Adit drainage
				BUR097	HIDDEN TREASURE MINE	Adit drainage
				BUR098	HERCULES NO. 5	Adit drainage
				BUR190	GEM NO.3	Adit drainage
		Mainstem SFCDR	MIDGradSeg01	KLE040	SF CDA RIVER IMPACTED FLOODPLAIN: NO. 5	Groundwater
				KLE048	SF CDA RIVER SVNRT REHAB	Groundwater
				KLE049	SF CDA RIVER IMPACTED RIPARIAN (MidGradSeg01 & MidGradSeg02)	Groundwater
				OSB065	SF CDA RIVER IMPACTED FLOODPLAIN: NO. 3	Groundwater
				OSB119	OSBURN ZANETTI GRAVEL OPERATION	Groundwater
				OSB120	SF CDA RIVER IMPACTED FLOODPLAIN: NO. 4	Groundwater
				WAL001	OSBURN TAILINGS PONDS	Groundwater
				WAL004	SF CDA RIVER RAILROAD YARDS & IMP FLDP	Groundwater
		Ninemile Creek	NMSeg02	OSB089	SUCCESS NO.3	Adit drainage
		Upper SFCDR	UpperSFCDRSeg01	MUL012	STAR 1200 LEVEL	Adit drainage
				WAL038	SF CDA RIVER IMPACTED FLOODPLAIN: NO. 1	Groundwater
				MUL020	LUCKY FRIDAY TAILINGS POND No. 3	Groundwater
				MUL037	LUCKY FRIDAY TAILINGS POND No. 2	Groundwater
				MUL058	LUCKY FRIDAY TAILINGS POND No.1	Groundwater
Updated from Active Treatment to Passive Treatment	Changed from Active Treatment to updated Semi-Passive SRB Treatment (WT03)	Big Creek	BigCrkSeg04	KLE024	SUNSHINE TAILINGS POND: NO. 1	Groundwater
		Pine Creek	PineCrkSeg01	MAS020	SIDNEY (RED CLOUD) MINE/MILLSITE	Adit drainage
Updated from Excavation to Regrade/Consolidate/Revegetate	Changed from Excavation to Regrade/Consolidate/ Revegetate (C02)	Upper SFCDR	UpperSFCDRSeg01	MUL111	UNNAMED PROSPECT	Upland waste rock
Updated from Passive Treatment to Active Treatment	Changed from Passive Treatment to Active Treatment at the CTP in Kellogg (WT01)	Canyon Creek	CCSeg01	BUR109	OOM PAUL NO. 1	Adit drainage
			CCSeg02	BUR107	AJAX NO.3	Adit drainage
			CCSeg03	BUR087	HERCULES NO. 3	Adit drainage
				BUR088	AJAX NO.2	Adit drainage
				BUR091	TRADE DOLLAR MINE	Adit drainage
				BUR099	BENTON MINE	Adit drainage
			CCSeg04	BUR096	ANCHOR MINE	Adit drainage
				BUR112	GEM NO.2	Adit drainage
				BUR123	GREAT EASTERN MINE	Adit drainage
				BUR124	OMAHA MINE	Adit drainage
				BUR114	WEST STAR MINE	Adit drainage
				BUR121	BLACK BEAR FRACTION	Adit drainage
				BUR128	HECLA-STAR MINE & MILLSITE COMPLEX	Adit drainage
				BUR129	TIGER-POORMAN MINE	Adit drainage
		Mainstem SFCDR	MIDGradSeg01	WAL002	WESTERN UNION LOWER ADIT	Adit drainage
				WAL020	CALADAY MINE	Adit drainage

TABLE 6-20
Overview of Changes from Ecological Alternative 4 to Alternative 4+, OU 3
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Basis of Change	Change Description	Watershed	Segment	Site ID	Site Description	Trait Description
		Ninemile Creek	NMSeg02	OSB088	ALAMEDA MINE	Adit drainage
			NMSeg04	OSB039	DAYROCK MINE	Adit drainage
				OSB055	SILVER STAR MINE	Adit drainage
		Upper SFCDR	UpperSFCDRSeg01	LOK008	IDAHO SILVER NO. 2	Adit drainage
				LOK011	SNOWSTORM NO. 3	Adit drainage
				MUL001	GOLCONDA MINESITE	Adit drainage
				MUL013	WE LIKE MINE	Adit drainage
				MUL014	GROUSE MINE	Adit drainage
				MUL019	MORNING NO.6	Adit drainage
				MUL071	ATLAS MINE	Adit drainage
Updated Method of Hydraulic Isolation	Changed from Hydraulic Isolation with a Slurry Wall to Hydraulic Isolation with a Liner and French Drain (C14+C15)	Mainstem SFCDR	MIDGradSeg01	KLE048	SF CDA RIVER SVNRT REHAB	Floodplain sediments
				KLE049	SF CDA RIVER IMPACTED RIPARIAN (MidGradSeg01 & MidGradSeg02)	Floodplain sediments
				OSB065	SF CDA RIVER IMPACTED FLOODPLAIN: NO. 3	Floodplain sediments
				OSB120	SF CDA RIVER IMPACTED FLOODPLAIN: NO. 4	Floodplain sediments
				WAL004	SF CDA RIVER RAILROAD YARDS & IMP FLDP	Floodplain sediments
Updated Passive Treatment TCDs	Changed from Passive Treatment to updated Semi-Passive Lime Treatment (WT02)	Big Creek	BigCrkSeg03	POL004	BISMARK MINE	Adit drainage
				KLE067	ST. JOE NO.4	Adit drainage
		Canyon Creek	CCSeg03	BUR085	HERCULES NO. 1 & ASSOCIATED PITS	Adit drainage
		Mainstem SFCDR	MIDGradSeg01	OSB074	ST. JOE NO.1	Adit drainage
		Ninemile Creek	NMSeg01	BUR051	SUNSET MINE	Adit drainage
				BUR081	GUELPH MINE	Adit drainage
			NMSeg02	BUR058	TAMARACK NO.3	Adit drainage
				BUR170	TAMARACK 400 LEVEL	Adit drainage
				BUR171	TAMARACK NO.5	Adit drainage
		Pine Creek	PineCrkSeg01	MAS012	LYNCH-PINE CREEK MINE	Adit drainage
				MAS014	HILARITY MINE	Adit drainage
						Seep
				MAS015	LITTLE PITTSBURG MINE: NO. 2	Adit drainage
				MAS017	SIDNEY (DENVER) 500 LEVEL	Adit drainage
				MAS021	NEVADA-STEWART MINE	Adit drainage
				MAS050	CONSTITUTION UPPER TUNNEL & ROCK DUMP	Adit drainage
				MAS004	LOOKOUT MOUNTAIN MINE	Adit drainage
				MAS067	LOOKOUT MOUNTAIN MINE UPPER ROCK DUMP	Seep
		Upper SFCDR	UpperSFCDRSeg01	LOK004	SNOWSHOE NO. 2	Adit drainage
				LOK024	SILVER CABLE MINE	Adit drainage
				MUL023	FANNY GREMM MINE	Adit drainage
				MUL052	COPPER KING MINE	Adit drainage
				LOK014	PANDORA MINE	Adit drainage
				LOK028	HUNTER-SNOWSTORM LODE/UNNAMED PROSP	Adit drainage
				MUL024	YOU LIKE MINE	Adit drainage
				MUL053	NATIONAL MINE	Adit drainage
				MUL072	LOWER GIANT MINE	Adit drainage
				MUL085	VIENNA INTERNATIONAL MINE	Adit drainage
				MUL103	MISSOULA MINE	Adit drainage
	Changed from Passive Treatment to updated Semi-Passive SRB Treatment (WT03)	Big Creek	BigCrkSeg03	POL067	UNNAMED ADIT	Adit drainage
				POL002	SILVER DALE AND BIG HILL MINE	Adit drainage
			BigCrkSeg04	POL022	FIRST NATIONAL MINE	Adit drainage
				KLE054	CRESCENT/HOOPER TUNNEL	Adit drainage
		Mainstem SFCDR	MIDGradSeg01	OSB076	UNNAMED ADIT (May Claim)	Adit drainage
				OSB080	HARLOW TUNNEL	Adit drainage
		Ninemile Creek	NMSeg01	BUR053	INTERSTATE-CALLAHAN MINE/ROCK DUMPS	Adit drainage
			NMSeg02	BUR054	REX NO.2 / SIXTEEN-TO-ONE MINE	Adit drainage

TABLE 6-20

Overview of Changes from Ecological Alternative 4 to Alternative 4+, OU 3

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Basis of Change	Change Description	Watershed	Segment	Site ID	Site Description	Trait Description
		Pine Creek	PineCrkSeg01	MAS007	NABOB 1300 LEVEL	Adit drainage
				MAS011	IDAHO PROSPECT: NO. 2	Adit drainage
				MAS015	LITTLE PITTSBURG MINE: NO. 2	Adit drainage
				MAS016	LITTLE PITTSBURG MINE: NO. 1	Adit drainage
				MAS025	DOUGLAS MINE & MILLSITE	Adit drainage
				MAS054	MARMION OR SF FRACTION	Adit drainage
				MAS078	HIGHLAND-SURPRISE MINE & MILLSITE	Adit drainage
				MAS009	SHETLAND MINING CO-NABOB SILVER-LEAD	Adit drainage
				MAS029	BIG IT MINE	Adit drainage
			PineCrkSeg03	KLW081	AMY-MATCHLESS MILLSITE	Adit drainage
				MAS003	LIBERAL KING MINE & MILLSITE	Adit drainage
		Upper SFCDR	UpperSFCDRSeg01	MUL027	MORNING NO.4	Adit drainage
				LOK017	BEACON LIGHT	Adit drainage
				LOK019	PRINCETON MAGNA MINE	Adit drainage
				MUL028	MORNING NO.5	Adit drainage
				MUL054	UNNAMED ADIT	Adit drainage
				MUL081	REINDEER QUEEN MINE	Adit drainage
Changed to No Treatment per new water treatment screening levels	Changed from Passive Treatment to No Treatment	Canyon Creek	CCSeg04	BUR128	HECLA-STAR MINE & MILLSITE COMPLEX	Adit drainage
		Ninemile Creek	NMSeg01	BUR053	INTERSTATE-CALLAHAN MINE/ROCK DUMPS	Adit drainage
Changed to No Action per discussion with BLM	Changed from Excavation/Disposal in Repository to No Action	Pine Creek	PineCrkSeg01	MAS047	EF PINE & PINE CK IMPACTED FLOODPLAIN (PineCrkSeg01 & PineCrkSeg03)	Floodplain sediments
	Changed from Passive Treatment to No Action	Pine Creek	PineCrkSeg01	MAS052	OWL/FRED MINE	Adit drainage
				MAS067	LOOKOUT MOUNTAIN MINE UPPER ROCK DUMP	Seep
Changed to Action per discussion with BLM	Changed from No Action to Excavation/Disposal in Waste Consolidation Area (C01+C07)	Pine Creek	PineCrkSeg01	MAS014	HILARITY MINE	Upland waste rock
		Pine Creek	PineCrkSeg03	KLW080	BOBBY ANDERSON MINE	Upland waste rock
	Changed from No Action to Excavation/Disposal in Repository (C01+C08a)	Pine Creek	PineCrkSeg01	MAS025	DOUGLAS MINE & MILLSITE	Floodplain waste rock (intermixed tailing
	Changed from No Action to Regrade/ Consolidate/ Revegetate (C02)	Pine Creek	PineCrkSeg01	MAS081	SIDNEY (RED CLOUD) ROCK DUMP	Floodplain waste rock

Note:

The source IDs, names, trait descriptions, and estimated quantities are based on the inventory of source sites conducted by the Bureau of Land Management (BLM) in 1999 in support of the Remedial Investigation/Feasibility Study (RI/FS) for the Coeur d'Alene Basin (U.S. Environmental Protection Agency, 2001c, 2001d). For the purpose of comparing Ecological Alternatives 3 and 4 with Alternatives 3+ and 4+, the waste material quantities for all alternatives are based on the most recent estimates from BLM.

TABLE 6-21
Screening of Individual Actions Comprising Initial Remedial Alternatives for OU 2
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Component Description	Estimated Total Cost (30 Year NPV)	Estimated Dissolved Zinc Load Reduction (lb/day)	Estimated Total Cost (30 Year NPV)/Load Reduction ($M/lb/day)	Implementability Considerations and Evaluation Result
Alternative (a): Minimal Stream Lining				
SFCDR Liner - Eastern OU 2	$51,400,000	46	$1.13	Action retained due to higher estimated dissolved zinc load reduction.
SFCDR Liner - Western OU 2	$29,800,000	3	$9.08	Action excluded due to the high cost and limited benefit of the action.
Lower Government Gulch Liner	$1,930,000	3	$0.60	Action excluded due to the limited benefit of the action
Bunker/Magnet/Deadwood Creek Liners	$9,260,000	48	$0.19	Action retained due to higher estimated dissolved zinc load reduction and lower implementation cost.
Alternative (b): Extensive Stream Lining				
SFCDR Liner and Slurry Wall - Eastern OU 2	$62,200,000	1	$47.07	Action excluded due to the high cost, limited benefit, and difficult implementability of the action.
SFCDR Liner - Western OU 2	$58,100,000	7	$7.85	Action excluded due to the high cost and limited benefit of the action.
Government Gulch Liner and Slurry Wall	$10,500,000	51	$0.20	Action retained due to higher estimated dissolved zinc load reduction and lower implementation cost.
Bunker Creek Liner	$8,040,000	36	$0.22	Action retained due to higher estimated dissolved zinc load reduction and lower implementation cost.
Grouse/Humboldt Creek Liners and Slurry Walls	$8,010,000	6	$1.31	Action excluded due to the high cost and limited benefit of the action.
Magnet/Deadwood Creek Liners and Slurry Walls	$6,570,000	8	$0.78	Action retained due to the lower cost and related benefit of the action.
Alternative (c): French Drains				
Pipe CTP Effluent to SFCDR	$855,000	10	$0.09	Action retained due to the low cost/benefit of the action.
French Drains	$25,100,000	470	$0.05	Action retained due to the high benefit and low cost of this action.
Alternative (d): Stream Lining/French Drain Combination				
Pipe CTP Effluent to SFCDR	$855,000	4	$0.21	Action retained due to the low cost/benefit of the action.
French Drains	$25,300,000	467	$0.05	Action retained due to the high benefit and low cost of this action.
SFCDR Liner - Eastern OU 2	$51,400,000	1	$48.67	Action excluded due to the high cost and limited benefit of the action.
Government Gulch Action	$11,500,000	35	$0.33	Action retained due to the high benefit and low cost of this action.
Alternative (e): Extensive Stream Lining/French Drain Combination	$254,000,000	604	$0.42	Individual actions not evaluated as part of screening process. All actions considered important to achieve maximum practicable load reduction to the SFCDR.

Notes:

CTP = Central Treatment Plant in Kellogg, Idaho
lb/day = pound(s) per day
NPV = net present value
OU 2 = Operable Unit 2
SFCDR = South Fork Coeur d'Alene River

NOTE: The above costs are presented rounded to three significant figures.

TABLE 6-22

Summary of OU 2 Alternative (a) Remedial Actions

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Remedial Action Description	TCD Code	Waste Type	Quantity
Line the SFCDR from Elizabeth Park to gaining/losing transition zone	C14c	Groundwater	10,000 lf
Line Bunker Creek from the headwaters to the I-90 culvert	C14b	Groundwater	9,000 lf
Line Deadwood Creek and Magnet Creek from the gulch mouths to the confluence with Bunker Creek	C14a	Groundwater	2,450 lf
Check dam across the Reed and Russel tunnels in the interior of the mine. Convey residual adit drainage to the 9 level via Cherry Raise	C20, C10, PUMP-1, PIPE-1, PRESSURE-PIPE-1, PRESSURE-PIPE-4	AMD	100 gpm

Notes:

AMD = acid mine drainage
gpm = gallons per minute
lf = linear feet
SFCDR = South Fork Coeur d'Alene River

TABLE 6-23
Summary of OU 2 Alternative (b) Remedial Actions
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Remedial Action Description	TCD Code	Waste Type	Quantity
Line Bunker Creek from the headwaters to the I-90 culvert	C14b	Groundwater	9,150 lf
Line Government Creek from Galena Ridge Pond to the I-90 culvert	C14b	Groundwater	11,200 lf
Slurry wall and extraction wells across Government Gulch upgradient of the stream liner	C11d, C17b	Groundwater	275 lf
Line Deadwood Creek and Magnet Creek from the headwaters to the confluence with Bunker Creek	C14a	Groundwater	10,200 lf
Slurry walls and extraction wells across Deadwood Gulch and Magnet Gulch upgradient of the stream liners	C11b, C17a	Groundwater	485 lf
Check dam across the Reed and Russel tunnels in the interior of the mine. Convey residual adit drainage to the 9 level via Cherry Raise	C20, C10, PUMP-1, PIPE-1, PRESSURE-PIPE-1, PRESSURE-PIPE-4	AMD	100 gpm

Notes:

AMD = acid mine drainage
gpm = gallons per minute
lf = linear feet

TABLE 6-24
Summary of OU 2 Alternative (c) Remedial Actions
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Remedial Action Description	TCD Code	Waste Type	Quantity
French drain along gaining reach of the SFCDR between the CIA and I-90 and treatment at the CTP or PRB with no active treatment (estimated 4,040 gpm peak drain flow)	C15d, WT01, PUMP-5, PRESSURE-PIPE-3	Groundwater	4,225 lf
French drain transversing the SFCDR valley floor from the west side of the Government Gulch mouth to the west end of the CIA drain and treatment at the CTP (estimated 450 gpm peak flow)	C15c, WT01, PUMP-5, PRESSURE-PIPE-3	Groundwater	1,000 lf
CTP effluent conveyed directly to the SFCDR on the east side of the CIA	PRESSURE-PIPE-3	Treated AMD/Groundwater	2,500 lf
Check dam across the Reed and Russel tunnels in the interior of the mine. Convey residual adit drainage to the 9 level via Cherry Raise	C20, C10, PUMP-1, PIPE-1, PRESSURE-PIPE-1, PRESSURE-PIPE-4	AMD	100 gpm

Notes:

AMD = acid mine drainage
CIA = Central Impoundment Area
CTP = Central Treatment Plant
gpm = gallons per minute
lf = linear feet
PRB = permeable reactive barrier
SFCDR = South Fork Coeur d'Alene River

TABLE 6-25
Summary of OU 2 Alternative (d) Remedial Actions
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Remedial Action Description	TCD Code	Waste Type	Quantity
Line Government Creek from Galena Ridge Pond to the I-90 culvert	C14b	Groundwater	11,000 lf
French drain along gaining reach of the SFCDR between the CIA and I-90 and treatment at the CTP or PRB with no active treatment (estimated 3,900 gpm peak drain flow)	C15d, WT01, PUMP-4, PRESSURE-PIPE-3	Groundwater	4,225 lf
French drain transversing the SFCDR valley floor from the west side of the Government Gulch mouth to the west end of the CIA drain and treatment at the CTP (estimated 450 gpm peak drain flow)	C15c, PRESSURE-PIPE-3, PUMP-4, WT01	Groundwater	1,150 lf
Extraction wells installed across the mouth of Government Gulch and treatment at the CTP (estimated 30 gpm peak extraction well flow)	C17b, C17c, PRESSURE-PIPE-3, PUMP-4, WT01	Groundwater	5 ea
Slurry wall and extraction wells across Government Gulch upgradient of the stream liner	C11d	Groundwater	275 lf
CTP effluent conveyed directly to the SFCDR on the east side of the CIA	PRESSURE-PIPE-1	Treated AMD/Groundwater	2,500 lf
Check dam across the Reed and Russel tunnels in the interior of the mine. Convey residual adit drainage to the 9 level via Cherry Raise	C20, C10, PUMP-1, PIPE-1, PRESSURE-PIPE-1, PRESSURE-PIPE-4	AMD	100 gpm

Notes:

AMD = acid mine drainage
CIA = Central Impoundment Area
CTP = Central Treatment Plant
ea = each
gpm = gallons per minute
lf = linear feet
PRB = permeable reactive barrier
SFCDR = South Fork Coeur d'Alene River

TABLE 6-26

Summary of OU 2 Alternative (e) Remedial Actions

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Remedial Action Description	TCD Code	Waste Type	Quantity
Line the SFCDR from Elizabeth Park to the Pinehurst Narrows	C14c	Groundwater	34,000 lf
Line Bunker Creek from the headwaters to the I-90 culvert	C14b	Groundwater	9,150 lf
Line Government Creek from Galena Ridge Pond to the I-90 culvert	C14b	Groundwater	11,200 lf
Line Deadwood Creek and Magnet Creek from the headwaters to the confluence with Bunker Creek	C14a	Groundwater	10,200 lf
Line Grouse Creek and Humboldt Creek from the gulch mouths to the SFCDR	C14a	Groundwater	12,800 lf
French drain along gaining reach of the SFCDR between the CIA and I-90 and treatment at the CTP (estimated 2,700 gpm peak drain flow)	C15d, WT01, PUMP-3, PRESSURE-PIPE-3	Groundwater	4,225 lf
French drain from the mid-Smelterville Flats area to the Pinehurst Narrows and treatment at the CTP (estimated 1,000 gpm peak drain flow)	C15a, WT01, PUMP-2, PRESSURE-PIPE-2	Groundwater	7,900 lf
Slurry wall and extraction wells across the SFCDR valley at Transect 1	C11g, C17c, C18, C19	Groundwater	1,750 lf
Slurry wall and extraction wells across Government Gulch upgradient of the stream liner	C11d, C17b	Groundwater	475 lf
Slurry walls and extraction wells across Deadwood Gulch and Magnet Gulch upgradient of the stream liners	C11b, C17a	Groundwater	425 lf
Slurry walls and extraction wells across Grouse Gulch and Humboldt Gulch upgradient of the stream liners	C11f, C17b	Groundwater	300 lf
Check dam across the Reed and Russel tunnels in the interior of the mine. Convey residual adit drainage to the 9 level via Cherry Raise	C20, C10, PUMP-1, PIPE-1, PRESSURE-PIPE-1, PRESSURE-PIPE-4	AMD	100 gpm

Notes:

AMD = acid mine drainage
CIA = Central Impoundment Area
CTP = Central Treatment Plant
gpm = gallons per minute
lf = linear feet
PRB = permeable reactive barrier
SFCDR = South Fork Coeur d'Alene River

TABLE 7-1

Summary of Remedial Actions by Waste Type, OU 3

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Description	Remedial Actions	Units	Alt. 3	Alt. 3+	Alt. 4	Alt. 4+
Floodplain Sediments	Excavation/Disposal in Repository	CY	2,100,000	2,100,000	3,600,000	3,600,000
	Excavation/Disposal in Waste Consolidation Area	CY	95,000	95,000	--	--
	Hydraulic Isolation at Discrete Facilities	CY	1,500,000	1,400,000	920,000	920,000
	Hydraulic Isolation of Stream Reaches	CY	1,700,000	2,300,000	2,000,000	2,000,000
	No Action	CY	1,400,000	860,000	350,000	350,000
	Total Materials	CY	6,800,000	6,800,000	6,800,000	6,800,000
Floodplain (Artificial Fill)	Excavation/Disposal in Repository	CY	2,900	5,700	250,000	250,000
	Excavation/Disposal in Waste Consolidation Area	CY	200,000	--	--	--
	Regrade/Consolidate/Revegetate	CY	46,000	46,000	--	--
	No Action	CY	--	200,000	--	--
	Total Materials	CY	250,000	250,000	250,000	250,000
Tailings, Impounded in Inactive Facilities	Cap	CY	3,600,000	1,300,000	--	--
	Excavation/Disposal in Repository	CY	--	--	3,700,000	3,700,000
	Excavation/Disposal in Waste Consolidation Area	CY	13,000	13,000	--	--
	Hydraulic Isolation	CY	42,000	1,800,000	--	--
	No Action	CY	--	630,000	--	--
	Total Materials	CY	3,700,000	3,700,000	3,700,000	3,700,000
Tailings, Impounded in Active Facilities	Cap	CY	--	4,000,000	--	4,700,000
	Hydraulic Isolation	CY	4,000,000	(a)	4,700,000	(a)
	No Action	CY	1,900,000	1,900,000	1,200,000	1,200,000
	Total Materials	CY	6,000,000	6,000,000	6,000,000	6,000,000
Tailings, Unimpounded	Cap	CY	21,000	56,000	--	--
	Excavation/Disposal in Repository	CY	360,000	370,000	820,000	850,000
	Excavation/Disposal in Waste Consolidation Area	CY	430,000	410,000	--	--
	No Action	CY	470,000	450,000	470,000	440,000
	Total Materials	CY	1,300,000	1,300,000	1,300,000	1,300,000
Waste Rock with Loading Potential	Cap	CY	4,000,000	4,000,000	20,000	20,000
	Excavation/Disposal in Repository	CY	400	400	4,300,000	4,300,000
	Excavation/Disposal in Waste Consolidation Area	CY	1,600,000	1,600,000	1,800,000	1,800,000
	Regrade/Consolidate/Revegetate	CY	680,000	860,000	290,000	380,000
	No Action	CY	800,000	590,000	640,000	530,000
	Total Materials	CY	7,100,000	7,100,000	7,100,000	7,100,000

TABLE 7-1

Summary of Remedial Actions by Waste Type, OU 3

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Description	Remedial Actions	Units	Alt. 3	Alt. 3+	Alt. 4	Alt. 4+
Waste Rock, Upland (with Little Loading Potential)	Cap	CY	81,000	120,000	--	--
	Excavation/Disposal in Repository	CY	--	--	110,000	110,000
	Excavation/Disposal in Waste Consolidation Area	CY	7,900	7,900	28,000	66,000
	Regrade/Consolidate/Revegetate	CY	500,000	540,000	3,500,000	3,500,000
	No Action	CY	3,800,000	3,700,000	800,000	770,000
	Total Materials	CY	4,400,000	4,400,000	4,400,000	4,400,000
Waste Rock, Upland (Human Health)	Regrade/Consolidate/Revegetate	AC	15	15	--	--
	Total Materials	AC	15	15	--	--
Adit Drainage	Active Treatment	LB/DAY	86	88	89	88
	Passive Treatment	LB/DAY	45	43	44	43
	No Action	LB/DAY	1.4	1.6	0	2
	Total Materials	LB/DAY	130	130	130	130
Stream and Riparian Cleanups	Bioengineered Revetments	LF	110,000	110,000	130,000	130,000
	Current Deflectors	EA	1,800	1,800	2,200	2,200
	Floodplain/Riparian Planting	AC	330	330	560	560
	Off-Channel Hydrologic Features	AC	100	100	210	210
	Sediment Traps	EA	190	190	0	0
	Vegetative Bank Stabilization	LF	140,000	140,000	160,000	160,000

Notes:

AC = acres
CY = cubic yards
LB/DAY = pounds of dissolved zinc per day
LF = lineal feet
EA = each

The purpose of including Alternatives 3 and 4 is to highlight the differences between the remedial actions included in the original 2001 FS ecological alternatives and the remedial actions included in Alternatives 3+ and 4+ in this FFS, assuming that quantities of wastes (sediments, tailings, waste rock, and pounds per day of zinc in adit discharges, groundwater, and seeps) at each individual site are identical. Estimates of the waste materials at some sites have changed since the 2001 FS. For the purpose of comparing Ecological Alternatives 3 and 4 with Alternatives 3+ and 4+, the waste material quantities for all alternatives have been modified as described in detail in Section 6.0.

Most of the significant changes between Alternatives 3 and 3+, particularly for floodplain sediments and impounded tailings, are the result of proposed actions in Woodland Park.

(a) In addition to capping, tailings that are impounded in active facilities will also include hydraulic isolation activities.

TABLE 7-2

Summary of Alternative 3+ in OU 3 by Remedial Action Type

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Remedial Action Type	Waste Type	Quantity	
Excavation/Disposal in Repository	Floodplain (Artificial Fill)	5,700	CY
	Floodplain Sediments	2,100,000	CY
	Tailings, Unimpounded	370,000	CY
	Waste Rock with Loading Potential	400	CY
	Total	**2,500,000**	**CY**
Excavation/Disposal in Waste Consolidation Area	Floodplain Sediments	95,000	CY
	Tailings, Impounded in Inactive Facilities	13,000	CY
	Tailings, Unimpounded	410,000	CY
	Waste Rock with Loading Potential	1,600,000	CY
	Waste Rock, Upland (with Little Loading Potential)	7,900	CY
	Total	**2,100,000**	**CY**
Hydraulic Isolation	Tailings, Impounded in Inactive Facilities	1,800,000	CY
Hydraulic Isolation at Discrete Facilities	Floodplain Sediments	1,400,000	CY
Hydraulic Isolation of Stream Reaches	Floodplain Sediments	2,300,000	CY
Cap	Tailings, Impounded in Active Facilities	4,000,000	CY
	Tailings, Impounded in Inactive Facilities	1,300,000	CY
	Tailings, Unimpounded	56,000	CY
	Waste Rock with Loading Potential	4,000,000	CY
	Waste Rock, Upland (with Little Loading Potential)	120,000	CY
	Total	**9,500,000**	**CY**
Regrade/Consolidate/Revegetate	Floodplain (Artificial Fill)	46,000	CY
	Waste Rock with Loading Potential	860,000	CY
	Waste Rock, Upland (Human Health)	15	AC
	Waste Rock, Upland (with Little Loading Potential)	540,000	CY
	Total	**1,400,000**	**CY**
Passive Treatment	Adit Drainage	43	LB/DAY
	Seep	4	LB/DAY
	Total	**47**	**LB/DAY**
Active Treatment	Adit Drainage	88	LB/DAY
	Groundwater	550	LB/DAY
	Total	**690**	**LB/DAY**

TABLE 7-2

Summary of Alternative 3+ in OU 3 by Remedial Action Type

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Remedial Action Type	Waste Type	Quantity	
Stream and Riparian Cleanups	Bioengineered Revetments	110,000	LF
	Current Deflectors	1,800	EA
	Floodplain/Riparian Planting	330	AC
	Off-Channel Hydrologic Features	100	AC
	Sediment Traps	190	EA
	Vegetative Bank Stabilization	140,000	LF

Notes:

AC = acres
CY = cubic yards
LB/DAY = pounds of dissolved zinc per day
LF = lineal feet
EA = each

TABLE 7-3

Estimated Average and Maximum Flow and Dissolved Zinc Loads Treated under Alternative 3+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Source ID	Watershed	Source Water	Average Flow (gpm)	Maximum Flow (gpm)	Average Dissolved Zinc Load (lb/day)	Maximum Dissolved Zinc Load (lb/day)
Active Treatment at the CTP (WT01)						
BUR067	Canyon Creek	Adit drainage	709	1410	12.2	24.4
BUR088	Canyon Creek	Adit drainage	44.9	89.8	0	0
BUR096	Canyon Creek	Adit drainage	3.64	7.27	0.000967	0.00194
BUR097	Canyon Creek	Adit drainage	646	1290	3.04	6.08
BUR098	Canyon Creek	Adit drainage	880	1350	17.9	27.4
BUR099	Canyon Creek	Adit drainage	44.9	89.8	0	0
BUR107	Canyon Creek	Adit drainage	44.9	89.8	0	0
BUR112	Canyon Creek	Adit drainage	44.9	89.8	0	0
BUR121	Canyon Creek	Adit drainage	507	1010	0.551	1.1
BUR129	Canyon Creek	Adit drainage	44.9	89.8	0	0
BUR190	Canyon Creek	Adit drainage	162	449	29.1	80.8
KLE040	Mainstem SFCDR	Groundwater	598	598	12.8	12.8
KLE048	Mainstem SFCDR	Groundwater	598	598	12.8	12.8
KLE049	Mainstem SFCDR	Groundwater	598	598	12.8	12.8
LOK011	Upper South Fork	Adit drainage	2580	5390	0.371	0.776
MUL012	Upper South Fork	Adit drainage	193	312	16.3	26.2
MUL014	Upper South Fork	Adit drainage	817	1630	0.822	1.65
MUL019	Upper South Fork	Adit drainage	530	830	1.06	1.66
MUL020	Upper South Fork	Groundwater	8.98	44.9	5.38	26.9
MUL037	Upper South Fork	Groundwater	8.98	44.9	0	0
MUL058	Upper South Fork	Groundwater	8.98	44.9	0	0
OSB039	Nine Mile Creek	Adit drainage	3.05	6.1	0.00277	0.00554
OSB065	Mainstem SFCDR	Groundwater	598	598	12.8	12.8
OSB088	Nine Mile Creek	Adit drainage	2.92	5.83	0	0
OSB089	Nine Mile Creek	Adit drainage	8.53	15.7	6.35	11.7
OSB119	Mainstem SFCDR	Groundwater	22.4	44.9	0	0
OSB120	Mainstem SFCDR	Groundwater	598	598	12.8	12.8
WAL001	Mainstem SFCDR	Groundwater	18	89.8	0	0
WAL002	Mainstem SFCDR	Adit drainage	0.359	0.898	0	0
WAL004	Mainstem SFCDR	Groundwater	598	598	12.8	12.8
WAL011	Canyon Creek - Woodland Park	Adit drainage	44.9	89.8	0.112	0.224

TABLE 7-3

Estimated Average and Maximum Flow and Dissolved Zinc Loads Treated under Alternative 3+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Source ID	Watershed	Source Water	Average Flow (gpm)	Maximum Flow (gpm)	Average Dissolved Zinc Load (lb/day)	Maximum Dissolved Zinc Load (lb/day)
WAL020	Mainstem SFCDR	Adit drainage	44.9	89.8	0.0248	0.0495
WP-OPTIONC	Canyon Creek - Woodland Park	Groundwater	539	674	117	146
WT01 Total			***11,600***	***18,900***	***287***	***432***
Semi-Passive Treatment using Lime Precipitation (WT02)						
BUR051	Nine Mile Creek	Adit drainage	44.9	89.8	15.3	30.6
BUR058	Nine Mile Creek	Adit drainage	44.9	89.8	0	0
BUR170	Nine Mile Creek	Adit drainage	37.3	74.5	0.0496	0.0992
BUR171	Nine Mile Creek	Adit drainage	14.4	27.4	0.0336	0.0641
LOK004	Upper South Fork	Adit drainage	50.3	101	0.00181	0.00362
LOK024	Upper South Fork	Adit drainage	44.9	89.8	0.592	1.18
MAS012	Pine Creek	Adit drainage	44.9	89.8	8.55	17.1
MAS014	Pine Creek	Adit drainage	44.9	89.8	3.35	6.71
MAS014	Pine Creek	Seep	44.9	89.8	4.04	8.08
MAS017	Pine Creek	Adit drainage	44.9	89.8	1.86	3.73
MAS021	Pine Creek	Adit drainage	33	49.8	3.89	5.88
MAS050	Pine Creek	Adit drainage	35.5	43.9	0.139	0.173
MUL023	Upper South Fork	Adit drainage	44.9	89.8	0.0215	0.0431
MUL052	Upper South Fork	Adit drainage	37.7	50.3	0.0181	0.0241
OSB074	Mainstem SFCDR	Adit drainage	44.9	89.8	1.45	2.91
POL067	Big Creek	Adit drainage	50.3	101	0.00603	0.0121
WT02 Total			***663***	***1,260***	***39***	***77***
Semi-Passive Treatment using SRBs (WT03)						
BUR054	Nine Mile Creek	Adit drainage	7.63	12.1	0.182	0.29
KLE054	Big Creek	Adit drainage	44.9	89.8	0.102	0.205
MAS007	Pine Creek	Adit drainage	23	33.2	2.12	3.05
MAS011	Pine Creek	Adit drainage	0.288	0.576	0.0363	0.0726
MAS015	Pine Creek	Adit drainage	0.781	3.01	0.0763	0.294
MAS016	Pine Creek	Adit drainage	0.189	0.379	0.139	0.279
MAS020	Pine Creek	Adit drainage	8.08	39.9	4.23	20.9
MAS054	Pine Creek	Adit drainage	3.99	7.99	0.00531	0.0106
MAS078	Pine Creek	Adit drainage	17.1	34.1	0.583	1.17
MUL027	Upper South Fork	Adit drainage	6.82	13.6	0.0777	0.156

TABLE 7-3

Estimated Average and Maximum Flow and Dissolved Zinc Loads Treated under Alternative 3+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Source ID	Watershed	Source Water	Average Flow (gpm)	Maximum Flow (gpm)	Average Dissolved Zinc Load (lb/day)	Maximum Dissolved Zinc Load (lb/day)
MUL028	Upper South Fork	Adit drainage	24.6	39.5	0.476	0.766
WT03 Total			***137***	***270***	***8***	***27***
Total Treated Load						
Semi-Passive Treatment Total			**800**	**1,530**	**47**	**104**
All Treatment Total			**12,400**	**20,400**	**334**	**536**

Notes:

gpm = gallons per minute
lb/day = pounds per day
SFCDR = South Fork Coeur d'Alene River

The average and peak flows for OU 2 and Woodland Park are based on the groundwater flow model results.
The Bunker Hill mine flows are based on the measured average flow and the design capacity of the CTP.
Adit flows with no record of measured flows were assigned an average flow of 45 gpm and and a peak flow of 90 gpm.
Limited data are available for many of the water sources included for treatment. In some cases, the "average" or "maximum" flow estimates provided in this table are based on only 1 or 2 data points. During the design phase, additional data will be collected on all water sources slated for treatment so that seasonal fluctuations and average flow rates can be more accurately assessed.

TABLE 7-4

Summary of Alternative 4+ in OU 3 by Remedial Action Type

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Remedial Action Type	Waste Type	Quantity	
Excavation/Disposal in Repository	Floodplain (Artificial Fill)	250,000	CY
	Floodplain Sediments	3,600,000	CY
	Tailings, Impounded in Inactive Facilities	3,700,000	CY
	Tailings, Unimpounded	850,000	CY
	Waste Rock with Loading Potential	4,300,000	CY
	Waste Rock, Upland (with Little Loading Potential)	110,000	CY
	Total	**13,000,000**	**CY**
Excavation/Disposal in Waste Consolidation Area	Waste Rock with Loading Potential	1,800,000	CY
	Waste Rock, Upland (with Little Loading Potential)	66,000	CY
	Total	**1,900,000**	**CY**
Hydraulic Isolation at Discrete Facilities	Floodplain Sediments	920,000	CY
Hydraulic Isolation of Stream Reaches	Floodplain Sediments	2,000,000	CY
Cap	Tailings, Impounded in Active Facilities	4,700,000	CY
	Waste Rock with Loading Potential	20,000	CY
	Total	**4,700,000**	**CY**
Regrade/Consolidate/Revegetate	Waste Rock with Loading Potential	380,000	CY
	Waste Rock, Upland (with Little Loading Potential)	3,500,000	CY
	Total	**3,900,000**	**CY**
Passive Treatment	Adit Drainage	43	LB/DAY
	Seep	4	LB/DAY
	Total	**47**	**LB/DAY**
Active Treatment	Adit Drainage	88	LB/DAY
	Groundwater	95	LB/DAY
	Total	**180**	**LB/DAY**
Stream and Riparian Cleanups	Bioengineered Revetments	130,000	LF
	Current Deflectors	2,200	EA
	Floodplain/Riparian Planting	560	AC
	Off-Channel Hydrologic Features	210	AC
	Vegetative Bank Stabilization	160,000	LF

Notes:

AC = acres
CY = cubic yards
LB/DAY = pounds of dissolved zinc per day
LF = lineal feet
EA = each

TABLE 7-5

Estimated Average and Maximum Flow and Dissolved Zinc Loads Treated under Alternative 4+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Source ID	Watershed	Source Water	Average Flow (gpm)	Maximum Flow (gpm)	Average Dissolved Zinc Load (lb/day)	Maximum Dissolved Zinc Load (lb/day)
Active Treatment at the CTP (WT01)						
BUR067	Canyon Creek	Adit drainage	709	1410	12.2	24.4
BUR087	Canyon Creek	Adit drainage	44.9	89.8	0	0
BUR088	Canyon Creek	Adit drainage	44.9	89.8	0	0
BUR091	Canyon Creek	Adit drainage	44.9	89.8	0	0
BUR096	Canyon Creek	Adit drainage	3.64	7.27	0.000967	0.00194
BUR097	Canyon Creek	Adit drainage	646	1290	3.04	6.08
BUR098	Canyon Creek	Adit drainage	880	1350	17.9	27.4
BUR099	Canyon Creek	Adit drainage	44.9	89.8	0	0
BUR107	Canyon Creek	Adit drainage	44.9	89.8	0	0
BUR109	Canyon Creek	Adit drainage	44.9	89.8	0	0
BUR112	Canyon Creek	Adit drainage	44.9	89.8	0	0
BUR114	Canyon Creek	Adit drainage	44.9	89.8	0	0
BUR121	Canyon Creek	Adit drainage	507	1010	0.551	1.1
BUR123	Canyon Creek	Adit drainage	44.9	89.8	0	0
BUR124	Canyon Creek	Adit drainage	44.9	89.8	0	0
BUR129	Canyon Creek	Adit drainage	44.9	89.8	0	0
BUR190	Canyon Creek	Adit drainage	162	449	29.1	80.8
KLE040	Mainstem SFCDR	Groundwater	598	598	12.8	12.8
KLE048	Mainstem SFCDR	Groundwater	598	598	12.8	12.8
KLE049	Mainstem SFCDR	Groundwater	598	598	12.8	12.8
LOK008	Upper South Fork	Adit drainage	44.9	89.8	0	0
LOK011	Upper South Fork	Adit drainage	2580	5390	0.371	0.776
MUL001	Upper South Fork	Adit drainage	13.6	27.3	0.00294	0.00589
MUL012	Upper South Fork	Adit drainage	193	312	16.3	26.2
MUL013	Upper South Fork	Adit drainage	44.9	89.8	0	0
MUL014	Upper South Fork	Adit drainage	817	1630	0.822	1.65
MUL019	Upper South Fork	Adit drainage	530	830	1.06	1.66
MUL020	Upper South Fork	Groundwater	8.98	44.9	5.38	26.9
MUL037	Upper South Fork	Groundwater	8.98	44.9	0	0
MUL058	Upper South Fork	Groundwater	8.98	44.9	0	0
MUL071	Upper South Fork	Adit drainage	0	0	0	0
OSB039	Nine Mile Creek	Adit drainage	3.05	6.1	0.00277	0.00554

TABLE 7-5

Estimated Average and Maximum Flow and Dissolved Zinc Loads Treated under Alternative 4+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Source ID	Watershed	Source Water	Average Flow (gpm)	Maximum Flow (gpm)	Average Dissolved Zinc Load (lb/day)	Maximum Dissolved Zinc Load (lb/day)
OSB055	Nine Mile Creek	Adit drainage	3.01	6.01	0.00451	0.00902
OSB065	Mainstem SFCDR	Groundwater	598	598	12.8	12.8
OSB088	Nine Mile Creek	Adit drainage	2.92	5.83	0	0
OSB089	Nine Mile Creek	Adit drainage	8.53	15.7	6.35	11.7
OSB119	Mainstem SFCDR	Groundwater	22.4	44.9	0	0
OSB120	Mainstem SFCDR	Groundwater	598	598	12.8	12.8
WAL001	Mainstem SFCDR	Groundwater	18	89.8	0	0
WAL002	Mainstem SFCDR	Adit drainage	0.359	0.898	0	0
WAL004	Mainstem SFCDR	Groundwater	598	598	12.8	12.8
WAL011	Canyon Creek - Woodlar	Adit drainage	44.9	89.8	0.112	0.224
WAL020	Mainstem SFCDR	Adit drainage	44.9	89.8	0.0248	0.0495
WAL038	Upper South Fork	Groundwater	2700	2700	13.8	162
WT01 Total			***14,100***	***21,600***	***184***	***448***
Semi-Passive Treatment using Lime Precipitation (WT02)						
BUR051	Nine Mile Creek	Adit drainage	44.9	89.8	15.3	30.6
BUR058	Nine Mile Creek	Adit drainage	44.9	89.8	0	0
BUR081	Nine Mile Creek	Adit drainage	44.9	89.8	0	0
BUR085	Canyon Creek	Adit drainage	44.9	89.8	0	0
BUR170	Nine Mile Creek	Adit drainage	37.3	74.5	0.0496	0.0992
BUR171	Nine Mile Creek	Adit drainage	14.4	27.4	0.0336	0.0641
KLE067	Mainstem SFCDR	Adit drainage	2.47	3.14	0.0135	0.0172
LOK004	Upper South Fork	Adit drainage	50.3	101	0.00181	0.00362
LOK014	Upper South Fork	Adit drainage	44.9	89.8	0	0
LOK024	Upper South Fork	Adit drainage	44.9	89.8	0.592	1.18
LOK028	Upper South Fork	Adit drainage	44.9	89.8	0.00538	0.0108
MAS004	Pine Creek	Adit drainage	12	24.1	0.00707	0.0141
MAS012	Pine Creek	Adit drainage	44.9	89.8	8.55	17.1
MAS014	Pine Creek	Adit drainage	44.9	89.8	3.35	6.71
MAS014	Pine Creek	Seep	44.9	89.8	4.04	8.08
MAS017	Pine Creek	Adit drainage	44.9	89.8	1.86	3.73
MAS021	Pine Creek	Adit drainage	33	49.8	3.89	5.88
MAS050	Pine Creek	Adit drainage	35.5	43.9	0.139	0.173
MUL023	Upper South Fork	Adit drainage	44.9	89.8	0.0215	0.0431

TABLE 7-5

Estimated Average and Maximum Flow and Dissolved Zinc Loads Treated under Alternative 4+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Source ID	Watershed	Source Water	Average Flow (gpm)	Maximum Flow (gpm)	Average Dissolved Zinc Load (lb/day)	Maximum Dissolved Zinc Load (lb/day)
MUL024	Upper South Fork	Adit drainage	44.9	89.8	1.24	2.49
MUL052	Upper South Fork	Adit drainage	37.7	50.3	0.0181	0.0241
MUL053	Upper South Fork	Adit drainage	78.1	156	0.0328	0.0656
MUL072	Upper South Fork	Adit drainage	10	20	0.00036	0.000721
MUL085	Mainstem SFCDR	Adit drainage	160	320	0.0613	0.123
MUL103	Upper South Fork	Adit drainage	44.9	89.8	0	0
OSB074	Mainstem SFCDR	Adit drainage	44.9	89.8	1.45	2.91
POL004	Big Creek	Adit drainage	5.03	10.1	0.000181	0.000362
POL067	Big Creek	Adit drainage	50.3	101	0.00603	0.0121
WT02 Total			***1,200***	***2,330***	***41***	***79***
Semi-Passive Treatment using SRBs (WT03)						
BUR054	Nine Mile Creek	Adit drainage	7.63	12.1	0.182	0.29
KLE024	Big Creek	Groundwater	8.98	44.9	0	0
KLE054	Big Creek	Adit drainage	44.9	89.8	0.102	0.205
KLW081	Pine Creek	Adit drainage	1.93	3.68	0.00488	0.00933
LOK017	Upper South Fork	Adit drainage	2.02	4.04	0.0000726	0.000145
LOK019	Upper South Fork	Adit drainage	0.135	0.269	0.0000339	0.0000679
MAS003	Pine Creek	Adit drainage	2.06	2.94	0.00144	0.00205
MAS007	Pine Creek	Adit drainage	23	33.2	2.12	3.05
MAS009	Pine Creek	Adit drainage	0.292	0.37	0.000049	0.0000622
MAS011	Pine Creek	Adit drainage	0.288	0.576	0.0363	0.0726
MAS015	Pine Creek	Adit drainage	0.781	3.01	0.0763	0.294
MAS016	Pine Creek	Adit drainage	0.189	0.379	0.139	0.279
MAS020	Pine Creek	Adit drainage	8.08	39.9	4.23	20.9
MAS025	Pine Creek	Adit drainage	44.9	89.8	0	0
MAS029	Pine Creek	Adit drainage	0.476	0.952	0.000205	0.000411
MAS054	Pine Creek	Adit drainage	3.99	7.99	0.00531	0.0106
MAS078	Pine Creek	Adit drainage	17.1	34.1	0.583	1.17
MUL027	Upper South Fork	Adit drainage	6.82	13.6	0.0777	0.156
MUL028	Upper South Fork	Adit drainage	24.6	39.5	0.476	0.766
MUL054	Upper South Fork	Adit drainage	3.14	6.28	0.00192	0.00385
MUL081	Upper South Fork	Adit drainage	3.37	4.94	0.000323	0.000474
OSB076	Mainstem SFCDR	Adit drainage	0.494	0.987	0.0000178	0.0000355

TABLE 7-5

Estimated Average and Maximum Flow and Dissolved Zinc Loads Treated under Alternative 4+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Source ID	Watershed	Source Water	Average Flow (gpm)	Maximum Flow (gpm)	Average Dissolved Zinc Load (lb/day)	Maximum Dissolved Zinc Load (lb/day)
OSB080	Mainstem SFCDR	Adit drainage	0.987	1.97	0.0000355	0.0000711
POL002	Big Creek	Adit drainage	7	14	0.000252	0.000504
POL022	Big Creek	Adit drainage	0.449	0.898	0.0000215	0.0000431
WT03 Total			***210***	***450***	***8***	***27***
Total Treated Load						
Semi-Passive Treatment Total			**1,410**	**2,780**	**49**	**106**
All Treatment Total			**15,500**	**24,400**	**233**	**554**

Notes:

gpm = gallons per minute
lb/day = pounds per day
SFCDR = South Fork Coeur d'Alene River

The average and peak flows for OU 2 and Woodland Park are based on the groundwater flow model results.
The Bunker Hill mine flows are based on the measured average flow and the design capacity of the CTP.
Adit flows with no record of measured flows were assigned an average flow of 45 gpm and and a peak flow of 90 gpm.
Limited data are available for many of the water sources included for treatment. In some cases, the "average" or "maximum" flow estimates provided in this table are based on only one or two data points. During the design phase, additional data will be collected on all water sources slated for treatment so that seasonal fluctuations and average flow rates can be more accurately assessed.

TABLE 7-6

Summary of Remedial Actions by Waste Type, Upper SFCDR Watershed

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Description	Remedial Actions	Units	Alt. 3	Alt. 3+	Alt. 4	Alt. 4+
Floodplain Sediments	Excavation/Disposal in Repository	CY	460,000	500,000	630,000	630,000
	Excavation/Disposal in Waste Consolidation Area	CY	38,000	38,000	--	--
	Hydraulic Isolation at Discrete Facilities	CY	360,000	360,000	360,000	360,000
	Hydraulic Isolation of Stream Reaches	CY	--	--	150,000	150,000
	No Action	CY	330,000	290,000	46,000	46,000
	Total Materials	CY	1,200,000	1,200,000	1,200,000	1,200,000
Floodplain (Artificial Fill)	Excavation/Disposal in Repository	CY	--	--	46,000	46,000
	Regrade/Consolidate/Revegetate	CY	46,000	46,000	--	--
	Total Materials	CY	46,000	46,000	46,000	46,000
Stream and Riparian Cleanups	Bioengineered Revetments	LF	24,000	24,000	24,000	24,000
	Current Deflectors	EA	470	470	530	530
	Floodplain/Riparian Planting	AC	66	66	73	73
	Off-Channel Hydrologic Features	AC	4.3	4.3	17	17
	Sediment Traps	EA	53	53	0	0
	Vegetative Bank Stabilization	LF	30,000	30,000	32,000	32,000
Tailings, Impounded in Inactive Facilities	Excavation/Disposal in Repository	CY	--	--	13,000	13,000
	Excavation/Disposal in Waste Consolidation Area	CY	13,000	13,000	--	--
	Total Materials	CY	13,000	13,000	13,000	13,000
Tailings, Impounded in Active Facilities	Cap	CY	--	930,000	--	930,000
	Hydraulic Isolation	CY	930,000	(a)	930,000	(a)
	Total Materials	CY	930,000	930,000	930,000	930,000
Tailings, Unimpounded	Excavation/Disposal in Repository	CY	--	--	130,000	130,000
	Excavation/Disposal in Waste Consolidation Area	CY	130,000	130,000	--	--
	No Action	CY	140,000	140,000	140,000	140,000
	Total Materials	CY	270,000	270,000	270,000	270,000
Waste Rock with Loading Potential	Cap	CY	1,100,000	1,100,000	--	--
	Excavation/Disposal in Repository	CY	--	--	900,000	900,000
	Excavation/Disposal in Waste Consolidation Area	CY	440,000	440,000	710,000	710,000
	Regrade/Consolidate/Revegetate	CY	270,000	270,000	150,000	150,000
	No Action	CY	390,000	390,000	390,000	390,000
	Total Materials	CY	2,200,000	2,200,000	2,200,000	2,200,000
Waste Rock, Upland (with Little Loading Potential)	Excavation/Disposal in Waste Consolidation Area	CY	--	--	24,000	24,000
	Regrade/Consolidate/Revegetate	CY	24,000	24,000	1,000,000	1,000,000
	No Action	CY	1,000,000	1,000,000	0	0
	Total Materials	CY	1,000,000	1,000,000	1,000,000	1,000,000

TABLE 7-6

Summary of Remedial Actions by Waste Type, Upper SFCDR Watershed

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Description	Remedial Actions	Units	Alt. 3	Alt. 3+	Alt. 4	Alt. 4+
Waste Rock, Upland (Human Health)	Regrade/Consolidate/Revegetate	AC	5	5	--	--
	Total Materials	AC	5	5	--	--
Adit Drainage	Active Treatment	LB/DAY	16	19	16	19
	Passive Treatment	LB/DAY	3.4	1.2	4.7	2.5
	No Action	LB/DAY	1.3	1.3	0	0
	Total Materials	LB/DAY	21	21	21	21

Notes:

AC = acres
CY = cubic yards
LB/DAY = pounds of dissolved zinc per day
LF = lineal feet
SFCDR = South Fork Coeur d'Alene River
EA = each

The purpose of including Alternatives 3 and 4 is to highlight the differences between the remedial actionsincluded in the original 2001 FS ecological alternatives and the remedial actions included in Alternatives 3+ and 4+ in this FFS, assuming that quantities of wastes (sediments, tailings, waste rock, and pounds per day of zinc in adit discharges, groundwater, and seeps) at each individual site are identical. Estimates of the waste materials at some sites have changed since the 2001 FS. For the purpose of comparing Ecological Alternatives 3 and 4 with Alternatives 3+ and 4+, the waste material quantities for all alternatives have been modified as described in detail in Section 6.0.

(a) In addition to capping, tailings that are impounded in active facilities will also include hydraulic isolation actions.

TABLE 7-7

Summary of Remedial Actions by Waste Type, Canyon Creek Watershed

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Description	Remedial Actions	Units	Alt. 3	Alt. 3+	Alt. 4	Alt. 4+
Canyon Creek (CCSeg01 through CCSeg04)						
Floodplain Sediments	Excavation/Disposal in Repository	CY	97,000	97,000	140,000	140,000
	No Action	CY	43,000	43,000	0	0
	Total Materials	CY	140,000	140,000	140,000	140,000
Stream and Riparian Cleanups	Bioengineered Revetments	LF	8,000	8,000	13,000	13,000
	Current Deflectors	EA	240	240	270	270
	Floodplain/Riparian Planting	AC	24	24	70	70
	Off-Channel Hydrologic Features	AC	0	0	8.7	8.7
	Sediment Traps	EA	27	27	0	0
	Vegetative Bank Stabilization	LF	13,000	13,000	13,000	13,000
Tailings, Unimpounded	Excavation/Disposal in Repository	CY	--	--	94,000	94,000
	Excavation/Disposal in Waste Consolidation Area	CY	92,000	92,000	--	--
	No Action	CY	2,500	2,500	0	0
	Total Materials	CY	94,000	94,000	94,000	94,000
Waste Rock with Loading Potential	Cap	CY	1,100,000	1,100,000	--	--
	Excavation/Disposal in Repository	CY	--	--	1,100,000	1,100,000
	Excavation/Disposal in Waste Consolidation Area	CY	350,000	350,000	440,000	440,000
	Regrade/Consolidate/Revegetate	CY	--	88,000	120,000	120,000
	No Action	CY	120,000	32,000	0	0
	Total Materials	CY	1,600,000	1,600,000	1,600,000	1,600,000
Waste Rock, Upland (with Little Loading Potential)	Regrade/Consolidate/Revegetate	CY	55,000	99,000	770,000	770,000
	No Action	CY	710,000	670,000	0	0
	Total Materials	CY	770,000	770,000	770,000	770,000
Waste Rock, Upland (Human Health)	Regrade/Consolidate/Revegetate	AC	3	3	--	--
	Total Materials	AC	3	3	--	--
Adit Drainage	Active Treatment	LB/DAY	59	63	62	63
	Passive Treatment	LB/DAY	3.7	--	0.66	0
	Total Materials	LB/DAY	63	63	63	63

TABLE 7-7

Summary of Remedial Actions by Waste Type, Canyon Creek Watershed

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Description	Remedial Actions	Units	Alt. 3	Alt. 3+	Alt. 4	Alt. 4+
Canyon Creek -- Woodland Park (CCSeg05)						
Floodplain Sediments	Excavation/Disposal in Repository	CY	56,000	24,000	430,000	430,000
	Hydraulic Isolation at Discrete Facilities	CY	320,000	230,000	--	--
	Hydraulic Isolation of Stream Reaches	CY	46,000	89,000	--	--
	No Action	CY	26,000	110,000	25,000	25,000
	Total Materials	CY	450,000	450,000	450,000	450,000
Floodplain (Artificial Fill)	Excavation/Disposal in Repository	CY	2,900	5,700	210,000	210,000
	Excavation/Disposal in Waste Consolidation Area	CY	200,000	--	--	--
	No Action	CY	--	200,000	--	--
	Total Materials	CY	210,000	210,000	210,000	210,000
Stream and Riparian Cleanups	Bioengineered Revetments	LF	4,700	4,700	7,800	7,800
	Current Deflectors	EA	70	70	78	78
	Floodplain/Riparian Planting	AC	47	47	110	110
	Off-Channel Hydrologic Features	AC	0	0	78	78
	Sediment Traps	EA	8	8	0	0
	Vegetative Bank Stabilization	LF	7,800	7,800	7,800	7,800
Tailings, Impounded in Inactive Facilities	Cap	CY	2,700,000	300,000	--	--
	Excavation/Disposal in Repository	CY	--	--	2,700,000	2,700,000
	Hydraulic Isolation	CY	0	1,800,000	--	--
	No Action	CY	--	630,000	--	--
	Total Materials	CY	2,700,000	2,700,000	2,700,000	2,700,000
Tailings, Unimpounded	Excavation/Disposal in Repository	CY	--	13,000	24,000	24,000
	Excavation/Disposal in Waste Consolidation Area	CY	24,000	--	--	--
	No Action	CY	--	12,000	--	--
	Total Materials	CY	24,000	24,000	24,000	24,000
Waste Rock, Upland (with Little Loading Potential)	Regrade/Consolidate/Revegetate	CY	--	--	76,000	76,000
	No Action	CY	76,000	76,000	--	--
	Total Materials	CY	76,000	76,000	76,000	76,000

Notes:

AC = acres
CY = cubic yards
LB/DAY = pounds of dissolved zinc per day
LF = lineal feet
EA = each

The purpose of including Alternatives 3 and 4 is to highlight the differences between the remedial actionsincluded in the original 2001 FS ecological alternatives and the remedial actions included in Alternatives 3+ and 4+ in this FFS, assuming that quantities of wastes (sediments, tailings, waste rock, and pounds per day of zinc in adit discharges, groundwater, and seeps) at each individual site are identical. Estimates of the waste materials at some sites have changed since the 2001 FS. For the purpose of comparing Ecological Alternatives 3 and 4 with Alternatives 3+ and 4+, the waste material quantities for all alternatives have been modified as described in detail in Section 6.0.

TABLE 7-8

Summary of Remedial Actions by Waste Type, Ninemile Creek Watershed

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Description	Remedial Actions	Units	Alt. 3	Alt. 3+	Alt. 4	Alt. 4+
Floodplain Sediments	Excavation/Disposal in Repository	CY	100,000	100,000	150,000	150,000
	Excavation/Disposal in Waste Consolidation Area	CY	34,000	34,000	--	--
	No Action	CY	14,000	14,000	0	--
	Total Materials	CY	150,000	150,000	150,000	150,000
Stream and Riparian Cleanups	Bioengineered Revetments	LF	20,000	20,000	20,000	20,000
	Current Deflectors	EA	270	270	240	240
	Floodplain/Riparian Planting	AC	46	46	46	46
	Off-Channel Hydrologic Features	AC	0.75	0.75	0.84	0.84
	Sediment Traps	EA	30	30	0	0
	Vegetative Bank Stabilization	LF	23,000	23,000	25,000	25,000
Tailings, Impounded in Inactive Facilities	Cap	CY	430,000	430,000	--	--
	Excavation/Disposal in Repository	CY	--	--	430,000	430,000
	Total Materials	CY	430,000	430,000	430,000	430,000
Tailings, Unimpounded	Excavation/Disposal in Repository	CY	360,000	360,000	390,000	390,000
	Excavation/Disposal in Waste Consolidation Area	CY	32,000	32,000	--	--
	Total Materials	CY	390,000	390,000	390,000	390,000
Waste Rock with Loading Potential	Cap	CY	860,000	860,000	--	--
	Excavation/Disposal in Repository	CY	--	--	460,000	460,000
	Excavation/Disposal in Waste Consolidation Area	CY	--	--	690,000	690,000
	Regrade/Consolidate/Revegetate	CY	290,000	290,000	--	--
	Total Materials	CY	1,200,000	1,200,000	1,200,000	1,200,000
Waste Rock, Upland (with Little Loading Potential)	Cap	CY	4,000	4,000	--	--
	Excavation/Disposal in Repository	CY	--	--	17,000	17,000
	Excavation/Disposal in Waste Consolidation Area	CY	--	--	4,000	4,000
	Regrade/Consolidate/Revegetate	CY	17,000	17,000	480,000	480,000
	No Action	CY	480,000	480,000	0	0
	Total Materials	CY	500,000	500,000	500,000	500,000
Adit Drainage	Active Treatment	LB/DAY	6.3	6.4	6.3	6.4
	Passive Treatment	LB/DAY	16	16	16	14
	No Action	LB/DAY	0.028	0.028	0	2
	Total Materials	LB/DAY	22	22	22	22

Notes:

AC = acres
CY = cubic yards
LB/DAY = pounds of dissolved zinc per day
LF = lineal feet
EA = each

The purpose of including Alternatives 3 and 4 is to highlight the differences between the remedial actions included in the original 2001 FS ecological alternatives and the remedial actions included in Alternatives 3+ and 4+ in this FFS, assuming that quantities of wastes (sediments, tailings, waste rock, and pounds per day of zinc in adit discharges, groundwater, and seeps) at each individual site are identical. Estimates of the waste materials at some sites have changed since the 2001 FS. For the purpose of comparing Ecological Alternatives 3 and 4 with Alternatives 3+ and 4+, the waste material quantities for all alternatives have been modified as described in detail in Section 6.0.

TABLE 7-9

Summary of Remedial Actions by Waste Type, Big Creek Watershed

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Description	Remedial Actions	Units	Alt. 3	Alt. 3+	Alt. 4	Alt. 4+
Floodplain Sediments	Excavation/Disposal in Repository	CY	140,000	140,000	160,000	160,000
	Hydraulic Isolation at Discrete Facilities	CY	--	--	39,000	39,000
	No Action	CY	59,000	59,000	--	--
	Total Materials	CY	200,000	200,000	200,000	200,000
Stream and Riparian Cleanups	Bioengineered Revetments	LF	5,800	5,800	5,800	5,800
	Current Deflectors	EA	140	140	150	150
	Floodplain/Riparian Planting	AC	7.4	7.4	8.6	8.6
	Off-Channel Hydrologic Features	AC	4	4	4.1	4.1
	Sediment Traps	EA	16	16	0	0
	Vegetative Bank Stabilization	LF	5,800	5,800	5,800	5,800
Tailings, Impounded in Inactive Facilities	Cap	CY	400,000	400,000	--	--
	Excavation/Disposal in Repository	CY	--	--	400,000	400,000
	Total Materials	CY	400,000	400,000	400,000	400,000
Tailings, Impounded in Active Facilities	Cap	CY	--	--	--	710,000
	Hydraulic Isolation	CY	--	--	710,000	(a)
	No Action	CY	710,000	710,000	--	--
	Total Materials	CY	710,000	710,000	710,000	710,000
Tailings, Unimpounded	No Action	CY	210,000	210,000	210,000	210,000
	Total Materials	CY	210,000	210,000	210,000	210,000
Waste Rock with Loading Potential	Excavation/Disposal in Repository	CY	--	--	570,000	570,000
	Excavation/Disposal in Waste Consolidation Area	CY	470,000	470,000	--	--
	Regrade/Consolidate/Revegetate	CY	100,000	100,000	--	--
	No Action	CY	1,000	1,000	1,000	1,000
	Total Materials	CY	570,000	570,000	570,000	570,000
Waste Rock, Upland (with Little Loading Potential)	Regrade/Consolidate/Revegetate	CY	--	--	94,000	94,000
	No Action	CY	190,000	190,000	99,000	99,000
	Total Materials	CY	190,000	190,000	190,000	190,000
Adit Drainage	Passive Treatment	LB/DAY	0.11	0.11	0.11	0.11
	No Action	LB/DAY	0.00045	0.00045	0	0
	Total Materials	LB/DAY	0.11	0.11	0.11	0.11

Notes:

AC = acres
CY = cubic yards
LB/DAY = pounds of dissolved zinc per day
LF = lineal feet
EA = each

The purpose of including Alternatives 3 and 4 is to highlight the differences between the remedial actions included in the original 2001 FS ecological alternatives and the remedial actions included in Alternatives 3+ and 4+ in this FFS, assuming that quantities of wastes (sediments, tailings, waste rock, and pounds per day of zinc in adit discharges, groundwater, and seeps) at each individual site are identical. Estimates of the waste materials at some sites have changed since the 2001 FS. For the purpose of comparing Ecological Alternatives 3 and 4 with Alternatives 3+ and 4+, the waste material quantities for all alternatives have been modified as described in detail in Section 6.0.

(a) In addition to capping, tailings that are impounded in active facilities will also include hydraulic isolation actions.

TABLE 7-10

Summary of Remedial Actions by Waste Type, Moon Creek Watershed

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Description	Remedial Actions	Units	Alt. 3	Alt. 3+	Alt. 4	Alt. 4+
Floodplain Sediments	Excavation/Disposal in Repository	CY	3,300	3,300	3,300	3,300
	Total Materials	CY	3,300	3,300	3,300	3,300
Stream and Riparian Cleanups	Bioengineered Revetments	LF	4,600	4,600	4,600	4,600
	Current Deflectors	EA	150	150	160	160
	Floodplain/Riparian Planting	AC	17	17	17	17
	Off-Channel Hydrologic Features	AC	2	2	3	3
	Sediment Traps	EA	13	13	0	0
	Vegetative Bank Stabilization	LF	4,900	4,900	4,900	4,900
Waste Rock with Loading Potential	Excavation/Disposal in Repository	CY	400	400	400	400
	Regrade/Consolidate/Revegetate	CY	17,000	17,000	17,000	17,000
	Total Materials	CY	17,000	17,000	17,000	17,000
Waste Rock, Upland (with Little Loading Potential)	Regrade/Consolidate/Revegetate	CY	--	--	48,000	48,000
	No Action	CY	48,000	48,000	0	0
	Total Materials	CY	48,000	48,000	48,000	48,000

Notes:

AC = acres
CY = cubic yards
LF = lineal feet
EA = each

The purpose of including Alternatives 3 and 4 is to highlight the differences between the remedial actionsincluded in the original 2001 FS ecological alternatives and the remedial actions included in Alternatives 3+ and 4+ in this FFS, assuming that quantities of wastes (sediments, tailings, waste rock, and pounds per day of zinc in adit discharges, groundwater, and seeps) at each individual site are identical. Estimates of the waste materials at some sites have changed since the 2001 FS. For the purpose of comparing Ecological Alternatives 3 and 4 with Alternatives 3+ and 4+, the waste material quantities for all alternatives have been modified as described in detail in Section 6.0.

TABLE 7-11

Summary of Remedial Actions by Waste Type, Pine Creek Watershed

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Description	Remedial Actions	Units	Alt. 3	Alt. 3+	Alt. 4	Alt. 4+
Floodplain Sediments	Excavation/Disposal in Repository	CY	35,000	35,000	35,000	35,000
	Total Materials	CY	35,000	35,000	35,000	35,000
Stream and Riparian Cleanups	Bioengineered Revetments	LF	4,700	4,700	4,700	4,700
	Current Deflectors	EA	65	65	73	73
	Floodplain/Riparian Planting	AC	16	16	16	16
	Off-Channel Hydrologic Features	AC	7.5	7.5	7.1	7.1
	Sediment Traps	EA	8	8	0	0
	Vegetative Bank Stabilization	LF	4,700	4,700	4,700	4,700
Tailings, Impounded in Inactive Facilities	Cap	CY	0	42,000	--	--
	Excavation/Disposal in Repository	CY	--	--	42,000	42,000
	Hydraulic Isolation	CY	42,000	0	--	--
	Total Materials	CY	42,000	42,000	42,000	42,000
Tailings, Unimpounded	Cap	CY	21,000	56,000	--	--
	Excavation/Disposal in Repository	CY	80	80	120,000	150,000
	Excavation/Disposal in Waste Consolidation Area	CY	98,000	98,000	--	--
	No Action	CY	35,000	0	35,000	0
	Total Materials	CY	150,000	150,000	150,000	150,000
Waste Rock with Loading Potential	Cap	CY	78,000	78,000	20,000	20,000
	Excavation/Disposal in Repository	CY	--	--	360,000	380,000
	Excavation/Disposal in Waste Consolidation Area	CY	300,000	320,000	--	--
	Regrade/Consolidate/Revegetate	CY	--	95,000	--	95,000
	No Action	CY	250,000	140,000	250,000	140,000
	Total Materials	CY	630,000	630,000	630,000	630,000
Waste Rock, Upland (with Little Loading Potential)	Cap	CY	77,000	110,000	--	--
	Excavation/Disposal in Repository	CY	--	--	93,000	93,000
	Excavation/Disposal in Waste Consolidation Area	CY	7,900	7,900	--	38,000
	Regrade/Consolidate/Revegetate	CY	--	--	390,000	390,000
	No Action	CY	520,000	480,000	120,000	80,000
	Total Materials	CY	600,000	600,000	600,000	600,000
Waste Rock, Upland (Human Health)	Regrade/Consolidate/Revegetate	AC	2	2	--	--
	Total Materials	AC	2	2	--	--
Adit Drainage	Active Treatment	LB/DAY	4.2	--	4.2	--
	Passive Treatment	LB/DAY	21	25	21	25
	No Action	LB/DAY	0.014	0.26	--	0.24
	Total Materials	LB/DAY	25	25	25	25

Notes:

AC = acres
CY = cubic yards
LB/DAY = pounds of dissolved zinc per day
LF = lineal feet
EA = each

The purpose of including Alternatives 3 and 4 is to highlight the differences between the remedial actions included in the original 2001 FS ecological alternatives and the remedial actions included in Alternatives 3+ and 4+ in this FFS, assuming that quantities of wastes (sediments, tailings, waste rock, and pounds per day of zinc in adit discharges, groundwater, and seeps) at each individual site are identical. Estimates of the waste materials at some sites have changed since the 2001 FS. For the purpose of comparing Ecological Alternatives 3 and 4 with Alternatives 3+ and 4+, the waste material quantities for all alternatives have been modified as described in detail in Section 6.0.

TABLE 7-12

Summary of Remedial Actions by Waste Type, Mainstem SFCDR Watershed

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Description	Remedial Actions	Units	Alt. 3	Alt. 3+	Alt. 4	Alt. 4+
Floodplain Sediments	Excavation/Disposal in Repository	CY	1,200,000	1,200,000	2,000,000	2,000,000
	Excavation/Disposal in Waste Consolidation Area	CY	23,000	23,000	--	--
	Hydraulic Isolation at Discrete Facilities	CY	840,000	840,000	520,000	520,000
	Hydraulic Isolation of Stream Reaches	CY	1,600,000	2,200,000	1,800,000	1,800,000
	No Action	CY	960,000	340,000	280,000	280,000
	Total Materials	CY	4,700,000	4,700,000	4,700,000	4,700,000
Stream and Riparian Cleanups	Bioengineered Revetments	LF	26,000	26,000	30,000	30,000
	Current Deflectors	EA	280	280	340	340
	Floodplain/Riparian Planting	AC	100	100	220	220
	Off-Channel Hydrologic Features	AC	76	76	80	80
	Sediment Traps	EA	35	35	0	0
	Vegetative Bank Stabilization	LF	25,000	25,000	26,000	26,000
Tailings, Impounded in Inactive Facilities	Cap	CY	82,000	82,000	--	--
	Excavation/Disposal in Repository	CY	--	--	82,000	82,000
	Total Materials	CY	82,000	82,000	82,000	82,000
Tailings, Impounded in Active Facilities	Cap	CY	--	3,100,000	--	3,100,000
	Hydraulic Isolation	CY	3,100,000	(a)	3,100,000	(a)
	No Action	CY	1,200,000	1,200,000	1,200,000	1,200,000
	Total Materials	CY	4,300,000	4,300,000	4,300,000	4,300,000
Tailings, Unimpounded	Excavation/Disposal in Repository	CY	--	--	57,000	57,000
	Excavation/Disposal in Waste Consolidation Area	CY	57,000	57,000	--	--
	No Action	CY	88,000	88,000	88,000	88,000
	Total Materials	CY	150,000	150,000	150,000	150,000
Waste Rock with Loading Potential	Cap	CY	870,000	870,000	--	--
	Excavation/Disposal in Repository	CY	--	--	920,000	920,000
	Excavation/Disposal in Waste Consolidation Area	CY	14,000	14,000	--	--
	No Action	CY	35,000	35,000	0	0
	Total Materials	CY	920,000	920,000	920,000	920,000
Waste Rock, Upland (with Little Loading Potential)	Regrade/Consolidate/Revegetate	CY	400,000	400,000	590,000	590,000
	No Action	CY	770,000	770,000	590,000	590,000
	Total Materials	CY	1,200,000	1,200,000	1,200,000	1,200,000
Waste Rock, Upland (Human Health)	Regrade/Consolidate/Revegetate	AC	5	5	--	--
	Total Materials	AC	5	5	--	--

TABLE 7-12

Summary of Remedial Actions by Waste Type, Mainstem SFCDR Watershed

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Description	Remedial Actions	Units	Alt. 3	Alt. 3+	Alt. 4	Alt. 4+
Adit Drainage	Active Treatment	LB/DAY	--	0.025	--	0.025
	Passive Treatment	LB/DAY	1.5	1.5	1.6	1.5
	No Action	LB/DAY	0.061	0.061	0	0
	Total Materials	LB/DAY	1.6	1.6	1.6	1.6

Notes:

AC = acres
CY = cubic yards
LB/DAY = pounds of dissolved zinc per day
LF = lineal feet
SFCDR = South Fork Coeur d'Alene River
EA = each

The purpose of including Alternatives 3 and 4 is to highlight the differences between the remedial actionsincluded in the original 2001 FS ecological alternatives and the remedial actions included in Alternatives 3+ and 4+ in this FFS, assuming that quantities of wastes (sediments, tailings, waste rock, and pounds per day of zinc in adit discharges, groundwater, and seeps) at each individual site are identical. Estimates of the waste materials at some sites have changed since the 2001 FS. For the purpose of comparing Ecological Alternatives 3 and 4 with Alternatives 3+ and 4+, the waste material quantities for all alternatives have been modified as described in detail in Section 6.0.

(a) In addition to capping, tailings that are impounded in active facilities will also include hydraulic isolation actions.

TABLE 7-13

Estimated Average and Maximum Flow and Dissolved Zinc Loads Treated at the Central Treatment Plant

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Alternative	Remedial Actions	Average Flow (gpm)	Maximum Flow (gpm)	Average Dissolved Zinc Load (lb/day)	Maximum Dissolved Zinc Load (lb/day)
Alternative 3+ (a)	Alternative 3+ for OU 3	11,500	18,800	287	432
	Alternative (a) for OU 2	-	-	-	-
	Alternative SubTotal	**11,500**	**18,800**	**287**	**432**
	Bunker Hill Mine Water[1]	1,300	5,000	3,100	120,000
	Total	**12,800**	**23,800**	**3,390**	**120,000**
Alternative 3+ (b)	Alternative 3+ for OU 3	11,500	18,800	287	432
	Alternative (b) for OU 2	-	-	-	-
	Alternative SubTotal	**11,500**	**18,800**	**287**	**432**
	Bunker Hill Mine Water[1]	1,300	5,000	3,100	120,000
	Total	**12,800**	**23,800**	**3,390**	**120,000**
Alternative 3+ (c)	Alternative 3+ for OU 3	11,500	18,800	287	432
	Alternative (c) for OU 2	3,900	4,200	1,163	1,303
	Alternative SubTotal	**15,400**	**23,000**	**1,450**	**1,740**
	Bunker Hill Mine Water[1]	1,300	5,000	3,100	120,000
	Total	**16,700**	**28,000**	**4,550**	**122,000**
Alternative 3+ (d)	Alternative 3+ for OU 3	11,500	18,800	287	432
	Alternative (d) for OU 2	3,900	4,400	1,146	1,350
	Alternative SubTotal	**15,400**	**23,200**	**1,433**	**1,780**
	Bunker Hill Mine Water[1]	1,300	5,000	3,100	120,000
	Total	**16,700**	**28,200**	**4,530**	**122,000**
Alternative 3+ (e)	Alternative 3+ for OU 3	11,500	18,800	287	432
	Alternative (e) for OU 2	2,400	4,800	531	1,213
	Alternative SubTotal	**13,900**	**23,600**	**820**	**1,650**
	Bunker Hill Mine Water[1]	1,300	5,000	3,100	120,000
	Total	**15,200**	**28,600**	**3,920**	**122,000**
Alternative 4+ (a)	Alternative 4+ for OU 3	14,000	21,600	184	448
	Alternative (a) for OU 2	-	-	-	-
	Alternative SubTotal	**14,000**	**21,600**	**184**	**448**
	Bunker Hill Mine Water[1]	1,300	5,000	3,100	120,000
	Total	**15,300**	**26,600**	**3,280**	**120,000**

TABLE 7-13

Estimated Average and Maximum Flow and Dissolved Zinc Loads Treated at the Central Treatment Plant

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Alternative	Remedial Actions	Average Flow (gpm)	Maximum Flow (gpm)	Average Dissolved Zinc Load (lb/day)	Maximum Dissolved Zinc Load (lb/day)
Alternative 4+ (b)	Alternative 4+ for OU 3	14,000	21,600	184	448
	Alternative (b) for OU 2	-	-	-	-
	Alternative SubTotal	**14,000**	**21,600**	**184**	**448**
	Bunker Hill Mine Water[1]	1,300	5,000	3,100	120,000
	Total	**15,300**	**26,600**	**3,280**	**120,000**
Alternative 4+ (c)	Alternative 4+ for OU 3	14,000	21,600	184	448
	Alternative (c) for OU 2	3,900	4,200	1,163	1,303
	Alternative SubTotal	**17,900**	**25,800**	**1,350**	**1,750**
	Bunker Hill Mine Water[1]	1,300	5,000	3,100	120,000
	Total	**19,200**	**30,800**	**4,450**	**122,000**
Alternative 4+ (d)	Alternative 4+ for OU 3	14,000	21,600	184	448
	Alternative (d) for OU 2	3,900	4,400	1,146	1,350
	Alternative SubTotal	**17,900**	**26,000**	**1,330**	**1,800**
	Bunker Hill Mine Water[1]	1,300	5,000	3,100	120,000
	Total	**19,200**	**31,000**	**4,430**	**122,000**
Alternative 4+ (e)	Alternative 4+ for OU 3	14,000	21,600	184	448
	Alternative (e) for OU 2	2,400	4,800	531	1,213
	Alternative SubTotal	**16,400**	**26,400**	**720**	**1,660**
	Bunker Hill Mine Water[1]	1,300	5,000	3,100	120,000
	Total	**17,700**	**31,400**	**3,820**	**122,000**

Notes:

[1]Average load value obtained from the Bunker Hill Mine Water RI/FS Study (USEPA, 2001a). Maximum load value calculated from a sample result of 2,000 mg/L taken on 5/23/08 and a flow of 5,000 gpm.

TABLE 7-14

Estimated Lime Demand and Solids Formed for the Waters Requiring Active Treatment

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Alternative	Average Flow (gpm)	Lime Demand (lb/1,000 gal $Ca(OH)_2$)	Lime Usage (tons/year CaO)	Solids Formed (lb/1,000 gal)	Dewatered Sludge Volume in Sludge Disposal Cell (CY/Year)
Alternatives 3+(a)/3+(b)	12,800	1.34	3,400	1.22	8,900
Alternative 3+(c)	16,700	1.59	5,300	1.45	13,900
Alternative 3+(d)	16,700	1.59	5,300	1.45	13,800
Alternative 3+(e)	15,200	1.51	4,600	1.37	11,900
Alternatives 4+(a)/4+(b)	15,300	1.24	3,800	1.13	9,900
Alternative 4+(c)	19,200	1.48	5,700	1.35	14,900
Alternative 4+(d)	19,200	1.48	5,700	1.35	14,800
Alternative 4+(e)	17,700	1.40	5,000	1.27	12,900

Notes:

CaO = calcium oxide
CIA = Central Impoundment Area
CTP = Central Treatment Plant
CY/year = cubic yards per year
gpm = gallons per minute
lb/1,000 gal $Ca(OH)_2$ = pounds per one-thousand gallons of calcium hydroxide

Average flows include 1,300 gpm of Bunker Hill Mine water.

Lime demand and solids formed for each alternative were calculated based on available lime demand and solids formed data collected between 2006 and 2008 for OU 2 and OU 3 sources. The Bunker Hill Mine water lime demand and solids formed data was taken from the Bunker Hill Mine Water Management Remedial Investigation/Feasibility Study (USEPA, 2001a). The sludge properties were interpolated based on existing CTP sludge properties and sludge properties observed during the 2005 Canyon Creek groundwater treatability study (CH2M HILL, 2006c).

TABLE 7-15

Current Central Treatment Plant Operational Effluent Limitations

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Daily Average Limit[1]		Daily Maximum Limit[2]	
Parameter	*(µg/L)*	*(lb/day)*	*(µg/L)*	*(lb/day)*
pH, standard units (s.u.)	---------- The pH must be between 6.0 and 10.0 ----------			
Total Suspended Solids	20,000	985	30,000	1,907
Total Zinc	730	36.2	1,480	91.3
Total Lead	300	14.8	600	37.0
Total Cadmium	50	2.4	100	6.1
Total Copper[3]	150	7.4	300	18.6
Total Mercury[3]	1	0.05	2	0.12

Notes:

lb/day = pounds per day
s.u. = standard pH units
µg/L = micorgrams per liter

[1] The total units discharged during a month divided by the number of days the plant operated that month.
[2] The maximum value attained on any day in a given monitoring month.
[3] Daily monitoring for copper and mercury not required.

TABLE 7-16

Central Treatment Plant Operational Effluent Limitations Following Upgrades

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Parameter	Maximum Daily Limit (µg/L)	Average Monthly Limit (µg/L)
Arsenic[1]	101	50
Cadmium[1]	5.6	2.8
Copper[1]	63.5	31.7
Lead[1]	171	85.2
Mercury[2]	0.020	0.010
Selenium[1]	8.2	4.1
Silver[1]	43.9	21.9
Thallium[1]	0.94	0.47
Zinc[1]	489	244
Aluminum[1]	143	71.2
Iron[1]	1,643	819
Manganese[1]	164	81.9
pH (s.u.)	---------- within the range of 6.5 to 9.0 ----------	
Total Suspended Solids(TSS) (mg/L)	30	20
Dissolved Oxygen. (mg/L)	---------- >6 mg/L ----------	
Temperature (^{o}C)	$\leq$ 22^{o}C, max daily average no greater than 19^{o}C	

Notes:

ºC = degrees Celsius
lb/day = pounds per day
mg/L - milligrams per liter
s.u. = standard pH units
µg/L = micrograms per liter

[1]Expressed in terms of total recoverable metal.
[2]Expressed in terms of total metal.

TABLE 7-17

Central Treatment Plant Upgrades to Treat Additional OU 2/OU 3 Waters

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

CTP Component	Upgrade/ Expansion Not Necessary	Phase I Upgrade	Phase II Upgrade	Comments
Thickener Hydraulic Capacity		X		The hydraulic capacity of the CTP thickener will need to be upgraded during Phase I to meet the total design capacity. Components include piping, valves, and others.
Aeration Basin (Reactor B)		X	X	Two Reactor B tanks will be installed, one each during Phase I and Phase II. Each Reactor B will be sized for CTP capactiy.
Piping		X	X	Piping will be installed during both phases as part of Reactor B and filter installation.
Sludge Conditioning Reactor (Reactor A)		X		A single Reactor A will be installed and sized for Phase II capacity.
Filtration System		X	X	This also includes the filter building, backwash pumps, backwash water supply, backwash storage, and a filter feed pump station. The filter building space, filters, and backwash pumps will be added as needed to accomodate the CTP capacity.
Effluent Discharge System		X		Depending on the selected alternative for OU 2, the CTP effluent will be discharged to Bunker Creek or the SFCDR. A station to measure effluent flow and collect water quality samples would be installed for either option.
Polymer Makeup System		X		An automated polymer makeup and feed system will be implemented, reducing labor and increasing polymer use efficiency. The current flocculation basin will be decommisioned and the polymer will be added directly into the pipeline or center, or both.
Thickener Tank	X			The thickener tank is adequately sized for the estimated capacity of the OU 2 and OU 3 waters. The thickener tank was reconditioned in 2004.
Thickener Rake	X			The thickener rake is adequately sized for the estimated capactiy of the OU 2 and OU 3 waters.

TABLE 7-17

Central Treatment Plant Upgrades to Treat Additional OU 2/OU 3 Waters

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

CTP Component	Upgrade/ Expansion Not Necessary	Phase I Upgrade	Phase II Upgrade	Comments
Thickener Drop Box		X		The thickener drop box will require upsizing to meet the CTP capacity.
Thickener Feed Well and Discharge Launder		X		The thickener feed well and discharge launder will require upsizing to meet the CTP capactiy.
Control Building	X			The control building was recently constructed and has the capability to control/monitor all water collection and conveyance systems as part of the selected alternative.
Lime Storage and Feeding System	X			The lime storage and feeding system was recently constructed and will meet the estimated capacity of the OU 2 and OU 3 waters.
Sludge Recycle and Wasting Pumps		X		These pumps will be sized according to expected recycle and wasting rates.

Notes:

CTP = Central Treatment Plant
SFCDR = South Fork Coeur d'Alene River

TABLE 7-18

Costs for Central Treatment Plant Expansion and Upgrades to Treat the Combined OU 2 and OU 3 Waters

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Alternative	Total Capital Cost	O&M Cost (30 Year NPV)	O&M Cost (Annual Average)	Total Cost (30 Year NPV)
3+(a)/3+(b)	$26,300,000	$11,800,000	$1,000,000	$38,000,000
3+(c)	$32,200,000	$15,800,000	$1,300,000	$47,900,000
3+(d)	$32,400,000	$15,800,000	$1,300,000	$48,100,000
3+(e)	$33,100,000	$14,200,000	$1,100,000	$47,200,000
4+(a)/4+(b)	$30,100,000	$14,400,000	$1,200,000	$44,500,000
4+(c)	$36,000,000	$18,400,000	$1,500,000	$54,400,000
4+(d)	$36,200,000	$18,400,000	$1,500,000	$54,600,000
4+(e)	$36,900,000	$16,800,000	$1,400,000	$53,700,000

Notes:

NPV = net present value
O&M = operation and maintenance

1. The above costs are presented rounded to 3 significant figures.

2. Active treatment is not included in the OU 2 Alternatives (a) and (b); therefore, total flows for Alternatives 3+(a) and 3+(b), and

Alternatives 4+(a) and 4+(b) will be identical, respectively.

3. Costs are based on TCD WT01, presented in Section 5.0 and Appendix D (Cost Analysis Documentation).

4. Costs are for expansion and upgrades for treatment of the additional OU 2 and OU 3 waters; they do not include the cost to treat the

Bunker Hill Mine Water.

5. The above cost opinion is a Feasibility-Study-level estimate with a nominal accuracy of –30 percent to +50 percent (–30/+50%).

6. The above cost opinion is in 2009 dollars and does not include future escalation. The order-of-magnitude cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, the final project scope, the final project schedule, and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making

specific financial decisions or establishing final budgets.

TABLE 7-19

Costs for Sludge Disposal Cell Construction, Closure, and O&M

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Alternative	Total Capital Cost	O&M Cost (30-Year NPV)	O&M Cost (Annual Average)	Existing Sludge Pond Closure Cost (30-Year NPV)	Total Cost (30-Year NPV)
3+(a)/3+(b)	$3,930,000	$254,000	$20,500	$1,125,000	$5,310,000
3+(c)	$6,140,000	$397,000	$32,000	$1,230,000	$7,770,000
3+(d)	$6,100,000	$397,000	$32,000	$1,230,000	$7,730,000
3+(e)	$5,260,000	$340,000	$27,400	$1,230,000	$6,830,000
4+(a)/4+(b)	$4,380,000	$283,000	$22,800	$1,170,000	$5,830,000
4+(c)	$6,590,000	$426,000	$34,300	$1,290,000	$8,310,000
4+(d)	$6,540,000	$423,000	$34,100	$1,290,000	$8,250,000
4+(e)	$5,700,000	$369,000	$29,700	$1,230,000	$7,300,000

Notes:

NPV = net present value
O&M = operation and maintenance

1. The above costs are presented rounded to 3 significant figures.

2. Active treatment is not included in the OU 2 Alternatives (a) and (b); therefore, total flows for Alternatives 3+(a) and 3+(b), and

Alternatives 4+(a) and 4+(b) will be identical, respectively.

3. The above costs are based on averages flows including 1,300 gpm of Bunker Hill Mine Water.

4. The NPV Sludge Disposal Cell closure costs are based on the time for the existing sludge disposal cell to reach capacity.

5. The above cost opinion is a Feasibility-Study-level estimate with a nominal accuracy of –30 percent to +50 percent (–30/+50%).

6. The above cost opinion is in 2009 dollars and does not include future escalation. The order-of-magnitude cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, the final project scope, the final project schedule, and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making

specific financial decisions or establishing final budgets.

TABLE 7-20

Evaluation Criteria for Superfund Remedial Alternatives

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Category	Criterion	Description
Threshold Criteria	Overall protection of human health and the environment	Determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.
	Compliance with ARARs	Evaluates whether the alternative meets federal, state, and tribal environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.
Primary Balancing Criteria	Long-term effectiveness and permanence	Considers the ability of an alternative to maintain protection of human health and the environment over time.
	Reduction of toxicity, mobility, or volume through treatment	Evaluates an alternative's use of treatment to reduce (a) the harmful effects of principal hazardous substances, (b) their ability to move in the environment, and (c) the amount of hazardous substances remaining after remedy implementation.
	Short-term effectiveness	Considers the length of time needed to implement an alternative and the risk the alternative poses to workers, residents, and the environment during implementation.
	Implementability	Considers the technical and administrative feasibility of implementing the alternative, including factors such as the availability of materials and services.
	Cost	Includes estimated present worth capital and O&M costs. O&M costs are estimated for a 30-year period using a discount rate of 7 percent.
Modifying Criteria	State/tribal acceptance	Considers whether the States and Tribes agree with USEPA's analyses and recommendations, as described in the FFS Report and the Proposed Plan.
	Community acceptance	Considers whether the local community agrees with USEPA's analyses and the Selected Remedy. Comments received on the Proposed Plan during the public comment period are an important indicator of community acceptance.

Notes:

Adapted from: USEPA, September 2002, *Record of Decision, The Bunker Hill Mining and Metallurgical Complex Operable Unit 3,* Part 2, Table 10.0-1.

ARAR = applicable or relevant and appropriate requirement
FFS = Focused Feasibility Study
O&M = operation and maintenance
RI = Remedial Investigation
USEPA = U.S. Environmental Protection Agency

TABLE 7-21

Summary of Predictive Analysis Results

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	At Remedy Completion					
	Post-Remediation Dissolved Zinc Load (lb/day)	80% Probability Interval on Load Estimate		Post-Remediation Dissolved Zinc Load Reduction		
	Best Estimate	Lower	Upper	Pounds/Day	Percent	AWQC Ratio
Elizabeth Park (SF-268)						
No Action Alternative	1,260	330	2,540	0	0	5.5
Alt. 3+ (OU 3 Only)	513	90	1,120	744	59	1.9
Alt. 4+ (OU 3 Only)	432	75	940	825	66	1.6
Pinehurst (SF-271)						
No Action Alternative	2,290	433	4,910	0	0	5.2
Alt. 3+(a)	1,340	225	2,940	941	41	2.9
Alt. 3+(b)	1,350	227	2,960	933	41	3.0
Alt. 3+(c)	942	97	2,140	1,340	59	1.8
Alt. 3+(d)	905	84	2,060	1,380	60	1.7
Alt. 3+(e)	835	71	1,900	1,450	63	1.5
Alt. 4+(a)	1,250	223	2,700	1,040	45	2.8
Alt. 4+(b)	1,250	226	2,720	1,030	45	2.8
Alt. 4+(c)	844	90	1,910	1,440	63	1.6
Alt. 4+(d)	807	76	1,830	1,480	65	1.5
Alt. 4+(e)	737	63	1,680	1,550	68	1.3

Notes:

The predicted post-remediation timing for the No Action Alternative is different from the predicted post-remediation timing for the action alternatives because the No Action Alternative prediction reflects current conditions, whereas each of the action alternatives would take several decades to complete (the times required to implement each alternative are discussed beginning in Section 7.3.4). With any of the alternatives, it is assumed that high-priority sources for action would be targeted early, so it is anticipated that disproportionally greater effects of the remedy would be seen during the earlier portions of the implementation period.

AWQC = ambient water quality criteria

lb/day = pounds per day

TABLE 7-22

Summary of Load Reduction and Cost Estimates for OU 2 Alternatives

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	At Remedy Completion				
Alternative	**Average Annual Dissolved Zinc Load Reduction[1] (lb/day)**	**Percent Reduction in Dissolved Zinc Load[2]**	**Total Capital Cost ($)**	**O&M 30-Year NPV Cost ($)**	**Total 30-Year NPV Cost ($)**
OU 2 Alternative (a): Minimal Stream Lining	108	5%	$ 60,200,000	$ 1,190,000	$ 61,400,000
OU 2 Alternative (b): Extensive Stream Lining	100	4%	$ 24,800,000	$ 1,020,000	$ 25,900,000
OU 2 Alternative (c): French Drains	510	22%	$ 21,800,000	$ 5,790,000	$ 27,600,000
OU 2 Alternative (d): Stream Lining/French Drain Combination	547	24%	$ 32,900,000	$ 6,460,000	$ 39,400,000
OU 2 Alternative (e): Extensive Stream Lining/French Drain Combination	617	27%	$ 250,000,000	$ 10,000,000	$ 260,000,000

Notes:

[1]Estimates of load reduction for each alternative were developed using the numerical groundwater model, described in Appendix A.

[2]Based on implementation of OU 2 actions only and an estimated average annual load at Pinehurst of 2,285 lb/day dissolved Zn (Appendix B, Table B-7).

lb/day = pounds per day
O&M = operation and maintenance
NPV = net present value

TABLE 8-1a

Comparative Analysis of the No Action Alternative and Alternatives 3+(a) through 3+(e)

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Criteria	No Action	OU 3 Component: Alternative 3+: More Extensive Removal, Disposal, and Treatment OU 2 Component: OU 2 Alternative (a) Minimal Stream Lining Combined Upper Basin Alternative: Alternative 3+(a)	OU 3 Component: Alternative 3+: More Extensive Removal, Disposal, and Treatment OU 2 Component: OU 2 Alternative (b) Extensive Stream Lining Combined Upper Basin Alternative: Alternative 3+(b)	OU 3 Component: Alternative 3+: More Extensive Removal, Disposal, and Treatment OU 2 Component: OU 2 Alternative (c) French Drains Combined Upper Basin Alternative: Alternative 3+(c)	OU 3 Component: Alternative 3+: More Extensive Removal, Disposal, and Treatment OU 2 Component: OU 2 Alternative (d) Stream Lining/French Drain Combination Combined Upper Basin Alternative: Alternative 3+(d)	OU 3 Component: Alternative 3+: More Extensive Removal, Disposal, and Treatment OU 2 Component: OU 2 Alternative (e) Extensive Stream Lining/French Drain Combination Combined Upper Basin Alternative: Alternative 3+(e)
Overall Protection of Human Health and the Environment						
Controls used to reduce risks	No actions to reduce risks. Existing unacceptable risks to ecological receptors would remain unabated. Potential human health risks would remain unchanged.	Under Alternative 3+(a), environmental risks would be reduced by removing tailings-impacted alluvium and waste rock from the 100-year floodplain, containing/stabilizing other high-level wastes in-place, treatment of most adit drainage, and hydraulic isolation and groundwater treatment at tailings impoundments and river reaches. Intensive stream and riparian cleanup actions and creation of off-channel hydrologic units would improve stream stability. Dredging of sediment traps would reduce bedload transport. Potential human health risks would be addressed by the above actions and additional access restrictions. Decontamination of structures would further address potential human health risks. The OU 2 stream liners would reduce the infiltration of relatively clean surface water into contaminated subsurface materials beneath OU 2, and thereby reduce metals loading from groundwater to surface water in the downstream gaining reaches.	See Alternative 3+(a). In addition, this alternative would provide more extensive stream lining throughout the Bunker Hill "Box". Extraction wells and slurry walls would also be included in some Box tributaries to collect clean groundwater for discharge to the lined stream. Under Alternative 3+(b), there would be no stream liner on the SFCDR as there is under Alternative 3+(a).	See Alternative 3+(a). Alternative differences include no stream lining and the addition of French drains in the Box. Direct piping of the CTP effluent to the SFCDR is also included.	See Alternative 3+(c). The only difference between this alternative and Alternative 3+(c) is that this alternative also has a stream liner in Government Gulch, with a slurry wall and extraction wells at the upstream end for discharge of clean groundwater to the lined stream channel. Direct piping of the CTP effluent to the SFCDR is also included.	See Alternative 3+(a). In addition, this alternative includes extensive stream lining with slurry walls and extraction wells for groundwater collection, as well as French drains along the SFCDR. The extensive actions included in this alternative would effectively decouple the groundwater and surface water systems through the Box.
Effectiveness summary	Contaminants would limit recovery of habitat structure and ecosystem function.	Would effectively contain media with high to intermediate loading potential, and improve recovery of ecosystem function. Overall moderate load reduction (41 percent at Pinehurst). Natural source depletion processes would further reduce residual risk.	Would effectively contain media with high to intermediate loading potential, and improve recovery of ecosystem function. Overall moderate load reduction (41 percent at Pinehurst). Natural source depletion processes would further reduce residual risk.	Would effectively contain media with high to intermediate loading potential, and improve recovery of ecosystem function. Overall large load reduction (59 percent at Pinehurst). Natural source depletion processes would further reduce residual risk.	Would effectively contain media with high to intermediate loading potential, and improve recovery of ecosystem function. Would provide slightly higher effectiveness than Alternative 3+(c) by providing additional benefits to the water quality in Government Creek. Overall large load reduction (60 percent at Pinehurst). Natural source depletion processes would further reduce residual risk.	Would effectively contain media with high to intermediate loading potential, and improve recovery of ecosystem function. In addition, significantly more aggressive actions would be implemented in the Box. Overall large load reduction (63 percent at Pinehurst). Natural source depletion processes would further reduce residual risk.
ARARs summary	No actions would be conducted to reduce contaminant concentrations in soil, sediment, source materials, or surface water.	Overall moderate AWQC-ratio reduction (2.9 compared to 5.2) for Pinehurst. Attainment of ARARs for surface water would require a period of natural source depletion.	Overall moderate AWQC-ratio reduction (3.0 compared to 5.2) for Pinehurst. Attainment of ARARs for surface water would require a period of natural source depletion.	Overall large AWQC-ratio reduction (1.8 compared to 5.2) for Pinehurst. Attainment of ARARs for surface water would require a period of natural source depletion.	Overall large AWQC-ratio reduction (1.7 compared to 5.2) for Pinehurst. Attainment of ARARs for surface water would require a period of natural source depletion.	Overall large AWQC-ratio reduction (1.5 compared to 5.2) for Pinehurst. Attainment of ARARs for surface water would require a period of natural source depletion.

TABLE 8-1a

Comparative Analysis of the No Action Alternative and Alternatives 3+(a) through 3+(e)

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Criteria	No Action	OU 3 Component: Alternative 3+: More Extensive Removal, Disposal, and Treatment OU 2 Component Combined Upper Basin Alternative Alternative 3+(a)	Alternative 3+(b)	Alternative 3+(c)	Alternative 3+(d)	Alternative 3+(e)
		OU 2 Alternative (a) Minimal Stream Lining	**OU 2 Alternative (b) Extensive Stream Lining**	**OU 2 Alternative (c) French Drains**	**OU 2 Alternative (d) Stream Lining/French Drain Combination**	**OU 2 Alternative (e) Extensive Stream Lining/French Drain Combination**
Compliance with ARARs						
Chemical-specific ARARs	Would not comply with chemical-specific ARARs for surface water and groundwater until natural decay processes reduced loading to sufficient levels. Would not meet PRGs for soil and sediment.	Would achieve surface water ARARs, but only after a period of natural source depletion. Would meet PRGs for soil and sediment in locations where actions are taken. Would not meet ARARs in groundwater in all locations.	See Alternative 3+(a).	See Alternative 3+(a).	See Alternative 3+(a).	See Alternative 3+(a).
Location- and action-specific ARARs	Not applicable	Would comply with all action-specific and location-specific ARARs, including substantive requirements of CWA Section 404, Rivers and Harbors Act Section 10, and Endangered Species Act.	See Alternative 3+(a).	See Alternative 3+(a).	See Alternative 3+(a).	See Alternative 3+(a).
Long-Term Effectiveness and Permanence						
Magnitude of residual risk	Does not meet either of the Threshold Criteria; therefore, Primary Balancing Criteria not evaluated.	Moderate reduction in expected post-remediation mass loadings in surface water (estimated 41% reduction). Some smaller loading sources would receive no action or limited containment. Low potential for mobilization (through erosion) of contaminated alluvium left in place. Natural source depletion processes would further reduce residual risks from surface water. Risks from contaminated soil and sediment would be significantly reduced. Low residual risk to humans. Decontamination of structures and access restrictions would be effective.	See Alternative 3+(a). Additional benefits would be achieved through this alternative by significantly improving water quality in several OU 2 tributaries (Government, Magnet, and Deadwood Creeks). Low residual risk to humans. Decontamination of structures and access restrictions would be effective.	Large reduction in expected post-remediation mass loading in surface water (estimated 59% reduction). Some smaller loading sources would receive no action or limited containment. Low potential for mobilization (through erosion) of contaminated alluvium left in place. Natural source depletion processes would further reduce residual risks. Risks from contaminated soil and sediment would be significantly reduced. Low residual risk to humans. Decontamination of structures and access restrictions would be effective.	Large reduction in expected post-remediation mass loading in surface water (estimated 60% reduction). Load reduction estimates provided are for the SFCDR. Additional benefits would be achieved through this alternative by significantly improving water quality in Government Creek. Some smaller loading sources would receive no action or limited containment. Low potential for mobilization (through erosion) of contaminated alluvium left in place. Natural source depletion processes would further reduce residual risks. Risks from contaminated soil and sediment would be significantly reduced. Low residual risk to humans. Decontamination of structures and access restrictions would be effective.	Large reduction in expected post-remediation mass loadings (estimated 63% reduction). Additional benefits would be achieved through this alternative by significantly improving water quality in many OU 2 tributaries. Some smaller loading sources would receive no action or limited containment. Low potential for mobilization (through erosion) of contaminated alluvium left in place. Natural source depletion processes would further reduce residual risks. Risks from contaminated soil and sediment would be significantly reduced. Low residual risk to humans. Decontamination of structures and access restrictions would be effective.
Adequacy and reliability of controls	Not evaluated.	Remedy could effectively be maintained through monitoring, maintenance, and institutional controls. Moderate maintenance requirements for caps, stream and riparian cleanup actions, sediment traps, French drains, and stream liners. High maintenance requirements for passive and active treatment.	See Alternative 3+(a).	See Alternative 3+(a). More linear feet of French drain are included in this alternative, although less stream lining.	See Alternative 3+(a). More linear feet of French drain and slightly less stream lining would be included in this alternative.	See Alternative 3+(a). Significantly more stream lining and French drains would be included in the alternative, as well as slurry walls and groundwater extraction wells.

TABLE 8-1a

Comparative Analysis of the No Action Alternative and Alternatives 3+(a) through 3+(e)

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Criteria	No Action	OU 3 Component: Alternative 3+: More Extensive Removal, Disposal, and Treatment; OU 2 Component: OU 2 Alternative (a) Minimal Stream Lining; Combined Upper Basin Alternative: Alternative 3+(a)	OU 3 Component: Alternative 3+: More Extensive Removal, Disposal, and Treatment; OU 2 Component: OU 2 Alternative (b) Extensive Stream Lining; Combined Upper Basin Alternative: Alternative 3+(b)	OU 3 Component: Alternative 3+: More Extensive Removal, Disposal, and Treatment; OU 2 Component: OU 2 Alternative (c) French Drains; Combined Upper Basin Alternative: Alternative 3+(c)	OU 3 Component: Alternative 3+: More Extensive Removal, Disposal, and Treatment; OU 2 Component: OU 2 Alternative (d) Stream Lining/French Drain Combination; Combined Upper Basin Alternative: Alternative 3+(d)	OU 3 Component: Alternative 3+: More Extensive Removal, Disposal, and Treatment; OU 2 Component: OU 2 Alternative (e) Extensive Stream Lining/French Drain Combination; Combined Upper Basin Alternative: Alternative 3+(e)
Reduction of Toxicity, Mobility, or Volume through Treatment						
Treatment processes used	Does not meet either of the Threshold Criteria; therefore, Primary Balancing Criteria not evaluated.	Active treatment of adit drainages, and groundwater from impoundment closures and hydraulic isolation, and repository drainage areas using hydroxide precipitation. Estimated average flow rate from all sources to the CTP is approximately 11,500 gpm (290 lb/day). All of this flow is from OU 3. No water from OU 2 would be treated. Semi-passive treatment of 800 gpm (47 lb/day) would occur at 36 additional adits and one seep using either SRB or lime addition/precipitation.	See Alternative 3+(a).	Treatment processes and semi-passive treatment scheme are the same as for Alternative 3+(a). Estimated average flow rate from all sources to the CTP is approximately 15,400 gpm (1,450 lb/day). The majority of this flow is from OU 3 with the exception of approximately 3,900 gpm (1,160 lb/day) from the French drains in OU 2.	Treatment processes and semi-passive treatment scheme are the same as for Alternative 3+(a). Estimated average flow rate from all sources to the CTP is approximately 15,400 gpm (1,430 lb/day). The majority of this flow is from OU 3 with the exception of approximately 3,900 gpm (1,150 lb/day) from the French drains and extraction wells in OU 2.	Treatment processes and semi-passive treatment scheme are the same as for Alternative 3+(a). Estimated average flow rate from all sources to the CTP is approximately 13,900 gpm (820 lb/day). The majority of this flow is from OU 3 with the exception of approximately 2,400 gpm (530 lb/day) from the French drains and extraction wells in OU 2.
Amount treated or destroyed	Not evaluated.	Total estimated dissolved zinc load removed from water through treatment is approximately 325 lb/day.	Total estimated dissolved zinc load removed from water through treatment is approximately 325 lb/day.	Total estimated dissolved zinc load removed from water through treatment is approximately 1,470 lb/day.	Total estimated dissolved zinc load removed from water through treatment is approximately 1,450 lb/day.	Total estimated dissolved zinc load removed from water through treatment is approximately 850 lb/day.
Reduction in toxicity, mobility, or volume	Not evaluated.	Water treatment would reduce the mobility and toxicity of metals by hydroxide precipitation and adsorption/precipitation into media. Volume of contaminated water would be reduced.	Same as Alternative 3+(a).	See Alternative 3+(a). A greater mass of contaminants would be removed through treatment under this alternative than Alternatives 3+(a) and 3+(b).	Reduction in toxicity, mobility, or volume is similar for Alternative 3+(d) and 3+(c).	Reduction in toxicity, mobility, or volume is lower than that for Alternatives 3+(d) and 3+(c) but higher than that for Alternatives 3+(a) and (b).
Irreversible treatment	Not evaluated.	Treatment is irreversible for the water stream treated for both active and semi-passive processes. Treatment residuals (Spent SRB media and hydroxide sludge) would require proper disposal to ensure that leaching of metals into the environment would not occur.	Same as Alternative 3+(a).	Same as Alternative 3+(a).	Same as Alternative 3+(a).	Same as Alternative 3+(a).
Type and quantity of residuals	Not evaluated.	Spent SRB substrate and hydroxide sludge require disposal. It is assumed that these wastes would be disposed of onsite. Total volume requiring disposal is estimated to be 9,100 cy/y.	Same as Alternative 3+(a).	Same waste types as for Alternative 3+(a). Total volume requiring disposal is greater, and estimated to be 14,100 cy/y.	Same as Alternative 3+(c).	Same waste types as for Alternative 3+(a). Total volume requiring disposal is greater than Alternative 3+(a) and (b) but less than Alternatives 3+(c) and (d), and is estimated to be 12,100 cy/y.
Statutory preference for treatment	Not evaluated.	Satisfies.	Satisfies.	Satisfies.	Satisfies.	Satisfies.

TABLE 8-1a

Comparative Analysis of the No Action Alternative and Alternatives 3+(a) through 3+(e)

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Criteria	No Action	OU 3 Component: Alternative 3+: More Extensive Removal, Disposal, and Treatment OU 2 Component: OU 2 Alternative (a) Minimal Stream Lining Combined Upper Basin Alternative: Alternative 3+(a)	OU 3 Component: Alternative 3+: More Extensive Removal, Disposal, and Treatment OU 2 Component: OU 2 Alternative (b) Extensive Stream Lining Combined Upper Basin Alternative: Alternative 3+(b)	OU 3 Component: Alternative 3+: More Extensive Removal, Disposal, and Treatment OU 2 Component: OU 2 Alternative (c) French Drains Combined Upper Basin Alternative: Alternative 3+(c)	OU 3 Component: Alternative 3+: More Extensive Removal, Disposal, and Treatment OU 2 Component: OU 2 Alternative (d) Stream Lining/French Drain Combination Combined Upper Basin Alternative: Alternative 3+(d)	OU 3 Component: Alternative 3+: More Extensive Removal, Disposal, and Treatment OU 2 Component: OU 2 Alternative (e) Extensive Stream Lining/French Drain Combination Combined Upper Basin Alternative: Alternative 3+(e)
Short-Term Effectiveness						
Community protection	Does not meet either of the Threshold Criteria; therefore, Primary Balancing Criteria not evaluated.	Short-term risks to the community from construction traffic. Risks would be minimized by traffic control plans and selective repository siting.	See Alternative 3+(a). Slightly higher volume of truck trips would be associated with the longer stream liner lengths in Alternative 3+(b).	See Alternative 3+(a). Slightly higher volume of truck trips would be associated with more extensive floodplain work to install French drains.	See Alternative 3+(c). Slightly higher volume of truck trips would be associated with stream lining and associated work in Government Gulch.	See Alternative 3+(d). Significant increase in highway and local traffic logistics (because of the upstream and downstream cutoff walls on the SFCDR that would need to be constructed through I-90).
Worker protection	Not evaluated.	Limited risks to workers from remedial actions. Risks would be minimized with standard health and safety measures.	Limited risks to workers from remedial actions. Risks would be minimized with standard health and safety measures.	Limited risks to workers from remedial actions. Risks would be minimized with standard health and safety measures.	Limited risks to workers from remedial actions. Risks would be minimized with standard health and safety measures. Risks may be slightly higher than for Alternative 3+(c) due to the additional actions in Government Gulch.	Limited risks to workers from remedial actions. Risks would be minimized with standard health and safety measures. Relative to other alternatives, Alternative 3+(e) would present the greatest short-term risks to workers.
Environmental impacts	Not evaluated.	Short-term environmental impacts could result from construction. These impacts would be minimized and mitigated through engineering controls and revegetation. In the context of current water quality in the SFCDR, these potential risks would be minimal. The impacts would be associated with: - 240,000 LF stream and riparian cleanup actions - Extensive excavation - Construction within floodplains - Repository requirements - Potential stream flow reduction (hydraulic isolation)	See Alternative 3+(a). In addition, more extensive floodplain construction would be required in the Box, adding to the short-term risks, although in the context of current water quality in the SFCDR, these potential risks would be minimal.	Slightly less floodplain construction would be required in the Box relative to Alternative 3+(b); therefore, short-term risks would be slightly lower. In the context of current water quality in the SFCDR, these potential risks would be minimal.	Short-term risks would be roughly comparable to Alternative 3+(b). In the context of current water quality in the SFCDR, these potential risks would be minimal.	Short-term risks would be higher than for Alternatives 3+(a) through 3+(d) due to extensive floodplain construction in the Box. In the context of current water quality in the SFCDR, these potential risks would be minimal.
Time until action is complete[c]	Not evaluated.	Approximately 50 to 90 years to implement actions. Additional time would be required for natural source depletion to attain ARARs for surface water. In addition, water treatment would need to be continued beyond the Remedy Implementation Phase for an unknown period of time.	See Alternative 3+(a).	Approximately 50 to 90 years to implement actions. Additional time would be required for natural source depletion to attain ARARs for surface water; however, it is expected this time would be shorter than Alternatives 3+(a) and 3+(b), given the lower predicted AWQC ratios at remedy completion. In addition, water treatment would need to be continued beyond the Remedy Implementation Phase for an unknown period of time.	See Alternative 3+(c).	Approximately 60 to 100 years to implement actions. Less time would be required for natural source depletion to attain ARARs for surface water given the lower predicted AWQC ratios at remedy completion. In addition, water treatment would need to be continued beyond the Remedy Implementation Phase for an unknown period of time.

TABLE 8-1a

Comparative Analysis of the No Action Alternative and Alternatives 3+(a) through 3+(e)

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Criteria	No Action	OU 3 Component: Alternative 3+: More Extensive Removal, Disposal, and Treatment OU 2 Component: OU 2 Alternative (a) Minimal Stream Lining Combined Upper Basin Alternative: Alternative 3+(a)	OU 3 Component: Alternative 3+: More Extensive Removal, Disposal, and Treatment OU 2 Component: OU 2 Alternative (b) Extensive Stream Lining Combined Upper Basin Alternative: Alternative 3+(b)	OU 3 Component: Alternative 3+: More Extensive Removal, Disposal, and Treatment OU 2 Component: OU 2 Alternative (c) French Drains Combined Upper Basin Alternative: Alternative 3+(c)	OU 3 Component: Alternative 3+: More Extensive Removal, Disposal, and Treatment OU 2 Component: OU 2 Alternative (d) Stream Lining/French Drain Combination Combined Upper Basin Alternative: Alternative 3+(d)	OU 3 Component: Alternative 3+: More Extensive Removal, Disposal, and Treatment OU 2 Component: OU 2 Alternative (e) Extensive Stream Lining/French Drain Combination Combined Upper Basin Alternative: Alternative 3+(e)
Implementability						
Technical feasibility	Does not meet either of the Threshold Criteria; therefore, Primary Balancing Criteria not evaluated.	No significant technical feasibility concerns. Significant uncertainties in construction volumes – these could be handled in design/construction phases. Major cost and logistical considerations for obtaining borrow materials and excavating in floodplains. Potential construction difficulties for hydraulic isolation. The reach of the SFCDR to be lined in the Box would be located within the developed areas of the City of Kellogg. Access for large equipment along with space for SFCDR diversion would pose significant logistical issues. Impacts of stream liners on river hydraulics would need to be evaluated. Treatability testing would be required for semi-passive treatment design. Monitoring could assess effectiveness and need for additional action.	See Alternative 3+(a). Longer stream lining included in Alternative 3+(b) would add to the logistical issues noted, although there is no SFCDR liner in this alternative which would have many logistical challenges. See Alternative 3+(a).	See Alternative 3+(a). In addition, the extensive French drains included in this alternative would add to the logistical issues noted. Excavation of sediments from below the water table would pose significant logistical issues and result in higher costs. These implementability concerns are great under this alternative because the French drain and pump station depth may range from 10 to 40 feet below ground surface. Deeper excavations, if required, would increase the dewatering difficulties. See Alternative 3+(a).	See Alternative 3+(c). In addition, work in Government Gulch would add to the logistical issues noted. See Alternative 3+(a).	See Alternative 3+(c). In addition, extensive work in the Box would add to the logistical issues noted. See Alternative 3+(a).
Administrative feasibility	Not evaluated.	Significant difficulties would be encountered in acquiring land and obtaining approvals for repositories and active treatment conveyance pipelines, and for obtaining borrow materials. Coordination with other agencies would be required, potentially including completion of a biological assessment.	See Alternative 3+(a).	See Alternative 3+(a).	See Alternative 3+(a). More linear feet of French drains and slightly less stream lining would be included in this alternative.	See Alternative 3+(a). Extensive actions in the Box would add to the difficulties in acquiring land and obtaining approvals.
Availability of services and materials	Not evaluated.	Services, equipment, and technologies are all available, at least on a regional level.	See Alternative 3+(a).	See Alternative 3+(a).	See Alternative 3+(a).	See Alternative 3+(a).

TABLE 8-1a

Comparative Analysis of the No Action Alternative and Alternatives 3+(a) through 3+(e)

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

		OU 3 Component				
		Alternative 3+: More Extensive Removal, Disposal, and Treatment				
		OU 2 Component				
		OU 2 Alternative (a) Minimal Stream Lining	OU 2 Alternative (b) Extensive Stream Lining	OU 2 Alternative (c) French Drains	OU 2 Alternative (d) Stream Lining/French Drain Combination	OU 2 Alternative (e) Extensive Stream Lining/French Drain Combination
		Combined Upper Basin Alternative				
Criteria	**No Action**	**Alternative 3+(a)**	**Alternative 3+(b)**	**Alternative 3+(c)**	**Alternative 3+(d)**	**Alternative 3+(e)**
Cost						
Total Capital Cost	$0	$1,240,000,000	$1,200,000,000	$1,200,000,000	$1,210,000,000	$1,430,000,000
O&M Cost (30-Year NPV) [a]	$0	$95,000,000	$94,900,000	$99,800,000	$100,500,000	$104,000,000
Total Cost (30-Yr NPV) [b]	$0	$1,340,000,000	$1,290,000,000	$1,300,000,000	$1,310,000,000	$1,530,000,000
	No cost alternative.	Costs for Alternatives 3+(a) through 3+(d) are very similar and within the accuracy of the estimate (-30/+50%). Costs for alternatives based on Alternative 3+ are lower than corresponding alternatives based on Alternative 4+.	Costs for Alternatives 3+(a) through 3+(d) are very similar and within the accuracy of the estimate (-30/+50%). Costs for alternatives based on Alternative 3+ are lower than corresponding alternatives based on Alternative 4+.	Costs for Alternatives 3+(a) through 3+(d) are very similar and within the accuracy of the estimate (-30/+50%). Costs for alternatives based on Alternative 3+ are lower than corresponding alternatives based on Alternative 4+.	Costs for Alternatives 3+(a) through 3+(d) are very similar and within the accuracy of the estimate (-30/+50%).Costs for alternatives based on Alternative 3+ are lower than corresponding alternatives based on Alternative 4+.	This alternative has a relatively high cost although is still within the accuracy of the estimate relative to Alternatives 3+(a) through 3+(d). Costs for alternatives based on Alternative 3+ are lower than corresponding alternatives based on Alternative 4+.

Notes:

[a] O&M costs over 30 years in current dollars, assuming a 7% discount factor.

[b] Total NPV cost equals the total equivalent cost of the alternative over 30 years in current dollars, assuming a 7% discount factor.

[c] This assumes a rough estimated range of $15M/yr to $25M/yr of available annual funding to cover capital and O&M costs.

ARARs = applicable or relevant and appropriate requirements
AWQC = ambient water quality criteria
CTP = Central Treatment Plant
CWA = Clean Water Act
cy = cubic yards
gpm = gallons per minute
LF = lineal feet
NPV = net present value
O&M = operation and maintenance
OU = Operable Unit
PRG = Preliminary Remediation Goal
RAO = Remedial Action Objective
SFCDR = South Fork Coeur d'Alene River
SRB = sulfate-reducing bioreactor
cy/y = cubic yards per year

The above costs are presented rounded to three significant figures.

The above cost opinion is a Feasibility-Study-level estimate with a nominal accuracy of –30 percent to +50 percent (–30/+50%).

The above cost opinion is in 2009 dollars and does not include future escalation. The order-of-magnitude cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, the final project scope, the final project schedule, and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

TABLE 8-1b

Comparative Analysis of Alternatives 4+(a) through 4+(e)

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Criteria	OU 3 Component: Alternative 4+: Maximum Removal, Disposal, and Treatment OU 2 Component: OU 2 Alternative (a) Minimal Stream Lining Combined Upper Basin Alternative: Alternative 4+(a)	OU 3 Component: Alternative 4+: Maximum Removal, Disposal, and Treatment OU 2 Component: OU 2 Alternative (b) Extensive Stream Lining Combined Upper Basin Alternative: Alternative 4+(b)	OU 3 Component: Alternative 4+: Maximum Removal, Disposal, and Treatment OU 2 Component: OU 2 Alternative (c) French Drains Combined Upper Basin Alternative: Alternative 4+(c)	OU 3 Component: Alternative 4+: Maximum Removal, Disposal, and Treatment OU 2 Component: OU 2 Alternative (d) Stream Lining/French Drain Combination Combined Upper Basin Alternative: Alternative 4+(d)	OU 3 Component: Alternative 4+: Maximum Removal, Disposal, and Treatment OU 2 Component: OU 2 Alternative (e) Extensive Stream Lining/French Drain Combination Combined Upper Basin Alternative: Alternative 4+(e)
Overall Protection of Human Health and the Environment					
Controls used to reduce risks	Would reduce environmental risks with extensive removal and containment to address all known media above PRGs. Highest-performance containment using repositories. Expanded treatment would address all adit drainages of concern and remaining contaminated groundwater. More off-channel hydrologic units would be created. Demolition and cleanup of any structures would further address potential human health risks.	See Alternative 4+(a). In addition, this alternative would provide more extensive stream lining throughout the Box. Extraction wells and slurry walls would also be included in some Box tributaries to collect clean groundwater for discharge to the lined stream. Under Alternative 4+(b), there would be no stream liner on the SFCDR as there is under Alternative 4+(a).	See Alternative 4+(a). Alternative differences include no stream lining and the addition of French drains in the Box. Direct piping of the CTP effluent to the SFCDR is also included.	See Alternative 4+(c). The only difference between this alternative and Alternative 4+(c) is that this alternative also has stream lining in Government Gulch with a slurry wall and extraction wells at the upstream end for discharge of clean groundwater to the lined stream channel. Direct piping of the CTP effluent to the SFCDR is also included.	See Alternative 4+(a). In addition, this alternative includes extensive stream lining with slurry walls and extraction wells for groundwater collection, as well as French drains along the SFCDR.
Effectiveness summary	Would provide high effectiveness in containing all media with significant loading potential, and in recovery of ecosystem function. Extensive hauling would pose significant short-term risks to the community and to workers. Overall moderate load reduction (45 percent at Pinehurst). Natural recovery processes would further reduce residual risk.	See Alternative 4+(a). Overall moderate load reduction (45 percent at Pinehurst). Natural recovery processes would further reduce residual risk.	See Alternative 4+(a). Overall large load reduction (63 percent at Pinehurst). Natural recovery processes would further reduce residual risk.	See Alternative 4+(a). Would also provide slightly higher effectiveness than Alternative 3+(c) by providing additional benefits to the water quality in Government Creek. Overall large load reduction (65 percent at Pinehurst). Natural recovery processes would further reduce residual risk.	See Alternative 4+(a). In addition, significantly more aggressive actions would be implemented in the Box. Overall large load reduction (68 percent at Pinehurst). Natural recovery processes would further reduce residual risk.
ARARs summary	Overall moderate AWQC-ratio reduction (2.8 compared to 5.2) for Pinehurst. Attainment of ARARs for surface water would require a period of natural source depletion.	Overall moderate AWQC-ratio reduction (2.8 compared to 5.2) for Pinehurst. Attainment of ARARs for surface water would require a period of natural source depletion.	Overall large AWQC-ratio reduction (1.6 compared to 5.2) for Pinehurst. Attainment of ARARs for surface water would require a period of natural source depletion.	Overall large AWQC-ratio reduction (1.5 compared to 5.2) for Pinehurst. Attainment of ARARs for surface water would require a period of natural source depletion.	Overall large AWQC-ratio reduction (1.3 compared to 5.2) for Pinehurst. Attainment of ARARs for surface water would require a period of natural source depletion.
Compliance with ARARs					
Chemical-specific ARARs	Would achieve surface water ARARs, but only after a period of natural source depletion. Would meet PRGs for soil and sediment in locations where actions are taken. Would not meet ARARs in groundwater in all locations.	See Alternative 4+(a)	See Alternative 4+(a)	See Alternative 4+(a)	See Alternative 4+(a)
Location- and action-specific ARARs	Would comply with all action-specific and location-specific ARARs, including substantive requirements of CWA Section 404, Rivers and Harbors Act Section 10, and Endangered Species Act. Potential difficulties in meeting requirements for repository siting and obtaining borrow materials.	See Alternative 4+(a)	See Alternative 4+(a)	See Alternative 4+(a)	See Alternative 4+(a)

TABLE 8-1b

Comparative Analysis of Alternatives 4+(a) through 4+(e)

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Criteria	OU 3 Component Alternative 4+: Maximum Removal, Disposal, and Treatment OU 2 Component OU 2 Alternative (a) Minimal Stream Lining Combined Upper Basin Alternative Alternative 4+(a)	OU 2 Alternative (b) Extensive Stream Lining Alternative 4+(b)	OU 2 Alternative (c) French Drains Alternative 4+(c)	OU 2 Alternative (d) Stream Lining/French Drain Combination Alternative 4+(d)	OU 2 Alternative (e) Extensive Stream Lining/French Drain Combination Alternative 4+(e)
Long-Term Effectiveness and Permanence					
Magnitude of residual risk	Moderate reduction in expected post-remediation mass loading in surface water (estimated 45% reduction). All significant loading sources in OU 3 would receive action. Low potential for mobilization (through erosion) of contaminated alluvium left in place. Natural recovery processes would further reduce residual risks. Risks from contaminated soil and sediment would be significantly reduced. Low residual risk to humans. All areas posing significant risk would be cleaned up or contained.	See Alternative 4+(a). Low residual risk to humans. All areas posing significant risk would be cleaned up or contained.	Large reduction in expected post-remediation mass loadings (estimated 63% reduction). Some smaller loading sources would receive no action or limited containment. Low potential for mobilization (through erosion) of contaminated alluvium left in place. Natural recovery processes would further reduce residual risks. Risks from contaminated soil and sediment would be significantly reduced. Low residual risk to humans. All areas posing significant risk would be cleaned up or contained.	Large reduction in expected post-remediation mass loadings (estimated 65% reduction). Some smaller loading sources would receive no action or limited containment. Low potential for mobilization (through erosion) of contaminated alluvium left in place. Natural recovery processes would further reduce residual risks. Risks from contaminated soil and sediment would be significantly reduced. Low residual risk to humans. All areas posing significant risk would be cleaned up or contained.	Large reduction in expected post-remediation mass loadings (estimated 68% reduction). Some smaller loading sources would receive no action or limited containment. Low potential for mobilization (through erosion) of contaminated alluvium left in place. Surface water ARARs would be achieved at the time of remedy completion. Risks from contaminated soil and sediment would be significantly reduced. Low residual risk to humans. All areas posing significant risk would be cleaned up or contained.
Adequacy and reliability of controls	Remedy could effectively be maintained through monitoring, maintenance, and institutional controls. Moderate maintenance requirements for caps; low maintenance requirements for stream and riparian cleanup actions; high maintenance requirements for passive and active treatment.	See Alternative 4+(a).	See Alternative 4+(a). More linear feet of French drain are included in this alternative, although less stream lining.	See Alternative 4+(a). More linear feet of French drain and slightly less stream lining would be included in this alternative.	See Alternative 4+(a). Significantly more stream lining and French drains would be included in this alternative, as well as slurry walls and groundwater extraction wells.
Reduction of Toxicity, Mobility, or Volume through Treatment					
Treatment processes used	Active treatment of adit drainages, and groundwater from impoundment closures and hydraulic isolation, and repository drainage areas using hydroxide precipitation. Estimated average flow rate from all sources to the CTP is approximately 14,000 gpm (184 lb/day). All of this flow is from OU 3. No water from OU 2 would be treated. Semi-passive treatment of 1,410 gpm (49 lb/day) would occur at 51 additional adits and one seep using either SRB or lime addition/precipitation.	See Alternative 4+(a).	Treatment processes and semi-passive treatment scheme are the same as for Alternative 4+(a). Estimated average flow rate from all sources to the CTP is approximately 17,900 gpm (1,350 lb/day). The majority of this flow is from OU 3 with the exception of approximately 3,900 gpm (1,160 lb/day) from the French drains in OU 2.	Treatment processes and semi-passive treatment scheme are the same as for Alternative 4+(a). Estimated average flow rate from all sources to the CTP is approximately 17,900 gpm (1,330 lb/day). The majority of this flow is from OU 3 with the exception of approximately 3,900 gpm (1,150 lb/day) from the French drains and extraction wells in OU 2.	Treatment processes and semi-passive treatment scheme are the same as for Alternative 4+(a). Estimated average flow rate from all sources to the CTP is approximately 16,400 gpm (720 lb/day) . The majority of this flow is from OU 3 with the exception of approximately 2,400 gpm (530 lb/day) from the French drains and extraction wells in OU 2.
Amount treated or destroyed	Total estimated dissolved zinc load removed from water through treatment is approximately 217 lb/day.	Total estimated dissolved zinc load removed from water through treatment is approximately 217 lb/day.	Total estimated dissolved zinc load removed from water through treatment is approximately 1,380 lb/day.	Total estimated dissolved zinc load removed from water is approximately 1,360 lb/day.	Total estimated dissolved zinc load removed from water is approximately 750 lb/day.
Reduction in toxicity, mobility, or volume	Water treatment would reduce the mobility and toxicity of metals by hydroxide precipitation and adsorption/precipitation into media. Volume of contaminated water would be reduced.	Same as Alternative 4+(a).	See Alternative 4+(a). A greater volume of water would be treated under this alternative than Alternatives 4+(a) and 4+(b).	Reduction in toxicity, mobility, or volume is similar for Alternative 4+(d) and 4+(c).	Reduction in toxicity, mobility, or volume is lower than that for Alternatives 4+(d) and 4+(c) but higher than that for Alternatives 4+(a) and (b).

TABLE 8-1b

Comparative Analysis of Alternatives 4+(a) through 4+(e)

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Criteria	OU 3 Component: Alternative 4+: Maximum Removal, Disposal, and Treatment OU 2 Component OU 2 Alternative (a): Minimal Stream Lining Combined Upper Basin Alternative: Alternative 4+(a)	OU 2 Alternative (b): Extensive Stream Lining Alternative 4+(b)	OU 2 Alternative (c): French Drains Alternative 4+(c)	OU 2 Alternative (d): Stream Lining/French Drain Combination Alternative 4+(d)	OU 2 Alternative (e): Extensive Stream Lining/French Drain Combination Alternative 4+(e)
Reduction of Toxicity, Mobility, or Volume through Treatment *(continued)*					
Irreversible treatment	Treatment is irreversible for the water stream treated for both active and semi-passive processes. Treatment residuals (Spent SRB media and hydroxide sludge) would require proper disposal to ensure that leaching of metals into the environment would not occur.	Same as Alternative 4+(a).	Same as Alternative 4+(a).	Same as Alternative 4+(a).	Same as Alternative 4+(a).
Type and quantity of residuals	Spent SRB substrate and hydroxide sludge require disposal. It is assumed that these wastes would be disposed of onsite. Total volume requiring disposal is estimated to be 10,200 cy/y.	Same as Alternative 4+(a).	Same waste types as for Alternative 4+(a). Total volume requiring disposal is greater, and estimated to be 15,200 cy/y.	Same as Alternative 4+(c).	Same waste types as for Alternative 4+(a). Total volume requiring disposal is greater than Alternative 4+(a) and (b) but less than Alternatives 4+(c) and (d), and is estimated to be 13,100 cy/y.
Statutory preference for treatment	Satisfies.	Satisfies.	Satisfies.	Satisfies.	Satisfies.
Short-Term Effectiveness					
Community protection	Potentially significant short-term risks to the community from construction traffic. Risks would be minimized by traffic control plans and selective repository siting.	See Alternative 4+(a). Slightly higher volume of truck trips would be associated with the longer stream liner lengths in Alternative 4+(b).	See Alternative 4+(a). Slightly higher volume of truck trips would be associated with more extensive floodplain work to install French drains.	See Alternative 4+(c). Slightly higher volume of truck trips would be associated with stream lining and associated work in Government Gulch.	See Alternative 4+(d). Slightly higher volume of truck trips would be associated with additional construction work in the Box.
Worker protection	Limited risks to workers from remediation actions. Risks would be minimized with standard health and safety measures. The massive scope of actions under Alternative 4+ would increase the risk of work injury relative to Alternative 3+.	See Alternative 4+(a).	See Alternative 4+(a).	See Alternative 4+(a). Risks may be slightly higher than for Alternative 4+(c) due to the additional actions in Government Gulch.	See Alternative 4+(a). Relative to other alternatives, Alternative 4+(e) would present the greatest short-term risks to workers.
Environmental impacts	Significant and ongoing impacts to environment during several decades (or more) of construction. In the context of current water quality in the SFCDR, these potential risks would be minimal. Impacts associated with: - 300,000 LF stream and riparian cleanup actions - Very extensive excavation - Extensive repository requirements - Potential stream flow reduction (hydraulic isolation)	See Alternative 4+(a). In addition, more extensive floodplain construction would be required in the Box, adding to the short-term risks. In the context of current water quality in the SFCDR, these potential risks would be minimal.	Slightly less floodplain construction would be required in the Box relative to Alternative 4+(b); therefore, short-term risks would be slightly lower. In the context of current water quality in the SFCDR, these potential risks would be minimal.	Short-term risks would be roughly comparable to Alternative 4+(b). In the context of current water quality in the SFCDR, these potential risks would be minimal.	Short-term risks would be higher than for Alternatives 4+(a) through 4+(d) due to extensive floodplain construction in the Box. In the context of current water quality in the SFCDR, these potential risks would be minimal.

TABLE 8-1b

Comparative Analysis of Alternatives 4+(a) through 4+(e)

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Criteria	OU 3 Component Alternative 4+: Maximum Removal, Disposal, and Treatment OU 2 Component OU 2 Alternative (a) Minimal Stream Lining Combined Upper Basin Alternative Alternative 4+(a)	OU 2 Alternative (b) Extensive Stream Lining Alternative 4+(b)	OU 2 Alternative (c) French Drains Alternative 4+(c)	OU 2 Alternative (d) Stream Lining/French Drain Combination Alternative 4+(d)	OU 2 Alternative (e) Extensive Stream Lining/French Drain Combination Alternative 4+(e)
Short-Term Effectiveness *(continued)*					
Time until action is complete[c]	Approximately 80 to 130 years to implement actions. Additional time would be required for natural source depletion to attain ARARs in surface water. In addition, water treatment would need to be continued beyond the Remedy Implementation Phase for an unknown period of time.	See Alternative 4+(a).	Approximately 80 to 130 years to implement actions. Additional time would be required for natural source depletion to attain ARARs for surface water; however, it is expected this time would be shorter than Alternatives 3+(a) and 3+(b) and Alternatives 4+(a) and (b), given the lower predicted AWQC ratios at remedy completion. In addition, water treatment would need to be continued beyond the Remedy Implementation Phase for an unknown period of time.	See Alternative 4+(c).	Approximately 90 to 140 years to implement actions. Less time would be required for natural source depletion to attain ARARs for surface water given the lower predicted AWQC ratios at remedy completion. In addition, water treatment would need to be continued beyond the Remedy Implementation Phase for an unknown period of time.
Implementability					
Technical feasibility	Technically feasible, but major logistical constraints on truck traffic. Large uncertainty in construction volumes – these could further increase construction difficulties and administrative difficulties. Major cost and logistical considerations for obtaining borrow materials and excavating in floodplains. Potential construction difficulties for hydraulic isolation. Treatability testing would be required as with all alternatives. Monitoring could assess effectiveness and the need for additional action.	See Alternative 4+(a). Longer stream lining included in Alternative 4+(b) would add to the logistical issues noted, although there is no SFCDR liner in this alternative which would have many logistical challenges. See Alternative 4+(a).	See Alternative 4+(a). In addition, the extensive French drains included in this alternative would add to the logistical issues noted. Excavation of sediments from below the water table would pose significant logistical issues and result in higher costs. These implementability concerns are great under this Alternative because the French drain and pump station depth may range from 10 to 40 feet below ground surface. Deeper excavations, if required, would increase the dewatering difficulties. See Alternative 4+(a).	See Alternative 4+(c). In addition, work in Government Gulch would add to the logistical issues noted. See Alternative 4+(a).	See Alternative 4+(c). In addition, extensive work in the Box would add to the logistical issues noted. See Alternative 4+(a).
Administrative feasibility	Major difficulties in acquiring land and obtaining approvals for repositories and active treatment pipelines, obtaining borrow materials, and coordinating truck traffic. Coordination with other agencies would be required, potentially including completion of a biological assessment.	See Alternative 4+(a).	See Alternative 4+(a).	See Alternative 4+(a).	See Alternative 4+(a). Extensive actions in the Box would add to the difficulties in acquiring land and obtaining approvals.
Availability of services and materials	Services, equipment, and technologies are all available, at least on a regional level.	See Alternative 4+(a).	See Alternative 4+(a).	See Alternative 4+(a).	See Alternative 4+(a).
Cost					
Total Capital Cost	$1,840,000,000	$1,800,000,000	$1,800,000,000	$1,810,000,000	$2,030,000,000
O&M Cost (30-Year NPV) [a]	$145,000,000	$145,000,000	$150,000,000	$151,000,000	$154,000,000
Total Cost (30-Yr NPV) [b]	**$1,990,000,000**	**$1,950,000,000**	**$1,950,000,000**	**$1,960,000,000**	**$2,180,000,000**
	Costs for Alternatives 4+(a) through 4+(d) are very similar and within the accuracy of the estimate (-30/+50%).Costs for alternatives based on Alternative 4+ are higher than corresponding alternatives based on Alternative 3+.	Costs for Alternatives 4+(a) through 4+(d) are very similar and within the accuracy of the estimate (-30/+50%).Costs for alternatives based on Alternative 4+ are higher than corresponding alternatives based on Alternative 3+.	Costs for Alternatives 4+(a) through 4+(d) are very similar and within the accuracy of the estimate (-30/+50%).Costs for alternatives based on Alternative 4+ are higher than corresponding alternatives based on Alternative 3+.	Costs for Alternatives 4+(a) through 4+(d) are very similar and within the accuracy of the estimate (-30/+50%). Costs for alternatives based on Alternative 4+ are higher than corresponding alternatives based on Alternative 3+.	This alternative has a relatively high cost although is still within the accuracy of the estimate relative to Alternatives 4+(a) through 4+(d). Costs for alternatives based on Alternative 4+ are higher than corresponding alternatives based on Alternative 3+.

Notes:

[a] O&M costs over 30 years in current dollars, assuming a 7% discount factor.
[b]Total NPV cost equals the total equivalent cost of the alternative over 30 years in current dollars, assuming a 7% discount factor.
[c]This assumes a rough estimated range of $15M/yr to $25M/yr of available annual funding to cover capital and O&M costs.

ARARs = applicable or relevant and appropriate requirements
CTP = Central Treatment Plant
CWA = Clean Water Act
cy = cubic yards
gpm = gallons per minute
LF = linear feet
NPV = net present value
O&M = operation and maintenance
OU = Operable Unit
PRG = preliminary remediation goal
RAO = Remedial Action Objective
SFCDR = South Fork Coeur d'Alene River
SRB = sulfate-reducing bioreactor

The above costs are presented rounded to three significant figures.

The above cost opinion is a Feasibility-Study-level estimate with a nominal accuracy of –30 percent to +50 percent (–30/+50%).

The above cost opinion is in 2009 dollars and does not include future escalation. The order-of-magnitude cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, the final project scope, the final project schedule, and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

TABLE 8-2

Estimated Costs Summarized by Alternative

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Alternative	Remedial Actions	Total Capital Cost	O&M Cost (30 Year NPV)	O&M Cost (Annual Average)	Total Cost (30 Year NPV)
Alternative 3+(a)	Alternative 3+ for OU 3	$ 1,170,000,000	$ 93,600,000	$ 7,540,000	$ 1,270,000,000
	Alternative (a) for OU 2	$ 60,200,000	$ 1,190,000	$ 95,900	$ 61,400,000
	Sludge Disposal Cell	$ 5,055,000	$ 254,000	$ 20,500	$ 5,310,000
	Total	**$ 1,240,000,000**	**$ 95,000,000**	**$ 7,660,000**	**$ 1,340,000,000**
Alternative 3+(b)	Alternative 3+ for OU 3	$ 1,170,000,000	$ 93,600,000	$ 7,540,000	$ 1,270,000,000
	Alternative (b) for OU 2	$ 24,800,000	$ 1,020,000	$ 82,200	$ 25,900,000
	Sludge Disposal Cell	$ 5,055,000	$ 254,000	$ 20,500	$ 5,310,000
	Total	**$ 1,200,000,000**	**$ 94,900,000**	**$ 7,640,000**	**$ 1,290,000,000**
Alternative 3+(c)	Alternative 3+ for OU 3	$ 1,170,000,000	$ 93,600,000	$ 7,540,000	$ 1,270,000,000
	Alternative (c) for OU 2	$ 21,800,000	$ 5,790,000	$ 466,600	$ 27,600,000
	Sludge Disposal Cell	$ 7,370,000	$ 397,000	$ 32,000	$ 7,770,000
	Total	**$ 1,200,000,000**	**$ 99,800,000**	**$ 8,040,000**	**$ 1,300,000,000**
Alternative 3+(d)	Alternative 3+ for OU 3	$ 1,170,000,000	$ 93,600,000	$ 7,540,000	$ 1,270,000,000
	Alternative (d) for OU 2	$ 32,900,000	$ 6,460,000	$ 520,600	$ 39,400,000
	Sludge Disposal Cell	$ 7,330,000	$ 397,000	$ 32,000	$ 7,730,000
	Total	**$ 1,210,000,000**	**$ 100,500,000**	**$ 8,090,000**	**$ 1,310,000,000**
Alternative 3+(e)	Alternative 3+ for OU 3	$ 1,170,000,000	$ 93,600,000	$ 7,540,000	$ 1,270,000,000
	Alternative (e) for OU 2	$ 250,000,000	$ 10,000,000	$ 805,900	$ 260,000,000
	Sludge Disposal Cell	$ 6,490,000	$ 340,000	$ 27,400	$ 6,830,000
	Total	**$ 1,430,000,000**	**$ 104,000,000**	**$ 8,370,000**	**$ 1,530,000,000**
Alternative 4+(a)	Alternative 4+ for OU 3	$ 1,770,000,000	$ 144,000,000	$ 11,600,000	$ 1,910,000,000
	Alternative (a) for OU 2	$ 60,200,000	$ 1,190,000	$ 95,900	$ 61,400,000
	Sludge Disposal Cell	$ 5,480,000	$ 279,000	$ 22,500	$ 5,760,000
	Total	**$ 1,840,000,000**	**$ 145,000,000**	**$ 11,700,000**	**$ 1,990,000,000**
Alternative 4+(b)	Alternative 4+ for OU 3	$ 1,770,000,000	$ 144,000,000	$ 11,600,000	$ 1,910,000,000
	Alternative (b) for OU 2	$ 24,800,000	$ 1,020,000	$ 82,200	$ 25,900,000
	Sludge Disposal Cell	$ 5,480,000	$ 279,000	$ 22,500	$ 5,760,000
	Total	**$ 1,800,000,000**	**$ 145,000,000**	**$ 11,700,000**	**$ 1,950,000,000**
Alternative 4+(c)	Alternative 4+ for OU 3	$ 1,770,000,000	$ 144,000,000	$ 11,600,000	$ 1,910,000,000
	Alternative (c) for OU 2	$ 21,800,000	$ 5,790,000	$ 466,600	$ 27,600,000
	Sludge Disposal Cell	$ 7,880,000	$ 426,000	$ 34,300	$ 8,310,000
	Total	**$ 1,800,000,000**	**$ 150,000,000**	**$ 12,100,000**	**$ 1,950,000,000**
Alternative 4+(d)	Alternative 4+ for OU 3	$ 1,770,000,000	$ 144,000,000	$ 11,600,000	$ 1,910,000,000
	Alternative (d) for OU 2	$ 32,900,000	$ 6,460,000	$ 520,600	$ 39,400,000
	Sludge Disposal Cell	$ 7,830,000	$ 423,000	$ 34,100	$ 8,250,000
	Total	**$ 1,810,000,000**	**$ 151,000,000**	**$ 12,200,000**	**$ 1,960,000,000**
Alternative 4+(e)	Alternative 4+ for OU 3	$ 1,770,000,000	$ 144,000,000	$ 11,600,000	$ 1,910,000,000
	Alternative (e) for OU 2	$ 250,000,000	$ 10,000,000	$ 805,900	$ 260,000,000
	Sludge Disposal Cell	$ 6,930,000	$ 369,000	$ 29,700	$ 7,300,000
	Total	**$ 2,030,000,000**	**$ 154,000,000**	**$ 12,400,000**	**$ 2,180,000,000**

TABLE 8-2

Estimated Costs Summarized by Alternative

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Alternative	Remedial Actions	Total Capital Cost	O&M Cost (30 Year NPV)	O&M Cost (Annual Average)	Total Cost (30 Year NPV)

Notes:

O&M = operation and maintenance
NPV = net present value
OU 2 = Operable Unit 2
OU 3 = Operable Unit 3

The above costs are presented rounded to three significant figures.

The above cost opinion is a Feasibility-Study-level estimate with a nominal accuracy of –30 percent to +50 percent (–30/+50%).

The above cost opinion is in 2009 dollars and does not include future escalation. The order-of-magnitude cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, the final project scope, the final project schedule, and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

The OU 3 Total Capital Cost includes the Roads and Bridges Costs.
The NPV Sludge Disposal Cell closure costs includes closure of the existing sludge disposal cell.
The NPV Sludge Disposal Cell closure costs are based on the time for the existing sludge disposal cell to reach capacity.
The O&M Cost (Annual Average) is calculated by dividing the O&M Cost (30 Year NPV) by a factor of 12.409 to account for the 30 years at 7%.

TABLE 9-1

Number of Remediated Parcels by Community

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Community	Total Parcels Remediated
Pinehurst[1]	204
Smelterville[1]	305
Kellogg[1,a]	1,113
Wardner[1]	197
Osburn[2,c]	576
Silverton[2]	178
Wallace[2,d]	461
Mullan[2,b]	467
Page[1]	27
Kingston[2]	180
Total	3,708

Notes:

[1] Total as of 2004 from Bunker Hill Second Five-Year Review (USEPA, 2005b*).* Minimal additional work has been completed since 2004.

[2] Total as of 2008 from *2009 Basin Property Remediation Work Plan* (IDEQ, 2009).

[a] Kellogg includes outlying communities such as Elizabeth Park, Montgomery Gulch, and Ross Ranch.

[b] Mullan includes outlying communities of Bingville and East Mullan.

[c] Osburn includes outlying communities of Sunny Slopes, Nuchols Gulch, Twomile Gulch, and Terror Gulch.

[d] Wallace includes outlying communities near Ninemile and Canyon Creeks.

[e] Communities downstream from Cataldo.

TABLE 9-2
List of Side Gulches
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Watershed Name	Closest Community	Existing Infrastructure Summary	Remediated Parcel Estimate
Big Creek	Big Creek	5 culvert crossings (Trail of the Coeur d'Alene River, High Water Rd, Sunshine Mill Complex Access Road, Sunshine Tailing Pond Loop, North American Mine Access) 4,200 lf of stream (upstream from Sunshine tailing pond and repository) 2 miles of total stream runs along remediated properties, tailing pond, and repository	520 lf of remediated properties within 100 feet of stream 2,500 lf of remediated property within 1,000 feet of stream
Willow Creek	East of Mullan	2 culvert crossings (Interstate 90, Friday Ave) 1,500 lf of stream	300 lf of remediated properties within 100 feet of stream 900 lf of stream runs through remediated properties
Elk Creek	Elizabeth Park	5 culvert crossings (Appleburg, E Park Dr, Trail of the Coeur d'Alene River, E Park Dr loop) 6,500 total lf of stream: East Fork Elk Creek - 2,200 lf; West Fork Elk Creek - 4,300 lf	2,700 lf of stream runs through remediated parcels 4,800 lf of stream runs through or adjacent to remediated properties
Moon Creek	Elk Creek	6 culvert crossings (Moon Gulch Rd [2], Loper Rd, Elk Creek Rd, Silver Valley, Interstate 90) 2 miles of total stream runs along area where remediation has been done	4,640 lf of stream runs through remediated parcels 7,800 lf of stream runs through or adjacent to remediated properties
Montgomery Creek	Montgomery Gulch	4 culvert crossings (Swinnerton Gulch Rd, Robinson Creek Rd, Silver Valley Rd, Interstate 90) 2.65 miles (14,000 lf) of stream	1,550 lf of stream runs within 300 feet of remediated properties 3,300 lf of stream runs through remediated properties
Shirttail Gulch	Northeastern Osburn	2 culvert crossings (Steins Rd, Nuchols Gulch Rd) 1,200 lf of stream	1,200 lf of stream runs near nonremediated residential properties
Nuchols Gulch	Nuchols Gulch	6 culvert crossings: 1 under Steins Rd; 3 under private drives; and 2 under Nuchols Gulch Rd 4,750 lf of stream in the vicinity of culvert crossings 3,400 lf of stream from start of remediated area to the SFCDR	1,400 lf of stream runs through remediated properties
Silver Creek	Page	1 culvert crossing (Upper Page Rd) 3,000 lf of stream	3,000 lf of stream runs through remediated properties
Slaughterhouse Gulch	Slaughterhouse Gulch	1 culvert crossing (Main-Wardner St) 1,400 lf of stream	235 lf of stream runs through remediated properties 1,300 lf of stream runs through or adjacent to remediated properties (within 50 feet)
Terror Gulch	Terror Gulch	2 culvert crossings (Sunny Slopes Rd and private area) 4,500 lf of stream	650 lf of stream runs adjacent to remediated properties 1,350 lf of stream runs through remediated properties
Twomile Creek	Twomile	2 to 4 culvert crossings (Nuchols Gulch Rd, residential drives) 5.600 lf of stream	350 lf of stream runs within 250 feet of remediated properties 225 lf of stream runs through remediated properties
Ninemile Creek	Wallace	6 bridge and/or culvert crossings (Ninemile Creek Rd at multiple locations, Zanetiville Loop Entrance, Creekside Rd, Trail of the Coeur d'Alene River, residential drives) 3.6 miles (19,000 lf) of stream from start of remediated area to the SFCDR	1,400 lf of stream runs through remediated properties 2,600 lf of stream runs within 200 feet of remediated properties.
Canyon Creek	Woodland Park	10 culvert and/or bridge crossings (Grays Bridge Rd, Gruber Rd, Burke Rd at multiple locations, Yellow Dog Rd at multiple locations, private drives, residential driveways) 6.9 miles (36,500 lf) of stream from start of remediated area to the SFCDR	150 lf of stream runs through remediated properties 6,900 lf (1.3 miles) of stream runs adjacent to remediated properties within 250 feet
Hunt Gulch	Kingston	7 culvert crossings (Hunt Gulch Rd at two locations, Finlay Loop, Silver Valley Rd, Interstate 90, Riverview Rd, residential driveway) 5,000 lf of stream	850 lf of stream runs through remediated properties 1,400 lf of stream runs within 100 feet of remediated properties
French Gulch	Kingston	4 culvert crossings (Newburn, Beamis, Silver Valley Rd, Interstate 90) 6,000 lf of stream	1,250 lf of stream runs through remediated properties
Government Gulch	Silver King	4 culvert crossings (Interstate 90, McKinley, Government Gulch Rd., Zinc Plant Access) 1 Gabion Dam Over 8,000 lf of stream	1,000 lf of stream runs adjacent to remediated commercial property 7,000 lf of stream runs through nonpopulated remediated property
Bunker Creek	Kellogg	2 culvert crossings with multiple culverts at each crossing. Concrete box culvert discharge to SFCDR	Rails-to-Trails along alignment
Humboldt Gulch	Page	2 culvert crossings (both under Lower Page Rd) 3,750 lf of stream	2,100 lf of stream runs through or adjacent to remediated properties

Notes:

lf = linear feet
SFCDR = South Fork Coeur d'Alene River

TABLE 9-3

Area of Selected Human Health Remedies at Risk during Storm Events

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Community[1]	Area of Existing Remedy (SF)	Estimated Area at Risk during Storm Event (SF)[2]			Percent of Remedy at Risk during Storm Event		
		5-YR	25-YR	50-YR	5-YR	25-YR	50-YR
Pinehurst	3,162,000	685,000	1,313,000	2,152,000	22%	42%	68%
Smelterville	2,591,000	162,000	639,000	1,251,000	6%	25%	48%
Kellogg	10,301,000	92,000	144,000	168,000	1%	1%	2%
Wardner	1,480,000	135,000	135,000	135,000	9%	9%	9%
Osburn	2,475,000	256,000	701,000	859,000	10%	28%	35%
Silverton	786,800	185,000	311,000	617,000	24%	40%	78%
Wallace	773,700	17,000	48,000	103,000	2%	6%	13%
Mullan	1,907,000	164,000	399,000	559,000	9%	21%	29%
TOTAL	**23,480,000**	**1,696,000**	**3,690,000**	**5,844,000**	**7%**	**16%**	**25%**

Notes:

SF = square feet

[1] Communities only include parcels located within investigation areas identified in Section 9.1.3.

[2] Estimated area at risk during flood event was developed using hydrologic and hydraulic models as documented in Appendix G. Values are rounded.

TABLE 9-4

Technologies and Process Options for Remedy Protection

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Technology	Process Option	Description
Creek Channel Modifications		
	Channel Hydraulic Capacity Improvements	Increase cross-sectional area (widening, deepening, increasing bank height, and/or removal of material)
	New Channel	Re-route creek to new channel; develop new channel
	Channel Stabilization - Vegetation	Bank stabilization (vegetation, other)
	Channel Stabilization - Riprap	Bank stabilization (riprap)
	Channel Stabilization - Concrete	Bank stabilization (concrete channel)
	Channel Realignment	Change in channel alignment to remove sharp bend and improve hydraulic capacity of the channel
	Creek Culvert - Box	Concrete box/bridge (new or replacement) for roadways and/or driveway stream crossings
	Creek Culvert - Pipe	Installation of new pipe culverts or replacement of existing culverts with larger sizes
Inlet and Diversion Structures		
	Diversion Structure	Diversion structure for high-flow bypass
	Inlet Structure	New or improved existing inlet structure to collect creek flows
General Drainage Improvements		
	Stormwater Drainage Network	Network of inlets, catch basins, pipes, and vaults for conveyance of local precipitation runoff; either new discharge location or tie into existing system
	High-Flow Bypass Drainage Network	Network pipes and manholes/vaults for conveyance of creek high-flow bypass; either new discharge location or tie into existing system
	Drainage Network Maintenance Improvements to Existing Drainage System	Installation of manhole or cleanout in existing drainage system to allow for more effective cleaning and maintenance of existing infrastructure.
	High-Capacity Stormwater Inlet	Cattle guard or oversized Department of Transportation-type inlet structure to collect runoff; tie into drainage system
	Rolling Dip	Rolling dip on roadway surface to channel water
Road Shoulder Drainage Improvements		
	Road Shoulder - Pavement	Paving of roadway shoulder
	Road Shoulder - Gravel	Replacement of contaminated road shoulder gravel with clean materials.
	Road Shoulder - Armoring	Placement of larger rock along road shoulder to limit scouring
	Paved Roadside Ditches	Paved roadside ditches (asphalt); either add new ditches and/or line existing with asphalt
	Rock-Lined Roadside Ditches	Rock-lined roadside ditches with rock sized for estimated flow velocities and with check dams if necessary
	Curb and Gutter	Curb and gutter network
	Rolled Curb	Rolled concrete curb across driveway approaches
Inspection		
	Visual Observation and Documentation	Observation and documentation of the condition of watersheds and drainage systems

TABLE 9-5

No Further Action (Post-Event Response)–Example Cost Calculation

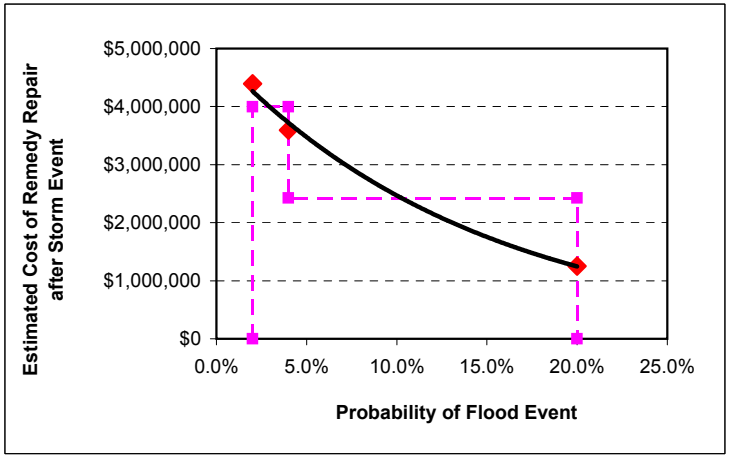
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Calculation of Expected Annual Damage[1]

30-Year Life Cycle Cost

Storm Event (Years)	Probability of Occurrence[2]	Estimated Damage[3]	Frequency Interval[4]	Average Damage for Frequency Interval	Expected Annual Damage
50	2.00%	$4,440,000			
			2.00%	$4,030,000	$80,600
25	4.00%	$3,620,000			
			16.00%	$2,470,000	$396,000
5	20.00%	$1,320,000			
Total					**$476,000**

Real Discount Rate	7%
Target Number of Years for Remedy Protection	30
Present Value of Expected Annual Damage over 30-year Period	**$5,910,000**



Notes:

[1] Calculation of expected annual damage based on method described in *Methodology for Estimating Expected Loss from Damage to Remedies* Memorandum (CH2M HILL, 2009k).

[2] Probability of occurrence calculated based on the percent chance that the storm event will happen in any given year. For example in a single year, there is a 2% probability of experiencing the damage from a 50-year storm event.

[3] Estimated damage values are from modeling outputs and unit cost assumptions discussed in Section 9.6.1.1 and documented in Appendix G.

[4] The frequency interval is the difference between the probability of occurrence for two storm events.

TABLE 9-6

Alternative RP-1: Summary of Costs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Estimated Area of Remedy Affected by Flood Event[1] (SF)			Estimated Cost for Post-Event Response by Flood Event[1]			Total Cost
Community	**5-Year**	**25-Year**	**50-Year**	**5-Year**	**25-Year**	**50-Year**	**(30-Year NPV)[2]**
Pinehurst	685,000	1,313,000	2,153,000	$3,540,000	$6,790,000	$11,130,000	$12,500,000
Smelterville	162,000	640,000	1,251,000	$835,000	$3,310,000	$6,470,000	$5,320,000
Kellogg	92,000	144,000	168,000	$474,000	$745,000	$867,000	$1,410,000
Wardner	135,000	135,000	135,000	$696,000	$696,000	$696,000	$1,550,000
Osburn	255,000	700,000	859,000	$1,320,000	$3,620,000	$4,440,000	$5,910,000
Silverton	185,000	311,000	617,000	$954,000	$1,610,000	$3,190,000	$3,140,000
Wallace	17,000	48,000	103,000	$87,600	$249,000	$534,000	$431,000
Mullan	164,000	400,000	559,000	$848,000	$2,070,000	$2,890,000	$3,520,000
TOTAL							**$ 33,800,000**

Notes:

SF = square feet

[1] From TerraGraphics hydrologic and hydraulic models documented in Appendix G.

[2] Based on methodology described in *Methodology for Estimating Expected Loss from Damage to Remedies* Memorandum (CH2M HILL, 2009k)

NOTE: The above costs are presented rounded to three significant figures.

NOTE: The above cost opinion is a Feasibility Study-level estimate with a nominal accuracy of –30 percent to +50 percent (–30/+50%).

NOTE: The above cost opinion is in 2009 dollars and does not include future escalation. The order-of-magnitude cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, the final project scope, the final project schedule, and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

TABLE 9-7

Alternative RP-2: Summary of Costs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Community	Drainage	Brief Description of Project	Drainage Capital Cost	Total Capital Cost	O&M Cost (Annual Average)	O&M Cost (30-Year NPV)	Total Cost (30-Year NPV)
Pinehurst				$ 2,300,000	$ 68,000	$ 844,000	$ 3,140,000
	Little Pine Creek	Channel hydraulic capacity improvements and culvert replacement	$ 2,300,000				
Smelterville				$ 1,700,000	$ 50,000	$ 620,000	$ 2,320,000
	Grouse Creek	Channel hydraulic capacity improvements (including concrete walls)	$ 1,700,000				
Kellogg				$ 277,000	$ 12,000	$ 149,000	$ 429,000
	Jackass Creek	Channel hydraulic capacity improvements and stabilization with riprap	$ 28,900				
	Italian Gulch[1]	Visual observation and documentation	$ -				
	Portland Road	Asphalt-lined ditches and pipe culvert installation	$ 248,000				
	Localized Drainages[1]	Visual observation and documentation	$ -				
Wardner				$ 110,000	$ 8,000	$ 99,000	$ 209,000
	Milo Creek	High-capacity stormwater inlets and associated below-grade piping	$ 110,000				
Osburn				$ 2,110,000	$ 60,000	$ 745,000	$ 2,900,000
	Shields Gulch	Channel hydraulic capacity improvements, culvert replacement, and new channel alignment	$ 449,000				
	Rosebud Gulch	Channel hydraulic capacity improvements and culvert replacement	$ 409,000				
	Meyer Creek	Below-grade bypass drainage network	$ 1,249,000				
	McFarren[1]	Visual observation and documentation	$ -				
Silverton				$ 4,030,000	$ 108,000	$ 1,340,000	$ 5,370,000
	Revenue Gulch	High-flow bypass drainage network and stormwater drainage network.	$ 3,940,000				
	Unnamed Creek	Channel hydraulic capacity improvements and culvert replacement	$ 93,000				
Wallace				$ 100,000	$ 8,000	$ 99,000	$ 199,000
	Printer's Creek	New inlet structure and drainage system maintenance improvements	$ 100,000				
	Placer Creek[1]	Visual observation and documentation	$ -				
Mullan				$ 3,110,000	$ 87,000	$ 1,080,000	$ 4,190,000
	Mill Creek	Rolling dip, channel hydraulic capacity improvements, concrete-lined channel, and culvert replacement	$ 1,300,000				
	Tiger Creek	Diversion structure, channel stabilization, culvert replacement, and asphalt-lined ditch	$ 129,000				
	Neighborhood Surface Flow Issues[2]	Asphalt-lined ditches, pipe culvert installation, and stormwater catch basins	$ 1,680,000				
TOTAL				**$ 13,700,000**	**$ 401,000**	**$ 4,980,000**	**$ 18,800,000**

Notes:

[1] Only process option is visual observation and documentation. No capital cost. These costs are accounted for in community O&M costs.

[2] Alternative RP-2 includes remedy protection for neighborhood surface flow issues in the following Mullan neighborhoods: 3rd Street, Mill Street, Dewey Street Area, Copper Street, and the south end of 2nd Street.

NOTE: The above costs are presented rounded to three significant figures.

NOTE: The above cost opinion is a Feasibility Study-level estimate with a nominal accuracy of –30 percent to +50 percent (–30/+50%).

NOTE: The above cost opinion is in 2009 dollars and does not include future escalation. The order-of-magnitude cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, the final project scope, the final project schedule, and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

TABLE 9-8

Comparative Analysis of Remedy Protection Alternatives

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Feasibility Criterion	Description of Criterion	Remedy Protection Alternatives	
		ALTERNATIVE RP-1 No Further Action (Post-Event Response Only)	**ALTERNATIVE RP-2 Modifications to Selected Remedies to Enhance Protectiveness (Remedy Protection Projects)**
Threshold Criteria			
Overall Protection of Human Health and the Environment	Ability of alternative to achieve and maintain protection of human health and the environment	Alternative RP-1 would be protective of human health and the environment because the existing Selected Human Health Remedies are currently protective. The risk of exposure to contaminated material for Alternative RP-1 could temporarily increase following a storm event from the time the Selected Remedies were damaged until the post-event response was completed.	Alternative RP-2 would be protective of human health and the environment because the existing Selected Human Health Remedies are currently protective. Additionally, Alternative RP-2 would be more protective of human health and the environment than Alternative RP-1 because it would enhance the long-term effectiveness and permanence of the Selected Remedies by reducing the potential for floods or surface water flow to damage the existing Selected Remedies.
Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)	Ability of alternative to meet location- and action-specific ARARs	Alternative RP-1 could potentially be implemented in compliance with location- and action-specific ARARs. Chemical-specific ARARs were not included as part of this evaluation because the remedy protection alternatives only maintain the existing Selected Remedies.	Alternative RP-2 could potentially be implemented in compliance with location- and action-specific ARARs. Chemical-specific ARARs were not included as part of this evaluation because the remedy protection alternatives only maintain the existing Selected Remedies.
Primary Balancing Criteria			
Long-Term Effectiveness and Permanence	Ability of technology to be protective of human health and the environment without upset over the long term	Alternative RP-1 would provide relatively less long-term effectiveness and permanence. Based on hydrologic and hydraulic models, there are areas of the existing Selected Remedies which are at risk of recontamination due to flooding and uncontrolled surface water flow. Alternative RP-1 would not address this issue of permanence of the existing Selected Remedies, but instead would rely on post-event response to repair the Selected Remedies when damaged.	Alternative RP-2 would enhance the long-term effectiveness and permanence of the Selected Remedies. This alternative would be expected to provide protectiveness to the communities from storm events smaller than the 50-year event.
Reduction of Toxicity, Mobility, or Volume through Treatment	Ability of alternative to reduce mobility, toxicity, or volume of contaminants	Alternative RP-1 would not reduce the toxicity, mobility, or volume of metals contamination through treatment.	Alternative RP-2 would not reduce the toxicity, mobility, or volume of metals contamination through treatment.
Short-Term Effectiveness	Ability of alternative to protect human health and the environment during the short-term time frame	In general, Alternative RP-1 would be effective in the short term because the existing Selected Remedies are currently protective of human health and the environment. Much of the existing infrastructure within communities is under-capacity. Therefore, Alternative RP-1 would allow a relatively higher risk of contaminant mobility within residential areas during and immediately following storm events. Additionally, the risk of exposure could temporarily increase following a storm event until the post-event response is completed.	Alternative RP-2 would be effective in the short term because the existing Selected Remedies are currently protective of human health and the environment. Additionally, Alternative RP-2 would reduce the risk of exposure to contaminated material by protecting the Selected Remedies up to the 50-year storm event. This alternative would effectively convey stormwater and floodwater for storm events smaller than the 50-year event and would reduce the risk of exposure and mobility of contaminants within residential areas.
Implementability	Ability of alternative to meet technical, administrative, and logistical challenges associated with implementation	Alternative RP-1 would not be expected to have any technical feasibility issues. There would be administrative issues regarding the availability of funds to repair the Selected Remedies following a storm event. Additionally, in some cases, the repair of the protective barriers could be time-sensitive in order to maintain protectiveness and limit a resident's risk of exposure.	Alternative RP-2 would not be expected to have any technical implementability issues. The list of technologies and process options applied for Alternative RP-2 are standard engineering practices. There could be administrative issues that arise in regard to which state or local entity will perform and fund the O&M tasks associated with Alternative RP-2. Additionally, there could be logistical challenges to performing Alternative RP-2 on private properties, where access and easement agreements would be needed prior to construction.
Cost	Total Capital Cost for Upper Basin Communities[1]	NA	$13,700,000
	O&M Cost (30-Year NPV) for Upper Basin Communities[1]	NA	$4,980,000
	Total Cost (30-Year NPV) for Upper Basin Communities[1]	$33,800,000	$18,800,000
	Total Capital Cost for Side Gulches[2]	NA	$10,900,000
	O&M Cost (30-Year NPV) for Side Gulches[2]	NA	$4,180,000
	Total Cost (30-Year NPV) for Side Gulches[2]	$16,300,000	$15,100,000
	Total Cost (30-Year NPV)	**$50,100,000**	**$33,900,000**

Notes:

NPV = net present value

NA = not applicable

[1] The costs for Alternatives RP-1 and RP-2 in the eight primary Upper Basin communities include Pinehurst, Smelterville, Kellogg, Wardner, Osburn, Silverton, Wallace, and Mullan.

[2] Side gulch costs for Alternatives RP-1 and RP-2 are approximate based on assumptions discussed in Appendix D of this FFS Report

NOTE: The above costs are presented rounded to three significant figures

NOTE: The above cost opinion is a Feasibility Study-level estimate with a nominal accuracy of –30 percent to +50 percent (–30/+50%).

NOTE: The above cost opinion is in 2009 dollars and does not include future escalation. The order-of-magnitude cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, the final project scope, the final project schedule, and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

TABLE 9-9

Comparison of Alternative RP-1 and Alternative RP-2 Total Costs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Community	Total Costs (30-Year NPV) Alternative RP-1: No Further Action (Post-Event Response)		Alternative RP-2: Modifcations to Selected Remedies to Enhance Protectiveness (Remedy Protection Projects)	
Pinehurst	$	12,500,000	$	3,140,000
Smelterville	$	5,320,000	$	2,320,000
Kellogg	$	1,410,000	$	429,000
Wardner	$	1,550,000	$	209,000
Osburn	$	5,910,000	$	2,900,000
Silverton	$	3,140,000	$	5,370,000
Wallace	$	431,000	$	199,000
Mullan	$	3,520,000	$	4,190,000
Community Total	$	33,800,000	$	18,800,000
Side Gulches[1]	$	16,300,000	$	15,100,000
TOTAL	**$**	**50,100,000**	**$**	**33,900,000**

Notes:

[1] Costs for side gulches included are approximate based on assumptions discussed in Section 9.6 and documented in Appendix D of the FFS Report.

NOTE: The above costs are presented rounded to three significant figures

NOTE: The above cost opinion is a Feasibility Study-level estimate with a nominal accuracy of –30 percent to +50 percent (–30/+50%).

NOTE: The above cost opinion is in 2009 dollars and does not include future escalation. The order-of-magnitude cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, the final project scope, the final project schedule, and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.